

Expert and Government Review Comments on the IPCC WGI AR5 Second Order Draft – Chapter 1

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-1	1	0	0	0	0	Review of the progress of previous IPCC FAR-AR4 shall focus on the improvement of awareness on human activity contributing to climate change. The previous AR findings shall not be separately stated. The original texts shall be cited as possible. [Government of China]	Taken into account - Very vague comments. Box 1.1 is being extensively revised, which should handle the concerns. The purpose in Chapter 1 is to not present the findings from other AR5 chapters but to establish the groundwork based on prior assessments.
1-2	1	0	0	0	0	This introduction to the report should not address findings/results etc. (this is the purpose of the SPM) but should rather introduce the general concepts (e.g. metrics), the tools and methods, the structure of the full report and the logical articulation between chapters (including justifications), and its overall articulation with WG2 and WG3 reports, for readability. It should also indicate clearly what is new in AR5 wrt to AR4 in terms of topics addressed or studied in much more depth, additional information provided, new data available, new scenarios, scientific development/breakthrough/challenges... This chapter could be shorter and much more focused, avoiding by construction possible inconsistencies with other chapters. [Government of France]	Accepted - We agree and have attempted all along to make sure we focused on past findings; we are revising the chapter to ensure it does not get into AR5 findings.
1-3	1	0	0			In general, this Chapter serves a good and useful purpose and will assist readers in understanding subsequent chapters. The sections are each very useful for educated generalists seeking essential background information before reading the more detailed technical chapters. [Government of Canada]	Noted - thank you.
1-4	1	0	1			Consistency in assessment numbers: Because chapter assessments continue to be refined, please check carefully all values (and the uncertainty ranges) carefully between tables, figures, main text, and summary text within your chapter. If numbers are taken from other chapters, please also ensure the latest results are used. Specific examples will be highlighted in our chapter comments. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The text will be checked prior to final publication.
1-5	1	0	2			Treatment of Uncertainty: please follow the IPCC guidance note carefully; use italics to highlight formal uncertainty assessments; use likelihood in conjunction with high/very high confidence only (except in exceptional cases); if likelihood is given for situations where confidence is less than 'high', we recommend to put confidence in brackets at the end of the sentence rather than combining both confidence and likelihood in text. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - italics are used to highlight formal uncertainty assessments. The use of "likely" is avoided, where it does not refer to formal assessments.
1-6	1	0	3			Format of Executive Summary (ES): As agreed at the third lead author meeting, we would ask that all chapters follow a consistent style for the ES. 1) The first sentence (or two) of each paragraph should be bolded to highlight the key message, with the subsequent sentences providing the detailed quantitative assessment. 2) Statements should incorporate the IPCC Uncertainty Language 3) Each paragraph must include a traceability to the underlying sections/subsections where the key message was drawn from (to the second level section heading), indicated using square brackets at the end of each paragraph. 3) Paragraphs should be grouped together under subtitles. The use of bullets should be avoided. 4) Finally, because the ES should be short and concise, lengthy textbook or chapeau type introductory text should be avoided. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - We will aim at doing this in the revised version.
1-7	1	0	4			Cross-chapter references AR5: suggest to update cross-chapter references to not just refer to Chapter number but to refer to specific section if appropriate. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Cross-chapter references are being updated.
1-8	1	0	5			References to AR4 and earlier IPCC assessments: be as specific as possible. Writing just AR4 without any reference is not useful to the reader. Please refer to specific chapter where possible. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the specific chapter is indicated where possible
1-9	1	0	6			Use of acronyms: In order to improve overall readability of the report, we would like to suggest that you please avoid acronyms that are not needed and/or are not used in more than one section of your chapter. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been checked for any acronyms that are not used in more than one section.
1-10	1	0	7			Personal pronouns: our strong preference is to minimize the usage of personal pronouns, e.g., we/us/our to the extent possible. Exceptions to this would be when the Chapter's assessments conclusions are presented as clear summary statements. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the document has been checked for personal pronouns and the text has been rephrased where possible.
1-11	1	0	8			Please make sure to provide updates of relevant data from your chapter that will be collected in Annex II - Climate System Scenario Tables, to the Annex II Chair. Also, please take the time to critically check all the entries in Annex II that are based on your Chapter assessment or that you are using in your chapter	Noted - this does not apply to any of our data.

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						assessment. [Thomas Stocker/ WGI TSU, Switzerland]	
1-12	1	0		0		We appreciate the points that the authors are attempting to make with figures 1.4 and 1.5 as described in the text (Chapter 1, pages 9-10). However, we feel that the figures do not reflect key messages from the report and can very easily be misinterpreted. Therefore, we recommend their deletion. Since these figures (and the supporting figures 1.6-1.8; 1.11) are the only data-driven figures in Chapter 1, it is critical that they bring forward the most important data-driven messages – and in a fully accurate manner. To that end, we see four major concerns with these figures: (1) natural variability on the 20-year timescale can be as large or larger than the anthropogenic contribution to climate change; hence a comparison on this timescale does not accurately assess how well the forced response was projected. In other words, the scenarios that underpin the projections were intended to support centennial projections, not near-term projections; (2) the forcings used in the projections do not match the historical forcings (in particular, the projections overestimated short-lived forcings, creating a tendency for the projections to overestimate warming on the time scale shown in these figures); (3) aligning the values to match the avg observed value in 1990 is quite misleading- values should be aligned so that 1961-1990 mean of the obs lines up with 1961-1990 mean of projections. Since 1990 was unusually warm, this would shift the projections downwards. (i.e., for 1990, projections would be a little lower than obs); and (4) the figure is likely to be misinterpreted as presenting the results of a model evaluation exercise, which for the reasons just stated, it does not. If the authors find deletion unacceptable, we strongly urge them to consider the following changes to the figures in order address these concerns: (a) Extend the x-axis of the figure to 2100, or at least several more decades, to more accurately reflect the timescales for which the SRES scenarios were developed. Insets may be created that zoom in on the 1990-2015 timeframe, but these insets would appropriately highlight how this small time period fits into the bigger picture; (b) Extend the x-axis back to either 1970 or even 1850- along with all relevant observational data- to put the 1990-2015 timeframe into the appropriate context for the reader. As above, insets could be developed that would depict the 1990-2015 time period in the appropriate context; (c) as an alternative to (a), terminate the projection envelopes at the most recent year observations are available (2011) rather than extending them to 2015 for which we have projections but no observational data; (d) Reverse the color scheme such that the 90% uncertainty estimate (currently grey) is represented by a vibrant color and the projections from the various IPCC assessments are represented by various shades of grey tone. The current color scheme draws the reader's eye to the scenarios. Based on the text, we believe that the authors intended for the reader to pay greater attention to the 90% uncertainty estimate; (e) Consider adding a curve with adjusted temperature data along the lines of Foster and Rahmstorf (2011) that corrects for known short-term variations in global average temperature (e.g., El Niño/Southern Oscillation) and, therefore, better illustrates the trend in global average temperature. [reference: G. Foster, and S. Rahmstorf, 2011: Global temperature evolution 1979–2010, Environmental Research Letters, 6(4), 044022, http://dx.doi.org/10.1088/1748-9326/6/4/044022] [Government of United States of America]	Accepted - Figure 1.4 has been extensively revisited and redrawn. Figure 1.5 has been dropped.
1-13	1	0		0		The information contained in the Likelihood table (Table 1.1) and Confidence figure (Figure 1.12) is critical to interpreting conclusions throughout the document. This information should be repeated in the front of the SPM, the TS and each Chapter and the terminology should be applied consistently. [Government of United States of America]	Noted - the comment is passed to the other chapter CLAs.
1-14	1	0		0		This chapter seems caught between being purely "introductory" and "summary". In terms of summary, reading this chapter leaves the impression that little has changed since AR4 (in either the science or the conclusions). This is despite important changes described throughout the document. If this chapter is to include summary aspects, it should prioritize and include key findings and discoveries. [Government of United States of America]	Accepted - the chapter is not intended to serve as a summary of the report. The chapter is revised in several sections to account for this.
1-15	1	0		0		It was surprising that the first mention of information that is new to AR5 came on page 1-8 (line 34). Please consider consolidating all of the important "new information" and providing it early in the document (i.e. this chapter). This could really impact the value of this chapter by alerting readers early on as to the important advances since AR4. Alternatively, leave this chapter as only introductory in nature. [Government of United States of America]	Accepted - the chapter is not intended to serve as a summary of the report instead indeed it should be understood as introductory in nature. The chapter is revised in several sections to account for this.
1-16	1	0				General comment on the chapter: there are explanatory text pieces for various meteorological/climatic and mathematical terms (climate, confidence, density etc.), however, it is rather uneven to what extent such	Accepted - We are examining the text to make sure it flows better.

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						explanations are very simplistic (for non-experts) or less simplistic. On other occasions, much more complicated terms are not explained at all. I do not the solution, but it would good to determine better the intended "target group" for the AR5, its volumes or only for the SPMs, Intros and FAQs and accommodate the style to them. [Tibor Farago, Hungary]	
1-17	1	0				Misprints etc. introduced by * [Tibor Farago, Hungary]	Accepted - Text has been revised.
1-18	1	0				An excellent beginning !!. This section is a good job. The authors have a good starting that cause to be ready for the reading the other section, congratulation to authors! [Rahimzadeh Fatemeh, Iran]	Noted - thank you.
1-19	1	0				I think that Chapter 1 should contain a section that addresses typical arguments that have been used to publicly criticize AR4 (e.g. "it is all caused by the sun, cosmic rays, volcanoes etc.", "more CO2 is good", "nothing is happening", "humans are not the cause". This could also be a point in the FAQ. It should be placed prominently in Chapter 1 as this is most likely to be read by media people or the general public. [Dietrich Feist, Germany]	Rejected - Dealing with these issues is beyond the scope of this chapter based on how the agreed upon approach for the chapter from the IPCC.
1-20	1	0				Section 1.4 and 1.5 sould be exchanged. This would be a more logical order. [Dietrich Feist, Germany]	Rejected - it is not possible to change the sequence which was agreed upon by the IPCC.
1-21	1	0				The limitation of not having ice sheet models including ice streams and the fact that ice sheets models are poorly represented (and not interactively) in Earth System Models is not mentioned as an important knowledge gap in the chapter. [European Union]	Taken into account - Statement added to section 1.5.2 about the ongoing enhancement of processes in ESMs.
1-22	1	0				An important aim of this chapter is to discuss (and somehow defend) scientific practice. It should refer more to the refereed literature of epistemology. Check the words r"easonable" and "appropriate". [Government of France]	Taken into account - This is a science document that sticks to the scientific approach for discussing knowledge, and it does not purposefully get into philosophical terminology or discussion.
1-23	1	0				Please notify the reader that annexes providing a glossary and a list of acronyms exist. [Government of Germany]	Accepted - the information has been added in the executive summary.
1-24	1	0				Key messages tend to get lost in the details. There are many important facts and new scientific insights on climate change, yet the role that humans play in climate change does not come out directly and clearly – it is often implicit, as described through activities and sectors. However, the role of humans in developing fossil fuel-intensive energy and transport systems, land use changes, etc. seems to be taken for granted. Direct reference to individual and collective responsibility (humans and certain societies as the drivers of climate change) is missing, although there is an extensive scientific literature on this. This leaves the audience without a clear message on how humans and societies influence changes in average climate and in extremes. [Government of NORWAY]	Rejected - this is not the task of Chapter 1.
1-25	1	0				This chapter is generally well ordered and written but should be shortened significantly [Government of United Kingdom of Great Britain & Northern Ireland]	Rejected - the page limits are given by the TSU and are not exceeded.
1-26	1	0				Description of the RCPs is too technical. It would be useful to include a simpler, less technical and more accessible for non-specialists. [Government of United Kingdom of Great Britain & Northern Ireland]	Rejected - RCP discussion is important to the rest of the assessment, so has to be more technical than some readers might prefer.
1-27	1	0				Chapter reads well and figures are clear. I have indicated some instances where the text can be made more clear or precise. [Albert Klein Tank, Netherlands]	Noted - thank you.
1-28	1	0				after having reviewed the WG 1 SOD chapters 1, 2, and 4 I did not find any major conclusions and formulations of results in need for corrections or improvements [Herbert Lang, Switzerland]	Noted - thank you.
1-29	1	0				Figures are more attractive and informative, thanks for the effort [Belén Martín Míguez, Spain]	Noted - thank you.
1-30	1	0				(Entire chapter) The captions for most figures are far too long. Reduce them and make corresponding additions to the text as required. [John McLean, Australia]	Rejected - the figure captions are requested to be self-consistent and as requested by the IPCC guidance notes on figures cannot rely on information given in the text. See several comments below that

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							suggest to move information from the text to the figure caption.
1-31	1	0				[No comment - merely entry on blank line to ensure that processing doesn't abort at this point.] [John McLean, Australia]	Noted - thank you.
1-32	1	0				[No comment - merely entry on blank line to ensure that processing doesn't abort at this point.] [John McLean, Australia]	Noted - thank you.
1-33	1	0				The is a great introductory chapter. Particularly noteworthy are the extensive discussion of uncertainties (both observational and modeling), and the recent advances in both measurement and modeling capabilities. [Kenneth Minschwaner, United States of America]	Noted - thank you.
1-34	1	0				Annex II. In your discussion of RCPs and related emissions scenarios, please refer ahead to Tables All.2.1-22 (as a group is OK). Also please double check the values and units (e.g., Tg(N) vs. Tg(NO2) for NOx or Tg(C) vs. Tg for the BC/OC/NMVOCs: Table All.2.1a: Anthropogenic CO2 emissions from fossil fuels, other industrial sources (FF) (PgC yr-1) Table All.2.1b: Anthropogenic CO2 emissions from agriculture, forestry, land use (AFOLU) (PgC yr-1) Table All.2.1c: Anthropogenic total CO2 emissions (PgC yr-1) Table All.2.2: Anthropogenic CH4 emissions (Tg yr-1) Table All.2.3: Anthropogenic N2O emissions (TgN yr-1) Table All.2.4: Anthropogenic SF6 emissions (Gg yr-1) Table All.2.5: Anthropogenic CF4 emissions (Gg yr-1) Table All.2.6: Anthropogenic C2F6 emissions (Gg yr-1) Table All.2.7: Anthropogenic C6F14 emissions (Gg yr-1) Table All.2.8: Anthropogenic HFC-23 emissions (Gg yr-1) Table All.2.9: Anthropogenic HFC-32 emissions (Gg yr-1) Table All.2.10: Anthropogenic HFC-125 emissions (Gg yr-1) Table All.2.11: Anthropogenic HFC-134a emissions (Gg yr-1) Table All.2.12: Anthropogenic HFC-143a emissions (Gg yr-1) Table All.2.13: Anthropogenic HFC-227ea emissions (Gg yr-1) Table All.2.14: Anthropogenic HFC-245fa emissions (Gg yr-1) Table All.2.15: Anthropogenic HFC-43-10mee emissions (Gg yr-1) Table All.2.16: Anthropogenic CO emissions (Tg yr-1) Table All.2.17: Anthropogenic NMVOC emissions (Tg yr-1) Table All.2.18: Anthropogenic NOX emissions (TgN yr-1) Table All.2.19: Anthropogenic NH3 emissions (TgN yr-1) Table All.2.20: Anthropogenic SOX emissions (TgS yr-1) Table All.2.21: Anthropogenic OC aerosols emissions (Tg yr-1) Table All.2.22: Anthropogenic BC aerosols emissions (Tg yr-1) [Michael Prather, United States of America]	Accepted - We have double-checked the values given in our chapter to be consistent with Annex II. References to the Tables are given at the respective occurrences.
1-35	1	0				Overall from what I've read (mainly chapters 1 and 3) I get the impression that that these mega-author reports from the IPCC have had their day and that the IPCC needs to review its method of reporting in future. I don't recall ever seeing a report from any organisation that has so many authors organised under such an unwieldy structure. When I look at the names in Chapter 3 I see some undoubted experts in their fields, but I'm not convinced that they all have either the necessary contextual understanding, the dedicated interest or the required writing skill for this job. And when I read the chapter it shows. Unfortunately it's now too late to change things for AR5. [Toby Sherwin, United Kingdom]	Noted - Opinion that does not reflect on the text per se.
1-36	1	0				Consideration could be given to interchanging 1.4 and 1.5. 1.5 links naturally to 1.3; 1.4 stands more alone. [Adrian Simmons, United Kingdom]	Rejected - it is not possible to change the sequence which was agreed by the committees. See comment 1-20.
1-37	1	0				in general well explained and synthesized! [CLAUDIA STUBENRAUCH, France]	Noted - thank you.

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1-38	1	0				It is essential that Chapter 1 provide a clearly and accurate historical perspective on climate science and succinctly describe the additional scientific knowledge that has been acquired since AR4. In the First Order draft, parts of Chapter 1 - in particular, the Executive Summary - were unevenly written. I commend the Authors on the revisions they have made; the current draft of Chapter 1 is excellent. [Robert Waterland, United States of America]	Noted - thank you.
1-39	1	1	1	25	25	This chapter is much improved over the FOD version. The authors are commended for their efforts [David Bader, United States of America]	Noted - thank you.
1-40	1	1	1	55	12	Generally this is a very good chapter with useful summaries of the report. It is interesting and easy to read . Figure 9 is excellent and very clearly shows the impact of climate change on temperature and precipitation. Table 1.3 is also very useful in covering some key topical issues. [Dawei Han, United Kingdom]	Noted - thank you.
1-41	1	1	32		33	Insert what is in BLOCK LETTERS: .."new observations ..surrounding" THE UNBDERSTANDING OF [Sucharita Ghosh, Switzerland]	Accepted - text added.
1-42	1	1	33		37	A 'confidence level' is quantitative, e.g. 'confidence interval'. Here, confidence is further categorized to an ordinal scale. [Sucharita Ghosh, Switzerland]	Taken into account - See section 1.4 for explanation.
1-43	1	1		100		To emphasize the new findings of the AR5, it will be nice to have one chapter to summarize the same and different results with the AR4. [Joshua Xiouhua Fu, United States of America]	Accepted - text revised. The revised text includes a better description of findings from prior assessments to compare with the later findings from AR5. However, Chapter 1 does not do the comparisons of AR5 with those prior assessments -- that must be done through the TS and the SPM.
1-44	1	1				In general it would be beneficial to have more emphasis on CO2 (as opposed to general energy balance/fluxes), as this is the core of anthropogenic-induced climate change. [JOSHUA FISHER, United States of America]	Taken into account - Later chapters give more extensive discussion of CO2 and the carbon cycle.
1-45	1	1				(E.G. ESTIMATES OF TREND CURVES) "short timescale ..." [Sucharita Ghosh, Switzerland]	Taken into account - not clear where this statement occurred, but it has been rewritten.
1-46	1	1				Comment to the author: Note that, the natural process itself will go on with or without the capability of the observer [Sucharita Ghosh, Switzerland]	Noted - Of course, but we don't see an issue with the text as written.
1-47	1	1				to observe it. Only the precision of a statistical estimate will increase with increased sample size [Sucharita Ghosh, Switzerland]	Noted - same response as 1-46
1-48	1	1				(i.e. as new obserbvations come in). [Sucharita Ghosh, Switzerland]	Noted - same response as 1-46
1-49	1	2	0			Executive Summary: The ES seems to lack a paragraph highlighting the road map of the WGI contribution to AR5, i.e., highlighting the WGI groups of Chapters as presented in Section 1.6 from Observations to Process Understanding, to Forcing to D&A, to Global and Regional Projections, to the Synthesis Chapters. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the information is provided in the revised Executive Summary.
1-50	1	2	0			Executive Summary: The ES currently lacks lines of cite to the underlying Chapter sections. Each paragraph must include a traceability to the underlying sections/subsections where the key message was drawn from (to the second level section heading), indicated using square brackets at the end of each paragraph [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the specific sections have been referred to.
1-51	1	2	1	2	51	The Executive Summary does not refer to sections in the main body of the report, which makes it more difficult to trace statements made in the ES. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Accepted - the specific sections have been referred to.
1-52	1	2	1	2	53	The tone of this chapter is very defensive and often uses confrontational wording, like "Incontravertable" in line 12. Though people may be trying to contravert this evidence, the role of this chapter is not to defend it, but rather to provide an introduction to the topic. [Sarvesh Garimella, United States of America]	Accepted - text revised. Incontrovertible changed to Unequivocal to provide better clarity.
1-53	1	2	1	2	53	This Executive Summary is extremely important and it has the potential to tell that integrated story about	Rejected - The reviewers seem to misunderstand the

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						climate change, what changes are we seeing, why are these changes taking place and what does the scenarios tell us about future changes. Thus providing the reader with that broad picture on climate change and thus setting the stage for the entire report. However, please consider to devote some more space for this, and less for description of methods, tools and treatment of uncertainty. [Government of NORWAY]	purpose of Chapter 1. It is not intended to be a summary of all of the findings from the assessment. That will be done in the SPM.
1-54	1	2	3	2	4	What is "theoretical evidence"? I recommend "... observations, theoretical evidence ..." → ".... observations, theoretical analysis ...". [Martin Juckes, United Kingdom]	Accepted -The text has been revised.
1-55	1	2	3	2	5	the last part of the sentence starting from 'and to further strenghten' is irritating. delete 'basis' and insert 'prove' [Government of Germany]	Accepted - Sentence has been rewritten.
1-56	1	2	3	2	5	The statement that scientific knowledge is increasing and strengthening the basis for human activities "being" the primary driver of climate change is incorrect. This is a pedantic point, but it is important here. The basis for human activities being the primary driver is greenhouse gas emissions, not our knowledge of them. Scientific knowledge is, on the other hand, increasing and strengthening the basis for statements about the extent to which human activities drive climate change. In the terminology that is clarified later in the chapter, scientific knowledge is primarily about increasing confidence. In some cases it also decreases uncertainty – but not necessarily. It could also be argued that the "primary driver" of climate change on a local scale is natural variability. The implied split between "scientific knowledge" and other kinds of knowledge is awkward – "scientific advances" would be more appropriate. E.g. "scientific advances derived from have continued to increase confidence in expert judgements of the climate variability driven by human activities'. [Martin Juckes, United Kingdom]	Accepted - Sentence has been rewritten.
1-57	1	2	3	2	5	<p>The Second Order Draft acknowledges strong evidence of solar forcing beyond TSI but still needs to take account of the implications</p> <p>In a huge improvement over the First Order Draft, the SOD acknowledges strong evidence for a solar forcing more powerful than the slight variance in Total Solar Insolation. Both drafts cite a few papers that find correlations between solar activity and climate, but the SOD now adds the following sentence (p. 7-43, lines 2-4):</p> <p>"The forcing from changes in total solar irradiance alone does not seem to account for these observations, implying the existence of an amplifying mechanism such as the hypothesized GCR-cloud link."</p> <p>This important acknowledgment requires corresponding changes throughout the report that have still not been made. The main conclusion of the entire report, stated in the first line of the Executive Summary, is that advances since AR4 "further strengthen the basis for human activities being the primary driver in climate change" (p.1-2, lines 3-5, unchanged from the FOD).</p> <p>This conclusion is a direct result of the Chapter 8 assertion that: "There is very high confidence that natural forcing is a small fraction of the anthropogenic forcing." (Page 8-4, line 54.) As the next three lines in Chapter 8 explain, this assertion is arrived at by comparing anthropogenic forcings only to TSI and volcanic aerosols (p. 8-4, line 55-57):</p> <p>"In particular, over the past three decades (since 1980), robust evidence from satellite observations of the TSI and volcanic aerosols demonstrate a near-zero (–0.04 W m–2) change in the natural forcing compared to the anthropogenic AF increase of ~1.0 ± 0.3 W m–2."</p> <p>But as the SOD now acknowledges, there is strong evidence for solar forcing more powerful than TSI. That evidence invalidates any comparison between natural and anthropogenic forcings that does not include any solar effects but TSI. Thus the chapter 8 premise needs to be altered: there can be no "high confidence" that natural forcing is a small fraction of the anthropogenic forcing. And the Executive Summary conclusion must be similarly altered: the accumulation of evidence for a solar forcing beyond TSI does not "further strengthen the basis for human activities being the primary driver in climate change," but weakens it considerably.</p>	Rejected - this comment really relates to other chapters and has little effect on Chapter 1. The argument is also misleading and misrepresentative of current scientific understanding.

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						<p>How much? As I noted in my FOD comments, dozens of studies have found correlations of .4 to .7 between solar activity and various measures of climate (temperature, rainfall, etcetera). That is, solar activity "explains" in the statistical sense something like half of all past temperature change and there is no reason to think that the last century was any different. Solar activity was persistently high and the planet did a modest amount of warming. Now that the sun has gone quiet, warming seems to have stopped. The rough outlines fit well with a solar explanation.</p> <p>If this temperature history is half due to the sun, that cuts in half the amount of warming that could be attributable to CO2, diminishing the implied climate sensitivity accordingly, and in the absence of a hypersensitive climate there is absolute nothing to fear from CO2. Any modest amount of warming is good. The only actual danger would be runaway warming, driven by a high climate sensitivity, and any substantial solar-warming effect takes that possibility completely off the table.</p> <p>The real danger is that solar variation might well turn out to be a MORE powerful climate driver than the human contributions to atmospheric CO2, in which case our now quiescent sun portends a period of global cooling, which we know from the planet's history of glaciation really can feed on itself in runaway fashion and really is something to worry about.</p> <p>What has become clear since AR4 is 1) that there has been a cessation of warming (whether temporary or long term) and 2) the growing mountain of evidence for some mechanism of solar forcing far more powerful than the slight variation in TSI. AR5 recognizes that evidence, now it needs to also recognize the implications: we can have NO confidence that anthropogenic forcings are greater than solar forcing and hence no confidence that human activity is the primary driver in climate change. If the report is to be honest, this needs to be stated right in the first line of the Executive Summary. [Alec Rawls, United States of America]</p>	
1-58	1	2	3	2	51	This is all good stuff but the summary has a somewhat self congratulatory tone. I would change the uncertainty paragraph to address existing limitations more explicitly [Piers Forster, United Kingdom of Great Britain & Northern Ireland]	Taken into account - The Executive Summary just provides an overview of the broad state of understanding; it is not intended to be more than that. A lot of the ES has been rewritten.
1-59	1	2	3		4	The first lines may be better-written 'Since the Fourth Assessment Report (AR4) of the IPCC, the scientific knowledge derived from observations, theoretical evidence, and modelling studies has continued to increase. This increase in knowledge has further strengthened the basis for human activities as being the primary driver of climate change.' This comment also holds for the text on page 1-3. [Paul Stoy, United States of America]	Accepted - Sentence has been rewritten
1-60	1	2	4	2	4	?missing word at the end of the line: 'understanding'? [Helga Nitsche, Germany]	Accepted - Sentence has been rewritten
1-61	1	2	4	2	5	The ending of this phrase should be written more clearly, as in page 3 line 6 [Maira Evelina Doyle, Argentina]	Accepted - Sentence has been rewritten
1-62	1	2	4	2	5	This is such an important message to get across to the reader and it provides that important context for the discussions that follows in WGI, WGII and WGIII. As it reads now it lacks a word either conclusion or evidence. Suggest making the statement clearer and alternatively use the wording under 1.1: "Since the last assessment, the scientific knowledge gained through observations, theoretical evidence, and modeling studies has continued to increase and to further strengthen the evidence that human activities are the primary driver in the ongoing changes in climate". [Government of NORWAY]	Accepted - Sentence has been rewritten
1-63	1	2	5	2	5	I am missing a clear definition of the term "climate change" in this chapter. In this sentence the term is misleading I would say because what is meant here is "global warming". Two definitions could be: "Global Warming" is an increase in the global annual average heat content measured in Joules. "Climate Change" is any multi-decadal or longer alteration in one or more physical, chemical and/or biological components of the climate system. [Marcel Crok, The Netherlands]	Rejected - We meant exactly what we said. Climate change is a whole lot more than just warming temperatures.
1-64	1	2	5	2	5	I suggest a rewording of the sentence "...human activities being the primary driver in climate change" in order to account for possible natural drivers (e.g. volcanic eruptions) [Jan Fuglestedt, Norway]	Accepted - Sentence has been rewritten
1-65	1	2	5	2	5	"in the ongoing climate change" would be more adequate [Government of France]	Accepted - text revised. This comment is probably

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							related to Page 3 and not Page 2.
1-66	1	2	5	2	5	The "primary driver" is true only for the past decades (since 1950s); this should be added. [Albert Klein Tank, Netherlands]	Accepted - Sentence has been rewritten
1-67	1	2	5	2	6	"At the same time": there is nothing new in this sentence – clarify or delete. [Martin Juckes, United Kingdom]	Accepted - the text was clarified.
1-68	1	2	8	2	10	It is critical to get in here that the changes in atmospheric concentrations and in the energy budget comes from changes in emissions. Suggested wording could be something like the following: "...human activities are affecting the Earth's energy budget THROUGH EMISSIONS THAT CHANGES the atmospheric concentrations of radiative important gases and aerosols and THROUGH land surface CHANGES. [Government of NORWAY]	Taken into account - Sentence has been rewritten
1-69	1	2	8	2	20	This part should be deleted, as chapter 1 should not duplicate the SPM, or rewritten ; it should clearly separate the detection of climate change from the attribution of this change to anthropogenic emissions. The latter attribution is mainly justified by the agreement between observations and models, as clearly stated in the SPM and several chapters of this report. This major argument is not presented in this paragraph. [Government of France]	Accepted - Text has been revised to enhance reference to prior assessments. There is nothing new stated in this paragraph but it does provide context.
1-70	1	2	8	2	20	This part should be deleted, as chapter 1 should not duplicate the SPM or entirely rewritten ; it should clearly separate the detection of climate change from the attribution of this change to anthropogenic emissions. The later attribution is mainly justified by the agreement between observations and models, as clearly stated in the SPM and several chapters of this report. This major argument is not presented in this paragraph. [Michel Petit, France]	Accepted - Text has been revised to enhance reference to prior assessments. There is nothing new stated in this paragraph but it does provide context.
1-71	1	2	9			Change "radiatively important" to "energy absorbing" or just "radiative". [JOSHUA FISHER, United States of America]	Rejected - The text is better as is.
1-72	1	2	10	2	11	suggest to repeat here that this statement is based on the results from previous assessments to avoid the impression that this refers to the AR5 assessment presented in the following chapters. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been added.
1-73	1	2	12	2	12	These are all systems that exist, or are there any more? [Albert Klein Tank, Netherlands]	Rejected - We think the current text is adequate for this. No change needed.
1-74	1	2	12	2	13	The term 'incontrovertible evidence' should be replaced by a standard confidence/likelihood statement, eg unequivocal. [Government of Australia]	Accepted - Text revised.
1-75	1	2	12			"Incontrovertible" is a rather unusual word (I had to look it up). Better use a synonym like "indisputable". [Dietrich Feist, Germany]	Accepted - Text has been revised.
1-76	1	2	12			systems' could be removed without loss of meaning. [Paul Stoy, United States of America]	Accepted - Sentence has been revised.
1-77	1	2	13	2	13	About the expression: "...carbon dioxide, methane, nitrous oxides and chlorofluorocarbons have increased over the last 200 years", I consider that not all mentioned greenhouse gases have always increased over the period of 200 years (see the corresponding Figure SPM.1 in AR4-WGI). I understand that Authors tried to present a general statement, but it must be more precise in the sense that the increase was as a mean value (since short period oscillations can be seen in the concentrations, mainly at the beginning of the considered period and even a mean decrease for Nitrous oxide). Also, since "200 years" is a precise time interval, it is probably better to say "in the last centuries" (or to put a more precise value, after a detailed analysis of each GHG). Chlorofluorocarbons were introduced in the atmosphere in the last century, not in the last 200 years. I suggest Authors to make a specific description of the time period for these contaminant gases. [Rubén D Piacentini, Argentina]	Taken into account - We do not say that they "always" increased. Absolute precision on when the increases occurred is not needed for this general statement. However, we did modify the sentence regarding the last few centuries suggestion.
1-78	1	2	14	2	16	Some numbers on how much GHG and temperature have increased would be good. [Dietrich Feist, Germany]	Rejected - This is covered in depth in later chapters. You are referring only to the Executive Summary of Chapter 1 where such details are not necessary for the point being made.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-79	1	2	14	2	17	From chapter 2, 3 and 10, it clearly showed that the global average land surface temperature were rising at a slower rate in the period since 1998 than in the period from the 1950s to the end of the 20th century. In our view, although it does not mean that the global climate change mainly characterized with warming has ceased or reversed in trend, yet the above observed fact of wide concern since the AR4 should be elaborated on or explained in this paragraph. [Government of China]	Rejected - The details of the temperature trend update belongs in Chapter 2, not in the ES for Chapter 1.
1-80	1	2	14			"atmospheric" should be changed to "tropospheric" because stratospheric temperatures have NOT increased over the past 100 years [Government of United States of America]	Taken into account - Text changed to include "surface" which is more precise in the sentence as written.
1-81	1	2	15	2	16	The heat content measured by the ARGO buys is roughly flat, see C. Loehle, Energy and Environment, 20 (2009) 101 – Willis, J.K. Geophys. Res. Lett. 37 (2010) L06602 – Knox, R.S., D.H. Douglass, Int. J. Geosciences 1 (2010) doi:10.4236/ijg2010.00000. [François Gervais, France]	Rejected - This flattening in all of the data is only since 2004 (see Lyman et al., 2010) and even then there is still an increase since 2004 (see http://oceans.pmel.noaa.gov).
1-82	1	2	15	2	16	Papers reporting on ocean temperatures show mixed findings, some say cooling and some warming. [John McLean, Australia]	Rejected - We agree that some ocean areas are cooling and others are warming, but we only mentioned the global mean trend. No change in text.
1-83	1	2	16			Start a new sentence after "... heat content of the oceans." [Dietrich Feist, Germany]	Accepted - The text has been revised.
1-84	1	2	17	2	17	"Global heat content" of what? [Albert Klein Tank, Netherlands]	Accepted - The sentence has been revised for better clarity.
1-85	1	2	18	2	18	Change "...in situ observations..." to "...in situ measurements..." [James Renwick, New Zealand]	Accepted - The text has been revised.
1-86	1	2	18	2	19	This sentence suggests that the Arctic and Antarctic sea ice extents have both decreased during the last few decades, which is not the case (see Chapter 4). [Thierry Fichefet, Belgium]	Accepted - The text has been revised.
1-87	1	2	18	2	19	"Observations from satellites and in situ observations show a trend of significant reductions in most glaciers, in sea ice, and in ice sheets (especially in the Arctic region)." It should be made clear that the reduction in sea ice is only in the Arctic. [Government of Australia]	Accepted - The text has been revised.
1-88	1	2	18	2	19	reductions in most glaciers -- in what? Number of glaciers, length, ice volume? Please clarify. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The text has been revised.
1-89	1	2	19	2	19	This sentence may be misleading. Sea ice extent is decreasing only in the Arctic, it is increasing in the Southern Ocean. [Hugues Goosse, Belgium]	Accepted - The text has been revised.
1-90	1	2	19	2	19	?missing word at the end of the line: 'to'? [Helga Nitsche, Germany]	Rejected - Sentence ok as is.
1-91	1	2	19	2	20	After "Paleoclimatic reconstructions have ... of natural climate variability" there should be one more sentence expressing where today's climate is with respect to that palaeoclimatic record: within the natural variability or far outside? [Dietrich Feist, Germany]	Rejected -The paleo chapter discusses this assessment of the trend. It does not belong in Chapter 1.
1-92	1	2	22	2	28	Isn't this too rosy a picture? I think the sentences need to be qualified this somehow. [Olivier Boucher, France]	Accepted - Sentence has been revised.
1-93	1	2	22			in' could be replaced with 'over'. [Paul Stoy, United States of America]	Accepted - The text has been revised.
1-94	1	2	23			observations of the Earth system' would be more complete. [Paul Stoy, United States of America]	Accepted - Text has been revised.
1-95	1	2	25			Maybe it is better here 'geological' than historical'. [JAVIER MARTIN-VIDE, SPAIN]	Rejected - but text has nonetheless been revised.
1-96	1	2	27	2	28	We suggest adding "better" to "estimates". Otherwise this could be interpreted as stating that previous assessments have not provided estimates of uncertainties in climate change projections. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-97	1	2	27			I feel that 'physical, chemical and biological processes' would be a more accurate description. [Paul Stoy, United States of America]	Accepted - The text has been revised.
1-98	1	2	30	1	30	by' should be 'on' [Peter Burt, United Kingdom]	Accepted - The text has been revised.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-99	1	2	30	2	32	"resolved at a variety of rates": it is not clear what is meant here – "resolved" as in cleared up or "resolved" as in "measured". I think the sentence would be clearer if you omitted most of the first phrase, leaving: "Consequently, new observations may ... ". [Martin Jukes, United Kingdom]	Accepted - The text has been revised.
1-100	1	2	30	2	32	We find this is a rather awkward sentence: "Uncertainties are ... resolved at a variety of rates...rather than at a single, predictable rate". We don't understand what you are trying to convey here. What does it for example mean that "Uncertainties are resolved..." [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Text revised already based on comment 1-100.
1-101	1	2	30	2	39	This is a vague technical paragraph. I would explicitly address remaining uncertainties and limitations of the science head on. E.g. start by saying "Despite significant progress in observations, modelling and process understanding significant uncertainties remain...." [Piers Forster, United Kingdom of Great Britain & Northern Ireland]	Accepted - The text has been revised to make this paragraph clearer.
1-102	1	2	31	2	32	This sentence should be reduced to the mention of the critical re-examination [Government of France]	Accepted - The text has been revised to make this paragraph clearer.
1-103	1	2	37	2	38	"provide a quantified measures" should be "provide a quantified measure" [Sonya Legg, United States of America]	Editorial - Copyedit to be completed prior to publication
1-104	1	2	37	2	38	typo: ... provide 'quantified measures' or provide 'a quantified measure' [CLAUDIA STUBENRAUCH, France]	Editorial - Copyedit to be completed prior to publication
1-105	1	2	37			"expert judgement" is a qualitative, not quantitative measure [David Bader, United States of America]	Accepted - Sentence has been revised.
1-106	1	2	37			*Likelihood(s) provide a quantified measure(s) .. [Tibor Farago, Hungary]	Accepted - The text has been revised.
1-107	1	2	38	2	38	typo "measures" [Albert Klein Tank, Netherlands]	Accepted - The text has been revised.
1-108	1	2	38			I'm probably pissing into the wind here, but since the vast majority (?) of the quantified assessment of uncertainty referred to here has been performed within the Bayesian paradigm, is it not rather confusing to use the term "likelihood" in such a non-standard (at least from the Bayesian POV) manner? Why not just "probability" here? It appears that you are using these two terms interchangeably, so one consistent choice would seem preferable. Putting it another way, when you say "likelihood", do you mean something distinct from "probability"? [James Annan, Japan]	Rejected - We use the official language on uncertainty that was determined by IPCC for this assessment.
1-109	1	2	39	2	39	"expert judgement"? But who decides who is an expert? Laframboise showed that IPCC 4AR had lead authors who had insufficient experience to be called expert. Your statement is not robust. [John McLean, Australia]	Rejected -No change necessary. Expert judgment is always an important element in an assessment. Not everyone on each chapter has all of the knowledge, but the collective knowledge does win out.
1-110	1	2	41	2	41	Do NOT use the term "computer models". The models you refer to are not models of computers. Further, engineering models are run on computers but are not called "computer models" but "engineering models". [John McLean, Australia]	Accepted - Text has been revised.
1-111	1	2	41	2	42	"Each IPCC assessment has provided new computer model projections more advanced. The range of climate projections from [FAR]...": the projections are provided by WCRP and assessed by the IPCC. It is very important to avoid perpetuating the myth that the IPCC runs climate models. "Each IPCC assessment has exploited ... " (or "benefited from") and "The range of projections in [FAR]" [Martin Jukes, United Kingdom]	Accepted - Text has been revised.
1-112	1	2	41	2	48	Executive summary paragraph on the advancement in projections should also mention the evolution of scenarios since the FAR (ref figures 1.4 - 1.8,1.11) [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Sentence has been added.
1-113	1	2	42	2	48	I have concerns with this comparison. Earlier assessment reports did not provide decadal predictions and I think we should avoid that the long term projections are interpolated and treated as such. This is noted on page 9, line 16, but why make this comparison then? The results have no meaning. Suggesting that 5 more years (page 8, line 47) provides additional confidence is misleading for many variables. The outcomes of this comparison are meaningless for variables that have considerable natural variability (as noted on page 9, line 34-35). Recent global temperature change indicates where this can lead us. [Albert Klein Tank, Netherlands]	Accepted - The figures have been revised to deal with this concern.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-114	1	2	44	2	44	"examining the capabilities": should be "examining the change in capabilities ..."? [Martin Juckes, United Kingdom]	Accepted - The text has been revised.
1-115	1	2	45	2	46	Assuming that the discrepancy between the text and the figures is resolved by making the text match what is shown in the figures, this summary sentence will also need to be revised. It should say something like "Although CO2 concentrations in the atmosphere have risen in line with earlier projections, globally-averaged temperature observations have risen less than projected and are currently at or below the low end of the range in past IPCC assessments." Or maybe, "As shown in Figures 1.4 and 1.5, since the end of the 1992 Pinatubo volcano, models have predicted a steady upward trend in global average temperatures, but the observed series have been comparatively trendless, and thus the range of model warming predictions since the early 1990s can be seen to have been biased towards more warming than was subsequently observed." [Ross McKittrick, Canada]	Accepted - The figure and corresponding text have been revised.
1-116	1	2	45	2	48	Out of scope here. [Government of France]	Accepted - The text has been revised.
1-117	1	2	46	2	48	"closer to the lower limit" -- suggest to adapt this formulation as actually the CH4 observations are outside (i.e., lower than) the range projected by the models. (see Figure 1.7) [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text is revised, in accordance with the underlying section.
1-118	1	2	50	2	51	Of course we focus on new scientific knowledge since AR4 but I would say that pre-AR4 literature forms as much the basis for our understanding and for this report than post-AR4 publications. This needs to be rephrased slightly. [Olivier Boucher, France]	Accepted - The text has been revised.
1-119	1	2	50	2	51	Since this report is based on "scientific advances and associated peer-reviewed publications that have appeared since AR4", why is there no mention of the absence of warming since AR4 and in fact since 1997? You cannot focus on one period for some material and turn a blind eye to it on other matters. [John McLean, Australia]	Accepted - The text has been revised.
1-120	1	2	50	2	51	please add the WGI Annexes to this sentence after "Chapters 2 through 14" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised
1-121	1	2	50			FROM MY REVIEW OF FOD; still applicable "Overall, the many notable scientific advances, and associated peer-reviewed publications, since AR4 provide the basis for the rest of this assessment of the science as found in Chapters 2 through 14," rather than giving any hint or clue as to what these advances have done to solidify understanding of climate change and its causes. I would urge the authors to identify major findings and state them. I am also concerned that any impression of lack of scientific advance might undermine commitment for further research. The argument being that the scientific research community has reached the end of the line in developing understanding. In the next several comments I briefly highlight what I think are important developments over the past several years that I think should be highlighted up front in this chapter. [Stephen E Schwartz, United States of America]	Rejected - It is not the role of Chapter 1 to summarize the entire assessment. That is done in the policymakers' and technical summaries.
1-122	1	2		25		Chapter 1 is an important part of the report as it should set the stage for everything that follows. Instead I find that it seem to flit around from topic to topic sometimes spending little time (and no references) on some key issues and then hitting some issues (that frankly don't seem all that crucial to me) with detailed text and references sometimes including some very new ones and others so old that they barely have any surviving relevance. It really comes across to me as a muddle mess and needs to be thoroughly rewritten in a consistent logically progressive manner. I like the text given to the discussion of certainty in climate forecasts. It is improved from the previous version but it still varies in writing substantially from section to section from high level/low detail to highly detailed. Perhaps I don't understand what the purpose of this chapter is... [Larry Thomason, United States of America]	Accepted - Much of this text has been rewritten for better clarity.
1-123	1	2				"The temperature measurements show a continuing increase in the heat content of the oceans" does not	Accepted - This comment was already dealt with

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						mention the fact that this continuing increase seems to have slowed down over the past few years, according to results reported at ARGO meetings. The sentence "paleoclimatic reconstructions have helped place ongoing climate changes in the perspective of natural climate variability" is not very informative. [Government of France]	above.
1-124	1	2				Include a summary paragraph of the paleoclimate perspective. E.g Present-day concentrations of atmospheric greenhouse gases exceed the range of variability of the past 800,000 years and are more similar to atmospheric greenhouse gas concentrations 3 million years ago; a time when global mean temperatures were approximately 2–3.5°C warmer than today, sea-level was probably significantly higher and global ice volume lower. [Christian Ohneiser, Netherlands]	Rejected - Such a summary is more appropriate to the paleoclimate chapter. Chapter 1 just sets the stage.
1-125	1	2				<p>FROM MY REVIEW OF FOD</p> <p>On looking ahead in the chapter, it seems that a thrust of the findings will be that there is a lot of improvement in modeling, observations; nothing much to change understanding. I disagree. I think that there is some major breakthrough in understanding. I would single out especially the sort of thinking reflected in</p> <p>Held IM, Winton M, Takahashi K, Delworth T, Zeng F, Vallis GK (2010) Probing the Fast and Slow Components of Global Warming by Returning Abruptly to Preindustrial Forcing. J Climate 23:2418-2427. doi:10.1175/2009JCLI3466.1</p> <p>which relates modeling to observations and thus lends valuable perspective to climate change over the industrial period. This advance in understanding is stated also in chapter 12, page 7, line 8:</p> <p>"If radiative forcing were stabilized, the fraction of realized warming at that point is around $85 \pm 10\%$ of the total, and is almost independent of the forcing scenario. Equilibrium is reached only after centuries to millennia"</p> <p>This finding is enormously important. It means that the great majority (75-95%) of the warming that is committed at any given time, under assumption of continued constant forcing, is realized at that time. This finding also leads to the concept and quantity, transient climate sensitivity, proportionality constant between increase in GMST and forcing and its utility as a quantifier of climate sensitivity pertinent to climate change on the multi-decade to century time scale.</p> <p>This finding is a consequence of recognition that Earth's radiation imbalance is rather small compared to GHG forcing. The finding is somewhat tentative because if aerosol forcing is offsetting a large fraction of GHG forcing, the imbalance is a much greater fraction of the forcing and the committed warming (for constant future forcing) is consequently greater.</p> <p>This finding also has major implications, again because forcing at any given time also includes aerosol forcing. If the forcing were to be maintained at its value at some time in the future, then that would require fossil fuel emissions to be essentially halted. At that point aerosol forcing would decrease greatly, absent some geoengineering to maintain it, and the temperature would rapidly increase.</p> <p>I offer the above as an example. You may differ as to what are the key findings and advances in understanding, but I think there is a real obligation here to identify key findings and place them in perspective. [Stephen E Schwartz, United States of America]</p>	Noted - We have forwarded this comment to TSU to see if another chapter discusses this type of information; it doesn't seem to belong in Chapter 1.
1-126	1	2				<p>FROM MY REVIEW OF FOD; still applicable</p> <p>Another major advance is the adjusted forcing concept. The finding, AF is 1.95 ± 0.9 (Chapter 8, p 3 line 9) is also a major advance, if correct. It brings uncertainty in forcing from a factor of 4 (0.6 to 2.4) to a factor of 2.7 [Stephen E Schwartz, United States of America]</p>	Taken into account - We introduce the concept of ERF (as it is now called) but the results belong in the later chapters 7 and 8. The new concept is introduced in chapter 1 but results discussed in the later chapters.
1-127	1	2				FROM MY REVIEW OF FOD; still applicable	Rejected - Those details of new findings belong in a

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Another major conceptual advance is the relation between temperature change and cumulative emitted CO2, only weakly dependent on temporal pattern of emissions. [Stephen E Schwartz, United States of America]	later chapter -- Chapter 1 does not summarize findings from this assessment, it sets the stage based on earlier assessments.
1-128	1	2				FROM MY REVIEW OF FOD; still applicable Yet another major conceptual advance is the use of Green's function to determine climate system response to unit forcing applied for one year and then to convolve that with forcing to get response to arbitrary forcing, as advanced by Hansen et al ACP 2011. Perhaps it is premature to say that this will work, but it seems essential to get this on the table so that modeling groups will test their models against this approach. In principle it should work not just for temperature but for any climate system response, such as radiation, winds, precip. Relate to pattern scaling as described in Ch 12 [Stephen E Schwartz, United States of America]	Rejected - Those details of new findings belong in a later chapter -- Chapter 1 does not summarize findings from this assessment, it sets the stage based on earlier assessments.
1-129	1	2				The executive summary is substantially improved over the previous version [Larry Thomason, United States of America]	Noted - thank you.
1-130	1	3	3		7	Don't start with review of what was done in AR4. Start right out with what this chapter does: This introductory chapter serves as a lead in ... [Stephen E Schwartz, United States of America]	Accepted - The text has been revised.
1-131	1	3	4	3	4	"evidence regarding a human influence ...": delete "a" [Martin Jukes, United Kingdom]	Accepted - The text has been revised.
1-132	1	3	5	3	5	What is "theoretical evidence"? I recommend "... observations, theoretical evidence ..." → "... observations, theoretical analysis ...". [Martin Jukes, United Kingdom]	Accepted - The text has been revised.
1-133	1	3	6	3	6	Too general statement. Detection/attribution indicates human influence on several aspects, not all "ongoing changes". [Albert Klein Tank, Netherlands]	Accepted - Although we don't think the sentence really implies "all", we have revised the text.
1-134	1	3	6	3	7	"... evidence that human activities are the primary driver in the ongoing changes in climate": I think the question as to what is "primary" depends on the scale you look at, and perhaps on what precisely you mean by "change" as opposed to "variability". Perhaps "evidence linking human activities to ongoing changes in climate" would be better? [Martin Jukes, United Kingdom]	Accepted - The text has been revised.
1-135	1	3	6	3	7	AR4 showed no evidence that human activities were the primary driver of ongoing changes in climate. The report's claims were based on flawed climate models and even then was expressed only as "very likely", not as a statement of fact. Please revise this sentence. [John McLean, Australia]	Taken into account - We disagree with the reviewer's statement, but the text has been revised.
1-136	1	3	7	3	9	Consider adding to this line a statement indicating that readers will find a synopsis of the new RCP scenarios in this chapter. This is a critical to mention here as this chapter is a 'guide'/introduction to the rest of the assessment report. [Government of Canada]	Accepted - Sentence has been added.
1-137	1	3	8	3	51	This overview is really helpful, but you should consider shortening some of the points. [Government of NORWAY]	Accepted - Text has been revised.
1-138	1	3	9	3	9	wording: 'findings found' .. Perhaps better: 'findings discussed' [Helga Nitsche, Germany]	Accepted - the text has been revised.
1-139	1	3	13	3	13	Additional full stop needs to be removed. [Lisa Alexander, Australia]	Accepted - The text has been revised.
1-140	1	3	13	3	13	Double full stop [Peter Burt, United Kingdom]	Accepted - The text has been revised.
1-141	1	3	13	3	13	typo: take out 2nd dot [CLAUDIA STUBENRAUCH, France]	Accepted - The text has been revised.
1-142	1	3	13	3	13	remove one dot [Pavel Tklich, Singapore]	Accepted - The text has been revised.
1-143	1	3	15	4	51	One clear message that should come early on in the introductory chapter is that the way humans live and the societies that they have created are changing the climate; in other words, they are changing the risks and influencing the climate system. The science of WGI is showing HOW, but it cannot forget the WHO, as this will inform discussions on responses in the other working groups. It is important to the "bigger picture" to show that humans are responsible, and thus have the capacity to reduce emissions and thus risks. It may be obvious to scientists, but some readers may not understand clearly that humans are the anthropogenic part of climate change, and central to the problem and solutions. [Government of NORWAY]	Accepted - text revised. Much of this point is addressed in the introduction to this chapter (not the section highlighted by this comment).

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-144	1	3	19	3	21	The assessments of the IPCC are set up to "provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts". What motivates governments for wanting these reports is probably the challenges nature and society are facing in a changing climate. What motivates scientists is probably some of the same. Not sure if the following wording give justice to this motivation: "In light of the importance and potential policy implications of climate change, the scientific community invests substantial resources.." [Government of NORWAY]	Accepted - Text changed to respond to point 1-146, which should resolve this issue.
1-145	1	3	19	3	21	In light of this sentence it makes no sense to confine 5AR chapters to predetermined word and page limits. [John McLean, Australia]	Noted - Page limits are obviously resources as well. Page limits allow resources to be allocated reasonably.
1-146	1	3	19	3	21	this sentence seems to misrepresent the way how the IPCC assessment process is set up and what the role of the scientific community is in there. Suggest to clarify the Intergovernmental nature of the process, the fact that the governments asks the IPCC panel to assess the scientific basis of climate change in order to inform the policy makers (rather than the public), which then leads to the experts and the scientific community to invest substantial resources ... etc. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised.
1-147	1	3	21	3	22	Why not cross-reference to WGII AR5 findings, instead of referring to AR4. Unsure if "potential" would be the right word to use on the findings they provide for various ecosystems and social systems. [Government of NORWAY]	Accepted-text revised.
1-148	1	3	22			potentially substantial' may be preferred over 'potentially significant' to keep words with distinct statistical meanings separate from other language in the text. [Paul Stoy, United States of America]	Accepted - text revised.
1-149	1	3	24	3	25	This statement is contrary to the refusal of IPCC authors of citing and discussing literature published in peer-review journals explicitly recommended in ROFOD by this reviewer. [François Gervais, France]	Rejected - As stated in the text, the IPCC does not discuss every paper, but does assess the state of the literature in the writing of the document.
1-150	1	3	24	3	25	It is surprising that this statement stresses what the report is not, rather than what it is. [Government of United States of America]	Accepted - the sentence was rewritten.
1-151	1	3	24	3	26	This sentence states that the report is an assessment of the current 'state' of research results rather than a review, i.e. "discussion of all relevant papers". Is this a standard distinction between assessment and review adopted by the IPCC? If all relevant papers are not considered than what are the criteria for selecting those that are included in the assessment? [David Sauchyn, Canada]	Rejected - Papers which are discussed in the report represent the current state of the science. Not all papers can be cited.
1-152	1	3	28	3	28	The term "appropriate" is here ambiguous as it is not defined in the text. [Government of France]	Accepted - text revised.
1-153	1	3	28	3	28	"A transparent review process ...": please give a reference or URL for a page describing the process. [Martin Jukes, United Kingdom]	Accepted - a reference to the IPCC document on the review procedures is added.
1-154	1	3	28	3	28	All views are included not only the appropriate ones (whatever these may be). [Albert Klein Tank, Netherlands]	Taken into account - see response to 1-152
1-155	1	3	28	3	28	Despite what the IPCC publicity machine might say, it is NOT a transparent review process because (a) the review comments were not made available to the public until someone resorted to Freedom of Information legislation to see the comments for AR4 and (b) unlike a conventional review process where the reviewers are anonymous and the authors are obliged to modify their paper until reviewers decide it acceptable, the IPCC process has named reviewers and anonymous authors who are not obliged to modify anything. Please reword. [John McLean, Australia]	Rejected - This is AR5. It is transparent. The authors are not anonymous-- they are written at the top of the chapter. All review responses are also checked by review editors to make sure they are carefully considered.
1-156	1	3	28			The review process is perhaps transparent but recommendations of reviewers are ignored. What is the definition of « appropriate views » ? Only those of IPCC authors ? But then, the review process, even transparent, would be useless. To further strengthen « inappropriate views », please plot temperature versus CO2 as it should have been done in any report since FAR. For 15 years, do you observe an ascending curve ? Not at all. It is roughly a plateau. Of course, during the ascending phase of the 60-year period sinusoid from 1975 to 1998 (see Box 2.2 Fig. 1 Bottom in this SOD), some correlation might have been suggested, but neither during the previous 25 years when Earth was cooling (in spite of the successive corrections always in	Rejected - This is a silly argument, showing that the reviewer really does not understand the climate system or its response to external forcing. There has never been suggested that there should an exact correlation between temperatures and levels of CO2. First of all, CO2 is only one of the forcings on climate. Secondly, climate change needs to look at time scales

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						the same direction to minimize the cooling, called homogenization), nor for 15 years. [François Gervais, France]	of 20-30 years not what happens over a short time period where natural variability can dominate.
1-157	1	3	28			Consider inserting, "...appropriate views are included AND PRESENTED ACCURATELY." [Government of United States of America]	Rejected - The previous sentence says that the IPCC presents science accurately, so this would be redundant.
1-158	1	3	30	3	30	The sentence "Scientific hypotheses are contingent" is not very clear. [Government of France]	Accepted - text revised.
1-159	1	3	30	3	30	"always subject to .." is a sweeping and unjustified generalisation – though you could say "always open to ...". [Martin Jukes, United Kingdom]	Accepted - text revised.
1-160	1	3	30	3	32	"Scientific hypotheses are contingent ... critical revision ": The "critical revision" you describe deals more with conclusions than hypotheses. [Martin Jukes, United Kingdom]	Accepted- the text will be revised for clarity.
1-161	1	3	30	3	36	".. is contingent. ... search for truth ... critical re-examination ...": I think a lot of theologians would question this statement – it is more the manner of critical re-examination that is important (I think). In any case, restricting yourself, as a scientist should, to the contingent does limit the range of truths that can be searched for. I guess that you are trying to say that the ability of science to correct itself is a strength, but want to avoid giving the impression that we can't decide on anything. It is really the focus on falsifiable hypotheses which distinguishes science, a focus which means scientists spend a lot of time looking for obscure sub-atomic particles and very little time worrying about the meaning of life. I recommend either removing the first 2 sentences of this paragraph or rephrasing them to draw attention to the importance of falsifiability – the important points of the paragraph are in the 3rd sentence and onwards. [Martin Jukes, United Kingdom]	Taken into account - The text has been revised, but we do not agree about dropping the first few sentences.
1-162	1	3	30	3	42	"Scientific .. disagreement" These points are important, however, it describes the general scientific assessment approach that has to be applied by the IPCC, as well (and by the WG-I for the AR5), therefore, it would be better to omit from here. If the part starting with "At any point .." remains that is more concretely valid for this WG-I contribution. [Tibor Farago, Hungary]	Rejected - We think it is important to discuss the self-correcting nature of science.
1-163	1	3	30		36	General comment: while reading the paragraph, at first it seemed that the discussion was going to be about [Sucharita Ghosh, Switzerland]	Taken into account - Yes, this is correct: the peer review structure is a part of how science is self-correcting in the authors' view
1-164	1	3	30			how hypotheses need to be reformulated in the light of new knowledge, but then the discussion turned towards the [Sucharita Ghosh, Switzerland]	Taken into account - continued from 1-163; see 1-163
1-165	1	3	30			current system of peer-reviewing! [Sucharita Ghosh, Switzerland]	Taken into account - continued from 1-163; see 1-163
1-166	1	3	30			Contingent is an adjective. [Paul Stoy, United States of America]	Rejected - Contingent can be a noun.
1-167	1	3	32	3	33	Peer review is a process rather than an institution. [Dietrich Feist, Germany]	Accepted - text revised
1-168	1	3	32	3	33	This sentence describes an aim, not a practice. Too many papers are reviewed and published only to roundly criticised by the wider community. Papers that rely on climate models are published despite the known deficiencies of climate models, which means that the review process either ignored the flaws or condoned them. Peer review fails science far too often. Please revise to describe as an aim. [John McLean, Australia]	Rejected - As part of the process, papers can be later criticized by other papers: this is still acceptable, not a failure of the system.
1-169	1	3	38	3	51	It may be clear to us scientists but it is definitely not clear to the general public: only peer-reviewed articles in internationally recognized scientific journals can be considered for the IPCC report (at least for WG1). Add a sentence that makes this clear. [Dietrich Feist, Germany]	Rejected - This statement is made in the previous paragraph.
1-170	1	3	39	3	40	"Usually these choices are uncontroversial [...] minor part in research" This statement is not backed up by any reference. [Government of France]	Rejected - Reference is not necessary
1-171	1	3	42	3	43	It is not clear what this sentence really says. Please consider to simplify the language. [Government of NORWAY]	Accepted - sentence rewritten.
1-172	1	3	46	3	47	The finding that there is a consensus is highly subjective (e.g. who decided there is one and on what basis?). All scientists should know that a consensus is irrelevant to determining scientific truth so it makes no sense	Rejected - Here we describe the process of scientific discovery and writing of assessment reports for non-

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						that this statement appears in a report written by scientists. [John McLean, Australia]	scientists and is thus valuable.
1-173	1	3	46	3	49	About the sentences: "In order to assess areas of scientific controversy, careful review of appropriate papers is conducted and evaluated. Not all papers on a controversial point end up being included in an assessment, but all views represented in the peer-reviewed literature are considered and presented in the assessment." Could Authors explain (at least for the Reviewers) the way in which they selected the main (published and submitted) articles (ie: The first published papers on the controversy, the impact factor of the Journal, etc)? [Rubén D Piacentini, Argentina]	Rejected - The procedure varies for each particular subject, unfortunately, and each section of the assessment, and thus this descriptions belongs in each assessment.
1-174	1	3	48	3	49	Re "careful review of the peer-reviewed literature"; lines 24-25 implied that this chapter was not a review. [David Sauchyn, Canada]	Accepted - text revised.
1-175	1	3	50	3	51	The examples given in this reviewer report contradict this statement. Not all views, only SELECTED (alarmist) views are considered in this assessment. Others are censored. [François Gervais, France]	Rejected - All peer-reviewed papers are included in the assessment
1-176	1	3	50	3	51	Maybe stress that this is the case for all issues dealt with in the report "As with all other issues dealt with in this assessment, not all papers can be included on a controversial point, but it is important to stress that all views represented in the" [Government of NORWAY]	Taken into account - We have "Not all papers on a controversial point can be included in an assessment, but every effort has been made to ensure that all views represented in the peer-reviewed literature are considered in the assessment process" on p1-4, lines 49-51.
1-177	1	3	50			The assertion that "all views... are considered" seems bold? Perhaps re-phrase to state, "Every effort has been made to ensure that all views represented in the peer-reviewed literature are considered..." [Government of United States of America]	Accepted - text revised.
1-178	1	3	53	4	4	The same as above. [Tibor Farago, Hungary]	Taken into account - Probably relates to comment 1-162; likewise, there is value in this discussion.
1-179	1	3	53	4	4	Excellent description of the difficulties face by climate scientists. Perhaps also include a line noting the value of model experiments in helping form understanding and intuition about the interaction of dynamic processes [Andrew Shao, United States of America]	Accepted - the information has been added.
1-180	1	3	54	4	2	Sorry, the whole sentence starting from "However, in common with Astronomy ..." is very confusing. Please rewrite! [Dietrich Feist, Germany]	Accepted - The sentence has been revised for better clarity.
1-181	1	3	55	3	56	Inappropriate use of capital letters [Peter Burt, United Kingdom]	Accepted - The text has been revised.
1-182	1	3	55	3	56	this list of disciplines is not complete, it includes all natural and social science, and therefore I would advised against specifying only certain disciplines [David Sauchyn, Canada]	Accepted - text revised.
1-183	1	3	55	4	3	This sentence is too long and convoluted. [Government of France]	Accepted - text revised.
1-184	1	3	55	4	4	These are two successive sentences that commence with the word "however". To start one sentence is poor English, so start two in succession is worse. [John McLean, Australia]	Accepted - text revised.
1-185	1	3	56	4	3	Would it be possible to discuss not just Earth sciences, but Earth systems sciences that include humans as parts of the system? The term "openness" in environmental systems is used, where does links to social systems comes in? Please consider to make a point out of the linkages between environmental change and social systems and how that affects complexity, uncertainty, etc. [Government of NORWAY]	Rejected - WG II and WG III focus on human interactions. This WG is focused on natural and physical science.
1-186	1	3	57	3	57	The word "temporal" in "spatially and temporal multi-scale character" should appear in adverb form. [Gan Zhang, United States]	Editorial - Copyedit to be completed prior to publication
1-187	1	3	57		57	be consistent: use 'spatial and temporal' or 'spatially and temporally' I think the latter is correct [Anne Verhoef, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-188	1	4	1	4	1	Move 'definitively' to after 'links' to remove split infinitive [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication

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1-189	1	4	1			environmental systems' is stated twice in the same sentence and the second mention is arguably a circular reference. [Paul Stoy, United States of America]	Accepted-text revised.
1-190	1	4	2	4	2	"...limits on the understanding ...": it is the applicable methodologies that are limited by these general aspects of the problem, not the understanding. Understanding is limited by our inability of available observations to resolve important spatial and temporal scales – but that is a statement about the current state of the science, not a general one about how far the science can go. [Martin Juckes, United Kingdom]	Taken into account - The problems in methodology limit our ability to improve understanding.
1-191	1	4	2	4	3	Oreskes et al 1994: A disturbingly irrational paper, which interprets the jargon phrase "model validation" literally (i.e. as meaning an effort to determine whether a model is "true" or "false"). "Model validation", of course, is always an attempt to find out whether a model is fit for purpose. Oreskes et al 1994 starts from a simple misunderstanding and proceeds with faulty logic – should not be cited here. [Martin Juckes, United Kingdom]	Rejected - The paper is useful in terms of showing why the environmental sciences are usually different from laboratory chemistry experiments, for instance.
1-192	1	4	3	4	4	Given the example in the many chapters, it seems appropriate to delete 'may be' and insert 'are' instead. [Government of Germany]	Accepted - text revised.
1-193	1	4	3	4	4	Causal links in climate science primarily from use of statistical tools? My (biased) sense is that it is largely from physical theory and climate modelling experiments (It has been argued that this is why the Charney report was successful.). [Timothy Merlis, United States of America]	Accepted - text revised
1-194	1	4	8	4	51	Box content could be tightened up - some conclusions are repeated - i.e. lines 31 and 38 [Government of Australia]	Taken into account - The box has been revised for more completeness to show how key messages have evolved over the prior assessments.
1-195	1	4	8	4	51	The summaries of IPCC report 1 to 4 are very useful for readers to quickly grasp the key points and the incremental progress in those reports. However, it would be very desirable if the key new points for AR5 to be included here as well because they will naturally flow from those precedent points in the former reports. It didn't feel right when Section 1.2.2 turned up immediately after the AR4 points. [Dawei Han, United Kingdom]	Rejected - this box is intended to summarize the main findings of the previous reports. It is beyond the scope of Chapter 1 to summarize new findings of AR5. These will be presented in the Technical Summary and Summary for Policymakers.
1-196	1	4	8	4	51	This is a very important box that will likely be widely cited and presented. It is important that it be both self-contained and accurate, which it is not. A major conclusion of the third assessment report was that 'most of the warming of the past half-century is likely due to human activities.' The two major conclusions of the fourth assessment report were that 'Warming is unequivocal' and that 'most of the warming of the past half-century is very likely due to increases in anthropogenic greenhouse gases'. [Susan Solomon, United States of America]	Accepted - The Box has been revised for clarity and completeness.
1-197	1	4	8			Box1.1: the list of major conclusions seems to lack some pertinent findings (e.g., "warming of the climate system is unequivocal", "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations"). Rather than giving what is currently a somewhat random list of findings, we would propose that you systematically select 3 topics (obs, d&a, projections) for 2 or 3 climate variables and show the development of statements relating to these topics from FAR to AR4). [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The Box has been revised for clarity and completeness.
1-198	1	4	11			Drop it (it is a general info from atmo. physics.) [Tibor Farago, Hungary]	Accepted - The box has been revised. Statements are directly from the cited prior assessments.
1-199	1	4	14	4	14	"during the next century"? To make any sense at all you either want to replace "next" with "current" or insert the word "predicted". [John McLean, Australia]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-200	1	4	14	4	14	"The rate... is about 0.3C per decade" reads as a statement of fact but I believe this was a projection from the FAR. Suggest "The rate... is projected to be ...about 0.3C per decade." [Kenneth Minschwaner, United States of America]	Accepted - The box has been revised.
1-201	1	4	14	4	14	The phrasing seems odd - I would have thought a main conclusion of the FAR should be changing global temperatures over the 20th Century, not the 'next century'. If this does indeed refer to the 21st century then use of the words 'projected to be' rather than 'is' seem more appropriate. [Kate Willett, United Kingdom]	Accepted - The box has been revised.

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1-202	1	4	14			Are you sure about the FAR "0.3C/decade" being an average over the next century? The AR4 (TS p68) cites this as having been a prediction for the coming decades. Also, I think the near-term multidecadal prediction was changed to 0.15C/decade for the SAR and TAR, then increased again to 0.2C/d for the AR4. I would have thought these values are worth mentioning as major conclusions. [James Annan, Japan]	Accepted - The box has been revised.
1-203	1	4	14			The rate of increase of global mean surface temperature .. [Tibor Farago, Hungary]	Accepted - The box has been revised.
1-204	1	4	14			This prediction appears unrelated to subsequent observations which shows no warming since 15 years. [François Gervais, France]	Accepted - The box has been revised.
1-205	1	4	14			Consider inserting "projected to be" to emphasize the modeled nature of these statements [Government of United States of America]	Accepted - The box has been revised.
1-206	1	4	14			I think that there is a verb problem here: 'will be' instead of 'is' [Larry Thomason, United States of America]	Accepted - The box has been revised.
1-207	1	4	17	4	17	Bullet point does not make sense: do you mean 'will rise'? [Peter Burt, United Kingdom]	Taken into account - the box has been extensively revised.
1-208	1	4	17	4	17	Again needs to either replace "next" or insert the word "predicted" [John McLean, Australia]	Accepted - The box has been revised.
1-209	1	4	17	4	17	Incomplete sentence, Suggest changing "The global mean sea level rise of about..." to "The global mean sea level rise is projected to be about..." [Kenneth Minschwaner, United States of America]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-210	1	4	17	4	17	The phrasing seems odd - I would have thought a main conclusion of the FAR should be changing sea level over the 20th Century, not the 'next century'. If this does indeed refer to the 21st century then use of the words 'projected to be' rather than 'is' seem more appropriate. [Kate Willett, United Kingdom]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-211	1	4	17			*The global mean sea level rise of about 6 cm per decade occurred .. [Tibor Farago, Hungary]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-212	1	4	17			Actual sea level rise rate shows a slope of 1 cm per decade since 2008 (see AVISO file discussed above) instead of 6 cm. [François Gervais, France]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-213	1	4	17			Typo: Global mean sea level rise WILL BE about 6 cm [Government of United States of America]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-214	1	4	17			Consider inserting "projected to be" to emphasize the modeled nature of these statements [Government of United States of America]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-215	1	4	17			Mopre awkward wording [Larry Thomason, United States of America]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-216	1	4	21			Insert, "AVERAGED GLOBALLY, anthropogenic aerosols..." because on local or regional scales aerosols can produce positive radiative forcing (i.e., where BC emissions are very large) [Government of United States of America]	Taken into account - The box has been revised. Statements are directly from the cited prior assessments.
1-217	1	4	22	4	22	As you should know, this very late conclusion was inserted after the review of SOD and was based on an unpublished paper written by several authors of the "attribution" chapter (refer section 8.2.1 + endnotes of Bolin, "A History of the Science and Politics of Climate Change", Cambridge Press, 2007), what's more the paper was dismissed by the scientific community when it was finally published. Please don't insult our intelligence with the statement that you currently have. [John McLean, Australia]	Rejected - The statement is directly taken from the Policymaker's Summary in the assessment and reflects the overall findings in the assessment itself.
1-218	1	4	24	4	33	Review of the history of IPCC should be objectively reflect the real reality. For example, it is indicated in IPCCAR that "new analyses of proxy data ...the 20th century is likely to have been the largest of any century	Accepted - the box has been revised

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						during the past 1,000years...1990s was the warmest decade and 1998 the warmest year." It is right or not? You can assess the property of the conclusion by using of new data, but you must cite the original words in the report. [Shaowu Wang, Beijing]	
1-219	1	4	25	4	25	The word "has" is redundant. [John McLean, Australia]	Accepted - the box has been revised
1-220	1	4	26	4	26	The temperatures have risen during the past four decades (from To ...) in the lowest 8 kilometres [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-221	1	4	28	4	28	Snow cover and ice extent have decreased by ... [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-222	1	4	28			Actual ice extent in Antarctica shows continuous increase. The discrepancy of predictions and observations since the beginning of this century appears considerable in view of comments on sentences on Lines 14, 17 and 28. [François Gervais, France]	Accepted - the box has been revised
1-223	1	4	29	4	29	Global average sea level has risen by ... and ocean heat content has increased by ... [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-224	1	4	30	4	30	Changes have also occurred in other important aspects of climate such as (or delete the statement) [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-225	1	4	30	4	30	The statement is so vague as to be worthless [John McLean, Australia]	Accepted - the box has been revised
1-226	1	4	30	4	31	Box 1.1 Some conclusions from TAR are too vague [European Union]	Accepted - the box has been revised
1-227	1	4	30	4	31	It would be useful to have some of the important aspects listed here. [Government of Germany]	Accepted - the box has been revised
1-228	1	4	30	4	31	Too vague. Could use some examples here, both for things that have changed and for things that appeared not to have changed, "...such as..." [Kenneth Minschwaner, United States of America]	Accepted - the box has been revised
1-229	1	4	30	4	31	changes that have occurred and aspects that appear not to have changed should be specified, at least by important examples [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - the box has been revised
1-230	1	4	30			These statements do not seem to be critical to include [Government of United States of America]	Accepted - the box has been revised
1-231	1	4	31	4	31	Some important aspects of climate appear not to have changed such as(or delete the statement) [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-232	1	4	31	4	31	Again the statement is vague and worthless. [John McLean, Australia]	Accepted - the box has been revised
1-233	1	4	32	4	32	This statement is not sustainable given that 3AR (and the SPM) included a figure that showed that many natural forces associated with radiative heat transfer were very poorly understood. It makes no sense to claim that a force that is poorly understood exerts a small force especially when multiple forces are poorly understood. [John McLean, Australia]	Accepted - the box has been revised
1-234	1	4	35	4	51	Didn't the AR4 also state that the observed climate change is "very likely" anthropogenic (as opposed to only "likely" in TAR) [Dietrich Feist, Germany]	Accepted - the box has been revised
1-235	1	4	35	4	51	It is indicated in IPCCAR4 that "It is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone." It would be better to use the original words of the report, and give an assessment by using of updated data. [Shaowu Wang, Beijing]	Accepted - the box has been revised
1-236	1	4	38	4	38	Box 1.1 This AR4 conclusion is too vague as well [European Union]	Accepted - the box has been revised
1-237	1	4	38	4	38	It would be useful to have some of the observed changes listed here. [Government of Germany]	Accepted - the box has been revised
1-238	1	4	38	4	38	Some aspects of climate have not been observed to change such as(or delete the statement) [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-239	1	4	38	4	38	Again the statement is vague and worthless. [John McLean, Australia]	Accepted - the box has been revised

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1-240	1	4	38	4	38	What does this refer to? This statement is ambiguous. [Timothy Merlis, United States of America]	Accepted - the box has been revised
1-241	1	4	38	4	38	Same as previous comment, need to be more specific here or give some examples. [Kenneth Minschwaner, United States of America]	Accepted - the box has been revised
1-242	1	4	38			These statements do not seem to be critical to include [Government of United States of America]	Accepted - the box has been revised
1-243	1	4	38			please specify important examples [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - the box has been revised
1-244	1	4	39	4	39	of the last half 20th century [Hosny Hasanean, Saudi Arabia]	Accepted - the box has been revised
1-245	1	4	39	4	39	There are good reasons to believe that the Medieval Warming period was warmer than today (e.g. via temperatures derived from the GISP2 ice core) and the proxies by which historical temperatures are determined are highly suspect. Your statement cannot be sustained with any certainty. [John McLean, Australia]	Rejected - Using a specific ice core as a basis for global temperatures is ludicrous. Paleoclimate based datasets or proxies is the best information scientists have available for evaluating those past periods. There have now been a number of analyses substantiating the statement made in the text.
1-246	1	4	42			Consider inserting a footnote defining "climate sensitivity" [Government of United States of America]	Rejected - climate sensitivity defined in the glossary and is dealt with in Chapter 10 and 12
1-247	1	4	45	4	45	It would be useful to have some of the induced changes listed here. [Government of Germany]	Accepted - the box has been revised
1-248	1	4	49	4	51	Here the concept of 'inertia' could be introduced. [JAVIER MARTIN-VIDE, SPAIN]	Accepted - the box has been revised
1-249	1	4	49	4	51	If 4AR reached this conclusion then it was flawed. The residency time of CO2 in the atmosphere is less than 10 years. This is logical given that the annual increase in atmospheric CO2 is typically about 55% of estimated emissions, which means that within 12 months the other 45% is absorbed by the biosphere. [John McLean, Australia]	Rejected - this box lists the major conclusions. The residency time is discussed in the chapter 6
1-250	1	4				Box 1.1: This historical overview is critically important. However it is too vague in many places (see following comments). [Kenneth Minschwaner, United States of America]	Accepted - the box has been revised
1-251	1	5	4	5	4	Suggest retitling this section as "Key Concepts in Climate Science". [Government of Canada]	Accepted - the title has been revised.
1-252	1	5	4	7	46	There seems to be very little connection between the different concepts in this section, such that it appears like a random mixture of concepts/tools. This is most notable, e.g., for "equilibrium climate experiment". Some further text introducing the relevance of such terms would be useful. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Some introductory sentences have been added.
1-253	1	5	6	5	16	The distinction between what is meant by weather and what is meant by climate needs to be clearer. Do they cover the same variables but just different time horizons or? The subclause "on the other hand" on line 10 can be deleted. [European Union]	Accepted - The wording of the definition have been modified based on the comment.
1-254	1	5	6			"key concepts affecting the Earth's climate" -- requires rewording as it's not the concepts that affect the Earth's climate. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised. It has been changed to "key concept in climate science"
1-255	1	5	7	5	12	„First of all .. time scales.“ A replacement/simplification is proposed: „Climate refers to the mean and the variability in the state of weather (that is., the conditions of the atmosphere at a certain place and time), in addition to including the state of the land surface, ocean and cryosphere, occurring on decadal to centennial time scales.“ [Tibor Farago, Hungary]	Taken into account - These sentences have been rewritten.
1-256	1	5	8	1	9	Suggestion: "...with reference to the temperature, humidity pressure, wind and other parameters (meteorological elements), the presence of clouds, precipitation, and the occurrence of special phenomena, as thunderstorms, dust storms, tornados etc." Winds, thunderstorms etc. exert significant impacts on humans and biosphere! Furthermore, they are preferred objects of public perception, also in connection with climate change discussions. [Karl-Heinz Bernhardt, Germany]	Accepted - The text has been revised.
1-257	1	5	8	5	9	It would be better to extend the sentence by saying "... and other weather elements". [Government of Spain]	Accepted - text revised. The wordings have been modified, also in line with the previous comment.

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1-258	1	5	8	5	9	Knowing that this definition of weather can be shared and repeated, it is convenient to add more elements, such as precipitation or wind, o add 'etc' to the cited ones. [JAVIER MARTIN-VIDE, SPAIN]	Accepted - The text has been revised.
1-259	1	5	8	5	16	This text on weather versus climate is maybe not absolutely necessary or maybe doubtful. Weather is mainly perceived as the physical atmosphere. It would be useful at least to additionnally address the climate system and its components and to stress that they all interact in a complex manner, calling for earth system observation and modeling. [Government of France]	Taken into account - It is important and useful to clarify the difference between weather and climate. But the previous definitions have been improved, according to comments received.
1-260	1	5	9	5	9	Delete comma after 'pressure' [Peter Burt, United Kingdom]	Accepted - The text has been revised.
1-261	1	5	9	5	9	pressure, humidity insteade of humdity, pressure [YEHIA HAFEZ, Saudi Arabia]	Accepted - text revised.
1-262	1	5	9	5	9	'Weather' pertains to more variables than are mentioned here. I would suggest inserting '... key parameters such as ...' before 'the temperature' [Ian Simmonds, Australia]	Accepted - This has been taken care of by the new formulations according to other suggestions.
1-263	1	5	9			for a large part of the world, weather includes snow [David Sauchyn, Canada]	Rejected - The term precipitation includes liquid and solid precipitation.
1-264	1	5	9			The list contains only some weather variables. So at least a "such as" is needed. Omission of wind is serious. [Adrian Simmonds, United Kingdom]	Accepted - The text has been revised.
1-265	1	5	10	5	10	parameters insteade of events [YEHIA HAFEZ, Saudi Arabia]	Accepted - The text has been revised.
1-266	1	5	10	5	12	The climate definition included in the glossary is clearer, please change the text accordingly: "Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system." [Government of Spain]	Accepted - The text has been revised.
1-267	1	5	10	5	16	The operational definition of climate here could be replaced by defining climate as the statistical joint distribution of climate variables. It deals with more than mean and variability, as pointed out later in the paragraph. In fact, this seems to be the definition used on p. 1-11, line 12. [Peter Guttorp, United States of America]	Taken into account - This paragraph has been reformulated according to all comments received.
1-268	1	5	11			only those states that influence the overlying atmosphere [David Sauchyn, Canada]	Rejected - No, climate can be used for states in other components in the climate system.
1-269	1	5	12	5	12	Can 'associated statistics' be expanded a little with an e.g., frequency, magnitude, persistance etc.? I think this helps with understanding the definitions of weather verses climate. [Kate Willett, United Kingdom]	Accepted - text revised
1-270	1	5	12			defining climate as mean state at centennial time scales implies a large degree of stationarity; 100 year could encompass significant climate change; climate normal are defined in terms of 30 years of weather data [David Sauchyn, Canada]	Accepted - Text revised.
1-271	1	5	12			Would the inclusion of trends in addition to mean and variability be a more comprehensive definition of 'climate'? [Paul Stoy, United States of America]	Rejected - No, trend is usually considered as change in climate.
1-272	1	5	13	5	13	Suggestion: "...statistics, including those of combined parameters and extreme events..." The influence of weather and climate on biosphere and humans is exerted mainly by complex factors, as combinations of temperature, humidity, precipitation or sunshine, resp., for example. The role of factor combinations as mentioned on page 11, lines 14 to 16 in the given draft, should be considered also in a simplified definition of climate [Karl-Heinz Bernhardt, Germany]	Taken into account - This part has been reformulated, taking all comments including this one into consideration.
1-273	1	5	13	5	13	precipitation and droughts [YEHIA HAFEZ, Saudi Arabia]	Rejected - We do not think it is critical and necessary to add more examples.
1-274	1	5	14	5	14	anomalies instead of changes [YEHIA HAFEZ, Saudi Arabia]	Rejected - We were talking about climate changes after climate is defined.

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1-275	1	5	18	5	18	I suggest to add a scheme of the Earth's global energy budget after Figure 1.1, for example from Trenberth et al. 2009, as was be given in the zero order draft of WG I. [Karl-Heinz Bernhardt, Germany]	Rejected - Those details of the energy budget are discussed and presented in a later chapter.
1-276	1	5	18	5	18	I would prefer to begin with: The Earth's climate system involves energy exchange (Fig. 1.1-a) between the planet's surface (and interior), its atmosphere, and space (including the Sun), together with and driving water exchange between its water and land surfaces and its atmosphere (Fig. 1.1-b). The Earth's climate system is powered by... [Robert Kandel, France]	Rejected - There is only one Figure 1, with no 1.1 a and 1.1b, so it is not clear why the reviewer suggests a change. The rest of the paragraph is all about these exchanges so it is not clear why a different beginning sentence is necessary.
1-277	1	5	18	5	19	Suggestion: "Approximately half of the energy is supplied in the visible part..." As can be seen from textbooks (for example: Houghton, J. T. , The physics of atmospheres, 2nd ed., Cambr. Univ. Press, 1958, p. 238), nearly 47%, but not "the bulk"! of the incoming solar radiation is supplied in the 400 to 800 nm (visible) range, nearly 44% in the near infrared and nearly 9% in the ultraviolet regions. [Karl-Heinz Bernhardt, Germany]	Accepted - text revised.
1-278	1	5	18	5	19	About the sentence: "The bulk of the energy is supplied in the visible part of the electromagnetic spectrum." This statement must be improved, since for extraterrestrial solar irradiance (and even in general for terrestrial solar irradiance), the IR part of the spectrum, it has about the same contribution as the visible and UV has a small but significant contribution for different aspects of climate and life on Earth. Now in this "SOD" the sentence is at: page 5, lines 18-19, but before it was at: Chapter 1, page 4, lines 34-35. In my case that I made more than 130 comments and suggestions to the FOD, it is very complicated to determine in which page and lines are the new texts and if it was included what I suggested. It will be very useful to add new columns to this Excel sheet, explaining if the comment/suggestion was incorporated or not and in the affirmative case, in which page and lines. [Rubén D Piacentini, Argentina]	Rejected - We responded to this same comment in the FOD -- the discussion in the text is accurate as written.
1-279	1	5	18	5	32	need a reference [YEHIA HAFEZ, Saudi Arabia]	Rejected - this is text book material, which IPCC does not reference.
1-280	1	5	18	6	22	These paragraphs already makes use of crucial terms like "greenhouse gases", "greenhouse effect", "radiative forcing" even though none of them have been defined yet. Please add a paragraph e.g. at line 17 that gives at least a one-line definition of these terms. [Dietrich Feist, Germany]	Taken into account - reference to the glossary is added.
1-281	1	5	19	5	22	You seem here to be denying that there has been appreciable change in the average temperature of the earth for : "many centuries" How many is that? What about the "Little Ice Age" or the :Roman Warm Period?. [Vincent Gray, New Zealand]	Rejected - this is taken care of by the word "relatively"
1-282	1	5	20	5	20	Suggestion: "... the incoming solar energy must nearly be in balance..." Note, that a "small imbalance" is established correctly in lines 44 to 45! Without this imbalance the Earth's temperature would has been strongly, but not "relatively" constant, as noticed in lines 19 to 20 [Karl-Heinz Bernhardt, Germany]	Accepted - text revised.
1-283	1	5	21	5	21	Average temperature of the Earth is given as 15C. My understanding was that NOAA used 14.75C, Hadley 14C and NASA 14C. A reference for this statement would be useful. [Government of Australia]	Accepted - see Chapter 2
1-284	1	5	21	5	21	288° K instead of 288 K [YEHIA HAFEZ, Saudi Arabia]	Editorial - Copyedit to be completed prior to publication
1-285	1	5	21	5	21	"...black body radiation theory indicates that...": Blackbody radiation is not a theory, it is an observed phenomenon. In any event, it is the Planck function that dictates the wavelength distribution of emitted radiation. In fact this clause should be omitted (with no loss of clarity). [Kenneth Minschwaneer, United States of America]	Accepted - The sentence has been revised.
1-286	1	5	21	5	23	About the sentence: "Since the average temperature of the Earth is about 15°C (288 K), black body radiation theory indicates that the outgoing energy flux from the Earth is in the infrared part of the spectrum." The mean Earth ambient temperature must be specified for a given year. In particular, for the annual mean of 2010, it was 14.63 °C, following the GISS/NASA reference: http://data.giss.nasa.gov/gistemp/tabledata/GLB.Ts+dSST.txt (see also: http://www.earth-policy.org/indicators/C51). I like to point out that (to my knowledge) there no other part of the IPCC AR5 (WG1) Report were the absolute value of the mean ambient air temperature was included for a given year. So,	Accepted - see Chapter 2

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						it will be of importance for many applications, to have a more precise value plus minus its uncertainty (with the corresponding reference). [Rubén D Piacentini, Argentina]	
1-287	1	5	21			Change “black body radiation theory indicates” to “the physics described in black body radiation theory show”. [JOSHUA FISHER, United States of America]	Accepted - The text has been revised.
1-288	1	5	23	5	23	Suggest adding the words "Solar radiation" before the words "shortwave radiation" as this is the first mention of SWR. This change will make this reference consistent with the caption for figure 1.1 (page 6, line 25-26). [Government of Canada]	Accepted - text revised.
1-289	1	5	23			It may be worthwhile explicitly putting the wavelength range for the definition of SWR and LWR (especially as the following %'s will be relative to that). [JOSHUA FISHER, United States of America]	Rejected - information is given in the glossary.
1-290	1	5	25	5	25	Suggest adding the word "infrared" after the word "longwave" to make the link to line 22 where energy emitted from Earth is described as being in the infrared part of the radiation spectrum. [Government of Canada]	Accepted - text revised.
1-291	1	5	25	5	29	The already “largely absorbed” LWR emitted from the Earth’s surface is “reradiated” by atmospheric constituents and clouds through emission, but not through “absorption and emission”! From the viewpoint of atmospheric heat balance, the energy emitted as LWR into all directions by GHGs and clouds originates not only from absorbed upwelling LWR, but also from other atmospheric energy sources, as absorbed solar radiation, released latent heat etc. Suggestion: “The longwave radiation (LWR) emitted from the Earth’s surface is largely absorbed by certain atmospheric constituents (water vapour, CO2, CH4, N2O and other greenhouse gases (GHGs)) and clouds, which themselves emit longwave radiation into all directions. The downward directed component of this LWR adds heat to the lower layers of the atmosphere and to the Earth’s surface.” [Karl-Heinz Bernhardt, Germany]	Accepted - text revised.
1-292	1	5	26	5	26	componants instead of constituents [YEHIA HAFEZ, Saudi Arabia]	Rejected - we prefer constituents.
1-293	1	5	26			for clarity: and largely reradiated back towards the surface by .. [Tibor Farago, Hungary]	Taken into account - text revised according to 1-291.
1-294	1	5	26			That the longwave radiation emitted from the Earth’s surface is largely reradiated by greenhouse gases is highly questionable. If radiative transfer would be the dominant process as it is indeed in vacuum, why an infrared spectrometer facing ground from an altitude of a few tens meters does not measure any signal of the reradiated emissions of CO2 molecules at their two main frequencies of vibration at 20 and 70 THz, but conversely a zero signal ? The measurement gives zero because the radiation is absorbed and negligibly reemitted. The heat absorbed is dissipated by thermal conduction much more than by reemission which remains negligible as checked by the spectrometer. [François Gervais, France]	Rejected - basic physics in a real atmosphere work as described. Satellite measurements confirm stated processes.
1-295	1	5	26			Cont. – Measuring the emission of the Earth + atmosphere system from a spectrometer embarked in a satellite looking down (see e.g. Fig. 6.6 of the review book of G. Petty, A first course in atmospheric radiation, sundog Publishing Co. 2006) does not give the blackbody spectrum just at the frequencies of both main vibration modes of the CO2 molecule, but much less, consistent with the weak efficiency of radiative dissipative process with respect to thermal conduction process. More generally, why in the 2218 pages of SOD, there is not even one infrared spectrum of the radiation emitted by the Earth to show the components of OLR and illustrate their origin ? [François Gervais, France]	Rejected - see 1-294
1-296	1	5	26			Cont. – The only source of information for the reader about this essential topic is the glossary in Annex III where one learns that greenhouse gases emit infrared radiation. Nothing is said about the dissipation by thermal conduction, enhanced by convection. Is it not a little bit short in a report which is supposed to review the scientific knowledge on the subject ? [François Gervais, France]	Rejected - see 1-294
1-297	1	5	28	5	28	Heat energy is radiated in all directions therefore it follows that greenhouse gases also add heat to the upper layers of the atmosphere. Please correct. [John McLean, Australia]	Rejected - the qualifier "largely" takes care of this effect
1-298	1	5	30	5	30	Please clarify which changes have occurred in other aspects of climate. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted- This statement seems to refer to page 4 instead of 5. The Box 1.1 has been revised
1-299	1	5	30	5	31	Need to add here a line to explain why energy from the sun is not received equally at all latitudes. [Government of Canada]	rejected - this is high school knowledge and does not need to be mentioned here

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1-300	1	5	30	5	32	change to "...this energy is then partially redistributed to middle and high latitudes by ocean currents and atmospheric transport processes." [James Renwick, New Zealand]	Accepted - text revised.
1-301	1	5	30	5	32	Worded awkwardly and sounds a little redundant. Rewording to "The Earth is not uniformly heated by the sun, with the subtropics and the tropics receiving the bulk of solar SWR. Energy fluxes in the form of ocean currents and atmospheric transport mitigate this imbalance by transporting heat from the low to high latitudes." [Andrew Shao, United States of America]	Accepted - text revised
1-302	1	5	30			"The Sun primarily provides its energy to the Earth in the tropics and the subtropics"; change to "The Sun provides its energy to the Earth primarily in the tropics and the subtropics"; throughout, watch placement of restrictive adverbs. [Stephen E Schwartz, United States of America]	Accepted - text revised
1-303	1	5	31	5	32	I would state that these ocean and atmospheric processes redistribute heat energy and water vapour producing weather. This is a key concept; that fluctuations in the earth's energy balance are experienced as weather. [David Sauchyn, Canada]	Rejected - too detailed for Chapter 1
1-304	1	5	31	6	32	Suggest reverse order of 'ocean currents' and 'atmospheric transport' [Ian Simmonds, Australia]	Accepted - text revised to say oceanic and atmospheric transport
1-305	1	5	32	5	32	"redistributes" → "redistribute" [Martin Juckes, United Kingdom]	Accepted - The text has been revised.
1-306	1	5	32	5	32	redistribute (instead of redistributes) [Helga Nitsche, Germany]	Editorial - Copyedit to be completed prior to publication
1-307	1	5	32	5	32	typo: 'redistribute' instead of 'redistributes' [CLAUDIA STUBENRAUCH, France]	Editorial - Copyedit to be completed prior to publication
1-308	1	5	32			*redistribute(s) [Tibor Farago, Hungary]	Editorial - Copyedit to be completed prior to publication
1-309	1	5	34	5	36	Why "Either"? Presumably, fluctuations derive from both. [Government of France]	Rejected - either "or" does allow for both.
1-310	1	5	34			"Fluctuations"; suggest instead "Changes"; fluctuations implies ups and downs about some central value instead of systematic changes, which is what is intended. [Stephen E Schwartz, United States of America]	Accepted - The text has been revised.
1-311	1	5	35	5	36	Changes in incoming solar radiation derive from changes in the Solar output and changes in the Earth's albedo. [Hosny Hasanean, Saudi Arabia]	Rejected - 'or' does allow for "and", but both do not necessarily happen at the same time.
1-312	1	5	35			Greater care should be made to use terms consistently: SWR, visible, incoming vs. LWR, infrared, outgoing. In this instance, line 5 uses "incoming", line 40 uses "LWR", but a small % of incoming is LWR [Government of United States of America]	Taken into account - Text has been revised.
1-313	1	5	35			The acronym 'OLR' is necessary? [JAVIER MARTIN-VIDE, SPAIN]	Taken into account - Yes, it is used in Figure 1.1.
1-314	1	5	35			these are changes in 'net' incoming solar radiation [David Sauchyn, Canada]	Accepted - The text has been revised.
1-315	1	5	36			This statement should be revised to clarify that changes in Earth's surface albedo do not affect the amount of incoming solar radiation. Surface albedo can impact the amount of incoming SWR that is absorbed, but it is the albedo of Earth's upper atmosphere that affects the amount of incoming radiation [Government of United States of America]	Accepted - The text was changed to discuss "net" incoming.
1-316	1	5	38	5	38	Please provide information about which climate aspects have not been observed to change. [Thomas Stocker/WGI TSU, Switzerland]	Rejected -This statement seems to refer to page 4 instead of 5. Box 1.1 is being revised.
1-317	1	5	38	5	40	Solar emissions are more than just TSI so please mention the other forces (e.g. the UK's "Weather Action" derives its reasonably accurate weather predictions from solar particle flow. Given that solar particle flow impacts weather it logically follows that a sustained shift in particle flow would mean a sustained shift in weather patterns, which ultimately means a change in climate.) [John McLean, Australia]	Rejected -The science does not support solar particles playing a major important role in climate. For example, see review paper in Reviews of Geophysics by Gray et al (Leslie Gray is from the University of Reading in the UK) published in 2010 on Solar Influences on Climate.

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1-318	1	5	38			Might be worth mentioning that 1361 is down from the value of 1365 accepted at the time of AR4. This is a noteworthy observational change. [Adrian Simmons, United Kingdom]	Accepted - Text has been revised.
1-319	1	5	38			referring to Ch8 here is ok, but suggest to add peer reviewed reference to the 1361 W/m2 as the "generally accepted mean value of TSI". [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the reference has been added. Reference to Kopp and Lean 2011 is already there, although the text needed to be revised slightly.
1-320	1	5	39	5	40	"Variations of a few tenths of a percent are common, e.g., during the approximately 11 year sunspot solar cycle" This is slightly misleading since the measured TSI variations over an 11-yr cycle are less than 1 permil. Only on very short time scales the measured changes have been larger. [Raimund Muscheler, Sweden]	Accepted - Text has been revised.
1-321	1	5	40	5	40	add: Earth's global mean albedo has been observed to increase during the months following production of stratospheric aerosols by strong volcanic eruptions (cf. Sect. 7.7.2.1). However, apart from these, no global albedo variations have been reliably established on the basis of satellite measurements (Wielicki et al. 2005 , Kandel & Viollier 2010), although the satellite data do reveal significant regional and zonal mean albedo changes due mostly to cloud cover changes. [Robert Kandel, France]	Rejected - Too detailed for Chapter 1. This level of detail would be out of place in this chapter.
1-322	1	5	40	5	41	This should not be a statement of either/or because the last condition "changes in emission of LW from the earth surface" requires the first condition "changes in the temperature of earth's surface". [David Sauchyn, Canada]	Accepted - The sentence has been revised.
1-323	1	5	40	5	42	This sentence would be more accurate as "Changes in LWR can result from changes in the temperature of the Earth's surface or atmosphere or changes in the emissivity of long wave radiation from either the atmosphere or the Earth's surface." [David Parrish, United States of America]	Accepted - Text has been revised.
1-324	1	5	40	5	45	Changes in atmospheric emissivity of LWR is briefly depicted (line 42) but changes in Earth's surface emissivity is not. Maybe add one sentence startig by "For Earth's surface, ...". It would additionally introduce the next paragraphe [Government of France]	Accepted - The rewrite of the sentence basically fixes this.
1-325	1	5	42	5	42	Suppress : "in emissivity" [Government of France]	Accepted - The sentence has been revised.
1-326	1	5	42	5	42	changes in emission' instead of 'changes in emissivity'? [CLAUDIA STUBENRAUCH, France]	Accepted - Text changed to "emissivity"
1-327	1	5	42			"predominately" should be "predominantly" [Peter Guttorp, United States of America]	Editorial - Copyedit to be completed prior to publication
1-328	1	5	42			"are predominantly due to"; change to "are due predominantly to"; throughout, watch placement of restrictive adverbs. I rest my case; sloppy writing is generally reflective of haste or sloppy thinking. But note line 45: largely caused by --> caused largely by. [Stephen E Schwartz, United States of America]	Accepted - The text has been revised.
1-329	1	5	43	5	43	changes in cloud cover and cloud properties' instead of 'changes in cloud cover', because changes in cloud height, in water path or habit and size of cloud particles also affect LWR [CLAUDIA STUBENRAUCH, France]	Accepted - The text has been revised.
1-330	1	5	43	5	45	"The radiative energy budget of the Earth is largely in balance (Figure 1.1), but satellite measurements indicate a small imbalance in the radiative budget (Hansen et al., 2011; Trenberth et al., 2009)." This statement appears contradictory, the reason for and meaning of this difference should be made clear. [Government of Australia]	Taken into account - Text has been modified to clarify this.
1-331	1	5	43	5	45	The radiative energy budget is NEVER in a state of balance but at any moment in time is trying to move to that state of balance. The night-time energy budget is not the same as the day-time budget. The balance changes when solar irradiation moves from striking land to striking water. The seasonal imbalances are exacerbated by the imbalance in land masses in the NH and SH, and so on. (And you say something similar and just as flawed on page 1-7, lines 33-34) [John McLean, Australia]	Accepted - The text has been modified to clarify this.
1-332	1	5	43	5	45	The radiative imbalance is inferred from the increases in OHC (Levitus et al, 2010 and previous), not because of satellite measurements (which are not accurate enough to detect the small imbalance at TOA). [Gavin Schmidt, United States of America]	Taken into account - Some satellites claim they can capture this, but we add reference to ocean heat content.
1-333	1	5	43	5	46	**"The radiative energy budget of the Earth is largely in balance (Figure 1.1), but satellite measurements	Accepted - The text has been modified to clarify this

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						indicate a small imbalance .. This imbalance appears to be largely caused by the ongoing changes ..” More careful language would be necessary instead of “largely in balance .. small imbalance .. largely caused” [Tibor Farago, Hungary]	issue
1-334	1	5	43	5	46	This statement could be clarified in a way that stresses the importance of the "small imbalance" as the anthropogenic signal. As written, it leaves one wondering why we should be worried about a small imbalance. [Government of United States of America]	Accepted - The sentence has been rewritten.
1-335	1	5	43			*in greenhouse gases and (in) particle concentrations. [Tibor Farago, Hungary]	Rejected - the sentence is correct.
1-336	1	5	43			Pages 5 (ln 43), 6 (ln 28) and 36 (ln 8) Consider using either the term "particle(s)" or "aerosol(s)" throughout the text. Switching back and forth causes confusion. [Government of United States of America]	Accepted - Good idea: we use aerosol to be consistent with title of Chapter 7.
1-337	1	5	44	5	44	Please be specific about what direction the imbalance is in (i.e., note that the earth is retaining more energy than it is emitting). [Government of Canada]	Accepted - The sentence has been revised for more clarity
1-338	1	5	44	5	45	Delete the second occurrence of “the radiative budget” in this sentence (plus the preposition “in”) [David Sauchyn, Canada]	Accepted - The sentence has been revised for more clarity
1-339	1	5	44	5	45	should be updated with information from latest satellite data analyses: Loeb et al. 2012: Observed changes in top-of-the-atmosphere radiation and upper-ocean heating consistent within uncertainty, Nature Geoscience Letters, DOI: 10.1038/NGEO1375 and Stephens et al. 2012: An update on Earth’s energy balance in light of the latest global observations, Nature geoscience Progress Article, DOI: 10.1038/NGEO1580. [CLAUDIA STUBENRAUCH, France]	Accepted - Text revised to add reference to Chapter 2.3.
1-340	1	5	45	5	45	Papers should be cited in chronological order. (This statement applies throughout the Assessment.) [Ian Simmonds, Australia]	Editorial - Copyedit to be completed prior to publication
1-341	1	5	45	5	46	Please focus in this chapter on an error bar as large as 17 W/m2 for the Earth imbalance (G.L. Stephens, T. L’Ecuyer, R. Forbes, A. Gettelmen, J.-C. Golaz, A. Bodas-Salcedo, K. Suzuki, P. Gabriel, J. Haynes, in J. Geophys. Res., 115 (2010) D24211), questioning the methodology of the AR5 report which conversely ignores the considerable corpus of information from infrared absorption and emission spectra. Considered as « inappropriate views » ? [François Gervais, France]	Rejected - This is an introductory chapter, reviewing basics as would be shown in a text book, not a review of methodologies or an assessment of specific papers.
1-342	1	5	45	5	46	We are close to results, as opposed to introduction/tutorial. [Government of France]	Rejected - This is a review of AR4 status of the science, and thus appropriate
1-343	1	5	45	5	46	and hence the conclusion should be revised accordingly; even without reviewing the conclusion, one should take out 'ongoing' in line 46. [CLAUDIA STUBENRAUCH, France]	Accepted - Text revised.
1-344	1	5	48	5	48	In addition to changing the atmospheric concentrations of gases and aerosols, manmade is affecting [Hosny Hasanean, Saudi Arabia]	Rejected - We do not understand the comment.
1-345	1	5	48	5	50	change to read: In addition to changing the atmospheric concentrations of gases and aerosols, humans are affecting both the energy budget and the water budget of the planet by changing the land surface properties, with redistributions between latent and sensible heat fluxes. [Robert Kandel, France]	Accepted - Text revised largely as suggested, except where another comment is accepted instead.
1-346	1	5	48	5	52	Please add UHI effects. [John McLean, Australia]	Taken into account - The urban heat island is included in this sentence, since this changes the sensible and latent heat fluxes
1-347	1	5	48	6	12	The paragraph starts with “In addition to changing the atmospheric concentrations ..., humans ...”. In fact, nothing has been said so far about human influence. My suggestion: start a new paragraph at p.6, l.5 “Humans enhance ...” and exchange the two paragraphs. [Dietrich Feist, Germany]	Accepted - The sentences have been reordered and revised to address this and other review comments.
1-348	1	5	48	6	12	The order of material presented in this section is awkward because paragraph 3 on page 5 ends by referring to changing atmospheric composition, but that information is not presented until line 56 and is preceded by a discussion of LUC. Suggest moving the information beginning on page 5 line 55 (“In addition.....”) and ending on page 6 line 12 to become the 4th paragraph in section 1.2.2., to keep the discussion of atmospheric	Accepted - The sentences have been reordered and revised to address this and other review comments.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						composition changes together. [Government of Canada]	
1-349	1	5	48	6	12	This paragraph begins by talking about human impacts on atmospheric forcing agents and land use change, then CCN, then black carbon, then GHG's and pollutants. It was difficult to follow the point of the discussion. [Government of United States of America]	Accepted - The sentences have been reordered and revised to address this and other review comments.
1-350	1	5	48	6	12	It's not clear nor particularly discussed in this paragraph how humans have changed the water budget of the planet or the mechanisms by such a change affects climate. For instance, is it because of storage of water, diversion of riverine flow for irrigation/power generation, draining of marshlands? Recommend either expanding the discussion on water budget changes or remove altogether from this paragraph. [Andrew Shao, United States of America]	Taken into account - We are talking just about the changes in the land surface
1-351	1	5	49		49	replace 'water budget' by 'energy budget'. The water budget does not include sensible heat flux.. [Anne Verhoef, United Kingdom]	Accepted - Sentence rewritten to be more clear
1-352	1	5	50	5	55	The land use changes resulting from deforestation to cropland includes, as a rule, causes in increase in albedo so the sentence should be revised to indicate that (i.e., ... increases in the reflectivity of the land). [Government of Canada]	Rejected - Not in all cases, so prefer to keep as written.
1-353	1	5	51	5	51	"Forests" versus "agriculture" : take other words e.g. forest land and cultivated land. [Government of France]	Accepted - sentence rewritten to incorporate this.
1-354	1	5	51			the fact that humans change the composition of the atmosphere is only mentioned on page 6, line 5. Starting this paragraph with "In addition to changing the atmospheric concentrations" seems odd to us. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The sentences have been reordered and revised to address this and other review comments.
1-355	1	5	52	5	53	"clearing and burning a forest to prepare agricultural land reduces carbon storage in vegetation," but it is generally true for all kind of deforestation (and devegetation, i.e. even w/o burning) [Tibor Farago, Hungary]	Taken into account - True, this is just an illustration of common practice.
1-356	1	5	53	5	54	Include erosion problems produced by rain on bare soil, which is a critical situation in jungle areas [Government of Chile]	Rejected - We are concerned here with climate issues, not the important issues of land degradation.
1-357	1	5	53	5	54	The mention of CO2 at this point is premature unless you have already decided that CO2 causes significant warming, in which case why not end the report at this point? [John McLean, Australia]	Rejected- We review the science of the AR4, which includes the evidence that increases in CO2 from humans is largely responsible for temperature changes
1-358	1	5	53	5	55	The sentence beginning "Changes in land use can alter" is redundant; add albedo to one of the two previous sentences that also discuss the impact of change in land use on the radiation budget. [David Sauchyn, Canada]	Accepted - Sentence is deleted.
1-359	1	5	53			"adds" is better than "adding". Burning directly adds CO2 and other species to the atmosphere. [Adrian Simmons, United Kingdom]	Accepted - Sentence is revised as indicated.
1-360	1	5	54	5	55	Suggest adding the words "surface albedo" in brackets after the word "reflectivity". Then the whole sentence in line 55 beginning with "Changes in land use" can be deleted as it repeats what is in the previous sentence. [Government of Canada]	Accepted - sentence is revised as suggested.
1-361	1	5	54	5	55	Two sentences are redundant on reflectivity - "...changes the reflectivity of the land..." and "...can alter the Earth's reflectivity..." [Kenneth Minschwaner, United States of America]	Accepted - sentence is revised as suggested.
1-362	1	5	55	5	55	Changes in land use lead to the alter in the Earth's reflectivity (surface albedo). [Hosny Hasanean, Saudi Arabia]	Taken into account - The sentences have been reordered and revised to address this and other review comments.
1-363	1	5	55	6	5	suggest to refer to Ch7 for an in-depth discussion of the effects of clouds and aerosols [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Chapter 7 has been referenced.
1-364	1	5	55	6	12	Aerosol discussion seems like it should be its own paragraph, separate from the land use changes described earlier in this paragraph. [Andrew Shao, United States of America]	Accepted - text revised.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-365	1	5	55			Short-hand is used here. To be clear, the following insertion should be considered: "... in the SWR RANGE OF THE ELECTROMAGNETIC SPECTRUM." [Government of United States of America]	Accepted - sentence has been deleted due to other comments
1-366	1	5	55			I would say "with respect to SWR" rather than "in the SWR" [Tamlin Pavelsky, United States of America]	Accepted - sentence has been deleted due to other comments
1-367	1	5	55			"Earth's reflectivity (surface albedo) in the SWR"; let it read "Earth's reflectivity (surface albedo) in the SW". (no R for radiation). [Stephen E Schwartz, United States of America]	Accepted - sentence has been deleted due to other comments
1-368	1	5	57			"modify SWR" should be clarified. A suggested re-phrasing: "... and also modify THE AMOUNT OF SWR REACHING EARTH'S SURFACE." [Government of United States of America]	Accepted - sentence has been deleted due to other comments
1-369	1	5		7		Section 1.2.2 This section is not written in a way that is understandable for non-experts. [European Union]	Accepted - The text has been extensively revised for clarity.
1-370	1	5		7		Section 1.2.2 "Key Concepts in Climate": This section could benefit from reorganization. It does not flow smoothly, jumping from topic to topic in a way that makes it difficult to ingest. [Government of United States of America]	Accepted - transitions have been made smoother
1-371	1	6	1	6	12	need a reference [YEHIA HAFEZ, Saudi Arabia]	Accepted - Citations are made more consistent across this chapter.
1-372	1	6	2	6	2	in cloud albedo and life time' instead of 'in cloud albedo' [CLAUDIA STUBENRAUCH, France]	Accepted - text revised.
1-373	1	6	2	6	4	A reference to Chapter 7 would be nice here [Gunnar Myhre, Norway]	Accepted - text revised.
1-374	1	6	4	6	5	rephrase: Whether the net radiative effect of a cloud is one of cooling or of warming depends on its physical properties (height, water path and effective cloud particle size) as well as on the nature of the CCN population. [CLAUDIA STUBENRAUCH, France]	Accepted - text revised.
1-375	1	6	4	6	6	Please add that the influence of cloud also depends on the direction of radiation flow. (Cloud has a shading effect during the day and can impede LWR at night) [John McLean, Australia]	Rejected - This statement is too detailed for the text in this chapter
1-376	1	6	5	6	5	Delete comma after 'CH4' [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-377	1	6	6	6	10	Halocarbons should be mentioned somewhere in the discussion of greenhouse gases [Gunnar Myhre, Norway]	Accepted - text revised.
1-378	1	6	9			"important gases to LWR" should be clarified. A suggested re-phrasing: "...gases important IN DETERMINING THE AMOUNT OF LWR EXITING THE ATMOSPHERE, such as..." [Government of United States of America]	Accepted - text revised.
1-379	1	6	10	6	12	We propose that you include the statement that air pollution and climate science are intrinsically linked in the executive summary [Government of NORWAY]	Rejected - Such a statement would be beyond the scope of this chapter and is only true in part.
1-380	1	6	12	6	12	Atmospheric composition and chemistry would be preferable to "pollution science". [Government of France]	Accepted - text revised.
1-381	1	6	14	6	14	Change 'manmade' to 'man made' [Peter Burt, United Kingdom]	Taken into account - it now reads "anthropogenic"
1-382	1	6	14	6	14	Gender-neutral language should be used, e.g. human made instead of "manmade". [Dora Marinova, Australia]	Taken into account - it now reads "anthropogenic"
1-383	1	6	14	6	22	This information seems to belong with the discussion of the energy budget on page 5 lines 18-32. Suggest these paragraphs be merged. [Government of Canada]	Rejected - the concept of radiative forcing is included here.
1-384	1	6	14	6	22	You have forgotten to include wind, its role in distributing heat energy and the consequences of that. According to the Stephan-Boltzmann equation, all other things being equal, two equal sized grid cells with one at 30C and one at 20C will emit more radiation than two grid cells both at 25C despite the average temperature of the pairs of grid cells being identical (and this difference likewise occurs to varying extents across the usual range of temperatures). [John McLean, Australia]	Rejected - this is more detail than is appropriate in this chapter.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-385	1	6	14			Biosphere' can be added to the other climate components. [JAVIER MARTIN-VIDE, SPAIN]	Accepted - text revised.
1-386	1	6	14			I would suggest to add "biosphere" to the given components of the climate system [Jucundus Prof. Dr. Jacobeit, Germany]	Taken into account - see response to 1-385
1-387	1	6	15	6	15	With respect to some public discussions, I suppose after "...that affects climate" to add: The direct heat release from manmade energy production is negligible in the global scale, but should be considered in local scales (urban climate, climate of industrial regions). [Karl-Heinz Bernhardt, Germany]	Rejected -This is more detail than can be included here.
1-388	1	6	17	6	17	RF is a meas..... Must move to line 14 [YEHIA HAFEZ, Saudi Arabia]	Accepted - text revised.
1-389	1	6	17		17	energy balance has not been properly explained yet. Explain first or refer to other section. Also, what is meant by 'a net change'? Would that be a change in net radiation? Or in the distribution of Rn over he fluxes? Be precise. [Anne Verhoef, United Kingdom]	Rejected - this follows text from the same section
1-390	1	6	18	6	19	We ask that the concept of adjusted forcing to be included in the executive summary. The emphasis should be to explain this concept in relation to Short Lived Climate Forcers (SLCF) [Government of NORWAY]	Rejected - Those explanations belong in Chapters 7 and 8, not in Chapter 1, where only the basic concept is introduced.
1-391	1	6	18			This paragraph would be improved by offering a more nuanced explanation for why AF is necessary. What is the weakness in RF that AF improves upon? This is hinted at on Line 19, but it should be explained more explicitly here. [Tamlin Pavelsky, United States of America]	Taken into account - The name AF is being changed to ERF. This paragraph is being revised to more clearly state the explanation for ERF. Also see later Chapters 7 and 8 for a detailed discussion -- there is a new Box on ERF in Chapter 7.
1-392	1	6	19	6	19	comma missing after '(AF)' [Helga Nitsche, Germany]	Editorial - Copyedit to be completed prior to publication
1-393	1	6	19	6	22	It's not clear why AF is defined with sea-ice fixed, as the Chapter later speaks of rapid change in Arctic sea ice. Is this a less-significant factor than land-albedo change, or is it more a reflection of modelling difficulty? [Adrian Simmons, United Kingdom]	Taken into account - The albedo of the sea ice is allowed to be modified but not that extent: that is a longer time period response. The name AF is being changed to ERF. This paragraph is being revised to more clearly state the explanation for ERF. Also see later Chapters 7 and 8 for a detailed discussion -- there is a new Box on ERF in Chapter 7.
1-394	1	6	19			"that allows for" let it read "that accounts for". [Stephen E Schwartz, United States of America]	Accepted - text changed.
1-395	1	6	25	6	25	"Figure 1.1: Main drivers ...": the figure shows components, not "drivers". [Martin Jukes, United Kingdom]	Rejected - Depicted in Figure 1.1 are the components of the radiative budget (grey) with colours showing the drivers, so the emphasis is on the drivers. Climate change drivers is a common terminology also already adopted in IPCC AR4. No changes in Text
1-396	1	6	25	6	35	need a reference [YEHIA HAFEZ, Saudi Arabia]	Accepted - text revised
1-397	1	6	25		25	I object to the word energy balance here (maybe this is what you meant above). EB is $R_n = H + LE + G$. I think you mean the radiation balance or budget instead? [Anne Verhoef, United Kingdom]	Accepted - text revised
1-398	1	6	27			"(incoming SWR)" should be clarified. A suggested re-phrasing: "(THROUGH FLUCTUATIONS IN THE AMOUNT OF incoming SWR)" [Government of United States of America]	Accepted - text revised
1-399	1	6	29	6	29	Figure 1.1 caption: "...aerosols scatter and reflect SWR..." need to also include absorption (e.g. black carbon), so suggest "...aerosols absorb, scatter, and reflect SWR..." [Kenneth Minschwaner, United States of America]	Accepted - text revised
1-400	1	6	30	6	30	add " and possibly affecting precipitation" after "modifying the properties of cloud droplets" [Robert Kandel, France]	Accepted - text revised
1-401	1	6	32	6	32	The use of 'etc' is imprecise. Please remove, and/or give all gases [Peter Burt, United Kingdom]	Accepted - text revised

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-402	1	6	32	6	33	If the aerosols absorb LWR radiation how do they achieve a lower temperature (not higher) and reemit less energy? [David Sauchyn, Canada]	Taken into account - Only large size aerosol particles are efficient in absorbing LWG, and the LW forcing tends to be smaller than SW cooling.
1-403	1	6	32			Use of the term "large aerosols" is confusing - what size is considered "large"? [Government of United States of America]	Accepted - text revised in" Large particles (> 2.5 um in Diameter")
1-404	1	6	37	6	37	Insert space before bracket [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-405	1	6	37	6	37	It would be better to say: Once a forcing is applied, complex internal feedbacks determine the eventual response of the climate system, and will in general cause this response to differ from a simple linear one. [Government of France]	Accepted -text revised.
1-406	1	6	37	6	37	blank missing between responds and (IPCC) [Helga Nitsche, Germany]	Editorial - Copyedit to be completed prior to publication
1-407	1	6	37		37	space needed after 'response' [Anne Verhoef, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-408	1	6	37		47	<p>"the climate feedbacks describe how the climate system responds"; this is an overly broad definition of climate feedbacks and is at variance with the definition given in the glossary, page AIII-5; climate feedbacks are restricted to the further changes in radiative fluxes that result from a change in global temperature that results from an initial change in radiative flux, e.g., a change in water vapor amount that enhances the effect of a greenhouse forcing, but not all responses of the climate system are feedbacks. There are other feedbacks that can be defined, such as changes in vegetation, or in the carbon cycle from an initial change in CO2 that alter the ultimate change in CO2 from the initial change; these would be denoted carbon cycle feedbacks, not climate feedbacks.</p> <p>This concern would extend to Figure 1.2, especially to the time scales given there of order days to weeks for several feedbacks. If these changes in climate properties are responses to change in global mean temperature then they cannot operate faster than the change in global mean temperature, which puts the time scale on the order of a few years (1/e time). The processes operate on rapid time scales indicated, but not the feedbacks. Or at least in my opinion it is not useful to denote the processes that operate on that time scale as climate feedbacks, which is the definition given in the glossary, with which I concur. I would urge the authors to aim for consistency with the definition of climate feedback given in the glossary. [Stephen E Schwartz, United States of America]</p>	Taken into account - One goal of this figure and discussion is make sure scientists understand that the climate system includes the carbon cycle and is not isolated to just the physical portions of the climate system. Some feedbacks operate more quickly than others; all of them can't act until all others have acted, so the reviewer suggests that we cannot indicate a time scale effectively. However, some processes do have different time scales, and we know this, thus we keep the figure and discussion as stated.
1-409	1	6	37			Feedbacks do not describe the whole response of the climate system to a forcing. They are a factor in determining the response. The response will comprise some parts than can be characterised as significantly affected by feednacks, but other components of the response may not involve feedbacks of any significance. [Adrian Simmons, United Kingdom]	Accepted - Sentence modified to be consistent with comment1- 405, and thus addresses this comment.
1-410	1	6	38	6	38	Insert space after full stop [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-411	1	6	40	6	42	The hypothesis of water vapor feedback is questioned by the decrease of the specific humidity at the altitude of ~ 9000 meters where the models predict hot spots under the tropics. According to NOAA, the decrease reaches 15 % while the CO2 has increased by 24 % since 1959. [François Gervais, France]	Rejected - see feedbacks discussion in Chapter 7
1-412	1	6	40	6	42	Water vapour not always a positive feedback, what's more the evaporation of surface mositure to create that vapour took heat energy out of the system. Please correct. [John McLean, Australia]	Rejected - Water vapour is a classic positive feedback: please see Hartman, Global Physical Climatology for an explanation
1-413	1	6	40	6	42	The definition of water vapor feedback is not general: the explicit means by which humidity changes (change in evaporation or precipitation) need not be specified. [The "evaporation fallacy" is widely discussed: the concentration of water vapor and the flux of water vapor have different dimensions and are nontrivially related.] Only the relationship between temperature -> humidity -> radiation -> temperature needs to be	Accepted - Text is modified as requested.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						discussed in defining water vapor feedback. [Timothy Merlis, United States of America]	
1-414	1	6	40	6	42	It is more important that the saturation water vapour pressure increases than increase in the evaporation (see FAQ8.1) [Gunnar Myhre, Norway]	Accepted - Text is modified as requested.
1-415	1	6	40	6	42	This sentence is a little ambiguous, implying that it is just evaporation that increases the moisture content of the atmosphere rather than the added effect of warmer air being able to hold more water as a vapour. It might be better to explicitly say that a warmer atmosphere is able to contain/hold more moisture as a vapour than cooler air. [Kate Willett, United Kingdom]	Accepted - Text is modified as requested.
1-416	1	6	40	6	43	Reword to make it the process more clear: "An example of a positive feedback is the water vapour feedback: an increase in surface temperature enhances water evaporation, in turn increasing the amount of water vapour present in the atmosphere, which, because water vapor absorbs and emits infrared radiation, enhances the greenhouse effect and leads to further surface warming." [Andrew Shao, United States of America]	Accepted - Text modified to respond to comments 1-413 through 1-415 which includes less detail and thus addresses this comment.
1-417	1	6	45	6	45	Climate feedbacks cannot occur on the timescale of "seconds": The timescale for change in surface temperature is longer. (Radiation/forcing can change in "seconds", but not the surface temperature.) [Timothy Merlis, United States of America]	Accepted - Text modified to "hours"
1-418	1	6	45	6	49	The last sentence (about negative feedbacks) seems out of place and might benefit from being moved to precede the next to last sentence that discusses timescales of feedbacks. [Government of United States of America]	Accepted - text revised.
1-419	1	6	45			This example of a positive feedback could be made more clear, by inserting, "...and snow surfaces melt REVEALING DARKER SURFACES THAT ARE MORE EFFICIENT AT ABSORBING INCOMING SWR." [Government of United States of America]	Accepted - text revised.
1-420	1	6	47	6	48	actually cloud-albedo feedback would be an even more significant process contributing to the climate response [Government of France]	Taken into account - This is true, but we cannot include all feedbacks. This process is included in the figure.
1-421	1	6	47	6	49	This example of a negative feedback would be better placed before the sentence in line 45 that starts "In addition..." [Government of United States of America]	Accepted - text revised.
1-422	1	6	47	6	49	Because many (older?) publications refer to "zero-feedback", I believe it necessary to insist on the existence of the negative radiation feedback in all model calculations and not just call it an "example". One might write: The dominant negative feedback, necessary for climate stability, is the increased loss of energy through longwave radiation as surface temperature increases (sometimes also referred to as blackbody radiation feedback). One might refer to Fig. 7.8 and line 31 in sect. 7.2.4. where it is called the basic "black-body response". [Robert Kandel, France]	Accepted - text revised in part. We did not say that it is necessary for climate stability, since some other negative feedback would have compensated to create a very different climate equilibrium.
1-423	1	6	47	6	49	The negative feedback example hardly seems a feedback - it is the fundamental response of the earth as a blackbody to solar heating. [James Renwick, New Zealand]	Rejected - This is used as a feedback in classic climate books (e.g. Hartman's Global Physical Climatology), and is usually considered a feedback and does act as a feedback on this system.
1-424	1	6	47		49	"An example of a negative feedback is the increased loss of energy through longwave radiation as surface temperature increases (sometimes also referred to as blackbody radiation feedback)." This is not a feedback. It is a response. In fact if it is the black-body response, it is explicitly the no-feedback response. I have discussed this: Feedback and sensitivity in an electrical circuit: An analog for climate models. Schwartz S. E. Climatic Change 106, 315-326 (2011). doi: 10.1007/s10584-010-9903-9. Does any of this matter? It all depends on our objective. We use definitions to better convey the meaning of the words or phrases we use. We aim for consistency. Of course we can decide to make the words or phrases mean whatever we choose them to mean, but pretty soon we run into the world of Humpty Dumpty in Alice in	Rejected - This is used as a feedback in classic climate books (e.g. Hartman's Global Physical Climatology), and is usually considered a feedback and does act as a feedback on this system.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Wonderland. [Stephen E Schwartz, United States of America]	
1-425	1	6	47			melting of land ice sheets can take not only decades to centuries, but also millenia [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - text revised.
1-426	1	6	47			Melting of land ice sheets can take decades to centuries', but ice calving can take minutes and glacier melting can take days to months. [Paul Stoy, United States of America]	Accepted-text revised.
1-427	1	6	48	6	48	"Increased loss of energy through longwave radiation" is potentially confusing and could be reworded as "increased emission of longwave radiation". Also, this negative feedback is very important to explain and suggest more space could be devoted to it, as ultimately, this is the feedback that explains how a new climate equilibrium is reached. This would then link well to the discussion of equilibrium climate experiments in the next paragraph. [Government of Canada]	Accepted - text revised to replace "loss" with "emission". But we do not have space to discuss this in detail here, as suggested.
1-428	1	6	49			It would be important to add that the consideration of any particular feedback mechanism cannot provide a proper explanation of the overall changes, i.e. it cannot replace the complex evaluations [Tibor Farago, Hungary]	Accepted - Text modified in the first line to show non-linear responses of the climate system.
1-429	1	6	51	6	52	This is pointless unless the models can be proven accurately incorporate all climate forces, which even modellers agree is not the case at present. Delete it. [John McLean, Australia]	Rejected - as discussed in Chapter 9, the models are capable of capturing many features of the current climate.
1-430	1	6	51	7	4	This sentence concludes with a dismissal of equilibrium climate experiments, so why not delete the entire paragraph (and use the word space elsewhere)? [John McLean, Australia]	Rejected - Equilibrium climate experiments are often used, and thus are explained here.
1-431	1	6	51	7	4	Why virtually no references down to this paragraph and then 10+ in this one? The writing here is inconsistent with the rest of the chapter. [Larry Thomason, United States of America]	Accepted - We will check for balance in the references before publication.
1-432	1	6	53			"equilibrium response". Here and throughout it needs to be noted that this term, although widely used, is a misnomer; it is a steady state response. Equilibrium refers to a state in which all fluxes are negated by equal an opposite flux; detailed balance requirement. So again this veers on making words that have explicit, long-established meaning across a broad sweep of the scientific literature mean whatever we want them to mean. I suggest at minimum the term be qualified by a footnote at first use that indicates that this is a widely used terminology in the climate literature, despite being at variance with the conventional definition. [Stephen E Schwartz, United States of America]	Taken into account - Equilibrium is commonly considered when the fluxes are balanced, and we use this common definition here.
1-433	1	6	56	6	58	A brief description of transient climate experiments is needed here before launching into a discussion of the transient climate response. Also, it is not clear why TCR can only be measured in experiments with 1%/yr CO2 increase; please clarify. Perhaps a formal TCR measurement needs to be distinguished from more general use of the phrase transient response. [Government of Canada]	Accepted - text revised.
1-434	1	6	58			"a 1% yr-1 increase simulation at the time of " is awkward wording [David Sauchyn, Canada]	Accepted - text revised
1-435	1	6				Figure 1 Caption. "These changes are driven by ... as well as human influence (e.g., changes in vegetation height)." Does "changes in vegetation height" mainly imply vegetation type change? Otherwise, personally I find it hard to link this expression with any specific and massive processes. If it actually implies the type change, the expression may not be best choice. [Gan Zhang, United States]	Accepted - text revised
1-436	1	7	1			A reference to the NRC report, Climate Stabilization Targets would be valuable here. [Government of United States of America]	Rejected - We think there are enough references on this.
1-437	1	7	3	7	3	Referencing trail not clear. Chapters 9 and 12 where, in the cited references (which is how it is written)? [Peter Burt, United Kingdom]	Accepted - text revised.
1-438	1	7	4			Suggest also call attention to "transient climate sensitivity" the ratio between temperature change and forcing at any given time after application of forcing, which is seeing increasing application as a measure of climate sensitivity. Suggested language: Transient climate sensitivity, the ratio between temperature change and forcing at any given time after	Rejected - Unless TCS is picked up by another chapter it would be hard for us to justify its inclusion in the introductory chapter.

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						<p>application of forcing, is seeing increasing application as a measure of climate sensitivity, especially in situations of gradually increasing forcing such as characterizes the situation under anthropogenic forcing, as in twentieth century runs. This transient sensitivity differs from the equilibrium sensitivity because of the net heating of the planet; the system has not yet reached its new steady state. It is similar to "transient climate response", the ratio between temperature change and forcing in a climate run in which CO2 is increased at 1% per year, evaluated at the time of CO2 doubling.</p> <p>Because of the long time required to reach steady state climate following a perturbation, hundreds of years, transient sensitivity may be a more useful quantity than equilibrium sensitivity for interpretation of climate change on the decadal to centennial time frame and for policy considerations.</p> <p>References:</p> <p>Held IM, Winton M, Takahashi K, Delworth T, Zeng F, Vallis GK (2010) Probing the Fast and Slow Components of Global Warming by Returning Abruptly to Preindustrial Forcing. J Climate 23:2418-2427. doi:10.1175/2009JCLI3466.1</p> <p>Padilla, LE, Vallis GK, Rowley CW, (2011) Probabilistic Estimates of Transient Climate Sensitivity Subject to Uncertainty in Forcing and Natural Variability. J. Climate, 24: 5521–5537. doi: http://dx.doi.org/10.1175/2011JCLI3989.1</p> <p>Dufresne J-L, Bony S. (2008) An assessment of the primary sources of spread of global warming estimates from coupled atmosphere-ocean models. J. Climate 21: 5135-5144. doi: 10.1175/2008JCLI2239.1</p> <p>Schwartz S. E. Determination of Earth's transient and equilibrium climate sensitivities from observations over the twentieth century: Strong dependence on assumed forcing. Surveys Geophys. 33, 745-777 (2012). DOI 10.1007/s10712-012-9180-4</p> <p>[Stephen E Schwartz, United States of America]</p>	
1-439	1	7	7	7	12	The air-sea carbon dioxide exchange feedback may be positive or negative! It is true that the direct "ocean uptake carbon dioxide feedback" is negative with respect to increasing carbon dioxide in the atmosphere. But there exists also a positive feedback with respect to global warming, since carbon dioxide uptake potential is diminished in a warmer ocean, and, therefore, less carbon dioxide added into the atmosphere by human activities is deposited in the ocean. This results in a positive feedback in the climate warming process, added to that of water vapour as the main greenhouse gas. [Karl-Heinz Bernhardt, Germany]	Taken into account - The ocean uptake of carbon reduces the amount of carbon in the atmosphere, no matter the temperature, and thus acts as a negative feedback on the earth system.
1-440	1	7	7	7	12	About Figure 1.2: "... lapse time...". This expression is not explained previously in the text, so an explanation must be included here (ie, in parenthesis) or in the previous text. [Rubén D Piacentini, Argentina]	Accepted - text revised with a reference to the glossary definition
1-441	1	7	8	7	8	Why is ocean uptake of carbon listed as a negative feedback? Doesn't the maximum carbon uptake vary negatively with the temperature of ocean water? Doesn't that make it a positive feedback? [James Renwick, New Zealand]	Taken into account - The ocean uptake of carbon reduces the amount of carbon in the atmosphere, no matter the temperature, and thus acts as a negative feedback on the earth system. We are including here atmospheric carbon as a part of the earth system.
1-442	1	7	8	8	38	There is no reference to new theoretical lines of evidence here. The first sentence of the chapter gives theoretical advances the same weight as observational and modelling advances. It is not clear to me whether there is material that needs to be included here, or whether, on the other hand, the initial sentence needs to be revisited. It could be said, for instance, that theoretical advances both underpin and are drawn from new observational and modelling work. [Martin Jukes, United Kingdom]	Taken into account - Theoretical advances could either be in the interpretation of observations or in our understanding of processes (e.g. conceptual or numerical models) and are thus included here.
1-443	1	7	9	7	11	In discussing the drivers of climate change this chapter does so by assessing radiative forcing from natural and anthropogenic components. What these anthropogenic components are beyond emissions and land use changes is just to a limited degree discussed. It is critical that this chapter and other chapters in WGI does bring in the societal aspects more as it is an important part of the story. Expanding the earth science	Rejected - This chapter focuses on the drivers of climate change, many of which are explicitly human forced, and are such indicated. We believe we refer to this often enough already in the text.

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						perspective to Earth systems sciences that include humans as parts of the system. [Government of NORWAY]	
1-444	1	7	11			note “natural systems In the smaller box” [David Sauchyn, Canada]	Editorial - Copyedit to be completed prior to publication
1-445	1	7	14		14	A summary... is presented (singular). Suggest let sentence read: As global temperature increases in response to a net positive perturbateion, the changes in energy fluxes due to these perturbations are balanced by increased longwave radiation to space, changes in the amount of reflectedf shortwave radiation, and storage of energy in the Earth system, principally the oceans. [Stephen E Schwartz, United States of America]	Accepted -text revised.
1-446	1	7	16	7	16	Capital 'E' for 'earth' [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-447	1	7	19	7	19	first statement is not compelet and not accurate statement [YEHIA HAFEZ, Saudi Arabia]	Accepted - Text revised.
1-448	1	7	19	7	27	This is a difficult paragraph and introduces complex but important concepts. Avoidance of technical terms (e.g. power-law distributions) is recommended or where they are required, explanations should be given (e.g. hysteresis). The discussion here should make reference to the potential for abrupt vs gradual climate change. [Government of Canada]	Accepted - Text has been revised for clarity.
1-449	1	7	21	7	21	Don't start sentences with 'But' [Peter Burt, United Kingdom]	Accepted - text revised
1-450	1	7	22	7	23	I do not believe this is a consensus statement about the state of knowledge about glacial cycles or ENSO. [Timothy Merlis, United States of America]	Taken into account - Text has been revised but we do not see the issue with the statement.
1-451	1	7	23			Spell out “ENSO”. [Dietrich Feist, Germany]	Accepted - text revised
1-452	1	7	24	7	24	About the text included in Figure 1.3.a. OCEAN: "The world oceans has warmed since 1950....", but in AR4 it was informed about the “steady ” increase of the ocean level in the last century. So it is not correct to use a fixed year (1950) for the starting year for temperature increase of the oceans. [Rubén D Piacentini, Argentina]	Taken into account - This is really not referring to this page. And it relates to in terms of what is in Figure 1.3. Figure 1.3 has been revised and gives more general statements on indicators of climate change. The detailed assessment is given in later chapters.
1-453	1	7	24	7	27	the mean of this paragraph is not clear [YEHIA HAFEZ, Saudi Arabia]	Accepted - text revised.
1-454	1	7	26	7	27	I am unaware of unambiguous examples of hysteresis in a comprehensive model of the physical climate system. [Timothy Merlis, United States of America]	Rejected - There are many plausible sources of hysteresis in the climate system, especially on long timescales. See, for instance, Section 3.4.1 in Ray Pierrehumbert's Principles of Planetary Climate. It's true that comprehensive models show little in the way of hysteresis, but it's something of an open question as to whether or not this is a limitation of models (see, for instance, Liu et al., (2009) Science, 325 (5938): 310-314. The text has been written so as to reflect the current state of play in which simpler models often find evidence for hysteresis (eg Rahmstorf et al., (2005), GRL, 32, 23, DOI: 10.1029/2005GL023655) while GCMs often don't. We don't think the text is unreflective of this state of affairs.
1-455	1	7	26			suggest to explain briefly what "characterised by hysteresis" means. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - We added an explanation.
1-456	1	7	29	7	38	These lines would be better-placed if moved up in the text to line 5, before the current placement of Figure 1.2 [Government of United States of America]	Accepted - Text has been revised as suggested.
1-457	1	7	29	7	38	need a reference [YEHIA HAFEZ, Saudi Arabia]	Accepted - Text revised.
1-458	1	7	29	7	39	“Climate change commitment”: this is poorly defined here, and likely to cause confusion. The CMIP3	Accepted - Text revised.

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						“commit” experiments held atmospheric concentrations of greenhouse gases at 2000 levels – far from being what we are committed to, this is a purely hypothetical experiment with greenhouse gas levels below any credible scenario. The term “commitment” is used in the scientific community as a label, but it is misleading. There is no equivalent run in CMIP5. To avoid confusion, delete the first sentence of this paragraph and delete “commitment,” from the phrase “Related to commitment, multiple climate states ...”. (see also discussion in SOD Chapter 12, p61, lines 12-29, which makes it clear that the “commitment” issue resolves around social and political questions which are outside the scope of the WG1 report). Alternatively, refer to FAQ 12.3 which presents results for a range of different “commitment” definitions. [Martin Jukes, United Kingdom]	
1-459	1	7	29	7	46	In the discussion of climate change commitment, it would be very useful to give an indication that climate change commitment is very important. A short example or a reference to a later chapter would work. Something like: Even if radiative forcing remained constant, models indicate that atmospheric warming would still increase by about xx% (or zz degrees C) in the next yy years as the upper layers of the oceans come into equilibrium with the radiative forcing. [David Parrish, United States of America]	Taken into account - a cross reference to Chapter 12.5 is added.
1-460	1	7	29			Don't use the word being defined in the definition (i.e., “commit”, or even “climate”, if possible); how about: “Climate change commitment is defined as the inevitable different future climate caused by past or current forcings.” Or something along those lines. [JOSHUA FISHER, United States of America]	Accepted - Text revised.
1-461	1	7	31	7	31	?proper wording?: ..ranging from.....through to..? [Helga Nitsche, Germany]	Accepted - Text revised.
1-462	1	7	31			instantaneous ... feedbacks. Again, not as feedback has been used in the climate literature for some decades, which is change in climate system properties in response to change in global temperature that diminishes (negative feedback) or augments (positive feedback) the temperature change induced by the original perturbation. [Stephen E Schwartz, United States of America]	Accepted - replaced "instantaneous" to "rapid".
1-463	1	7	32			It is not completely clear which timescales the carbon cycle/ice-sheets examples refer to. [JOSHUA FISHER, United States of America]	Taken into account - References to chapters 5 & 6 added where these issues are more fully discussed.
1-464	1	7	34	7	37	The meaning of this long sentence is unclear [Government of France]	Accepted - Text revised.
1-465	1	7	34	7	37	Grammar: add a period. "[...] for many centuries. Furthermore slow processes can sometimes only be constrained [...]" [Andrew Shao, United States of America]	Editorial - Copyedit to be completed prior to publication
1-466	1	7	35	7	36	For easier reading break the sentence like this: "... reached for many centuries. Furthermore, slow processes ..." [Dietrich Feist, Germany]	Editorial - Copyedit to be completed prior to publication
1-467	1	7	35	7	36	Slow processes are not constrained by observations over long periods. Our understanding, monitoring and prediction of these slow processes are what needs observations over long periods. [Adrian Simmons, United Kingdom]	Accepted - Text revised
1-468	1	7	35	7	37	The text beginning with the word "furthermore" on line 35 and ending with "paleoclimate data" on line 37 should be deleted. It seems to be referring to model experiments specifically and so doesn't fit with the rest of the paragraph; furthermore the meaning of this text is difficult to understand. [Government of Canada]	Accepted - Text revised
1-469	1	7	36	7	37	Change to "...giving a particular salience to paleoclimate data for understanding equilibrium processes." [James Renwick, New Zealand]	Accepted - Text revised
1-470	1	7	36			*processes can sometimes only be constrained by data collected - ? (by data?) [Tibor Farago, Hungary]	Accepted - Text revised
1-471	1	7	36			Again, a word I had to look up: “salience”. Better use something like “prominence” or better rewrite the sentence? [Dietrich Feist, Germany]	Accepted - Text revised.
1-472	1	7	38	7	38	ngoing (instead of on-going) [Helga Nitsche, Germany]	Editorial - Copyedit to be completed prior to publication
1-473	1	7	38	7	39	clarify the sentence. Are multiple climate states and hysteresis the concept of irreversibility? And what does that mean? [Government of Germany]	Accepted - Text revised.
1-474	1	7	39			Chapter 1 seems to be generally-worded, but then words like “hysteresis” and “bifurcation” come in, which	Rejected- The report has numerous technical terms in

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						connects to a different audience, and loses another audience. [JOSHUA FISHER, United States of America]	it; these are just two more.
1-475	1	7	40	7	42	Why is it impossible? A sentence explaining that the previous combination of variables that define the climate should be included, explaining that not all variables are independent and therefore not all the possible climate states can be reached randomly. [Juan Blanco, Spain]	Taken into account - A full elaboration is inappropriate in the introduction. We have added a reference to Chapter 12 where the issue is more fully discussed.
1-476	1	7	40	7	46	It makes no sense to discuss "tipping points" and then say that there is no evidence that models cannot show that they exist on any meaningful scale. [John McLean, Australia]	Rejected - Text discusses evidence in peer-reviewed literature for threshold behaviour/tipping points in the Arctic, and model studies discussing possible global tipping points.
1-477	1	7	42	7	46	Is it appropriate to have these conclusions here about global scale tipping points in an introductory section explaining key concepts? Suggest this text be deleted or moved to an appropriate section of a technical chapter where the literature is more fully assessed. A reference to where that discussion can be found would be useful. [Government of Canada]	Taken into account - Examples are useful since they ground the discussion. Reference to Chapter 12 inserted to point readers to a longer discussion.
1-478	1	7	42	7	46	We ask that the discussion about tipping points is addressed in the executive summary. [Government of NORWAY]	Rejected - This is addressed in the Glossary
1-479	1	7	42	7	46	Again inconsistent use of references. Why does this sentence need 7 references when so many other statements need none? [Larry Thomason, United States of America]	Accepted - Referencing throughout chapter has been revisited to make it more even.
1-480	1	7	44	7	44	This is a very weak statement against a lot of scientific evidence about the plausibility of global tipping points, e.g. Barnosky et al. (2012), Approaching a state shift in the Earth's biosphere, Nature, 486, 52–58 (07 June 2012) doi:10.1038/nature11018 or Rockström et al. (2009) A safe operating space for humanity, Nature 476, 472-475 (24 September 2009) [Dora Marinova, Australia]	Taken into account - The issue is contested in the literature, and the discussion here reflects this. Reference to Chapter 12 inserted to point readers to a longer discussion.
1-481	1	7	45	7	45	blank missing: ... Arctic (e.g. Durate..) [Helga Nitsche, Germany]	Editorial - Copyedit to be completed prior to publication
1-482	1	7	48	7	48	Your Glossary no longer assumes that there is a necessary human component to "Climate Change" There is multiple evidence for Changes in the Climate, but no evidence that greenhouse gas emissions are responsible. [Vincent Gray, New Zealand]	Rejected - the Glossary states 'anthropogenic changes in the composition of the atmosphere and land use'
1-483	1	7	48	8	8	Out of scope here. [Government of France]	Rejected - It is not clear what is out of scope. These are introductory statements indicating which chapters the information will be discussed.
1-484	1	7	48	8	38	the concept of the multiple lines of evidence should be used consequently in the text to enhance understandability. Thus, in line 10 delete 'another perspective' and insert 'another line of evidence' and so on for the next two para as well. [Government of Germany]	Accepted - text revised.
1-485	1	7	50	7	55	need a reference [YEHIA HAFEZ, Saudi Arabia]	Taken into account - Paragraphs provide links to the appropriate chapter where they are discussed in more detail, with appropriate citations.
1-486	1	7	50	8	8	Evidence of climate change is not evidence of man-made climate change regardless of how much you might wish it so. This text is therefore invalid and should be deleted. [John McLean, Australia]	Rejected - Paragraphs provide links to the appropriate chapter where they are discussed in more detail.
1-487	1	7	53	7	53	Unequivocal should be used rather than incontrovertible. [Government of Australia]	Accepted - text revised.
1-488	1	7	53	7	56	You seem to be trying to imply that correlation proves causation, which is a fallacy. Delete or reword. [John McLean, Australia]	Taken into account - Paragraphs provide links to the appropriate chapter where they are discussed in more detail. The section highlighted does not actually indicate any causality.
1-489	1	7	53			"Incontrovertible" is a rather unusual word (I had to look it up). Better use a synonym like "indisputable". [Dietrich Feist, Germany]	Accepted - Text revised in response to comment 1-487, which addresses this point.
1-490	1	7	55	7	55	I would replace 'instrumental observations' by something like 'careful analysis of observation records' if this is	Accepted - text revised.

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						what was meant [CLAUDIA STUBENRAUCH, France]	
1-491	1	7	56	7	57	Better wording would be "Satellites provide a much broader spatial distribution of measurements ..." [Adrian Simmons, United Kingdom]	Accepted - text revised.
1-492	1	7	56	8	1	The extent of measurement is irrelevant to "Multiple lines of evidence for climate change" because measurement is not a line of evidence, so delete. [John McLean, Australia]	Rejected - The chapter is meant to introduce the relevant topics, and thus a discussion of the value and extent of data is relevant for the section.
1-493	1	7	56	8	1	could be rephrased like: 'Over the last 30 years, satellite observations allow a more complete coverage of the planet.' [CLAUDIA STUBENRAUCH, France]	Accepted - Modified text per 1-491 to clarify.
1-494	1	8	1	8	8	The detection of a small radiation imbalance at the top of the atmosphere combined with that of an increasing ocean heat content should be emphasized as a deciding evidence for global climate change. This imbalance should also be leaded in a first position of "Indicators of Climate Change" listed in paragraph 1.3. [Karl-Heinz Bernhardt, Germany]	Taken into account - The radiation imbalance is discussed in more detail in Chapter 2.
1-495	1	8	2	8	3	What does "an estimated 90-93% average" mean? Average of what? [Sonya Legg, United States of America]	Accepted - text revised
1-496	1	8	3	8	3	Revise the text "suggest reductions in glaciers, sea ice and ice sheets" to be consistent with phrasing in the SPM (Page 5 lines 1-6) that says that cryosphere observations "strengthen the evidence that ice sheets are losing mass, glaciers are shrinking and sea ice is reducing in the Arctic". [Government of Canada]	Taken into account - Chapter 1 indicates where in the AR5 the data is assessed, but cannot present any assessments and should not repeat SPM information from AR5. Text modified to be clear that only Arctic sea ice impacted.
1-497	1	8	3	8	3	Change "...in situ observations..." to "...in situ measurements..." [James Renwick, New Zealand]	Accepted - text revised.
1-498	1	8	3	8	3	"Observations from satellites and in situ observations suggest ..." The word "observations" appears twice and make the sentence structure somewhat redundant. [Gan Zhang, United States]	Accepted - text revised.
1-499	1	8	4	8	4	This sentence may be misleading. Sea ice extent is decreasing only in the Arctic, it is increasing in the Southern Ocean. [Hugues Goosse, Belgium]	Accepted - text revised
1-500	1	8	4			"ice sheets" should be followed by "especially in the Arctic region", as in the executive summary (page 2, line 19) [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - text revised.
1-501	1	8	5			"small imbalance" should be specified as "small positive imbalance that serves to increase global heat content", like in the executive summary (page 2, line 17) [Jucundus Prof. Dr. Jacobeit, Germany]	Taken into account - The observations of radiative imbalance and ocean heat content are independently made, although consistent.
1-502	1	8	7	8	7	Consider including uncertainty treatment, e.g. "types of data, uncertainties and processes" [Albert Klein Tank, Netherlands]	Accepted - text revised.
1-503	1	8	8			"around" or "across" might be better than "throughout", as we are dealing with the climate of only that part of our planet that is very close to the surface. [Adrian Simmons, United Kingdom]	Rejected - There is upper air and ocean data through multiple depths, therefore it seems more appropriate to use a 3-d preposition.
1-504	1	8	10	8	10	Conceptual and numerical models of the Earth's climate system suggest another perspective on climate change [Hosny Hasanean, Saudi Arabia]	Rejected - Offer is more appropriate here.
1-505	1	8	12	8	13	The statement "Numerical models ..." is not correct because model do not resolve the sub-grid scale where microphysical laws actually apply ; some rephrasing is needed. [Government of France]	Rejected - Numerical models follow laws of physics at large scales, where they also apply, therefore the sentence is correct as it stands.
1-506	1	8	13		13	physics and chemistry? What about biology (vegetation physiology embedded in the models?) [Anne Verhoef, United Kingdom]	Accepted - text revised.
1-507	1	8	14	8	16	To be added: models are also of prime importance for identifying future research needs on climate-related processes [European Union]	Rejected - Data is also useful to identifying future research needs, so it is not clear that this should be included in a section of evidence for climate change.

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1-508	1	8	14	8	16	You say that the models are not perfect but already in this chapter you have relied on the output of models. Either move this statement to the beginning of the section or go adjust all previous statements to make it clear that the models are not perfect. [John McLean, Australia]	Rejected - No model is perfect, ever: it would be the real world if it were perfect. Models however are inevitable and they are useful: we use conceptual models constantly in our everyday's lives, even though they are imperfect.
1-509	1	8	19			The word "empirical" should not be used to characterise observations. It is the information or evidence about climate that is deduced from observations that may be described as empirical. The observations themselves may well be science-based - for example retrieved values of geophysical variables from the radiation detected by satellite-borne instruments. [Adrian Simmons, United Kingdom]	Accepted - text revised.
1-510	1	8	20	8	20	Empirical detection in social or ecological systems is regarded as a good way to achieve maximum value with minimal effort. Another emerging direction for climate science research is by integrating results from what are considered unconnected fields by using integrative empirical indicators and network robustness, eg Scheffer et al. (2012) Anticipating critical transitions, Science, 338, 344 (2012); DOI: 10.1126/science.1225244 [Dora Marinova, Australia]	Rejected - This is too much detail for a general overview section.
1-511	1	8	21	8	21	"different from" instead "different than" ? [Karl-Heinz Bernhardt, Germany]	Rejected - Should remain different than
1-512	1	8	22	8	22	radiosonde measurements and satellite retrievals of instead of 'satellite and radiosonde observations' [CLAUDIA STUBENRAUCH, France]	Accepted - text revised.
1-513	1	8	26	8	26	Since this is an introductory chapter, please consider being specific and add "because stratospheric and tropospheric temperatures would respond with same sign" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the sentence has been revised.
1-514	1	8	28	8	38	The ocean is extremely important in the total energy change inventory (lines 2-3) but is not mentioned in this paragraph. [Government of France]	Rejected - the comment seems to be out of place
1-515	1	8	29	8	29	The use of 'etc' is imprecise. Please give all variables [Peter Burt, United Kingdom]	Accepted - the wording has been changed
1-516	1	8	33	8	34	please also refer to Ch5 [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Chapter 5 has been referenced.
1-517	1	8	36	8	37	greenhouse gas and mineral aerosol concentrations' instead of 'greenhouse gasses and mineral aerosols concentrations' [CLAUDIA STUBENRAUCH, France]	Accepted - text revised
1-518	1	8	38			*paleoclimate .. earlier there was the other spelling: palae .. [Tibor Farago, Hungary]	Editorial - Copyedit to be completed prior to publication
1-519	1	8	40	9	2	Section 1.3 Indicators of Climate Change: Text was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected with considered text. [Dirk Thielen, Venezuela]	Noted - thank you.
1-520	1	8	42	8	42	The climate of planet Earth has always been changing so either remove this sentence or clarify what you mean (e.g. "relative to 1460"). [John McLean, Australia]	Rejected - The sentence is fine as is based on the prior discussion in the chapter.
1-521	1	8	42	8	54	need a reference added to IPCC [YEHIA HAFEZ, Saudi Arabia]	Rejected - Reference to AR4 is already there
1-522	1	8	42	8	54	suggest to expand this paragraph highlighting that the choices of scenarios for SAR-AR4 for the various indicators shown in Figures 1.4-1.8 and 1.11 are different and depend on the quantity shown. The choice of which scenarios to show is made based on the criteria of showing the largest possible range for each of the previous AR (correct?). [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Text has been added.
1-523	1	8	42			Better first to identify the indicators and then to assess whether they indicate change; That would be a neutral assessment; as written it reads as if the verdict is in before the trial has begun; hang him and then conduct the trial and find him guilty. So let the tone of it be: There are many indicators of climate change. They are [enumerate; could be global temp; sea level; bird migration date; flowering date of plants; ice extent in arctic; melt date of lakes and harbors; pollens in sediments]; then report what is seen in these. [Stephen E Schwartz, United States of America]	Accepted - The text has been revised.
1-524	1	8	42			Same comment regarding use of word "throughout" as made for line 8 of this page. [Adrian Simmons, United	Accepted - the text has been revised

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						Kingdom]	
1-525	1	8	44			"compared with available model analyses". Seems to come much too abruptly for a para that starts out talking about indicators of climate change. This is a very separate concept. Finish the discussion on indicators. Once these indicators have been enumerated, and the changes in them briefly noted, then a new para that gets into comparison with models. [Stephen E Schwartz, United States of America]	Accepted - The text has been revised and a new paragraph is added.
1-526	1	8	45	8	46	See earlier comment for page 2, lines 42-48. [Albert Klein Tank, Netherlands]	Rejected - The comment is not clear and we do not find a reason to revise the text.
1-527	1	8	47	8	48	What is the relevance of the statement "The analyses presented in this section ..."? Presumably all peer-reviewed research represents an advancement of science; and this is broad observations is not required here unless the authors can be more specific. [David Sauchyn, Canada]	Accepted - The sentence has been deleted.
1-528	1	8	47			AR5 will be published seven years after AR4, yet the text speaks of "five more years of observations". Procedures mean that AR5 cannot be entirely up-to-date as regards observations, but this was true of AR4 also. So I believe the reference should be to "seven more years of observations". [Adrian Simmons, United Kingdom]	Accepted - The text has been revised.
1-529	1	8	49	8	50	suggest to revise this sentence to clarify that this is not meant to be comprehensive "or to replace the thorough assessments provided in the following chapters" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The text has been revised.
1-530	1	8	51	8	51	The comment that a projection is not a prediction is very debatable, as anything that goes out of the observed range can be considered as "prediction", either if it is a projection or not is indifferent. The differences between both terms and the context for those differences should be clearly explained in this text, before using both terms later to refer to different activities. [Juan Blanco, Spain]	Rejected - please see the definition of these two technical terms and how they differ in Annex III.
1-531	1	8	51	8	53	Unclear differentiation between projection and prediction. Suggest rewording to "Note that past projections made in previous IPCC assessment were not predictions; etc." Then on line 52-53 replace the words "and models considered from the earlier assessment" with the words "based on assumed scenarios of changes in climate drivers". [Government of Canada]	Accepted - The text has been revised for clarity.
1-532	1	8	51			It would be useful to explain briefly why a projection is not a prediction. A clear distinction between the two would assist policy makers. [Government of Australia]	Accepted - The text has been revised for clarity.
1-533	1	8	51			Consider to give a little bit more details on the projection/prediction distinction here; suggest to add reference to the Glossary. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The text has been revised.
1-534	1	8	53	8	53	"AR5 model results": should read "CMIP5 model results" – do not perpetuate the myth that IPCC runs climate model simulations. [Martin Jukes, United Kingdom]	Accepted - The text has been revised.
1-535	1	8	53			obviously it's general philosophy not to include the present AR in comparisons between observations and former ARs. However, it would be instructive to have AR5 assessments, too, at least within Figs. 1.4 and 1.11; as far as I can see, such a comparison is also not included in other chapters, therefore desirable for the Introduction. [Jucundus Prof. Dr. Jacobeit, Germany]	Rejected - Including AR5 results in Chapter 1 would be getting the cart before the horse. Discussions with Chapter 11 will likely result in revised treatment of these figures.
1-536	1	8		13		Section 1.3 Indicators of Change: The section could benefit from a more consistent approach to each topic. For example, 1.3.3 - Extreme Events does a good job of walking the reader through the evolution of treatment of extremes from the FAR to now. The approach was not applied consistently to the other subsections. See for example 1.3.4.3 - Ice Indicators which walks through the scientific evolution of understanding, but does not reference previous AR's. [Government of United States of America]	Accepted - We agree. We are aiming at making the sections more consistent.
1-537	1	8				Figure 1.4 Its not clear what the dark red shading is verses the lighter red - use of historical emissions levels verses projected emissions? [Kate Willett, United Kingdom]	Taken into account - Figure is being redone. This comment refers to page 9. Indeed the different colours illustrate the difference in emissions from historical to projections. However, in the revised Figure 1.4 AR4 projections start at year 2000.
1-538	1	9	1	9	1	re Fig 1.3. Define the year at which "pre-industrial times" begins. [John McLean, Australia]	Rejected - See glossary

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1-539	1	9	1	9	1	Given that the Little Ice Age ended around 1850 it is entirely to be expected that temperatures would naturally rise. Your implication that any warming is "man-made warming" is fundamentally dishonest and needs correction. [John McLean, Australia]	Rejected - Most of the concern with human-driven climate change has occurred in the last five decades, long after there would have been any such recovery.
1-540	1	9	4	9	35	"TAR and AR4 results are based on MAGICC": do the job accurately or omit the figure. There is no justification for not using accurate data here. [Martin Jukes, United Kingdom]	Taken into account - this is referring to the results plotted for the projections in the prior assessments, which limits what we can present here. If the assessments use the simple models rather than the GCMs, we basically have no choice even though there is not much difference in the results. However, we added a figure as supplementary material comparing CMIP3 results with observed temperature anomalies.
1-541	1	9	4	9	44	Please conclude with respect to the models' ability to reproduce surface temperatures, and include this in the executive summary. [Government of NORWAY]	Accepted - An additional sentence has been added to the text for clarification.
1-542	1	9	4	9	44	Because the model predictions from FAR through AR4 do match reasonably well, in the summary paragraph would it be reasonable to add in an explicit comment on the model ensemble skill? It seems implied from the sentence beginning with "In summary" but it would be beneficial to show that the IPCC has faith that even in the short term model climate projections seem fairly good. [Andrew Shao, United States of America]	Accepted - We have revised the text to add further to the discussion of these comparisons.
1-543	1	9	4	9	44	From FAR to AR5, the baseline period had been changed for several times, such as 1951-1980, 1961-1990, 1971-2000, 1986-2005. It should be mentioned and present an example (such as global annual mean surface air temperature) to show the values for different periods. [Zong-Ci Zhao, China]	Taken into account - The baselines are arbitrary but a comparison of different baseline periods, as long as they are for climatic time scales, has only a minor effect on the analyses being done in this chapter.
1-544	1	9	4	10	10	Adding to the three datasets another independent global mean temperature dataset from Japan Meteorological Agency, which is referred to in Chapter 10, serves to further consolidate the consistency, and better understand the uncertainty, associated with the temperature variability and long term trend. [Government of Japan]	Rejected - The Japanese dataset has not been peer reviewed. We are following the guidelines from the analyses in Chapter 2.
1-545	1	9	4	10	10	Section 1.3.1 Global and Regional Surface Temperatures: Text was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected with considered text. [Dirk Thielen, Venezuela]	Noted - thank you.
1-546	1	9	5	9	6	Figure 1.3: We are somewhat concerned about this figure as it summarizes results from the assessment of the subsequent observations chapters rather than presenting the pre-AR5 (i.e., FAR to AR4) status. The latter is what all the projections figures are attempting to do and that's why the AR5 projections are deliberately excluded from these figures. It's not clear to us why this would be handled differently between observations and projections in Chapter 1. Also note that the figure presents "paraphrased" assessments from other chapter, with no indication of uncertainty assessment, which requires very careful checking to avoid inconsistencies and errors as part of the changes in the observational chapters [Thomas Stocker/ WGI TSU, Switzerland]	The figure has been extensively revised.
1-547	1	9	6	9	6	MUST RELATED TO 1981-2010!!!! [YEHIA HAFEZ, Saudi Arabia]	Rejected - AR5 consistently uses 1961-1990 as a reference period concerning observations.
1-548	1	9	6	9	35	This paragraph seems to be avoiding the discussion of the flat temperature trend over the recent decade. It is better to address it here and be as open about it as possible. [Government of Canada]	Rejected - Observed temperature changes are analyzed in Chapter 2. This section focuses on the evolution of the previous projections compared to observations and does not discuss all details of the observations, as this is the scope of Chapter 2.
1-549	1	9	6	9	35	The records shown are not "observations" and they are not "temperatures". They are also not "globally averaged. They are a set of multiple averages, subtracted from an overall average, compiled from a vaying non-standardised set of maximum an minimum temperature measurements at varying weather sations and	Rejected - The comment does not reflect the scientific understanding. The errors in individual observations are not additive; we are also doing relative analysis

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						ship measurements. They were previously treated as "Mean Global Temperature anomaly" The uncertainties attached to each figure are very great, Individual temperature measurements are rarely accurate to better than one degree, so a claimed "trend" over 100 years of less than one degree has a very low level of statistical significance. [Vincent Gray, New Zealand]	that eliminates many of the concerns about individual errors. The reviewer obviously has a limited understanding of the associated error evaluation for analysis of large datasets. See Chapter 2 for more on the evaluation of these datasets. Or maybe even read a basic textbook.
1-550	1	9	6	9	35	This paragraph refers to Figure 1.4, and is described as a comparison of observed globally-averaged temperature anomalies from 1990 to 2011 to the predictions of climate models for the same interval as presented in the sequence of IPCC reports. It is nicely constructed and very informative. But the text in this paragraph does not describe what the Figure shows. For instance it refers to a smoothed black line as showing the observations, but there is no black line in the Figure, instead there are points and confidence interval whiskers. More importantly, the text claims that the observations are inside the uncertainty ranges of past assessments and generally lie in the middle of the model projections from past IPCC reports. This is not the case in the Figure I have. The Figure in my copy of the chapter shows something completely different. Leaving aside the gray shading for a moment (on which see the next comment), the path traced by the observations (black dots) and their uncertainty whiskers, representing the span of observations, dips at the time of the 1992 Pinatubo explosion, jumps at the 1998 El Nino, and then drifts horizontally, with no upward trend over the past decade, while the model forecasts trend steadily upwards, so that by 2012 the envelope of previous IPCC temperature projections lies completely above the observed global average. Are we reviewing the same Figure as the one the authors were writing about? [Ross McKittrick, Canada]	Taken into account - The figure has been totally redone for clarification. The new figure accounts more properly for the long term trend in the observation-based temperature trend. The black line for the observed trend accidentally got left out of the reviewed version and is now back in the analysis, except that now we show 3 black lines corresponding to the different temperature records. The text has also been extensively revised.
1-551	1	9	6	9	35	I find the grey shading on Figure 1.4 confusing. The description in the Figure caption is: "The 90% uncertainty estimate due to observational uncertainty and internal variability based on the HadCRUT4 temperature data for 1951-1980 is depicted by the grey shading." Based on this I suppose the grey band represents the sum of natural variability of the annual mean temperature data and the uncertainty in the observations. If this is so, why does the width of the band vary so significantly with time, and why does it seem to widen considerably after year 2000?. You should add some easily understood description of what the grey shading represents into the text on page 9, lines 6-35. [Robert Waterland, United States of America]	Taken into account - The figure has been totally redrawn and the gray area was no longer necessary. We agree with the reviewer that it was difficult to explain properly and just tended to cause confusion.
1-552	1	9	6			(Sorry this is out of order but the spreadsheet has forced it on me). When I look at Figs 1.4 and 1. the first thing that I notice is not that the observations of global temperature lie within the error bands of the previous IPCC model predictions but rather that the model all predict an upward trend whilst the observations show no discernable trend. Section 1.3.1 skirts around this point as though it is embarrassed about it. Having been a partner in THOR I know as well as anyone the difficulties of making decadal predictions but that's no reason for not drawing the reader to the attention of this fact. otherwise it's going to appear to some that the models are shouting wolf. As I look further into AR5 I see that there appears to be a reluctance to talk about mean global temperature observations, instead referring to surrogate observations of change (e.g. ocean heat content, CO2 levels in the atmosphere, the hydrological cycle, the trend since 1850 etc), almost as though there is a conspiracy not draw attention to the recent levelling off. My particular objection here is to the sentence that spans lines 15 to 17 which says rather tamely that at least the observations fit within the error bars of the models. The fact is that all the model representations over-predict what has actually happened (i.e. so far they appear alarmist). This problem may well be addressed elsewhere in the report and if it is then there should be a clear reference to it here. Otherwise I believe that the naysayers will have a field day on the models (and rightly so). [Toby Sherwin, United Kingdom]	Taken into account - The figure has been totally redone for clarification. The new figure accounts more properly for the long term trend in the observation-based temperature trend.
1-553	1	9	7	9	7	This figure confuses rather than clarifies. The projections from previous reports are highly selective. Why is the grey area - 90% uncertainty estimate for HadCRUT4 - greater than for the similar figure in 4AR? If HadCRUT4 has wider error margins then please state this. Why is the grey area relative to 1951-80 rather than 1961-90? Why are the observed temperatures smoothed at all and why can't the readers be shown a continuous line for the graph of observed temperatures? [John McLean, Australia]	Taken into account - This figure has been extensively revised for clarity. This eliminated the gray areas and the corresponding confusion.
1-554	1	9	8			suggest to move all the details about the datasets and all the details explaining the figure from the text to the caption (e.g., the sentences on page 9, line 12ff). [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The figure has also been extensively revised.
1-555	1	9	9	9	9	As written, this means only the observations of 2012. Please clarify. [Peter Burt, United Kingdom]	Rejected - we do not understand the comment.

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1-556	1	9	11	9	11	State what the main findings are. The text reads very apologetic and process centred rather than clear reporting of the findings. [Dora Marinova, Australia]	Accepted - The text has been extensively rewritten for clarity.
1-557	1	9	12	9	12	This may be fixed in the next version of this Figure, but currently there is no smooth black line in Figure 1.4 as referred to here in the text. [Government of Canada]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-558	1	9	12	9	12	There is no black line in Figure 1.4 [Government of Germany]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-559	1	9	12	9	12	The black line is the (In which figure?) please clarify [Hosny Hasanean, Saudi Arabia]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-560	1	9	12	9	13	There is no black line on the graph, there are only heavily processed black indicators. [John McLean, Australia]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-561	1	9	12	9	14	We don't see the "black line/ long term trend...." in Figure 1.4, as referred to here. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-562	1	9	13	9	13	Fig. 1.4 does not show a black line [European Union]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-563	1	9	13	9	13	"with ends reflected": it would be far better to omit the line where there is not enough data to define it. The last thing we need in this report is dodgy extensions to graphs for cosmetic purposes. [Martin Juckes, United Kingdom]	Accepted - text revised. The text referred to an older version of the figure. Thank you for pointing this out.
1-564	1	9	14	9	15	Please state that the projections from previous reports are only a small selection of all projections in those reports. [John McLean, Australia]	Accepted - We used the widest range possible from those assessments. The text has been revised for clarity.
1-565	1	9	15	9	17	While the observations do fall within the range of projections made in past assessments the years from 1999 onwards are consistently towards the lower bound of the range. This needs to be commented on explicitly. [Government of Australia]	Accepted -The text has been revised and the figure redrawn.
1-566	1	9	19	9	21	"The projections are all scaled to give the same value for 1990." I am not sure that such a "scaling" is so trivial without additional justification, at least, the explanations before this sentence (and those following it) make it clear enough. [Tibor Farago, Hungary]	Taken into account - The figure has been totally redone for clarification. The new figure accounts more properly for the long term trend in the observation-based temperature trend. In the process, this issue was dealt with.
1-567	1	9	19			suggest to replace "scaled to give the same value" by "harmonized to start from the same value" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-568	1	9	23			I think this section would benefit from brief discussion of the shaded grey area in Figure 1.4. It is not clear what this is unless the reader looks to the end of the figure caption, and it is pretty important. It conveys the magnitude and importance of internal climate variability, which (as noted) is the dominant driver of variability on short timescales. [Tamlin Pavelesky, United States of America]	Accepted - This figure has been extensively revised for clarity. This eliminated the gray areas and the corresponding confusion.
1-569	1	9	24	9	24	emission scenarios' instead of 'emissions scenarios' [CLAUDIA STUBENRAUCH, France]	Editorial - Copyedit to be completed prior to publication
1-570	1	9	25			It might be worth reminding the reader that the FAR could not (rather than did not) include the effect of the eruption of Pinatubo. [Adrian Simmons, United Kingdom]	Accepted - The text has been revised.
1-571	1	9	26	9	28	what's the reason to use a simple climate model tuned to fit the coupled climate models rather than using the coupled climate models themselves? What's the benefit of this approach? It would be preferable to show the results from the complex, coupled climate models in all the figures showing projections. [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - We used what was presented in the trend lines in the prior assessments. Unfortunately, the figures in the assessments did not themselves include the full 3-D model findings for this type of comparison.
1-572	1	9	26			Why are AR4 results based on MAGICC? All the AR4 data based on CMIP3 is available. [Reto Knutti,	Taken into account - We used what was presented in

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						Switzerland]	the trend lines in the prior assessments. Unfortunately, the figures in the assessments did not themselves include the full 3-D model findings for this type of comparison. A supplementary figure is added to compared CMIP3 results with observed temperature changes.
1-573	1	9	32	9	33	"... are well within the uncertainty range of all previous IPCC projections ...": from Fig. 1.4 I am not sure if this true for the FAR projections. And with respect to the Pinatubo-affected years, only AR4 is consistent with the data. [Dietrich Feist, Germany]	Accepted - The text has been revised to add clarity on all of these points.
1-574	1	9	32	9	34	"well within the uncertainty range of all previous IPCC projections and generally are in the middle of the scenario ranges" -- these two conclusions are difficult to reconcile with the projected ranges as shown in Figure 1.4. It's however not entirely clear what the grey shaded band represents? Apparently, some sort of a projection of an estimate of the uncertainty due to internal variability? But how is this constructed and how does it relate to the "previous IPCC projections"? From the figure and the legend it seems clear that the observations are lying below or at the lower end of the IPCC SAR to AR4 projected ranges. The grey shading and what it represents probably needs a more detailed explanation to avoid confusion. [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - The figure has been totally redone for clarification. The new figure accounts more properly for the long term trend in the observation-based temperature trend. This also eliminated the gray areas and the corresponding confusion.
1-575	1	9	32	9	35	For a generalist reader, this conclusion does not seem to be substantiated by the figure (1.4) and it risks sounding like the IPCC is biased. Many readers may look at Figure 1.4 and conclude that globally averaged surface temperatures are lower than then projected range (coloured shading), not "generally in the middle" as the text says. This is an important issue to address well here because it relates to the criticism that the IPCC and climate models exaggerate global warming. Recommend reviewing and rewording. Explanation is also required for Figure 1.4 to address whether the colour shading includes internal variability, and further explanation of the gray shading and colour bands would be beneficial. [Government of Canada]	Taken into account - The text has been extensively rewritten for clarity, and the figure has been redrawn. We agree that the comparison needed to be explained more fully.
1-576	1	9	32	9	35	Yet observed temperature anomalies look stable since 2000 (Fig.1.4) while all projections show an increased trend: need some discussion [European Union]	Accepted - The text has been extensively rewritten for clarity, and the figure has been redrawn. We agree that the comparison needed to be explained more fully.
1-577	1	9	32			"the globally-averaged surface 32 temperatures are well within the uncertainty range of all previous IPCC projections, and generally are in the 33 middle of the scenario ranges." Not true starting in 2004; data is well below the middle of the range, especially for AR4, where it is mostly outside the range. [Stephen Gaalema, United States of America]	Accepted - The text has been extensively rewritten for clarity, and the figure has been redrawn. We agree that the comparison needed to be explained more fully.
1-578	1	9	32			"enhance the comparison" should be clarified. A suggested re-phrasing: "...solar cycle changes would BRING THE MEAN OF THE PROJECTIONS MORE IN LINE with the AR4 and..." [Government of United States of America]	Accepted - The sentence has been revised for better clarity.
1-579	1	9	33	9	33	Add the words "Coloured shading" in brackets after the words "uncertainty range". [Government of Canada]	Taken into account - text revised
1-580	1	9	34	9	35	This statement about natural variability can be very misleading. It could very easily be mis-interpreted to read that recent changes are dominated by natural variability. As a result, it is suggested that this statement be deleted or carefully re-worded to reduce the chance of mis-interpretation. [Government of United States of America]	Agreed. The text has been rewritten.
1-581	1	9	34			This sentence is a bit confusing. What is meant by "early times?" Do you mean "early portions" of the scenarios? [Tamlin Pavelsky, United States of America]	Accepted - The sentence has been revised for better clarity.
1-582	1	9	42	9	43	While the observations do fall within the range of projections made in past assessments the years from 1999 onwards are consistently towards the lower bound of the range. This needs to be commented on explicitly. [Government of Australia]	Accepted - The text has been extensively rewritten for clarity, and the figure has been redrawn. We agree that the comparison needed to be explained more fully.
1-583	1	9	42	9	44	As with the statement on lines 33-34, this statement also seems to be unsubstantiated by the Figure	Taken into account - We have eliminated Figure 1.5. It

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						referenced (Fig 1.5). The observed data are only well within the grey shading which is not explained in the Figure. Recommend reviewing and rewording here and with reference to what is depicted in Figure 1.5. Further explanation should be considered for Figure 1.5 caption, specifically further explanation of the gray shading and colour bands would be beneficial. [Government of Canada]	just did not add much to the discussion.
1-584	1	9	43	9	44	is there a figure in one of the other chapters which shows that A1F1 is the highest temperature scenario 2001? If, yes please add reference. [Government of Germany]	Rejected - We don't know what the comment is for: 2001, 2010, or 2100? If up through 2010, the A1FI scenario is not higher, only at 2100.
1-585	1	9	43	9	44	The description that 'Even though A1FI is the highest temperature scenario by the end of the century, A1T is higher during the earlier part of this century as shown in Figure 1.5.' is puzzling. A explanation is needed here or a reference should be provided for its explanation. [Dawei Han, United Kingdom]	Taken into account - We have eliminated Figure 1.5. It just did not add much to the discussion.
1-586	1	9	43	9	44	"Even though A1FI is ... as shown in Figure 1.5." The sentence is not most directly relevant with the main point of this section. In the perspective of a reader, an interesting fact was specially raised here but the discussion seems undone. This could be distracting and possibly hurts the clarity of the main point. The question itself is an interesting one, but it may be better to make the discussion more complete or simply leave it for the other chapters. [Gan Zhang, United States]	Taken into account - We have eliminated Figure 1.5. It just did not add much to the discussion.
1-587	1	9	47			Figure 1.4: more details about the grey shading and what it represents are probably needed in the caption; The bars to the right of the figure need to be mentioned in the caption; Proper references for the sources for the FAR, SAR [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - The figure has been totally redone for clarification. The new figure accounts more properly for the long term trend in the observation-based temperature trend. This also eliminated the gray areas and the corresponding confusion.
1-588	1	9	47			Figures 1.4-1.8 and 1.11: data sources for the scenarios need to be provided, with proper references to FAR, SAR, TAR and AR4; reference to the Chapter 1 Appendix is required; in addition, the choice of scenarios for each of the four reports needs to be discussed: for example, what is the source of the SAR choices, which of the models is used (Bern model?), why does the SAR range include the range of Climate Sensitivities rather than just the model scenario range? What is the TAR full range? How do the choices of the parameter settings for the two models listed in the caption affect the result? Is the choice of the AR4 scenarios based on the largest range between two scenarios for a specific quantity shown (or for the emissions)? Why does Figure 1.11 for the AR4 only use A1B results, rather than a scenario range as for all the other figures? What does this mean for the cross-AR comparison? [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Figures and captions are extensively revised
1-589	1	9	47			Figures 1.4, 1.6-1.8 and 1.11: is it appropriate to combine the AR4 scenarios into a single multi-model, multi-scenario range? This was explicitly avoided by the AR4, so you will need to explain why this is done here and why you think this is appropriate. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The figures have been revised to deal with this concern. In the revised figures the three marker scenarios are shown individually.
1-590	1	9	50	9	50	What does "still perceived in the AR4" mean? Was it or was it not declared "very likely" in the AR4? [Government of Canada]	Taken into account - this refers to page 11, which has been rewritten
1-591	1	9	58			The whole concept of the 90% uncertainty estimate has not been introduced yet. This is not done before p. 15. [Dietrich Feist, Germany]	Taken into account - The caption has been revised based on the redrawn figure.
1-592	1	9				For all their prominence Figs 1-4 and 1-5 don't seem to tell much of a story. What is the point that is trying to be made? It is not coming through. [Stephen E Schwartz, United States of America]	Taken into account - Figure 1.4 has been extensively revised. Figure 1.5 has been eliminated.
1-593	1	10	4	10	12	Suggest this paragraph be deleted as attribution of observed changes was not included in the discussion of other indicators. This discussion could be left to the appropriate chapter. [Government of Canada]	Taken into account - This comment does not seems to be related this page. It is not clear, what paragraph this comment refers to. If it means where it says, figure 1.5 has been eliminated.
1-594	1	10	5	10	10	Figure 1.5 is described as "similar to Figure 1.4...." However, the grey shading in Figure 1.5 has another shape than that in Figure 1.4 describing the 90% uncertainty estimate. Which is the meaning of the grey shading in Figure 1.5? [Karl-Heinz Bernhardt, Germany]	Taken into account - Figure 1.4 has been extensively revised. Figure 1.5 has been eliminated.

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1-595	1	10	7	10	8	This contradicts page 9, line 40 [Peter Burt, United Kingdom]	Taken into account - Figure 1.5 has been eliminated.
1-596	1	10	12	10	36	Chapter 2 seems a more important reference here than chapter 6? [Piers Forster, United Kingdom of Great Britain & Northern Ireland]	Accepted - text revised.
1-597	1	10	12	11	6	Section 1.3.2 makes lots of references to the scenarios defined in the earlier reports. A table providing a list and a one-line description of each scenario would be very useful. [Dietrich Feist, Germany]	Rejected - This is out of the scope of Chapter 1
1-598	1	10	12	11	6	This section and relevant Figures (1.6 to 1.8) and Tables refers only to GHG measurements from one network (NOAA) ignoring AGAGE and others. Chapter 2 is where this is done correctly by averaging values from the various networks, and Chapter 2 is not even referenced here! Chapters 6 and 8 are not appropriate references for composition observations. Note also that the recent increase in CH4 (pg 10, lines 28-32) was reported first by AGAGE (Rigby et al, GRL,35,L22805, 2008) not NOAA (Dlugokencky et al, 2009). [Ronald Prinn, United States of America]	Taken into account - We are revising the figures using values from Chapter 2. We didn't have these earlier or we would have used them in the SOD.
1-599	1	10	12			section on greenhouse gas concentrations. This section should precede the section on temperature change. And should focus broadly on changes in atmospheric composition (chemical climate), and perhaps land use, affecting surface albedo and hence radiation. These are, as stated, the drivers of change of the physical climate, so logically these changes should be enumerated prior to change in physical climate such as temperature. [Stephen E Schwartz, United States of America]	Taken into account - We specifically start with temperature as the key observable before going back to the greenhouse gases. Your point is understood, but we had decided to follow this approach as a follow-up to the similar T figure in AR4.
1-600	1	10	14	10	20	Measurements of the gases are almost all restricted to over the sea. Emissions are almost all over the land, so it is impossible to find a relationship between them without a comprehensive programme of land based measurements [Vincent Gray, New Zealand]	Rejected - This comment indicates a lack of understanding of existing measurement programs, the associated biogeochemistry and atmospheric lifetimes.
1-601	1	10	14			Consider inserting, "Future key indicators OF GLOBAL CLIMATE CHANGE are the ..." [Government of United States of America]	Accepted - The text has been revised.
1-602	1	10	15	10	15	Start with the findings first and then discuss how they fit the model-based projections. [Dora Marinova, Australia]	Rejected - This comment does not make sense. We start with the observations and then compare the model- and scenario-based projections with those observations.
1-603	1	10	16	10	17	Concerning the LLGHGs there is a varying characterization of those which are (here) named "of most concern" and others as "other key gases"; on page 2 there is the term "radiatively important gases" or simply "important gases", on other places: negligible GHGs, important gases to LWR etc. A more unified terminology throughout the AR5 would be good especially for policy-makers. [Tibor Farago, Hungary]	Rejected - We don't really see this as a problem, since always using the same word might be regarded as bad English.
1-604	1	10	17	10	17	Chapter 2 should certainly be mentioned for further discussion of the gases [Gunnar Myhre, Norway]	Accepted - text revised; see 1-607
1-605	1	10	22	10	26	This paragraph is difficult to understand. What does it mean that the models assume historical emissions before 1990? And that "those model results may also account for historical emission analysis"? Please re-write to ensure that you communicate the correct message. [Government of NORWAY]	Accepted - the paragraph has been revised for clarity.
1-606	1	10	22			"tend to be in the middle of model based projections." The changes are observed, for gosh sakes. No need to adduce models here. [Stephen E Schwartz, United States of America]	Accepted - the paragraph has been revised for clarity (see also comment 1-605).
1-607	1	10	28	10	30	Please add reference to Chapter 2 in addition to referring to Chapter 6; Chapter 2 also assesses observations of well mixed GHG, CO2, N2O, CH4. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Chapter 2 is referenced.
1-608	1	10	28	10	32	The overall trend for methane is a decline in the rate of increase You choose to ignore this with a few recent measurements. However, with your temperature record you chooses to ignore recent behaviour, because it has been static for ten years, and emphasize only the previous "trend". [Vincent Gray, New Zealand]	Rejected - Reference to Chapter 2 and Chapter 6 was made for clarification.
1-609	1	10	28	10	32	I think the fact that all model projections show larger CH4 increases than recently observed (Fig. 1.7), requires more than a reference to Chapter 6 and a note that formerly trends were thought to continue. At least it should be mentioned that an intermediate decrease in wetland emissions (e.g. Bousquet et al. 2006) or a small drop in the hydroxyl radical concentration (e.g. Rigby et al. 2008) have been discussed as possible mechanisms.	Rejected - More details and references to the suggested papers are given in Chapter 2 and Chapter 6, which are referred to.

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						Bousquet, P. et al. 2006: Contribution of anthropogenic and natural sources to atmospheric methane variability. Nature 443, 439-443. Rigby, M. et al. 2008: Renewed growth of atmospheric methane. Geophys. Res. Lett., 35, L22805, doi:10.1029/2008GL036037. [Jucundus Prof. Dr. Jacobeit, Germany]	
1-610	1	10	34	10	36	the description of the trend in NO2 doen not match with the pattern observed in Fig 1.8. In fact, projections from TAR and AR4 do not compare well with the observed pattern. Only the projections from FAR include the majority of the measured data points, albeit likely related to the large range of these predictions. Only the most recent data point falls within the (lower end of the) range of AR4 [Elie Verleyen, Belgium]	Accepted - the text has been revised.
1-611	1	10	49			Figure 1.7: please add observational uncertainty to figure [Thomas Stocker/ WGI TSU, Switzerland]	Rejected - The uncertainty bars would not be visible at this scale. See figure caption.
1-612	1	10				Figure 1.9 Fewer or less cold extremes? I think it should be 'fewer' if you're talking about frequency of events and 'less' if you're talking about the magnitude. [Kate Willett, United Kingdom]	Accepted - text revised
1-613	1	11	8	11	8	This subsection makes vague references to "extreme events" without mentioning any specific events. Please provide a brief list of four or five. [John McLean, Australia]	Taken into account - two examples have been added. See more examples at the end of the paragraph or Figure 1.10.
1-614	1	11	8	12	30	Section 1.3.3 Extreme Events: Text was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected with considered text. [Dirk Thielen, Venezuela]	Noted - thank you.
1-615	1	11	8			extreme events. This section seems way out of place. Put the indicators of change in order of how confidently they are known. By putting extreme events here, you are really asking for trouble; jeopardizes all the other indicia of change that follow. [Stephen E Schwartz, United States of America]	Rejected - the outline of the chapter has given by the IPCC.
1-616	1	11	10	11	16	The extreme event not only by frequency but also by the strength (e.g hurricane katrina) [YEHIA HAFEZ, Saudi Arabia]	Accepted - the text has been revised.
1-617	1	11	10	11	27	Need to discuss with Ch 2 authors regarding these two paragraphs. For example some text in Ch 2 could be removed and cross referenced with this text from Ch 1. [Lisa Alexander, Australia]	Accepted - text has been revised and sent to a member of Chapter 2 for a final check of consistency.
1-618	1	11	10	12	30	This section needs to be better aligned to Ch 2/Ch10/Ch12 particularly where there is some overlap in text and perhaps some discrepancy (Ch 2 section 2.6 introduction, Box 2.4 and FAQ 2.2). Also there might be some confusion between Fig. 1.10 and TFE.9, Table 1 in the Technical Summary (based on Ch 2, 10,11,12 and 14) which provides revisions to some conclusions in AR4 and SREX. Some more specific comments follow. [Lisa Alexander, Australia]	Accepted - text has been revised and sent to a member of Chapter 2 for a final check of consistency.
1-619	1	11	11	11	11	Should define SREX at first use (maybe it was defined previously, but I couldn't find it). Also, SREX 2012 is not in the reference list. [Kenneth Minschwaner, United States of America]	Accepted - text revised
1-620	1	11	11	11	14	the SREX correctly uses the broader term of "extreme climate events" instead of "extreme weather events" or "extreme weather" (mentioned here 3 times) which are short term extremes (dislike e.g. drought) [Tibor Farago, Hungary]	Taken into account - as in the SREX we use "weather and climate" extremes.
1-621	1	11	11			Define SREX. [Government of France]	Accepted - text revised
1-622	1	11	12	11	12	Missing " after 'place' [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication
1-623	1	11	12	11	13	You say here "Definitions of rare vary, but an extreme weather event would normally be as rare or rarer than the 10th or 90th percentile". Ch 2 P49 L34-L35 states "Definitions of thresholds vary, but values with less than a 5% or 1% chance of occurrence during a specified reference period (generally 1961-1990) are often used". Similar phrasing is also used in the Technical Summary P13 L42-44. While not contradictory statements I think some discussion with Ch 2 is needed to refine these statements so as not to confuse the reader and reduce overlap. [Lisa Alexander, Australia]	Accepted - text has been revised and sent to a member of Chapter 2 for a final check of consistency.
1-624	1	11	12			The end quotes of the literal citation starting with "rare within their ..." are missing. [Dietrich Feist, Germany]	Editorial - Copyedit to be completed prior to

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							publication
1-625	1	11	13	11	14	Cross reference should be made here to FAQ 2.2 (see P2-60 L2-4). [Lisa Alexander, Australia]	Accepted - the reference has been added.
1-626	1	11	13			"... be as rare or rarer than ...": confusing! Should this mean something like "outside the range defined by the 10th to 90th percentile"? [Dietrich Feist, Germany]	Rejected - the current wording seems more suitable for a wider audience than the suggested.
1-627	1	11	15	11	15	Please replace hot waves with heat waves [Government of NORWAY]	Accepted - the text has been revised.
1-628	1	11	15	11	15	wording: 'heat waves' instead of 'hot waves' [Helga Nitsche, Germany]	Accepted - the text has been revised.
1-629	1	11	15		15	Did you really mean hot waves or rather heatwaves? [Anne Verhoef, United Kingdom]	Accepted - the text has been revised.
1-630	1	11	15			"several factors" should be specified, e.g. duration and intensity [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - the text has been revised.
1-631	1	11	18	11	19	In fact rarely do any climate variables follow a Gaussian distribution. [Lisa Alexander, Australia]	Accepted - text and caption revised
1-632	1	11	18	11	27	Cross reference to FAQ 2.2. and in particular FAQ 2.2 Fig. 1 which shows PDFs of observed Tmax and Tmin. [Lisa Alexander, Australia]	Accepted - text and caption revised
1-633	1	11	18	11	27	the paragraph need to clarify (The probability of occurrence of values.....this simple picture (Figure 1.9b, c and d). [Hosny Hasanean, Saudi Arabia]	Accepted - text and caption revised
1-634	1	11	18		19	DELETE: "that for some variables ... 'Gaussian' curve" [Sucharita Ghosh, Switzerland]	Accepted - text and caption revised
1-635	1	11	18			Comment to the author: The mentioning of Gaussian here is highly misleading. A lot of climate variables are not [Sucharita Ghosh, Switzerland]	Accepted - text and caption revised
1-636	1	11	18			bell shaped. [Sucharita Ghosh, Switzerland]	Accepted - text and caption revised
1-637	1	11	19	11	19	Add words "bell shaped" in brackets after "Gaussian". [Government of Canada]	Accepted - text and caption revised
1-638	1	11	29	11	52	Much of this text can and should be presented more clearly. For example: "SAR said this..., TAR said this..., AR4 said this..., SREX said this... The reason(s) for this evolution is(are)." As currently presented, the narrative is garbled. [Government of United States of America]	Accepted - text and caption revised
1-639	1	11	31	11	32	The tense needs to be changed because AR4 and all other IPCC reports are in the past. This sentence would be better as "In the AR4, the observational analyses of extremes increased substantially, such that some extremes were examined over most land areas...". [Lisa Alexander, Australia]	Accepted - the text has been revised.
1-640	1	11	40	11	40	This Figure is problematic (see below). [Lisa Alexander, Australia]	Noted - see response to your comments below.
1-641	1	11	44	11	45	Add an explanation for why DTR was not included in the extremes table in the AR4 (no longer considered a extreme variable). [Government of Canada]	Accepted - text revised.
1-642	1	11	49	11	51	Yes but the AR5 assessment agrees with AR4 and not SREX with regard to extreme precipitation projections (see TFE.9 Table 1 assuming that this is a fair assessment of Ch 12) so this is a very confusing statement. I think there is maybe a problem with the tense you are writing in and that everything you write here should be in the past tense and some cross referencing to Ch 12 saying "but the AR5 assessment has revised this SREX conclusion (see Ch 12) etc...". [Lisa Alexander, Australia]	Accepted - The sentence has been revised.
1-643	1	11	50	11	52	It is unclear to us why a downgrading of the SREX assessment on observed drought changes was a consequence of "biases and fairly large spread in precipitation projections", as currently written. Please revise wording here to avoid this misinterpretation. In terms of observed changes in drought, SREX cited a lack of direct observations, geographical inconsistencies in the trends, and dependency on the index used, as reasons for their reduced confidence. In terms of projected changes in drought, these same reasons plus the inability of models to include all factors influencing drought were given as factors limiting confidence. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The sentence has been revised.
1-644	1	11	52			Why was there a change from a quantitative characterization of uncertainty (likely) in TAR to a qualitative characterization (medium confidence) in SREX despite more data? It's worth an explanation (i.e., regional	Accepted - The sentence has been revised.

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						differences emerged that precluded a firm quantitative statement, etc.) [Government of United States of America]	
1-645	1	11	52			I would say "falls within" instead of "is in the middle of" [Tamlin Pavelsky, United States of America]	Accepted - The text has been revised. Note that this comment actually refers to page 12 instead of 11.
1-646	1	11	54	11	55	Again there is a strange use of tenses here. Would be preferable to say "the definition changed between the TAR and AR4). [Lisa Alexander, Australia]	Accepted - The text has been revised.
1-647	1	11	55	11	57	The SREX assessment regarding tropical cyclones is not explicitly reported here. We suggest these details are clarified and perhaps expanded. The sentence on line 57 "low confidence for any long term (>40years)..." is in fact from the SREX, but this is not clearly stated here. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the reference has been added.
1-648	1	11	57	11	58	probably 'deficiencies in the observational coverage' means that satellite data, covering the globe, start only 30 years ago and earlier observations are not systematic and mostly over land. What about uncertainties in the analyses (definition of 'intense' deterioration of peak wind speed)? [CLAUDIA STUBENRAUCH, France]	Taken into account - the text has been rephrased for clarity and a reference to the SREX was added.
1-649	1	11	58			It would be helpful to know whether the "deficiencies in observational coverage" refer only to deficiencies in coverage over past decades (in which case the word "past" could be added in front of "observational") or whether it is thought that current coverage is still inadequate (in which case we need to work on improvement). [Adrian Simmons, United Kingdom]	Accepted - the text has been revised.
1-650	1	12	4	12	5	Plenty evaluation studies of model simulated heatwaves exist which go beyond "simple reasoning". [Albert Klein Tank, Netherlands]	Taken into account - We agree, but the sentence says "some" rely on simple reasoning.
1-651	1	12	8	12	12	Cross reference to Ch 10-46 and also probably a reference to Peterson et al., 2012 would be warranted as the first coordinated attempt to attribute high impact events in a given year. [Lisa Alexander, Australia]	Accepted - the reference has been added.
1-652	1	12	9			*linking .. specific causal relationships (are) is difficult [Tibor Farago, Hungary]	Accepted - the text has been revised.
1-653	1	12	14	12	25	This diagram masks the fact that natural forces can account for extreme events. For example, 2003 European heat wave (and many other heat waves) are due to quasi-stationary pressure cells directing streams of warm air to the same location; the Australian tropical cyclones of early 2010 and 2011 can be attributed to the sudden cessation of near-El Nino conditions causing a very rapid westward movement of warm water. Revise your paragraph accordingly. [John McLean, Australia]	Rejected - This is only a generic illustration of a general principle. It is not intended to be an actual assessment as found in later chapters.
1-654	1	12	14	12	25	On Figure 1.9. In this figure, one may assume the gaussian pattern for all meteorological elements. However, for precipitation, we should think the frequency distribution not as a gaussian, but rather log normal or so. Then, we should be more careful adopting such explanation as in Fig. 1.9. Or at least, one should write as a comment that we should pay attention that not all the elements are gaussian distribution, here. [Izuru Takayabu, Japan]	Rejected - This is only a generic illustration of a general principle. It is not intended to be an actual assessment as found in later chapters.
1-655	1	12	22			If possible, the record low in sea ice extent for 2012 should be included in the discussion here. [Tamlin Pavelsky, United States of America]	Accepted - text revised; this may refer to a different page, see revised Section 1.3.4.3
1-656	1	12	32	12	32	The meaning and purpose of the words in brackets in the title are unclear. Delete or consider retitling as "Ocean Indicators"? It would also be helpful to have a short paragraph explaining the relation between ocean temperatures and heat content. Heat content of the atmosphere is not an indicator of climate change and so it is a reasonable question to ask why heat content of the ocean is an important indicator. This would be useful introductory information for later discussions in the report. [Government of Canada]	Accepted - Title has been changed and text in brackets omitted. Suggested explanatory text has not been added (to keep consistent with the required concise style)
1-657	1	12	32	12	32	It's a rather inelegant sub-section title, especially the use of parentheses. "Integrative Climate Change Indicators" would be more succinct, with an expansion of precisely what this means in the text. [Tim Johns, United Kingdom of Great Britain & Northern Ireland]	Accepted - text revised
1-658	1	12	32	12	32	Clarify what you mean by "only in terms of data indicating climate change"? [Albert Klein Tank, Netherlands]	Accepted - text revised
1-659	1	12	32			strike the qualifier: (only in Terms of Data Indicating Climate Change). This is what the whole section is about. [Stephen E Schwartz, United States of America]	Accepted text revised.

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1-660	1	12	32			Section 1.3.4: Our strong preference is that Chapter 1 does not provide the actual assessment results from the AR5 but rather restricts itself to providing an introduction to the various indicators, and point to the subsequent chapters where this assessment is provided. If the chapter insists on reporting observed changes from the AR5, they must be taken directly from the relevant underlying chapter with a reference given to that chapter, and ideally checked by the relevant chapter experts. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - The text is revised
1-661	1	12	35			It's unclear what the term "integrative" means in this context. Consider simplifying to read, "other indicators" [Government of United States of America]	Accepted - title has been changed.
1-662	1	12	38	12	52	In this section, there's no explication as to why sea level is an indicator of climate change though thermal expansion is mentioned later. Maybe even in the first sentence reword it so that it includes sea level change due to thermal expansion and melting land ice. [Andrew Shao, United States of America]	Accepted - the text has been revised in sentence one.
1-663	1	12	40	12	40	After the first sentence, consider adding some information to explain why sea level is an integrative indicator (i.e. what factors contribute to changing sea level). [Government of Canada]	Accepted - the text has been revised in sentence one.
1-664	1	12	40	12	52	Please add the causes for sea level rise, preferably in priority order. [Government of NORWAY]	Accepted - the text has been revised in sentence one.
1-665	1	12	40	12	52	Please describe why the rate of sea level rise reportedly accelerated in 1993, especially when the TAR of 2001 reported no such acceleration. [John McLean, Australia]	Rejected - Details are dealt with in Ch 3.
1-666	1	12	43	12	43	Suggest replacing "interpretations" with "consequences". [Government of NORWAY]	Accepted - "Interpretations" is replaced with "Expressions"
1-667	1	12	43	12	47	The sea level rise figures presented here are inconsistent with those used in the SPM, Chapter 2 and Chapter 13. It would be useful if the same numbers were used throughout to avoid confusion. [Government of Australia]	Accepted - text revised.
1-668	1	12	44	12	45	"1990" -> should be "1993" to be strictly consistent with the underlying chapter assessment. Rather than citing individual studies here (Church and White), it would be more appropriate to simply refer to the relevant sections of chapters 3 and 13, where the comprehensive assessment is provided. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised.
1-669	1	12	45	12	47	It's unclear whether this statement claims that the post-1990 changes are caused by the multidecadal oscillation between 1930-50. [Government of United States of America]	Rejected - The text states that "at least part of the increase....". Thus, the comment should be taken care of in the current version of the text.
1-670	1	12	46			This statement about the multidecadal oscillation does not make sense - such an oscillation should be present in all decades - perhaps you mean that the last time it was of similar amplitudes was in 1930-1950. [Government of Australia]	Accepted - text revised.
1-671	1	12	47			*small but positive acceleration in sea level rise (?) .. [Tibor Farago, Hungary]	Accepted - text revised.
1-672	1	12	48	12	52	I suggest include a short information about the contributions of thermally induced sea water expansion to sea level rise and its acceleration compared with the effect of ice sheets melting to this process. [Karl-Heinz Bernhardt, Germany]	Accepted - by revising the first sentence in this section
1-673	1	12	48	12	52	Remove reference to projections in earlier assessment reports. This chapter is supposed to be reporting observational data. [John McLean, Australia]	Rejected - One of the intentions of Chapter 1 is to show the progress made in the previous assessment reports. As stated in the Executive Summary: "The range of climate projections from the first IPCC assessment in 1990 to those in the 2007 AR4 provides an opportunity to compare the timespan of projections with the actually observed changes".
1-674	1	12	49	12	50	This comment is misleading. By definition, there are no models that include all the forcings, or they would be as complex as the real system they try to emulate. Change this expression to say that either earlier models did not include all the main or most important forcings, or that the uncertainty of projections was higher because earlier models lacked some important forcings [Juan Blanco, Spain]	Accepted - text revised

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1-675	1	12	49	12	50	"Earlier models...get the thermal expansion correct." Is this statement implying all the forcings have been identified now? The logic of this sentence may be problematic: 1. scientifically, there are always unknowns to be discovered; 2. reasonable estimates can still be made in certain contexts. For example, many important feedbacks had not been identified decades ago, but the estimates of carbon dioxide forcing largely agree with the current values. [Gan Zhang, United States]	Accepted - text revised
1-676	1	12	49	12	51	Fig. 1.11 - These two qualifying statements render this comparison almost useless. Suggest just showing the observed changes. If projections are to be used, projections should be used that were actually derived for such a (near-term) comparison. [Government of United States of America]	Rejected - By the time of the publication of the previous assessments up to AR4 such near-term climate simulations were not available. The data shown represents the state of scientific understanding at the time these reports were published.
1-677	1	12	54			Section 1.3.4.2 Ocean Acidification: please refer to WGI Chs 3 and 6. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the reference has been added.
1-678	1	12	56	13	3	A summary statement on observed changes in ocean acidification would be useful in this section. For example, as per chapter 3 "the ocean's uptake of carbon dioxide is having a significant impact on the chemistry of seawater. The average pH of ocean surface waters has already fallen by about 0.1 units, from about 8.2 to 8.1 (total scale), since the beginning of the industrial revolution" and "A decrease in ocean pH of 0.1 corresponds to a 26% increase in the H ⁺ concentration of seawater." [Government of Australia]	Taken into account - Reference to the relevant chapters have been added.
1-679	1	12	57			Define the depths that are included in "mixed layer". [Government of United States of America]	Accepted - Text is rewritten
1-680	1	13	3			Does Chapter 3 (Ocean obs) include a discussion of ocean acidification; if so, it deserves being cited alongside the WGII assessment. Additionally, Dick Feely's observational work warrants reference in this discussion. [Government of United States of America]	Taken into account - Partly accepted: discussion from Ch 3 is included. The suggested reference is not included.
1-681	1	13	5	13	14	As before, this diagram confuses rather than clarifies. Remove the cherry-picked projections from previous reports and show, as a continuous line, the reported average sea level. (I don't understand why you don't show the observational data as clearly as possible.) [John McLean, Australia]	Rejected - The details are presented in Ch 3, here we show marginalized data.
1-682	1	13	6			Figure 1.11: is it possible to add the observational uncertainty to the Altimeter GMSL record? [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - the figure has been extensively revised. In the revised figure no uncertainty estimates are shown for readability. See Chapter 2 and Chapter 13 for more information on sea level observations.
1-683	1	13	16			Section 1.3.4.3: Chapter 1 should not be coming up with their own values based on a handful of cited papers, and web-based articles. This section is particularly problematic, as almost none of the observed changes reported here are consistent with the assessment coming out of Chapter 4. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the section will be revised and consistency with Chapter 4 will be checked.
1-684	1	13	16			The Arctic sea ice extent broke history record in the 2012 melting season, which is worth mentioning here. [Gan Zhang, United States]	Accepted - text revised.
1-685	1	13	16			The section discusses sea ice first and then the discussion goes to land ice. However, this makes the discussion jump between the two polar regions (a. Arctic sea ice; b. Antarctic sea ice; c. Greenland land ice; d. Antarctic land ice). Personally speaking, the switching negatively impacts the reading experience. Besides, a and c, as well as b and d, are more directly associated in the real world. Rearranging the order of the first 4 paragraphs may bring some improvement. [Gan Zhang, United States]	Rejected - Any order of a. to d. would cause some kind of "jump" between sea ice/land ice and Arctic/Antarctic. The selected one is logical.
1-686	1	13	18	13	20	I guess that those numbers are for ice extent, not ice area. [Thierry Fichet, Belgium]	Accepted - text revised.
1-687	1	13	18	13	27	I think that, since the 2012 value has been the lowest in the series, this paragraph should be rephrased including the new minimum. [Claudio Cassardo, Italy]	Accepted - text revised.
1-688	1	13	18	13	27	Please update the description of sea ice extent in the Arctic with the 2012 September data [Government of NORWAY]	Accepted - text revised.
1-689	1	13	18	13	33	All sea ice observations here and time periods considered should be made consistent with the assessed	Accepted - the references have been revised.

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						statements coming out of chapter 4. Reference to web-based material should be replaced with reference to the appropriate WGI Chapter assessment [Thomas Stocker/ WGI TSU, Switzerland]	
1-690	1	13	19			Consider using consistent terms: "area" vs "cover" vs "extent" [Government of United States of America]	Accepted - text revised.
1-691	1	13	20	13	22	This statement on Arctic sea ice extent should be updated to include the record low of 2012. [Government of Australia]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-692	1	13	20	13	22	If possible include the 2012 minimum sea ice extent recently reported; the trend of declines towards present is quite compelling. [Nathaniel Ostrom, United States of America]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-693	1	13	21	13	22	The record minimum in 2012 should be mentioned. [Thierry Fichefet, Belgium]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-694	1	13	22	13	22	Include the 2012 season? [James Renwick, New Zealand]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-695	1	13	22			Update to include 2012 in list of lowest September sea ice extent. [Government of United States of America]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-696	1	13	22			Add 2012 as a record low year [Ron Lindsay, United States of America]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-697	1	13	22			Is it possible add '2012'? [JAVIER MARTIN-VIDE, SPAIN]	Taken into account - the sentence will be checked for consistency with Chapter 4.
1-698	1	13	25	13	26	This is disingenuous. NASA reported that the 2007 loss of Arctic sea ice was due to severe storms breaking up the ice and pushing into the paths of warm ocean currents. It's not surprising that since that year much of the Arctic sea ice is thin and best described as fragile. Do you honestly believe that climate models should have been able to predict those storms. In 2012 40% of the deficit via-a-vis the 1979-2008 average occurred across 2 weeks at the start of June, which again suggests unusual weather (hot SW winds from the USA that then displaced the cold Arctic air onto northern Europe?). [John McLean, Australia]	Taken into account - New sentence has been added
1-699	1	13	25	13	27	This sentence needs to be updated with CMIP5 findings (see Chapters 9 and 10). [Thierry Fichefet, Belgium]	Accepted - text revised.
1-700	1	13	25			Consider using consistent terms: "area" vs "cover" vs "extent" (see elsewhere also in this section) [Government of United States of America]	Accepted - text revised.
1-701	1	13	26			Were these AR4 models intended to be used for near-term assessments (as opposed to long-term assessments, like the SRES projections)? [Government of United States of America]	Taken into account - This particular issue is dealt with in Ch 12 and thus here we refer to Ch 12 for details
1-702	1	13	27	13	27	have' should be 'has' [Peter Burt, United Kingdom]	Accepted - text revised
1-703	1	13	27		1	Add some references to the reductions in sea ice volume. See Schweiger et al (2011). [Ron Lindsay, United States of America]	Accepted - Reference to Chapter 4.2.2 (where Schweiger et al. is referred to) is included
1-704	1	13	29	13	29	Elsewhere in the report, Antarctic sea ice extent is said to have increased by 1.4%. It is not clear why 2% is used here. [Government of Australia]	Accepted-text revised.
1-705	1	13	29	13	29	"sea ice extent" here refers to winter sea ice extent. This precision is needed in citing here sea ice extent. [Government of France]	Rejected - it refers to the total change independent of season
1-706	1	13	29	13	30	English does not make sense [Peter Burt, United Kingdom]	Accepted - text is revised
1-707	1	13	29	13	33	Make clear that this paragraph is not referring to ice mass. Otherwise, at first sight it looks contradictory that in this paragraph it is stated that ice is being lost, but two paragraphs down it seems that ice is being added. [Juan Blanco, Spain]	Rejected - text is clear on this issue
1-708	1	13	29	13	33	The impact of the ozone hole on the Antarctic sea ice is highly controversial. For instance, the recent study conducted by Bitz and Polvani (GRL, 2012, doi:10.1029/2012GL053393) suggests that the ozone depletion is responsible for a reduction in Antarctic sea ice extent. This controversy should be reflected in the statement.	Accepted - text revised.

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						[Thierry Fichefet, Belgium]	
1-709	1	13	29	13	33	This section about the recent increase in Southern Ocean Sea ice extent is not consistent with the discussion in Chapter 10 page 38 of the SOD. In particular, some recent studies suggest that ozone depletion lead to a decrease of the ice extent, not an increase. This section must be revised to be consistent with the recent literature (and then with Chapter 10). [Hugues Goosse, Belgium]	Accepted - text revised.
1-710	1	13	29	13	49	Please concatenate the two paragraph relative to Antarctica (the first in lines 29-33 and the 2nd in lines 44-49) [Claudio Cassardo, Italy]	Rejected - Current order is logical
1-711	1	13	35	13	49	The numbers reported here of observed changes in Ice sheet loss appear to be much larger than the numbers given in chapter 4. For example, it is stated here that Antarctic Ice Sheet annual loss increased from 112 +/- 91 Gt in 1996, to 196 +/- 92 Gt in 2006. This is very difficult to reconcile with the assessment coming from Chapter 4 that AVERAGE Antarctic ice loss for the period 1993 - 2010 was 65 +/- 33 Gt per year, and for the period 2005-2010 was 112 +/- 58 GT gt per year. All observations reported here and time periods considered should be made consistent with the assessed statements coming out of chapter 4. Reference to web-based material should be replaced with reference to the appropriate WGI Chapter assessment. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Numbers are now consistent with Chapter 4
1-712	1	13	36			Can these raw numbers (Gt ice loss) be framed in terms of a "% loss / decade" to give a little more context as to whether these numbers are big or small? [Government of United States of America]	Rejected - we are consistent with other chapters in AR5, e.g. Ch 4.
1-713	1	13	39	13	42	Regarding the rate of Greenland melt, the text currently states that "Since 1979, the area experiencing surface melting has increased significantly (Mernild et al., 2009; Tedesco, 2007), with 2010 breaking the record for surface melt area, runoff, and mass loss and the unprecedented retreat of the Greenland Ice Sheet in 2012 (http://www.nasa.gov/topics/earth/features/greenland-melt.html)." However, the NASA website states: "Ice cores from Summit show that melting events of this type occur about once every 150 years on average. With the last one happening in 1889, this event is right on time," says Lora Koenig, a Goddard glaciologist and a member of the research team analysing the satellite data. "But if we continue to observe melting events like this in upcoming years, it will be worrisome." [Government of Australia]	Rejected - no discussion/reference to return period is considered appropriate
1-714	1	13	39	13	42	This sentence does not tell the whole story. Anecdotal evidence (ship's logs etc) shows significant loss of Arctic ice in the 1930s and asuming that warming was the cause it seems logical to assume a reduction in Greenland ice. [John McLean, Australia]	Rejected - this paragraph is not dealing with historical climate records concerning the Greenland ice sheet
1-715	1	13	40			This statement claims that 2010 broke the record for surface melt area, but there are studies - or at least NASA data/press releases - that state that 2012 broke the record for surface melt area. [Government of United States of America]	Accepted - text revised.
1-716	1	13	41	13	41	The statement.. and the unprecedented retreat of the Greenland ice sheet in 2012.. is not true.. If "retreat" is replaced by "areal extent of surface melt" the statement would be true and also in agreement with the reference. [European Union]	Accepted - text revised.
1-717	1	13	41	13	42	The NASA web page is misquoted. It does not discuss "unprecedented retreat of the Greenland Ice Sheet in 2012"; it discusses unprecedented surface melt over Greenland associated with an exceptionally warm few days this summer. Not the same thing. Given the IPCC's strict rules for referring to peer-reviewed literature, with strict cut-off dates, is reference to such a web-based article appropriate? If it is allowed for one website, where do you draw the line? [Adrian Simmons, United Kingdom]	Taken into account - the reference to the website has been removed. We now refer to Nghiem et al., 2012. The section will be checked for consistency with Chapter 4.
1-718	1	13	41			Is the 2012 record here referring to "retreat" of the Greenland Ice Sheet or "surface melt area" as numerous reports from earlier this summer claimed? Thinning vs retreat... or both? [Government of United States of America]	Accepted - text revised.
1-719	1	13	42			Instead of citing a NASA web page, I would rcommend citing Nghiem et al. 2012, Geophys. Res. Lett., "The extreme melt across the Greenland Ice Sheet in 2012" [Tamlin Pavelesky, United States of America]	Accepted - text revised.
1-720	1	13	43			"we know" -- needs to be reformulated. This wording prejudices the Chapter 13 assessment and needs to be	Accepted - Note that this comment actually refers to

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						clearly presented as the Church and White estimate, not the IPCC WGI AR5 assessment (which could be implied by starting with "we know") [Thomas Stocker/ WGI TSU, Switzerland]	page 12. The text has been revised.
1-721	1	13	44	13	45	The reported ice mass losses for 1996 and 2006 are not consistent with the statement that estimated mass loss has increased. The two ranges have a significant overlap (and both mid-points are within the range of the estimate for the other year), so no conclusion about the trend can be drawn. Alternatively, it may be stated that the change in mass loss from 1996 to 2006 is anywhere between a decrease of about 100 Gt and an increase of more than 250 Gt. I suggest rewriting to "Estimates show that annual mass loss in Antarctica was 112 ± 91 Gt in 1996 and 196 ± 92 Gt in 2006, comparable..." [Arne Melsom, Norway]	Accepted - Figures are revised and correspond to those given in Ch 4. Reviewer's comment should now be taken care of.
1-722	1	13	44	13	46	The values and time periods given for Antarctic ice sheet loss in this section are different to those used in Chapter 4 which states 65±33 Gt yr-1 from 1993 to 2010 and 112±58 Gt yr-1 from 2005-2010. Consistency would be useful. [Government of Australia]	Accepted - Corrected and now in line with those in Chapter 4
1-723	1	13	44	13	49	Recommendation to shift the whole para to line 34 in order to deal with the Antarctic in block. [Government of Germany]	Rejected - The order is kept as it is.
1-724	1	13	44	13	49	This paragraph is unreasonable. The only reasonable statement is "There is on-going research and debate as to whether the Antarctic is losing ice." [John McLean, Australia]	Rejected - The text is balanced, covering both areas of mass loss and mass gain and consistent with Ch 4.
1-725	1	13	45	13	46	"comparable to losses to the Greenland Ice sheet" ?? According to chapter 4, the loss from Antarctic is around 50% less than the corresponding losses from Greenland over the same time periods. Hard to see how these losses are comparable. Please clarify. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised and the figures are consistent with those in Ch 4.
1-726	1	13	45			Can these raw numbers (Gt ice loss) be framed in terms of a "% loss / decade" to give a little more context as to whether these numbers are big or small? [Government of United States of America]	Rejected - we are keep consistent with Ch 4.
1-727	1	13	46	13	49	The work of Steig et al. should be referenced here give his prominence in studies of Antarctic ice changes. [Government of United States of America]	Rejected - this is not included in Ch 4.
1-728	1	13	48			it might be interesting to mention that also future projections indicate a positive surface mass balance for the Antarctic ice sheet, even growing with increasing RCP levels (see for example Chapter 13, Fig. 13.8) [Jucundus Prof. Dr. Jacobeit, Germany]	Rejected - This is covered in other chapters
1-729	1	13	51	13	52	the end of the Little Ice Age: the specification in bracket refer to the duration of Little ice Age (which, by the way, is not clearly identifiable by using absolute dates, since also in 15th century there have been several cold episodes), not to its end --> I suggest to change bracket in (around 1850). [Claudio Cassardo, Italy]	Accepted - Bracket is removed
1-730	1	13	51	13	52	The little ice age is defined differently in chapter 5 ("1400-1700 CE") [Raimund Muscheler, Sweden]	Accepted - We have removed the time period to avoid conflict with text in other chapters
1-731	1	13	51	13	58	Please back-up e.g. with a reference to other parts of the report, the statement that shrinking and mass loss of glaciers are largely due to anthropogenic effects. [Government of NORWAY]	Accepted - The statement "largely due to anthropogenic effects" is omitted.
1-732	1	13	51	13	58	Since this section discusses regional trends in glacier mass, a glaring omission is the lack of results from the 3 largest ranges in the world: Andes, Himalayas and Rockies. Consider inserting a statement about each, even if data is inconclusive. [Government of United States of America]	Rejected - The comment is incorrect, see Table 4.2
1-733	1	13	52	13	53	What is meant by englacial temperatures? Please consider to use a more commonly used term. [Government of NORWAY]	Accepted - text revised.
1-734	1	13	52	13	54	Delete 'englacial'; technical term that would need defining and sentence does not require it. Also, the reference to Luthi and Funk, 2001, may need revising as the text refers to changes over recent decades. A 2001 paper would not be reporting on the most recent decade. [Government of Canada]	Accepted - The term "englacial" has been removed and a reference from 2011 included
1-735	1	13	53			What is the definition of "mountain cold glaciers"? [Government of United States of America]	Accepted - text revised.
1-736	1	13	54	13	56	The claim that glacial ice loss is "largely due to anthropogenic effects" is not supported by any evidence shown here, so remove those words. The loss could easily have been due to the general warming caused by the 1976 switch from ENSO conditions dominated by the La Nina side of absolutely neutral (Troup SOI	Accepted - The statement "largely due to anthropogenic effects" is omitted.

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						average over 10, 20 30 years prior to 1976 were around +2) to conditions dominated by the El Nino side of absolutely neutral (Troup SOI average over 10, 20 30 years after 1976 were around -4). The strengthened Hadley Circulation would distribute warm tropical air into the mid latitudes , a natural consequence of which would be glacial loss. (Refer: Trenberth, K.E. (1990), Guilderson, T.P. and Schrag, D.P. (2006), Trenberth, K.E. (1996), Trenberth K.E. and Carron, J.M. (2000), and Trenberth et al (2002) - "Evolution of El Nino–Southern Oscillation and global atmospheric surface temperatures") [John McLean, Australia]	
1-737	1	13	54	13	58	It is not clear why "Arctic" is not included in the setence about greatest mass losses, when it is described in the following sentences as one of the two "most important regions with respect to total mass loss from glaciers" [Government of United States of America]	Rejected - First sentence lists the areas with greatest mass loss per unit area, while the next sentence lists areas with greatest mass loss (here Arctic is mentioned)
1-738	1	13	54			A better and up-to-date reference for the same site is Hoelzle, M., Darms, G., Lüthi, M.P. and Suter, S. (2011): Evidence of accelerated englacial warming in the Monte Rosa area, Switzerland/Italy. The Cryosphere 5, 231–243. [Wilfried Haerberli, Switzerland]	Accepted - text revised.
1-739	1	13	55	13	55	Suggest deleting the words "largely due to anthropogenic effects" from this sentence. This would need substantiating and Chapter 1 is not the appropriate place. Also, no attribution of other cryosphere indicators is given. [Government of Canada]	Accepted - the "largely due to anthropogenic effects" has been deleted. Thereby we avoid introducing attribution statements, which Chapter 10 focuses on.
1-740	1	13	55			The phrase "largely due to anthropogenic effects", if retained, would best be couched in terms of the IPCC's language on uncertainty or confidence. [Adrian Simmons, United Kingdom]	Taken into account - the "largely due to anthropogenic effects" has been deleted. Thereby we avoid introducing attribution statements, which Chapter 10 focuses on.
1-741	1	13	55			"largely due to anthropogenic effects" -- suggest to avoid introducing attribution statements in Chapter 1. This will be assessed in Chapter 10. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the "largely due to anthropogenic effects" has been deleted. Thereby we avoid introducing attribution statements, which Chapter 10 focuses on.
1-742	1	13	58			Do the Zemp et al. papers really formally attribute mass losses to anthropogenic effects? [Peter Guttorp, United States of America]	Taken into account - Corrected by omitting statement of "anthropogenic effects"
1-743	1	13		13		Section 1.3.4.3 Ice Indicators: Recognizing the difficulty of keeping this current, it is noted that while Greenland Ice Sheet retreat is noted for 2012 (line 41), record sea ice minima for 2012 is not included in the list (line 22). [Government of United States of America]	Accepted - text revised.
1-744	1	13				Figure 1.11: TOPEX/Poseidon was launched in August 1992. Hence, the T/P data only cover a few months in 1992, and is not comparable to the annual tide gauge data or later values in the T/-Jason time series. I suggest removing the T/P marker for 1992. [Arne Melsom, Norway]	Accepted - The figure has been revised revised.
1-745	1	14	2			This section might be better-placed earlier in the chapter [Government of United States of America]	Rejected - the outline of the chapter has been given by the IPCC.
1-746	1	14	4	14	19	There are no uncertainties in the environmental systems but uncertainties in environmental science when describing and understanding the environmental system, therefor delete 'system' and insert 'science' in the headline [Government of Germany]	Taken into account - Point debateable but text revised.
1-747	1	14	6	14	6	The 90% figures are sheer guesswork, unrelated to any genuine study on uncertainties [Vincent Gray, New Zealand]	Rejected - Sentence explains treatment of uncertainties in WGI.
1-748	1	14	6	14	7	I think that this should also include uncertainty from methodological/structural choices when building data-products which is separate from both model uncertainty and uncertainty analytical and interpretive methods. [Kate Willett, United Kingdom]	Rejected - Discussed under model uncertainty - statistical models of data products are still models.
1-749	1	14	6	14	9	The point could be made here that one of the issues is lack of measurements, which is not the same as uncertainty in measurements. There is uncertainty in our observation of climate due to sampling uncertainty as well as measurement uncertainty. [Adrian Simmons, United Kingdom]	Accepted - text revised.
1-750	1	14	6	14	19	need a reference [YEHIA HAFEZ, Saudi Arabia]	Rejected - Comment unclear

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1-751	1	14	7			could be added (because most users of the IPCC reports are mainly interested in the un/certainties of the projections and other quant. assessments: "in analyses and interpretation of scientific assumptions and results or conclusions." [Tibor Farago, Hungary]	Rejected - Comment unclear - missing line number reference.
1-752	1	14	9			strike "do"; no stress required, and in my view stress weakens statement. [Stephen E Schwartz, United States of America]	Accepted - text revised.
1-753	1	14	11	14	14	This sentence is very dubious. Climate derives from weather and weather is influenced by forces of varying strengths operating of various and variable time scales. There is no good reason to believe that short-term climate forces will be resolved quicker than long-term forces, in fact the identification, quantification and removal of long-term forces is likely to be necessary before short-term forces can be identified and quantified. [John McLean, Australia]	Rejected - Text refers to timescales required to constrain our knowledge of processes.
1-754	1	14	11	14	14	Availability of new observations may not necessarily decrease uncertainties, but can help better constrain/quantify uncertainties. [Arindam Samanta, United States of America]	Rejected - We think this is already reflected in text.
1-755	1	14	11		12	Better as a "because" clause: Because Earth's climate system is characterized by multiple spatial and temporal scales, uncertainties do not usually reduce at a single, predictable rate. [Stephen E Schwartz, United States of America]	Accepted - text revised.
1-756	1	14	14	14	16	In developing models we use what is already known - well known equations and parameterizations or best guesses. Given this, the use of models to enhance understanding of uncertainites would be effective when used in conjunction with newer observations - such as through data assimilation. Otherwise, models would probably not tell us anymore than what is already known. [Arindam Samanta, United States of America]	Rejected - We think this is already reflected in text.
1-757	1	14	21			Section 1.4.2: Perhaps a layman definition of uncertainty is in order here. This would help a vast number of readers from non-technical backgrounds. Beginning with a simple and generic definition of uncertainty would help readers to refer to as they read about it in greater detail. [Arindam Samanta, United States of America]	Rejected - Most comments seem to think this section was accessible to a broad audience.
1-758	1	14	23	15	21	Again, sampling uncertainty in addition to measurement uncertainty could be discussed a bit more here. It is touched on in the first line, with its reference to "lack of information", but not pursued. A paragraph on internal variability and consequences for predictability would complement the discussion of observational and modelling uncertainties. [Adrian Simmons, United Kingdom]	Accepted - text revised.
1-759	1	14	23			Section 1.4.2 A short discussion of methodological/structural uncertainty is missing here which underpins why any two data-products of the same variable (e.g., HadCRUT vs GHCN) may differ - and hence why having multiple data-products that estimate the same variable is very useful because their spread gives some estimate of the structural uncertainty. [Kate Willett, United Kingdom]	Rejected - This would be more appropriate in Chapter 2.
1-760	1	14	30	14	31	While we find the example/explanation on differences in how uncertainty is dealt with for observations and projections of future change useful, we find that the overall description for "the process and taxonomy" is different and difficult to understand. Please consider re-phrasing and consider to replace "taxonomy" with "classification". [Government of NORWAY]	Accepted - text revised. Now says "classification structures"
1-761	1	14	31	14	34	A brief mention of the BIPMs (Bureau International des Poids et Mesures) Guide to the Expression of Uncertainty in Measurement (http://www.bipm.org/en/publications/guides/gum.html) might be appropriate here as it specifically deals with measurement uncertainty, categorising it into two components. Type A is a random component linked to how precisely a variable can be measured. Type B refers to site specific errors such as instrument biases and observer mistakes. [Kate Willett, United Kingdom]	Accepted - Citation added
1-762	1	14	32	14	33	Other factors contribute to uncertainties in measured quantities, including calibration methodologies, instrument performance, and inherent instrumental limitations. [Government of United States of America]	Accepted - text revised.
1-763	1	14	34	14	37	You have failed to mention that modelling uncertainties are inevitable when the level of scientific understanding of forces are low. [John McLean, Australia]	Rejected - Text refers at length to model uncertainty.
1-764	1	14	36			It might be worthwhile including "observational uncertainty" too. [JOSHUA FISHER, United States of America]	Accepted - text revised.
1-765	1	14	39	15	21	model uncertainty is discussed widely, whereas scenario uncertainty and internal variability are not. Please	Accepted - text revised.

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						add some thought to the latter ones too. [Government of Germany]	
1-766	1	14	42	14	44	Enough of model "ensembles"! Climate models produce different results but obviously they can't all be correct. Showing the spread of output of climate does not imbue greater accuracy. If one model was accurate, even by chance, its results will be lost in the fog of output from inaccurate models. [John McLean, Australia]	Rejected - Text already refers to model uncertainty.
1-767	1	14	50			specify who is referred to here with "we". Does this refer to Chapter 1 or to the WGI contribution to AR5? [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - personal pronouns are avoided in the final draft.
1-768	1	14	53			"This uncertainty(model uncertainty) arises from approximations required in the development of models." This is too narrow. Model uncertainty encompasses misrepresentation of processes as well as omission of processes, not just approximations. Not all is understood, and not all that is thought to be understood is accurately understood. [Stephen E Schwartz, United States of America]	Rejected - Previous paragraph acknowledges this point by saying "and not all variables of interest are adequately simulated by global climate models."
1-769	1	14	56	15	4	Please note that a slightly different terminology is used in chapter 6. [Jan Fuglested, Norway]	Accepted - text revised
1-770	1	14	56	15	4	While model uncertainty is elaborated with quite some details, other uncertainty sources are not dealt with any further (scenario uncertainty/nat variability).Suggest to elaborate more on the different sources of uncertainty that need to be considered [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text added re: scenarios (pointers to SRES & RCPs) and natural variability (refernces to Hawkins & Sutton and pointers to chapters 10, 11 and FAQ 1.1).
1-771	1	14	57	15	1	strike "functional forms of the"; let it read "uncertainty in the model structure". There is nothing functional about it. Weakens the sentence and the concept you are trying to convey. [Stephen E Schwartz, United States of America]	Accepted - Text revised.
1-772	1	14				There is not enough emphasis on the difference between uncertainties from observations and uncertainties from models. The former can be estimated, the latter cannot. It is hard to say but the errors of coupled GCMS cannot be assessed. It is better to say it clearly. The only thing that can validate a climate model is whether it predicts things repeatedly and consistently. We are far from that. Why ? Because our models have viscosities that are many orders of magnitudes above the viscosities of the fluids that we model. [Government of France]	Taken into account - Text has been revised. New material added on observational uncertainty. Aspects of model uncertainty can be estimated; structural uncertainty is harder to address comprehensively but the report attempts to discuss these issues in several paces - see cross references.
1-773	1	15	6	15	11	It took me a while to understand that definition and realize that the use of 90% vs. 95% is correct. It might be easier to say that 5% of the values are below the lower endpoint and 5% are above the upper endpoint. [Dietrich Feist, Germany]	Accepted - text revised
1-774	1	15	6	15	11	This paragraph is important as it describes the reporting of uncertainty intervals and how to interpret them in the AR5. The text as written is fairly clear but could be strengthened to make it even more clear that the 90% interval is just that - an interval, a range of values versus the single values at the endpoints of this interval. Perhaps the following wording would make this clearer: "The 90% uncertainty interval, reported in square brackets, describes the interval (range of values) within which it is 90% likely that the value being estimated will fall. The endpoints of this interval, being single values, can be assigned likelihoods themselves. The upper endpoint.....etc." [Government of Canada]	Accepted - text revised.
1-775	1	15	6	15	21	where the reference of this paragraph [YEHIA HAFEZ, Saudi Arabia]	Rejected - this refers to AR5
1-776	1	15	6			"In the WGI contribution to the AR5, uncertainty is quantified using 90% uncertainty intervals"; let it read "In the WGI contribution to the AR5, uncertainty which can be quantified is quantified using 90% uncertainty intervals. [Stephen E Schwartz, United States of America]	Rejected - The current text is clear enough. Where uncertainty which cannot be quantified is a significant factor, this would suggest use of confidence language rather than likelihood language.
1-777	1	15	6			You might wish to justify the choice of the central 90%, which, for a gaussian distribution, is ± 1.64 sigma, not necessarily a bad choice, but an unconventional choice; should probably explicitly state the 1.64 sigma. [Stephen E Schwartz, United States of America]	Rejected - Many distributions in climate research are decidedly non-Gaussian. Reluctant to introduce this sort of distribution-dependent material.
1-778	1	15	8	15	10	This phrase is difficult to understand, may be you can clarify it in the sense of to differentiate between the reference of the 90% likelihood interval and the 95% (or 5%) likelihood tail resulted. [Méndez Carlos, Venezuela]	Accepted - text revised

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1-779	1	15	8	15	10	This seems to be a strange way of characterising the tails of the distribution. Perhaps preferable to say "There is a 5% likelihood of an estimated value exceeding the upper end point of the uncertainty interval and a 5% likelihood of an estimated value being less than the lower endpoint of this interval." [Government of Australia]	Accepted - text revised
1-780	1	15	8	15	10	The phrasing here is not intuitive: "The upper endpoint of the uncertainty interval has a 95% likelihood of exceeding the value that is being estimated..." Perhaps a more clear phrasing would be: "There is a 5% chance of the number being estimated exceeding the upper endpoint of the uncertainty interval..." [Government of United States of America]	Accepted - text revised
1-781	1	15	8	15	10	The 90% likelihood is easy enough to understand, but the sentence about upper endpoint and lower endpoint, and 95%, was confusing. Suggest deleting this sentence. [Kenneth Minschwaner, United States of America]	Accepted - text revised
1-782	1	15	18	15	20	An exact reference should be given to the IPCC specific, calibrated language scales here by adding e.g. see Table 1.1. [European Union]	Accepted - text revised.
1-783	1	15	23			Treatment of Uncertainty in IPCC .. : It is indicated how this issue has progressed since FAR, however, some hint would be useful (on changing the approach e.g. between AR4 and this AR5 described in subsequent 1.4.4.) for those who wish to have some comparison on how certainty/confidence levels have changed at least for some key results between AR4 and AR5. [Tibor Farago, Hungary]	Rejected - A reference to Mastrandrea et al. 2010 is given for information on the changes of the IPCC guidelines on uncertainty language.
1-784	1	15	46			Is a reference to Mastrandrea et al. 2010 needed here? [Government of United States of America]	Accepted - text revised.
1-785	1	15	49	15	51	This is not quite what Mastrandrea et al (2010) say. There is a strong expectation that one can only assign relevant likelihood terms on an issue where one has high or very high confidence that the underlying processes are well understood. Having less than high confidence is not inconsistent, but it requires clear signalling, precisely because it begins to question the ability to say something about quantitative likelihoods in the real world if confidence is less than high. Please adjust wording to be consistent with Mastrandrea et al (2010) by making clear that this is not just for stylistic purposes but a strong scientific rationality behind this. [Andy Reisinger, New Zealand]	Taken into account - Text revised. The omission of the high or very high qualifiers is a concession to stylistic clarity - people felt that the inclusion of confidence language, in situations with likelihoods also given, interrupted the flow and could be taken as read.
1-786	1	15	50	15	52	These definitions are not particularly clear. Consider splitting into smaller sentences, and further clarifying the concepts. [Government of France]	Accepted - Text revised.
1-787	1	15	52	15	53	The notion that a probabilistic assessment implicitly has high or very high confidence applies not only to "likely" but equally to an assessment that might arrive at something being "very unlikely". Consistent with Mastrandrea et al (2010), I suggest this is rephrased as "if something is described in likelihood (i.e. probabilistic) terms, then in the absence of additional qualifiers it should be inferred that it also has high or very high confidence." This is more general and correct than the narrow focus on high likelihood statements that the authors have in their current draft. [Andy Reisinger, New Zealand]	Accepted - text revised
1-788	1	15	53			"reasonably high confidence" is unhelpfully and unnecessarily vague. What is "reasonable"? Based on Mastrandrea et al (2010; 11E), it is high or very high confidence, and a lower confidence level only by explicit exception. I suggest you use that more explicit wording here, too. [Andy Reisinger, New Zealand]	Accepted - text revised.
1-789	1	15	53			suggest to delete "reasonably" here, it's very vague and not part of the formal terminology as presented in the AR5 uncertainty guidance note [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised.
1-790	1	16	6	16	7	expert judgement is a qualitative, not quantitative measure [David Bader, United States of America]	Rejected - Expert judgements can be expressed as quantitative estimates. The Bayesian interpretation of probability as degrees of belief in a proposition are just that.
1-791	1	16	9	16	10	Please clarify how many authors will form the judgement expressed in any sentence of this report. By my reckoning it's likely to be less than 5, so to claim "author teams" and imply a greater number is very misleading.. [John McLean, Australia]	Taken into account - The number of experts vary with the issue in question.
1-792	1	16	16	16	19	It is possible that this text was copied and pasted from the referenced Guidance Notes. The use of "should be" and "should not be" sounds like guidance. Do the authors mean that uncertainty IS presented and that confidence IS NOT interpreted probabilistically? [Government of United States of America]	Accepted - text revised.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-793	1	16	21			"The confidence level is based on the evidence (robust, medium, and limited)". Suggest "moderate confidence" in lieu of "medium confidence". "Medium" implies the middle of some known range; what one wishes to convey here is that the confidence (in a statement or conclusion) is somewhere between robust and limited [Stephen E Schwartz, United States of America]	Rejected - Existing language agreed at cross-working group meeting.
1-794	1	16	31	16	31	Expressing opinions as percentage probability is hugely flawed because an opinion is subjective and probability is objective and calculated. [John McLean, Australia]	Rejected - One of the two main interpretations of probability (the Bayesian paradigm) views probability as inherently subjective. We don't take a position on the Bayesian vs. frequentist interpretations, but the current language can accommodate both.
1-795	1	16	31	16	44	It is unfortunate that, as in the AR4, the AR5 is confusing about the use of the words "likely" and "likely range". This section defines "likelihood terms" and includes the definition of "likely" as "66–100% probability". However, the term "likely range" isn't even mentioned in Chapter 1. The first attempt at a definition of "likely range" that I can find is in the caption to Figure 12.8 in Chapter 8, where it is defined as a "5–95% range" (although there may well be an earlier definition). This really needs to be fixed early in the AR5 WGI report – this would be an appropriate place to define "likely range" (and any other "ranges" which are described by words rather than numbers). [John Hunter, Australia]	Taken into account - This figure is consistent with SREX
1-796	1	16	35	16	35	This is too general. More specific information about the methods used, including how expert views were integrated to estimate the probability would make things more convincing. [Dora Marinova, Australia]	Rejected - Because these vary it's pretty difficult (and would be very unwieldy) to describe all these. And it's a level of detail that's not appropriate to an introductory chapter.
1-797	1	16	40	16	40	Table 1.1 should include a definition of unequivocal as 100% probability [Government of Australia]	Rejected - It's clear enough.
1-798	1	16	40	16	40	The term 'unequivocal' is commonly used throughout the SOD but appears to remain undefined anywhere. Suggest that here on in the notes on additional terms, unequivocal is defined [Government of United Kingdom of Great Britain & Northern Ireland]	Rejected - It's clear enough.
1-799	1	16	40	16	40	The identification of anything above 99% probability as "virtually certain" is a little odd. It is unfortunate that the terminology introduced in AR4 for 95-100% (extremely likely) requires an intensification beyond "extremely". But it would be better to maintain symmetry between the terminology for 99% and 1%: i.e. use "Exceptionally likely". [Martin Jukes, United Kingdom]	Rejected - This terminology was derived through a special IPCC meeting and resulting guidance document that we are to use for AR5.
1-800	1	16	40	16	41	These levels are sheer guesswork unrelated to any scientific study of uncertainty [Vincent Gray, New Zealand]	Rejected - This section is just explaining the approach in this report.
1-801	1	16	42	16	43	Table 1.1 - Why aren't "extremely likely" and "extremely unlikely" put into the table? Even given their limited use, it's helpful to see them alongside the other 'likelihood' terms. [Government of United States of America]	Rejected- Current table consistent with Mastrandrea et al.
1-802	1	16				Table 1.1: The use of the phrase "virtually certain" to describe 99-100% probability seems highly inappropriate to me. It is likely too late to change this wording since it is already ingrained throughout the other chapters, but here is my objection: Even though in a colloquial sense most everyone knows that the qualifier "virtually" is akin to "nearly" or "almost", the definition (from Webster's College Dictionary) is "being such practically or in effect, although not in actual fact or name". This is much more vague than 99-100% probability, and also seems to exclude the possibility of something being factual or true (though some things in this report that are labeled "virtually certain" could in fact be true). Thus, I would suggest using the phrase "beyond reasonable doubt". This, I believe, is a much better description of what is meant when using the highest probability likelihood qualifier. [Kenneth Minschwaner, United States of America]	Rejected- The language was agreed in 2010.
1-803	1	17	2	17	3	it would be better to avoid a "dying" example to illustrate the various interpretations [Tibor Farago, Hungary]	Rejected- The example used effectively makes the point in the change. No change.
1-804	1	17	21	17	22	Are you sure that such a warning should be here ? (Imagine that this sentence is also translated e.g. to Chinese or Russian .. and those readers may even question the relevance of all the AR5 ..) [Tibor Farago,	Rejected- The example is drawn from the citation.

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						Hungary]	
1-805	1	17	22	17	22	The word "may" and "possible" appear together. It would not damage the sentence structure but may make it look redundant. [Gan Zhang, United States]	Accepted - text revised.
1-806	1	17	22			"a possible" could be omitted. "may lead to loss of precision" conveys the possibility. [Adrian Simmons, United Kingdom]	Accepted - text revised.
1-807	1	17	24	20	25	Section 1.5 : Assessing advances in measurement and modeling capabilities is not enough... advances in our physical understanding should also be assessed ! As discussed in a position paper (Bony et al. : Carbon Dioxide and Climate : Perspectives on a Scientific Assessment, in press, available on the WCRP Open Science Conference website), our ability to assess future climate change primarily relies on our physical understanding of how the climate system works. It is what made the Charney report published in 1979 so prescient. Progress in our physical understanding of climate relies on a large spectrum of models (not only GCMs), theories, observations, on our ability to formulate and test physical hypotheses through idealized experiments (as in CMIP5) or through particular field experiments, on our ability to assess the strengths and limitations of models and observations based on the long-term practice and experience of the research community. It should be discussed as well. [Sandrine BONY, France]	Taken into account - The text has been altered and references to the chapters, where the processes are discussed in detail, have been added.
1-808	1	17	29			in Section 1.5.1, suggest to add specific references for the individual observational systems where appropriate [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - since Table 1.2 is deleted, this is not necessary anymore.
1-809	1	17	31	18	39	This section omits an important aspect of climate observation; the construction of observational data records, including re-calibration, bias correction and homogenisation (call it what you will), and the formation of products. The space agencies have put considerable effort into this topic since AR4 - acronyms include GSICS, SCOPE-CM and ESA CCI - and have developed an overall strategy for climate monitoring from space. This should be acknowledged. [Adrian Simmons, United Kingdom]	Accepted - Some info including references have been added, as suggested.
1-810	1	17	31	18	39	The section reports a number of improvements in observational capabilities, but does not identify problem areas. It would be appropriate to echo the finding of GCOS(2009) that at best there has been limited progress in developing countries in filling gaps in their in situ observing networks, and that developed countries have made little progress in ensuring long-term continuity for several important observing systems. More specific cases of decline in some types of measurement, or of restricted international exchange of data could also be cited. This would make for a more balanced assessment of observational capabilities. [Adrian Simmons, United Kingdom]	Accepted - Some sentences describing these features have been added.
1-811	1	17	34	17	34	concerning satellite observations, there is an important update which could be added: GCOS 2011: Systematic Observation Requirements for Satellite-based Products for Climate Supplemental details to the satellite-based component of the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC - 2011 Update, (GCOS-154) December 2011. [CLAUDIA STUBENRAUCH, France]	Accepted - Text revised.
1-812	1	17	34			GCOS(2010) - the updated Implementation Plan published in August 2010 as document GCOS-148 - is a better reference for the ECV concept than GCOS(2009). The latter was a progress report that refers to the ECVs as defined in a 2003 GCOS publication. The 2010 publication revises the list of ECVs. [Adrian Simmons, United Kingdom]	Accepted - Text revised.
1-813	1	17	39	17	39	The parenthetical note "see Chapters 2, 3, and 4 for an assessment of observed changes)" seems incorrect. Are the authors referring to changes in observations rather than observed changes? [Government of United States of America]	Accepted - Text revised.
1-814	1	17	41	17	41	Consider providing brief explanation of proxy data here. [Government of Canada]	Accepted - Text revised.
1-815	1	17	41			*Earth's climate system. [Tibor Farago, Hungary]	Accepted - Text revised.
1-816	1	17	42	17	44	This paints quite a rosy picture where in reality a lot more coordinated and sustained effort is needed on data-rescue, digitisation and data-sharing. ACRE is doing a great job despite lack of funding and an overarching structure and is a nice example but more needs to be done - the reference Allan et al. 2011 could be added here: Allan, Rob, Philip Brohan, Gilbert P. Compo, Roger Stone, Juerg Luterbacher, Stefan Brönnimann,	Taken into account - We added "e.g." before the citation used to indicate that this is just an example.

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						2011: The International Atmospheric Circulation Reconstructions over the Earth (ACRE) Initiative. Bull. Amer. Meteor. Soc., 92, 1421–1425. doi: http://dx.doi.org/10.1175/2011BAMS3218.1 [Kate Willett, United Kingdom]	
1-817	1	17	46	17	51	It would be helpful here to first describe what reanalyses are. [Government of Canada]	Accepted - One sentence added.
1-818	1	17	46			Consider adding a footnote or discussion of what reanalysis is and how assimilation feeds into it; the value of it where obs do not exist; etc. [Government of United States of America]	Accepted - Text revised.
1-819	1	17	48	17	49	The sentence spanning these two lines is problematic in several respects, discussed separately in the three comments immediately below. [Adrian Simmons, United Kingdom]	Accepted - text revised in line with 1-820 to 822
1-820	1	17	48	17	49	It would be more informative to insert "by changes over time in observational coverage and biases, linked to the presence of biases in the assimilating model" after "limited". I could volunteer a few references to papers of my own or my colleague Dick Dee (and probably could find others) where this point has been made, but the point is so basic it perhaps does not need a reference. I would suggest deleting the rest of the sentence, for reasons explained in the next two comments. [Adrian Simmons, United Kingdom]	Accepted - Text revised.
1-821	1	17	48	17	49	In saying that a strategy is needed to address this, the implication is that those institutions undertaking reanalysis do not have such a strategy. I cannot speak for other institutions, but I can state categorically that ECMWF does have a strategy. Strategies are things that institution such as ECMWF usually develop and discuss with their governing bodies, advisory bodies and external funding agencies. The absence of a peer-reviewed paper spelling out the strategy is not evidence that the strategy does not exist. [Adrian Simmons, United Kingdom]	Accepted - To avoid misunderstanding, we have deleted this sentence.
1-822	1	17	48	17	49	The reference to Thorne and Vose (2010) in isolation is inappropriate, to say the least. Peter Thorne is an AR5 WG1 lead author. His paper with Vose has been the subject of extensive comment by Dee et al.(2011 - doi: http://dx.doi.org/10.1175/2010BAMS3070.1) that has, to the best of my knowledge as one of the authors of the comment, not been the subject of independent refutation. Referring to the one paper but not the other does not display the independence and balance that one looks for in an IPCC assessment. [Adrian Simmons, United Kingdom]	Taken into account - see the previous comment and response.
1-823	1	17	49	17	49	Consider referring to Box 2.3 Global Atmospheric Reanalyses in Ch2. [Albert Klein Tank, Netherlands]	Accepted - Text revised.
1-824	1	17	51	17	51	Please give examples of what you regard as "mostly-atmospheric observations" [Government of NORWAY]	Accepted - Text revised.
1-825	1	17	52			The term "ERA-Interim" should be defined or explained. [Government of United States of America]	Accepted - Text revised.
1-826	1	18	4	18	4	In "Few instruments ... For approx.", it may be better to avoid using the abbreviation "approx". [Gan Zhang, United States]	Accepted - Text revised.
1-827	1	18	9			Some rewording would be beneficial here. Deployment of Argo floats began in 2000, but it took until 2007 for numbers to reach the design target of 3000 floats. There has not been systematic coverage since 2000. [Adrian Simmons, United Kingdom]	Accepted - Text revised.
1-828	1	18	12			The number of operational floats can and should be updated from the stated Jan 2009 figure [Government of United States of America]	Accepted - text revised
1-829	1	18	13	18	13	The statements ending on this line need references [Government of United States of America]	Accepted - One reference has been added: WILLIS, J.K., J. M. LYMAN, G. C. JOHNSON, J. GILSON, 2009: In Situ Data Biases and Recent Ocean Heat Content Variability, JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY 26, 846-852.
1-830	1	18	13	18	15	Include the time period for this reduction. [Albert Klein Tank, Netherlands]	Accepted - Text revised.
1-831	1	18	16	18	16	The statements ending on this line need references [Government of United States of America]	Accepted - A reference is added.
1-832	1	18	17	18	17	The statements ending on this line need references [Government of United States of America]	Accepted - A reference is added.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-833	1	18	19	18	27	Please include information about the ICOS (Integrated carbon observation System) project. [Government of NORWAY]	Rejected - ICOS is not considered directly relevant here.
1-834	1	18	24	18	25	"Greening of a planet" is not a phrase that we could locate in Chapter 6, and such a phrase would require further explanation here. Rather, we would suggest to delete this part of the sentence "...and suggests greening of the planet", and thereby being consistent with the other improvements in observation capabilities that are noted in this paragraph, which do not include any additional assessment of what changes have been observed. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - Text revised.
1-835	1	18	26			To reflect the breadth of observations obtained during IPY, consider inserting, "...the number of borehole sites AMONG OTHER OBSERVATIONAL DATASETS was significantly increased..." [Government of United States of America]	Accepted - "as an example" is added to follow the suggestion.
1-836	1	18	39	19	1	Table 1.2: The definitions for AURA and AQUA need to be fixed. These refer to satellites here, not to latin words. [Martin Jukes, United Kingdom]	Taken into account - Fig. 1.13 has been extensively revised and Table 1.2 deleted
1-837	1	18	39			Is it really helpful to list all the satellite instruments (not all of whose identifiers are acronyms)? Perhaps reference can be made instead to the CEOS MIM database, as this should cover all missions and instruments. If the table remains, "radiation" needs changing to "radiances" in a couple of places. [Adrian Simmons, United Kingdom]	Taken into account - Fig. 1.13 has been extensively revised and Table 1.2 deleted
1-838	1	18		19		Many definitions in Table 1.2 need to be refined. See below: SMOS Soil Moisture and Ocean Salinity Satellite METEOSAT [Operational Geostationary] Meteorological Satellite [System] JASON Ocean Altimetry Satellites Quickscat Quick [Ocean Wind] Scatterometer Satellite [Project] AURA Atmospheric Chemical Environment Satellite Mission AQUA Atmospheric Physical Environment Satellite Mission COSMIC Constellation [GPS-based] Observing System for ... ENVISAT Atmospheric, Oceanic & Terrestrial Environment Satellite Mission METOP [Polar-orbiting] Meteorological Operational [Satellite Program] [Government of France]	Taken into account - Fig. 1.13 has been extensively revised and Table 1.2 deleted
1-839	1	18		19		Table 1.2: as described before there is a mix of instruments (SMOS), variables (AMV and RAD) and satellites (NOAA, METOP etc). It would be much more helpful to organize the table by satellites (which include METEOSAT, GOES) and include the instruments which are used for the assimilation (probably radiances), then continue with instruments (like SMOS), again add what is assimilated (probably radiances and in some cases wind vectors), I would also add spatial cover and time resolution (obs time). This information is much more useful than the origin of the names. [CLAUDIA STUBENRAUCH, France]	Taken into account - Fig. 1.13 has been extensively revised and Table 1.2 deleted
1-840	1	18				Figure 1.13: Bottom: this figure is really interesting, but the acronyms and display lead to some confusion if one wants to get some more relevant information: 'number of satellite instruments' in legend and on the graph 'number of satellite data sources used', ECMWF assimilates satellite radiances at different wavelengths and atmospheric motion vectors and probably some other variables. Acronyms mix satellites (NOAA, METOP, AQUA etc) and variables (RAD, AMV). Some satellites are geostationary and do not cover the whole globe but have a good temporal resolution, others are polar orbiting with two satellites or one satellite, leading to 4 or 2 equator overpasses per 24 hours. So the numbers shown are probably a mix of this. The number of informations would probably be more interesting (number of variables x diurnal frequency), especially because newer instruments like IASI provide much more information. [CLAUDIA STUBENRAUCH, France]	Taken into account - Fig. 1.13 has been extensively revised and Table 1.2 deleted
1-841	1	19	3	20	25	Section 1.5.2 : As a first, I would mention improvements in the representation of fundamental physical processes (radiation, convection, turbulence, clouds). As the NWP communities knows so well (e.g. at ECMWF), this aspect of model development has been one of the primary reasons why the quality of weather forecasts has improved with time. [Sandrine BONY, France]	Rejected - These processes in the atmosphere are part of the "representation of the Earth System processes" already mentioned.
1-842	1	19	8	19	13	need a reference [YEHIA HAFEZ, Saudi Arabia]	Rejected - This is a fairly general statement based on common knowledge. We don't think a reference is needed.
1-843	1	19	8	20	7	in the bullets take out firstly, secondly etc [CLAUDIA STUBENRAUCH, France]	Accepted - text revised
1-844	1	19	12	19	12	Text says Fig 15a is 110 km x 110 km whereas the Figure itself indicates 87.5 x 87.5. [Government of	Accepted - text revised

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Canada]	
1-845	1	19	12	19	12	The "110" km should be replaced by "87,5 km" as it refers to the horizontal resolution of a grid describes on fig 1,15 whose mesh is 87,5 [Government of France]	Accepted - text revised
1-846	1	19	12	19	12	The number quoted in the text (110 km) is inconsistent with Fig. 1.15a. [Timothy Merlis, United States of America]	Accepted - text revised
1-847	1	19	12			There is a mismatch between the spatial resolution of Figure 15a identified here (110 km) and shown in Figure 15a (87.5 km). [Tamlin Pavelsky, United States of America]	Accepted - text revised
1-848	1	19	13	19	13	The section is labelled "Global Climate Modelling" and the Fig. 1.15a shows topography at higher resolution than any current global model. I am unsure of why the resolution of regional models is discussed in a section labelled "Global Climate Modelling"? [Timothy Merlis, United States of America]	Taken into account - The text has been revised "regional" has been deleted. The wide range of model resolutions and domains are discussed in Chapter 9, which is referenced.
1-849	1	19	13			if appropriate, suggest to add "(similar to the current regional climate models)" after "grid spacing of 30 km" in order to connect the resolution with the type of models used. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been added.
1-850	1	19	15	19	19	Do we have any ability to assess whether the additional processes that have been included in model simulations are accurately represented? In other words, have any studies attempted to isolate and validate these processes? What about a discussion of hindcast experiments in this bullet or in a separate bullet? [Government of United States of America]	Accepted - A sentence has been added to provide more clarification and a reference to Chapter 9.
1-851	1	19	17			"More models include better representation of the carbon cycle" is a rather clumsy wording. Would it be better to say "The representation of the carbon cycle has been improved in many models"? [Adrian Simmons, United Kingdom]	Taken into account - the sentence has been revised and the rewrite accounts for this comment.
1-852	1	20	2			Are ensemble techniques used only to account for natural variability? Are they not used also to account for uncertainties in the formulation of models? [Adrian Simmons, United Kingdom]	Accepted - These aspects have been added in the bracket.
1-853	1	20	5	20	5	PCMDI is an American institution, not an international project. [Martin Jukes, United Kingdom]	Taken into account - "international" is replaced by "coordinated".
1-854	1	20	7	20	13	Was CMIP5 a model vs observations or model vs model effort? It's unclear from this bullet. [Government of United States of America]	Accepted - the first sentence refers to model evaluations using observations; Chapter 9 has been referenced. The second sentence refers to Coupled Model Intercomparisons. A reference to Taylor et al. 2012 has been added. These two reference should make it more clear that two different issues are presented.
1-855	1	20	8	20	8	"done for AR5": while CMIP5 was clearly influence by AR5, it was done to advance climate science. [Martin Jukes, United Kingdom]	Accepted - the text has been revised.
1-856	1	20	15	20	18	Maybe to strong to say "range of possible future conditions", maybe better to say something like "range of alternative images of how the future may unfold". Also consider adding "development" pathways or something indicating that these emission scenarios or storylines describes quite different societies and structures, and importantly different perspectives on the environment. [Government of NORWAY]	Accepted - the text has been revised.
1-857	1	20	28			Figure 1.14: suggest to switch from 3D cylinders to simply 1D as the 3D component does not add any substantial information. In fact, it could be even misleading as it implies that all the individual components are at the same level of complexity and understanding in a specific decade. In addition, the figure seems to suggest that development of a particular model component goes in continuous, step-like increments, which probably is not how progress actually is made [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - the figure caption was revised.
1-858	1	20	30	20	31	"T21L9 ... T95L95 ...": you need to explain the number of levels as well, e.g. "(9 levels in the vertical and roughly 500km horizontal mesh spacing)" [Martin Jukes, United Kingdom]	Accepted - the text has been added.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
1-859	1	20	30	20	31	T21L9 and T95L95 are described respectively as roughly 500and 100km resolution. This actually covers only the T21 and T95 parts. Something should be said about the L9 and L95 parts also. Likewise, Fig. 1.15 also covers only horizontal resolution. [Adrian Simmons, United Kingdom]	Accepted - the text has been added.
1-860	1	20	46	22	21	Please refer to and coordinate with Chapter 12, in particular sections 12.3 and 12.5.1, and its detailed assessment of the scenarios used in the WGI AR5 projection chapters. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised. A reference to Chapter 12.3 was added
1-861	1	20	48			*instead of „assumptions about how human activities or natural effects could alter ..“: .. assumptions on human activities or natural effects that could alter .. [Tibor Farago, Hungary]	Accepted - the text has been revised.
1-862	1	20	54			*these soc-econ. processes are called „drivers” or „driving forces” in the DPSIR framework: soc-econ drivers regarding population and .. [Tibor Farago, Hungary]	Accepted - the text has been revised.
1-863	1	20		21		Box 1.2 The concept of emissions scenarios should be describe in more detail here (or in another chapter with a clear cross reference). I.e. it needs to made clear what the emission profile and the major assumptions of the new RCP scenario are. [European Union]	Accepted - a cross reference has been added.
1-864	1	20				Figure 1.14: the increasing depth of the columns is not completely clear: probably it just indicates better vertical and horizontal resolution or more complexity? I don't know if you really need this 3D projection. It would be sufficient to just show the increasing coupling; or if you want to show the improvement of the different parts one has to be more specific. [CLAUDIA STUBENRAUCH, France]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.
1-865	1	21	1	21	7	is the 1%/yr case the only idealized scenario in the CMIP5 experimental setup? [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - It is not. However, this is given as one example of idealized experiments. Text revised.
1-866	1	21	1			It's worth inserting in parentheses here whether this 1% per annum increase in atmospheric CO2 concentration is what has been observed since [insert year]. [Government of United States of America]	Rejected - as stated in the text, these are idealized scenarios for model simulations. The observed values of CO2 are shown in Figure 1.6 from 1990-2012. The change in CO2-concentration is less than 1% per year (about half of a percent).
1-867	1	21	9	22	11	This text reflects, in itself, the difficulty to communicate on RCPs. One should get a summary of the rationale for the change (from SRES report/WG 3 ?) to have some clarity for non expert readers: what matters here is to be understood by non specialists [Government of France]	Taken into account - A sentence has been added. Also a cross reference to chapter 12.3 has been added. There a more detailed description of the scenarios is given. Moreover, a sentence is added in response to comment 1-872.
1-868	1	21	16	21	16	LLGHG: please explain the acronym [Claudio Cassardo, Italy]	Accepted - text revised
1-869	1	21	16			define LLGHG [Government of France]	Accepted - text revised
1-870	1	21	16			LLGHG needs to be defined. [Government of United States of America]	Accepted - text revised
1-871	1	21	17	21	18	change "B2" to "B1" -- the set of scenarios primarily assessed in Chapter 10 of WGI AR4 were B1, A1B and A2, i.e., not B2. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-872	1	21	17			Consider ending this paragraph with the following clarifying statement: "As a result of this and other shortcomings, revised scenarios were developed for AR5." [Government of United States of America]	Accepted - the sentence is added and more explanation is given.
1-873	1	21	19	21	33	I think the rationale behind the RCPs could be explained better. Also how the scenarios can be used to study what the different futures look like and which emission trajectories are needed. [Jan Fuglestad, Norway]	Taken into account - A sentence is added in response to comment 1-872.
1-874	1	21	21	21	33	I think it should be explained well why the RCP8.5 do not stabilize its forcing effect to 8.5 Wm-2 (see figure 1 of box) [Claudio Cassardo, Italy]	Accepted - text revised
1-875	1	21	21	21	33	Policy makers will be looking for the concentrations or emissions that relate to the RCPs. A clearer explanation of the multiple emission scenarios that can result in a particular RCP is needed. [Government of Australia]	Rejected - This is beyond the scope of the WGI assessment. See WGIII for such considerations.
1-876	1	21	21	21	33	The RCPs should be better explained in this section. Especially all the different assumptions for the various	Rejected - This is beyond the scope of the WGI

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						RCPs and how they connect to emission scenarios and stabilization temperatures including the 2 degree target. [Government of NORWAY]	assessment. See WGIII for such considerations.
1-877	1	21	21	21	33	This paragraph would benefit from a clear statement of what RF is now and what it was in pre-industrial times. [Government of United States of America]	Rejected - this information is shown in Box1.2 Figure 1 (black curve).
1-878	1	21	21	21	33	Generally an accurate description of the RCPs, however, the rationale for choosing the RCPs is not fully explained. I suggest that it be stated that the RCPs span the full range of radiative forcing associated with emission scenarios published in the peer-reviewed literature at the time of the development of the RCPs, and that the 2 middle scenarios were chosen to be roughly equally spaced between the two extremes (2.6 and 8.5) as described in the references given in this section. [HAROON KHESHGI, United States of America]	Accepted - text revised.
1-879	1	21	21	21	33	This section is the most accurate description of the RCPs in the SOD. Unfortunately, descriptions are given in the summaries and other chapters which are either incorrect or distortions. Suggest that this section be the source of descriptions for the remainder of the assessment. [HAROON KHESHGI, United States of America]	Noted - Thank you. This was sent to TSU to discuss with other Chapter teams.
1-880	1	21	21	21	42	the supplement SCP6to4.5 included in Box 1.2, Fig. 1, is neither mentioned in the text nor in the figure caption [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - it is now explained in the caption.
1-881	1	21	22	21	22	"concentrations rather than emissions": the RCP's include both. The crucial difference is that RCPs are not attached to particular socio-economic storylines. [Martin Jukes, United Kingdom]	Accepted - text revised.
1-882	1	21	26	21	26	Add after radiative forcing " derived by the reference model" [Michel Petit, France]	Accepted - the text has been added.
1-883	1	21	26			Add after radiative forcing " derived by the reference model" [Government of France]	Accepted - the text has been added.
1-884	1	21	29	21	29	Add a description of RF after 2100 in RCP8.5 to make clear it is not stabilizing at that level. [Government of Canada]	Accepted - text revised
1-885	1	21	30	21	33	These lines convey important information but could be reworded to clarify their meaning. Suggest first deleting the phrase "Note that due to the substantial uncertainties in RF", then revising the following text as "These forcing values should be understood as comparative labels representative of the forcing associated with each scenario, which will vary somewhat from model to model." [Government of Canada]	Accepted - the text has been revised.
1-886	1	21	39			suggest to add "for any given scenario" after "substantial uncertainty in ... radiative forcing levels" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-887	1	21	44	21	44	Again, it is important to be consistent in describing the RCPs. In line 22 above, they are specifically said NOT to be emissions scenarios, yet here they are referred to as emission scenarios. Suggest the beginning sentence on line 44 be preceded by a sentence like this: "Although the RCPs are described as concentration scenarios, they originated as emission scenarios from specific integrated assessment models, and subsequently needed converting into concentration pathways." [Government of Canada]	Taken into account - text revised. Note that actually the target stabilization level has been specified first and subsequently emission pathways were calculated to achieve these goals.
1-888	1	21	48	21	49	It is not clear what this text means. Perhaps an explanation of what is meant by "harmonization" in this context would help. [Government of United States of America]	Accepted - text revised
1-889	1	21	53	21	53	Suggest inserting here some text to explain how natural forcing is dealt with in the CMIP5 experiments. As described here the RCPs capture changes in anthropogenic forcing factors, but that leaves open the question of how natural forcing agents are simulated, and whether there any changes in these agents are assumed/modeled. This information is needed to properly understand Box 1.2 Figure 1 also. [Government of Canada]	Taken into account - see detailed discussion in Chapter 12.3
1-890	1	22	6			*post-2100 GHG emissions and concentrations (beyond 2100). [Tibor Farago, Hungary]	Taken into account - duplicate statement deleted.
1-891	1	22	13	22	19	It should be mentioned that the SRES scenarios are all "business-as-usual" scenarios, whereas there is a consensus that RCP2.6 will not happen without substantial policy interventions. [Martin Jukes, United Kingdom]	Rejected - while for example SRES A1B is a business-as-usual scenario, SRES B1 is certainly not.
1-892	1	22	25	22	29	WGI is assessing the physical science basis, but one cannot do this without also bringing in the social context in which these changes are occurring. There is more focus on the scientific advances that have been made	This is beyond the scope of the WGI assessment. See WGII and WGIII for such considerations.

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						since the last assessment, rather on the significance of these advances; what do these findings mean in terms of human responsibility for climate change? [Government of NORWAY]	
1-893	1	22	26	22	26	Wonder whether the wording “continuing to change” gives justice to the findings in the chapters that follow, maybe be more explicit on what this really means. [Government of NORWAY]	Taken into account - the sentence has been deleted, since the assessment is indeed provided in the chapters that follow.
1-894	1	22	33	22	33	typo: "They cover" instead of "It covers" [CLAUDIA STUBENRAUCH, France]	Accepted - text revised
1-895	1	23	14	23	17	suggest to state upfront here that the list provided is a non-comprehensive list of topical issues. I.e., suggest to replace "list of many of" with "a non-comprehensive list of" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-896	1	23	14	23	21	Table 1.3 and text: Inclusion of this table is a good idea, although admittedly there may be calls to expand it to unreasonably long lengths, duplicating an index. Suggest this list be sure to include the topics governments identified as being of interest during the scoping of the AR5. In that regard, the topic on aerosols should specifically mention black carbon (e.g. role of aerosols (including black carbon) in climate change). A topic on 'short-lived climate forcers' (or 'near-term climate forcers') is also recommended. Methane hydrates could also be listed as a topic. The text on lines 14-17 should be clearer about what the list of topics represents: 1. areas of current interest to policy-makers as identified through the AR5 scoping process, 2. areas of contention in the peer-reviewed literature, and 3. areas of rapidly evolving science, 4. areas of major scientific uncertainty.....(these are suggestions; the point is to be clear how the list of topics was developed). [Government of Canada]	Accepted - Table was revised
1-897	1	23	20	23	20	It was previously stated by the IPCC that the ENSO would feature in this report, so why doesn't it appear in this table? [John McLean, Australia]	Accepted - ENSO has been added to the list.
1-898	1	23	20	23	23	Arctic sea ice changes are also discussed in Chapters 11 and 12. [Thierry Fichefet, Belgium]	Accepted - the chapter have been added.
1-899	1	23	20			Please consider adding the role of the sun in climate change to this list [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the role of the sun in climate change has been added to the list.
1-900	1	23	21	25	27	FAQ1.1 (Uncertainties) : This FAQ contains the basics of an answer to the question, but I suggest it needs some significant further work given the expected non-expert and non-technical nature of the audience. I suspect that may members of the public would interpret “there are still considerable uncertainties around global and regional; climate projections” as “scientists don’t know what the future will bring”. This is part of a general problem that the public may interpret the concept of "uncertainties" as "don't know". I think the FAQ would benefit from some rewording of the chapeau, a new paragraph explaining what scientists mean by uncertainty, and some clarification of what is known as well as what the “uncertainty ranges” are. I provide some more specific suggestions in my following comments. [David Wratt, New Zealand]	Accepted - text revised
1-901	1	23	21	25	27	FAQ1.1 (continued): I suggest a slight rewording of the FAQ Question, to “If Understanding of the Climate System Has Increased, why haven’t SOME OF the Uncertainties decreased”. This would recognize that as stated in Page 24 lines 5-9 science has progressed since the AR4 and we can now “better constrain projections”. This to me is equivalent to a reduction in at least some uncertainties. [David Wratt, New Zealand]	Accepted - Response to 1-904 should answer issue.
1-902	1	23	21	25	27	FAQ1.1 (continued): I suggest redrafting the chapeau to address points I have raised above, e.g.: “The models used for making the temperature projections outlined by the IPCC agree on the direction of future global change, but different models and emission scenarios lead to an “uncertainty range” in the projected size of the changes. This results from several factors, including: The range of possible future greenhouse gas emission rates; natural year-to-year variability in climate; incomplete understanding and modeling of some underlying physical processes. The uncertainty range in projected greenhouse gas and aerosol precursor emissions, which depend on predictions of future social and economic conditions) cannot be materially reduced. However the uncertainty range around some of the factors influencing the climatic response to these emission changes may be reduced due to improved understanding and climate models, and observational constraints. The complexity of the climate system makes this a slow process”. [David Wratt, New Zealand]	Accepted - text revised
1-903	1	23	21	25	27	FAQ1.1 (continued): To address the point I’ve made above about what the public understands by “uncertainty” I suggest some changes at the beginning of the second text paragraph to explain what scientists interpret as	Accepted - text revised.

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						“uncertainty”, e.g.: “Despite these advances, there is still a range in plausible projections for future global and regional climate – this is what scientists refer to as an “uncertainty range”. These uncertainty ranges are specific to the variable being considered (precipitation vs temperature, ...) [David Wratt, New Zealand]	
1-904	1	23	25	23	25	I don't see the question being answered directly here - it's a good direct question and it needs a similarly direct answer. I would answer this by saying something like "Due to increased understanding uncertainty in many areas has in fact decreased. However, increased understanding can increase uncertainty in certain instances when unforeseen processes significantly alter our assessment. Further there are important persistent uncertainties that would continue to exist even if our understanding was perfect" [Piers Forster, United Kingdom of Great Britain & Northern Ireland]	Taken into account - Text rewritten by comments in 1-903, which should address this point.
1-905	1	23	25	23	26	I found the response to this question to be rather fuzzy, and I wonder if it wouldn't be helpful to sharpen the question, so that a more focussed response can be provided. In particular, "the uncertainties" seems a very broad target. Each reader will imagine something different when they read this, and therefore many will be disappointed when they discover that the response doesn't deal with what they imagined might be discussed. A solution would be to narrow the scope of the question a bit so that it asks, for example, why the range of temperature projections for future climate has not been reduced. [Francis Zwiers, Canada]	Accepted - text modified
1-906	1	23	25	23	26	I would like to challenge the authors to see if they could respond to the question by asserting that while there are uncertainties, there is also a great deal of information that we can provide with confidence (otherwise this question simply buys into the mantra that the science is uncertain ...). A general problem is that as scientists we quantify uncertainty - and communicate what we know in those terms. We enshrine the word in things like the title of our guidance paper for the consistent treatment of uncertainties. But that note could equally well have been entitled a guidance note on the consistent communication of assessments - the "uncertainties" language is very much about how we communicate what we know (what level of confidence, how likely, etc). The AR4 assessment on equilibrium climate sensitivity, for example, reflects scientific uncertainty, but it also provides policy makers with information that we are confident about (best estimate 3C, likely 2-4.5C, very unlikely less than 1.5C); that's actually a lot of information that is communicated with considerable certainty, and that should be "actionable". The likely ranges on projections, which are conditional on the choice of emissions pathway, similarly provide a lot of information, and should also be actionable (and in some cases, will be narrower for the AR5 than for the AR4). Can the response to this question be used to focus not just on uncertainties, but also give a message that we do have an improving ability to confidently provide quantified information about plausible futures? [Francis Zwiers, Canada]	Taken into account - The clarifications suggested in 1-903 and 1-905 should clarify this point.
1-907	1	23	25	25	15	Playing Devil's advocate here: The answer (and the question itself) both beg the question of why models still need to be developed. If we expect neither the mean climatic predictions to change nor uncertainties to decrease, what is the role of models in the future? (Non-Devil's advocate now): I think a crucial point to emphasize here is that by making models more sophisticated we can begin to understand (or at least help narrow down) the reasons why models don't agree with each other or with observations. They also serve as a "check" on the community's knowledge of the physics/dynamics behind climate change. For example in the ocean, the Gent-McWilliams mixed layer parameterization has offered much insight into and spurred discussion on eddy-mean flow interaction in observations in addition to bettering non-eddy resolving models (NOTE: this example is probably too technical for an introduction, but the point remains that models need to be further developed partly because confidence in models would increase and also they can be used to either validate, refine, or refute our understanding of climate dynamics, feedbacks, etc. [Andrew Shao, United States of America]	Accepted - we emphasize this in the final paragraph.
1-908	1	23	25	25	25	The answer to this question should state clearly that uncertainty has been significantly reduced. From chapter 10: the statement that warming since 1950 cannot be explained without external forcing is rated virtually certain compared with extremely likely for the equivalent statement in AR4. On temperature extremes there has been a move from “likely” to “very likely”. On Arctic sea-ice there has also been a shift from “likely” to “very likely”. In other areas wording has been strengthened or made more precise (e.g. AR4 said it was likely the human influence contributed to sea-level rise, whereas AR5 SOD says it is likely that human influence has contributed to 50% or more of recent thermosteric sea-level rise). On future sea-level rise, AR5 SOD is able to give a likely range, whereas AR4 statements reflected substantially higher uncertainty. Figure 12.8 indicates a	Taken into account - The range of temperature projections has not been reduce very much, which is more the focus of this FAQ. We make this more clear.

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						reduction in climate response uncertainty between AR4 and AR5. [Martin Juckes, United Kingdom]	
1-909	1	23	25	25	27	We feel that the lack of observations and long term time series is also a source to uncertainty, and that this should be better described in this FAQ. [Government of NORWAY]	Accepted - text revised.
1-910	1	23	25	25	27	GENERAL COMMENT: The re-writing of this whole section has disconcerted me. I found the original formulation much more clear and convincing, with the reasons for uncertainty being presented in a sort of "breakdown". [Belén Martín Míguez, Spain]	Rejected - The FOD version was not popular with most reviewers, so we adjusted it to this version.
1-911	1	23	28	23	31	This FAQ, and several others, use the word "around" in a rather vague way. My suggestion would be to avoid this word (which I suspect is only understood in the North American vernacular in any case). Also, this sentence seems circular (read literally, it says that uncertainty is due to uncertainty). My suggestion is to recraft these sentences as follows: "The uncertainty in climate change projections is caused primarily by differences in the way different climate models represent the climate system and differences in the scenarios of future emissions that climate modellers must use to project long-term climate change. Natural chaotic variability in the climate system also contributes some uncertainty, but it is not the main contributor to the spread between the various climate change projections that are available." [Francis Zwiers, Canada]	Taken into account - The sentence has been rewritten following 1-903.
1-912	1	23	28	24	3	The italicized text at the beginning of the FAQ leaves an impression that long-term projections of climate are approaching their limit in terms of ability to predict the climate more precisely - was this the intended message? The main body of the FAQ goes on to identify various areas where models can be improved, but this is not reflected in the italicized text. [Government of Canada]	Taken into account - The sentence has been rewritten following 1-903.
1-913	1	23	28		31	DELETE : ", around greenhouse gas, ... emissions" [Sucharita Ghosh, Switzerland]	Taken into account - The sentence has been rewritten following 1-903.
1-914	1	23	30	23	30	"chaotic" implies unpredictable, which may make climate projections difficult to understand to the average reader. Suggest rewording (e.g., "complexity") or explaining further. [Government of Canada]	Accepted - this text is changed.
1-915	1	23	30	23	31	"Because of the chaotic nature of the climate system, uncertainty in long-term climate projections due to natural variability is unlikely to be reduced." I think this is a strange sentence. If the climate system is chaotic how can we then predict climate at all? Would the uncertainty due to natural variability not be reduced (relatively) when the human impact becomes dominant? Is the climate not per definition an average over long enough time scales so that the chaotic weather noise gets reduced or averaged out? [Raimund Muscheler, Sweden]	Taken into account - The sentence has been rewritten following 1-903.
1-916	1	23	30	23	31	This part of the headline seems to have homed in on internal variability as an irreducible, which is certainly the case, but if there is any one lesson from CMIP3 (and now CMIP5) that stands out, it is that intra-ensemble variability (the differences between ensemble members produced with a given model and using a given forcing scenario) is small relative to inter-ensemble variability (differences in response between models), at least on the global scale. The former reflects the uncertainty in projections from internal variability. Headlining it here, and focusing a lot of the response to the question on internal variability, seems off the mark. My suggestion is to recraft lines 28-31 as follows: "The uncertainty in climate change projections is caused primarily by differences in the way different climate models represent the climate system and differences in the scenarios of future emissions that climate modellers must use to project long-term climate change. Natural chaotic variability in the climate system also contributes some uncertainty, but it is not the main contributor to the spread between the various climate change projections that are available." [Francis Zwiers, Canada]	Accepted - the suggested text is included.
1-917	1	23	30			FAQ 1.1: suggest to start the FAQ with a clear introduction and mentioning of what is needed to make climate projections (emissions, scenarios, models, ...) and then discuss uncertainties associated with these components. There needs to be a clear distinction upfront between scientific uncertainty, and scenario uncertainty etc. [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - Revisions from 1-903 should resolve this.
1-918	1	23	30			FAQ 1.1: Some further emphasis, including examples, could be given where our process understanding has increased. Sea level rise, and the closure of the observed budget could be used as an example, where we now have improved understanding of the observed contributions to Sea Level Rise, but important uncertainties remain in the projections. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the additional text is included.

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1-919	1	23	30			FAQ 1.1: Figure 1 is nice, but is only referred to very late in the FAQ. It would be good to have this figure more firmly embedded into the text and referred to from end to end. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the additional text is included.
1-920	1	23	30			FAQ 1.1: suggest to refer to (and use material from) Chapter 11, Section 11.3.1.1 and Figure 11.11a when revising the FAQ. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text changed.
1-921	1	23	31	23	31	El Nino, SOI and NAO [YEHIA HAFEZ, Saudi Arabia]	Rejected - It is unclear exactly what this comment is intended to convey. The addition of a description of these indices is beyond the scope of this FAQ
1-922	1	23	33	23	34	I think if there is a fundamental irreducible source of uncertainty, it is in the long-term prediction of socio-economic development pathways. Using language, such as "There is still considerable uncertainty..." suggests that this is a source of uncertainty that could eventually be reduced. I think that is incorrect. Why not simply say "A fundamental source of uncertainty is that we do not know how emissions will change in the future, and thus climate modellers use several different emissions scenarios that reflect a range of development and mitigation possibilities." [Francis Zwiers, Canada]	Accepted - the sentence has been replaced with a slight rewrite to avoid personal pronouns.
1-923	1	23	34	23	35	I agree with this statement, but I don't like the use of the word around (which simply sounds inarticulate to my ear; also, this particular usage of the word around may be specific to the North American vernacular). I suggest replacing "around the climate response" with "in the climate response to a given (or assumed?) emissions scenario". [Francis Zwiers, Canada]	Accepted - the text has been revised according to this comment.
1-924	1	23	35	23	35	typo: take out 'is' [CLAUDIA STUBENRAUCH, France]	Accepted - the text has been revised.
1-925	1	23	35	23	36	The sentence "Because of the chaotic nature of the climate system....." seems inconsistent with the well established view that natural variability plays only a very minor role in the uncertainty in long-term climate projections. This sentence seems to put the focus entirely on natural variability, but this is clearly not the dominant source of uncertainty beyond the near-term (20 years) (see the WGI AR5 Chapter 11/12 assessments). [Thomas Stocker/ WGI TSU, Switzerland]	Accepted: text has been revised to indicate this applies to shorter term projections.
1-926	1	23	35			*the complexity of the climate system makes this a slow process. [Tibor Farago, Hungary]	Accepted - text revised
1-927	1	23	35			Correct to "... makes this a slow process.". [Dietrich Feist, Germany]	Accepted - text revised
1-928	1	24	1	24	3	I think this could actually be deleted, particularly if you accept my suggestions for lines 28-35 of the previous page. Isn't it obvious that projecting future climate change is challenging? If it were easy, then we wouldn't need the IPCC or this report, after all. If you do keep this, then I think it is important to make a careful and deliberate choice as to when you use the words "project" and "predict". These two sentences seem to treat those words equally - but clearly a distinction has to be made between estimates of a future state that are conditional upon an assumed emissions scenario (projections), and estimates of a future state that attempt to derive skill from the specification of the initial state (forecasting or prediction). See also Chapter 11. [Francis Zwiers, Canada]	Accepted - text revised
1-929	1	24	2			*,ability to predict Earth's": to project [Tibor Farago, Hungary]	Accepted - text revised.
1-930	1	24	5	24	5	I suggest replacing "last assessment report" by "IPCC's Fourth Assessment report". (Reason: There are other organizations that have written assessment reports as well as the IPCC). [David Wratt, New Zealand]	Taken into account - text revised. Revised according to comment 1-931
1-931	1	24	5			add "IPCC" before "assessment" to read "the last IPCC assessment report" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised
1-932	1	24	6	24	9	"We also have", "We can now" -- who is we? Suggest to avoid using personal nouns whenever possible and to write "Understanding and modelling of have improved" and "Projections can now be better constrained...." [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - personal pronouns are avoided in the revised text.
1-933	1	24	11	24	11	I think the word "considerable" is too vague and open to interpretation. That is why I have removed it in the rewording I have suggested in my previous comments about this paragraph. [David Wratt, New Zealand]	Accepted - text revised
1-934	1	24	11	24	16	I think this over emphasizes the uncertainties, at the risk of sending the message that the projections do not	Accepted - the paragraph has been replaced.

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						provide useful information. My suggestion would be to start by saying "However, there continue to be uncertainties in global and regional climate projections. Uncertainties are greater for some aspects of the projections (e.g., precipitation) than for others (e.g., temperature), and some uncertainties appear to be irreducible (e.g., the choice of future emissions scenario), but climate science has nevertheless made considerable advances in describing uncertainties quantitatively and in confidently projecting the range of climate change that is consistent with a given choice of emissions pathway." [Francis Zwiers, Canada]	
1-935	1	24	14	24	16	"to understand the range....consistent with the current understanding"? -- suggest to delete "other scientists and policy-makers" and to rewrite as follows: "because they help constraining the range of values that are consistent with the current understanding [Thomas Stocker/ WGI TSU, Switzerland]	Taken into account - the paragraph has been rewritten (see comment 1-934).
1-936	1	24	15	24	15	delete 'scientists and policy makers' it is not limited to those and not neccessary to qualify. [Government of Germany]	Taken into account - the paragraph has been rewritten (see comment 1-934).
1-937	1	24	18	24	23	I think an important point to make at some point in the response is that uncertainties are now much better explored than previously, and that this permits scientists to more confidently project the range of future climate states that are consistent with a chosen emissions pathway. [Francis Zwiers, Canada]	Accepted - this text is added to the final paragraph.
1-938	1	24	18		23	DELETE : One can think of ... discovered. [Sucharita Ghosh, Switzerland]	Taken into account - Text rewritten following 1-939
1-939	1	24	21	24	23	I do not find the sentence spanning these lines, with its talk of known and unknown unknowns, to be at all clear. Why not say more straightforwardly that uncertainties may occur in projections both due to uncertain representations of known processes and due to processes that are missing in models? Processes that are missing from models may be either known processes or unknown processes. [Adrian Simmons, United Kingdom]	Accepted - text rewritten.
1-940	1	24	23	24	23	Consider adding "or newly introduced into a model" after "such as when a new process is discovered" [Government of United States of America]	Taken into account - Text rewritten following 1-939
1-941	1	24	23	24	23	Add at the end of the paragraph: ... when a new process is discovered ", which might have a significant influence on projections but has not been included in models before." [Urs Neu, Switzerland]	Taken into account - Text rewritten following 1-939
1-942	1	24	25	24	25	insert before 'emissions' 'future'. Furthermore it should be mentioned somewhere in the FAQ1 part that for long time projections the uncertainty with regard to future emissions is one of the main sources of uncertainty. [Government of Germany]	Accepted - text rewritten.
1-943	1	24	25	24	41	I think this over-emphasizes uncertainty from internal variability - at least on the global scale. I agree, however, that this is an important issue at smaller scales. [Francis Zwiers, Canada]	Taken into account - It is argued that the current 'flat' temperature is due to internal variability, and thus it is important for the global average.
1-944	1	24	27	24	28	Is this true? If it were true, wouldn't we be able to demonstrate more success in short-term prediction (decadal to multi-decadal), or alternatively, wouldn't we have less success in reproducing the history of reproducing the observed warming of the industrial era using runs that are launched in 1850, and from then on, only see the historical external forcing? [Francis Zwiers, Canada]	Accepted - we clarify to indicate the decadal projections.
1-945	1	24	30			INSERT: "PART OF THE" natural variability on decadal [Sucharita Ghosh, Switzerland]	Accepted - text modified.
1-946	1	24	30			once more, as above, I would suggest to add "biosphere" to the given components of the climate system [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - "biosphere" has been added.
1-947	1	24	31	24	31	Enye missing above second 'n' of Nino [Peter Burt, United Kingdom]	Accepted - text revised.
1-948	1	24	31	24	31	replace "and is also related to phenomena such as El Nino and the North Atlantic Oscillation" by "and the changing patterns of currents within the atmosphere and the ocean, which for example appear as phenomena such as El Nino and the North Atlantic Oscillation." Reason: ENSO and NAO are interactions between ocean and atmosphere. [Urs Neu, Switzerland]	Rejected - the sentence is discussing interactions between atmosphere and oceans.
1-949	1	24	32	24	32	Capital 'S' for 'sun' (sic) [Peter Burt, United Kingdom]	Editorial - Copyedit to be completed prior to publication

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1-950	1	24	32	24	32	Point out that this type of natural variability is externally forced (and therefore explainable) rather than being generated by internal, non-linear interactions. [Francis Zwiers, Canada]	Accepted - text modified.
1-951	1	24	32			INSERT: .. This natural variability can be viewed as 'ASPECTS OF' noise in the climate record... [Sucharita Ghosh, Switzerland]	Accepted - text modified.
1-952	1	24	33	24	34	Replace "which provides the backdrop against which the 'signal' of anthropogenic climate change is detected" by "which often exhibit higher variability over years or decades than the long-term trend due to climate change and thus may 'mask' the climate 'signal' in measurements over temporally limited time periods. [Urs Neu, Switzerland]	Rejected - the sentence becomes too long and awkward.
1-953	1	24	33			"poorly known current conditions, such as the temperature of the deep ocean" - we are having some problem reconciling this statement with the fact that chapter 3 is able to provide high confidence 'likely' and 'very likely' statements for warming rates in the deep ocean. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text modified.
1-954	1	24	34			"such uncertainties" -- unclear what this is referring to here. Please be specific about what exactly is meant by "such uncertainties". [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text modified.
1-955	1	24	36			Should the reference here be only to the ocean state? Does the state of the cryosphere merit a mention? [Adrian Simmons, United Kingdom]	Accepted - text modified.
1-956	1	24	38	24	39	"Averaging global climate variables over decadal time scales or longer helps reduce the relative importance of internal variability, making emissions and response uncertainties more evident (FAQ1.1, Figure 1)." This sentence appears to make the point that I wanted to make in comment No 2 [Raimund Muscheler, Sweden]	Noted - Thanks
1-957	1	24	38		39	CHANGE: "making response..more evident" TO "making large scale and long term signals more evident". [Sucharita Ghosh, Switzerland]	Accepted - text modified.
1-958	1	24	38		41	DELETE: "and are unlikely to BE averaged out over 10 years" [Sucharita Ghosh, Switzerland]	Accepted - text modified.
1-959	1	24	41	24	42	suggest to avoid personal nouns -- suggest to rewrite as "In order to project climate, plausible estimates of human emissions of greenhouse gases and aerosol precursors, and of land use are needed." [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised.
1-960	1	24	41			In stating that variability is unlikely to average out regionally to locally over ten years, it could be noted that "climate" has traditionally been defined on the basis of a thirty-year period. [Adrian Simmons, United Kingdom]	Accepted - text modified.
1-961	1	24	44	24	45	"are designed to sample some of the future uncertainty" --"some of" seems rather unspecific. In fact, if this is referring to the RCPs, we suggest to rewrite as "are intended to be compatible with the full range of emissions scenarios available in the current scientific literature, with and without climate policy (see VanVuuren et al., 2011, Climatic Change). I.e., they are intended to sample uncertainty in future scenarios. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text modified (except for citation which is not allowed in FAQ).
1-962	1	24	44			"are simulated" -- this seems to say that IPCC "simulates" scenarios. Suggest to rewrite to avoid the impression that IPCC is doing research and not only assessing existing and published research results. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-963	1	24	45	24	45	I suggest adding "aerosols" after "greenhouse gas" [Jan Fuglestad, Norway]	Taken into account - Text modified following 1-962 which answers this comment
1-964	1	24	47	24	48	"is intended to assist in policy-making" would be better rephrased as "the IPCC provides knowledge for policy-making" or something like this to avoid any implication that IPCC is involved in policymaking. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-965	1	24	51	24	51	Replace "species" by "substances" or "components" [Urs Neu, Switzerland]	Accepted - text revised.
1-966	1	24	52	24	52	Add 'emission' before 'uncertainties'. [Government of Canada]	Taken into account - Revised consistent with this comment with alternative wording
1-967	1	24	52	24	52	Replace "will not reduced" by "will not be reduced" [Urs Neu, Switzerland]	Editorial - Copyedit to be completed prior to

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							publication
1-968	1	24	52	24	52	Change to "...alternative scenarios for long-lived greenhouse gas emissions." [James Renwick, New Zealand]	Accepted - text revised.
1-969	1	24	52	24	53	What is stated here, in effect, is that uncertainties in greenhouse-gas emissions will not be reduced by improvements in climate science. This is a damning statement. Whilst we must hold a degree of cynicism/scepticism/realism, surely if global warming is a serious problem, then one can at least hope that improved climate science will increase the likelihood of governments taking concerted action to reduce greenhouse-gas emissions, enabling the more extreme high-emission scenarios to disappear and uncertainty ranges for greenhouse-gas emissions to be reduced. [Adrian Simmons, United Kingdom]	Noted - One can only hope. Nice statement but does not affect the text as written.
1-970	1	24	52		53	REWRITE or DELETE: "These uncertainties will not BE climate science" (which 'uncertainty?') [Sucharita Ghosh, Switzerland]	Accepted - the text has been revised.
1-971	1	24	52			suggest to change "These uncertainties" to "These scenario-related uncertainties" [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - the text has been revised.
1-972	1	24	55	24	55	This seems rather vague - there is not a signal metric of climate response. [Francis Zwiers, Canada]	Accepted - the text has been revised.
1-973	1	24	55	25	2	this paragraph should be deleted or else it needs to be placed much earlier in the FAQ, it seems misplaced where it sits currently. In addition, part of the sentences need to be reworded. For example, the sentence that "Climate response is a measure of..." is overly simplified and misleading. Similarly the sentence "A few dozen models have been developed, and these models project somewhat different future climates for a given scenario" is prone for misunderstanding without further details on the reasons for differences between models, i.e., components, complexity, resolution, parameterizations etc. [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text has been revised. This paragraph follows the logical order, described in previous paragraphs: natural variability, scenario uncertainty and then response uncertainty. Text is revised to make this more clear.
1-974	1	24	55			INSERT: IN THIS REPORT, climate response is a measure of ... [Sucharita Ghosh, Switzerland]	Accepted - Text revised per 1-973
1-975	1	25	2	25	2	Delete "innovative". Reason: is not informative, because it is not clear what that means. [Urs Neu, Switzerland]	Accepted - We revise the wording to avoid this expressions
1-976	1	25	2			Comments: There are also statistical approaches in the field of prediction; for instance [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-977	1	25	2			for predicting the probability that the total annual precipitation will or will not exceed a given level (see Ghosh & [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-978	1	25	2			Draghicescu 2002). Time series analysis offers a large number of approaches in this general topic. Methods such as [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-979	1	25	2			these need to be explored further for climate projection studies. [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-980	1	25	2			Reference: Ghosh, S., Draghicescu, D. (2002) Predicting the distribution function for long-memory processes. [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-981	1	25	2			International Journal of Forecasting, 18: 283-290. [Sucharita Ghosh, Switzerland]	Rejected - This is too detailed for this FAQ
1-982	1	25	2			The ways do not necessarily need to be "innovative". As climate models evolve there is a need to repeatedly test them against observations in standard ways also. It is this that provides metrics of progress. [Adrian Simmons, United Kingdom]	Accepted - text is modified
1-983	1	25	4	25	4	I suggest the word "considerable" is too vague and open to interpretation – I suggest it be removed so the line reads: "... there is still a range of future climate ..." [David Wratt, New Zealand]	Accepted - the text has been revised.
1-984	1	25	4	25	5	Despite multiple readings of this sentence it is unclear as to what the authors mean. [Government of United States of America]	Accepted - the text has been revised.
1-985	1	25	4		8	REWRITE: [Sucharita Ghosh, Switzerland]	Accepted - the text has been revised.
1-986	1	25	4			I do not understand why this sentence starts with "However". Would it be better to say "Despite these	Accepted - however has been removed.

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						limitations" to make the link with the previous paragraph? [Belén Martín Míguez, Spain]	
1-987	1	25	10			As science improves (DELETE THE) .. [Sucharita Ghosh, Switzerland]	Accepted - the text has been revised.
1-988	1	25	13			To bring clarity to this statement and to make use of concepts employed earlier in the chapter, consider inserting, "...previously unmeasured sources of uncertainty - INCLUSION OF THE SO-CALLED UNKNOWN UNKNOWNS." [Government of United States of America]	Accepted - Text has been rewritten.
1-989	1	25	16	25	16	It is suggested that at the end of the uncertainty discussion wording along the lines from Ch 12 be included - i.e. "There are inevitable uncertainties around future external forcings, and the climate systems response to them, further complicated by internally-generated variability. These uncertainties make the use of multiple scenarios and models a standard choice if we are to assess and characterise them, describing a wide range of possible future evolutions of the Earth's climate." [Government of Australia]	Rejected - This wording is exactly used in Chapter 12. We cannot repeat it.
1-990	1	25	17	25	25	Figure 1 page 55 does not have any label and unit for the Y axis. [Government of France]	Accepted - The figure has a unit, although this figure should be considered skematic, not literature.
1-991	1	25	18	25	18	Needs explanation of historical temperature change (compared to 1990?). An explicit comparison to pre-industrial levels to compare the scenarios/prospects with the 2 degree Celsius target of the UNFCCC would be helpful. If not in the figure than in the text. [European Union]	Accepted - The figure caption is modified although the figure is meant to be skematic, not literal..
1-992	1	25	23	25	23	Add sentence: "The given uncertainty range of 90% means, that the temperature is estimated to be in that range with a probability of 90%". [Urs Neu, Switzerland]	Accepted - the text has been added.
1-993	1	25				Instead of "historical" I would suggest "past" or "prehistorical". At least in American English, the word "historical" connotes recorded history. [Peter Guttorp, United States of America]	Taken into account - In climate science, historical means that observations were taken by humans at that time.
1-994	1	27	2	27	2	update reference: 'Chem. Phys., 11, 13421-13449.' [CLAUDIA STUBENRAUCH, France]	Accepted -reference updated
1-995	1	28	19	28	20	About the Reference: "Morgan, M. G., et al., 2009: Best Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making. ", it must be completed with Journal/Book, volume, pages. [Rubén D Piacentini, Argentina]	Taken into account - the reference was updated to CCSP 2009.
1-996	1	30	1			please specify what is meant by "have been graphically traced" noted in many of the tables of IPCC range in projections for several figures? Did this involve a GIS system or simple extraction by eye, etc.? [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised. The graphics were digitized using a graphics tool.
1-997	1	30	1			please refer to the Appendix in the relevant figure captions [Thomas Stocker/ WGI TSU, Switzerland]	Accepted - text revised
1-998	1	30	7	30	7	These are not "observed": temperatures. They are a set of multiple averages, subtracted from an overall average, compiled from a vaying non-standardised set of maximum an minimum temperature measurements at varying weather stations and ship measurements. They were previously treated as "Mean Temperature anomaly" The uncertainties attached to each figure are very great Individual temperature measurements are rarely accurate to better than one degree, so a claimed "trend" over 100 years of less than one degree has a very low level of statistical significance. [Vincent Gray, New Zealand]	Rejected - see Chapter 2.
1-999	1	30		34		I think it would make sense to add the units to the numbers in the tables [Raimund Muscheler, Sweden]	Accepted - text revised
1-1000	1	31	9	31	9	annual mean anomaly relative to 1961-1990? [Arindam Samanta, United States of America]	Accepted - text revised.
1-1001	1	31	18	31	30	Consider revising the description of uncertainty calculation to enhance clarity. Is the natural variability estimated from 1951-1980, observational uncertainty from 1990-2010? Why are then the anomalies calculated relative to 1961-1990, and not 1951-1980? [Arindam Samanta, United States of America]	Accepted - figure was extensively revised; the uncertainty band will no longer be shown in the final figure.
1-1002	1	36	3			It's not readily obvious that the gray arrow going into clouds is an arrow. [JOSHUA FISHER, United States of America]	Accepted - Figure changed
1-1003	1	36	3			It would be more clear to separate the sensible and latent heat fluxes so that the arrow from the latent heat flux isn't crossing over the sensible heat flux squiggly arrow. [JOSHUA FISHER, United States of America]	Accepted - Figure changed

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1-1004	1	36	3			This figure is important and will get widely used--consider working with a graphical design team to improve the aesthetics of this. [JOSHUA FISHER, United States of America]	Accepted - Figure changed
1-1005	1	36	5			It's a little inconsistent to have "CLOUDS" as all caps, but the rest of the box titles as normal capitalization. Also, the "Natural fluctuations in solar output" box could have consistent capitalization with the "Greenhouse Gases" box. The sizes of the boxes should either be consistent with one another OR reflect some relative magnitude. Right now, they are different sizes, but it's not clear why. [JOSHUA FISHER, United States of America]	Accepted - Figure changed
1-1006	1	36	12			Fig 1.1 - Two clarifications are needed in this line: (1) what is meant by "large" aerosols?", (2) the text can be made more clear by inserting, "...modify the AMOUNT OF OUTGOING LWR by ...". [Government of United States of America]	Accepted - text revised in" Large particles (> 2.5µm in diameter")
1-1007	1	36	13			Fig. 1.1 - A re-wording is needed to make this statement sensible. A suggestion: "... by absorbing outgoing LWR and, IN TURN, LOWERING THE SURFACE TEMPERATURE OF THE EARTH, WHICH CAUSES LESS ENERGY TO BE EMITTED BY EARTH'S SURFACE." [Government of United States of America]	Accepted - text revised
1-1008	1	36				Fig. 1.1 - Sensible and Latent heat fluxes are presented in this figure but are not mentioned or discussed in the text at all. These terms need to be defined and explained. [Government of United States of America]	Rejected - Both terms are defined in the Glossary in ANNEX III
1-1009	1	36				Fig. 1.1: I like the idea of this figure but suggest to have this made a professional designer, using fewer colors, one type of font, simpler graphical elements, etc. The current version is too wild, complex and colorful in my view. [Reto Knutti, Switzerland]	Accepted - Figure changed
1-1010	1	36				Figure 1.1: Box with Greenhouse Gases seems mDW, UCh more pixelated than any other part of the figure. No need to hve bullets in front of Ocean color, wave height, ice/snow cover, vegetation labels. Arrow missing on the SWR Reflected by the surface. Should specify what the colors of the boxes mean if they are meant to be taken as categories of drivers [Andrew Shao, United States of America]	Accepted - Figure changed
1-1011	1	36				The font sizes in Figure 1.1 can be made substantially larger to enhance communicability [Paul Stoy, United States of America]	Accepted - Figure changed
1-1012	1	37	1	37	2	The only useful part of this figure is the timescales inset in the bottom left. The rest is confusing (lapse rate feedback is actually positive over ice, the non-CO2 emission sources seem to all be the same magnitude, etc.). A table of the feedbacks, signs, magnitudes, and uncertainties would be much clearer. [Sarvesh Garimella, United States of America]	Accepted - We attempt to make the figure more clear
1-1013	1	37	1			Also consider rework by a graphic design team. [JOSHUA FISHER, United States of America]	Accepted - Figure changed
1-1014	1	37				Figure 1.2: You have prepared a very good figure that describe the positive and Negative feedbacks. Although you have described the meaning of + and - in the text, but you may show these signs in the figure. [Rahimzadeh Fatemeh, Iran]	Rejected - In the figure caption we described + and - as positive and negative feedbacks . No changes in the text .
1-1015	1	37				Fig.1.2: Contradiction between Air-Land CO2 exchanges as +/- while air-sea is only referred as uptake (negative) [European Union]	Taken into account - As discussed in Chapter 6, the land can be a source or sink of carbon, but in terms of the global mean net effect, the ocean is currently a sink. We are looking at the figure to determine if revisions are needed for clarity.
1-1016	1	37				Fig. 1.2 - Within the figure, the label ("Ocean uptake of carbon") and legend ("Air-Sea CO2 Exchange") should use consistent terms [Government of United States of America]	Accepted - Figure changed
1-1017	1	37				Fig. 1.2: I like the idea of this figure but suggest to have this made a professional designer, using fewer colors, one type of font, simpler graphical elements, etc. The current version is too wild, complex and colorful in my view. [Reto Knutti, Switzerland]	Accepted - Figure changed
1-1018	1	37				Figure 1.2: Illustration does not look polished. Inset about Climate feedback timescales should be moved to a separate figure.The "look" of the pluses and minuses is distracting. The sizes of the symbols also differ and is unclear as to whether the size is meant to be a metric of how large the feedback or whether it's just an artifact	Taken into account - We will improve Figure 1.2 for sizing etc .. but not move time scale out

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						of the figure construction. Also the texture of the ocean, forest, and cities is distracting and unpleasant [Andrew Shao, United States of America]	
1-1019	1	37				many of the timescales in Figure 1.2 could be debated. Both biogeophysics and air-land CO2 exchange could be extended to days to reflect rapid changes in ecosystem function like that after management (e.g. harvesting). [Paul Stoy, United States of America]	Accepted - Figure changed
1-1020	1	38	1	38	2	Figure 3 does too much assessing for a figure in the introduction: an easy fix to this issues is just to list the proxies/indicators used to assess climate variations. For example, present "stratospheric temperature" as something that is studied as opposed to providing a seemingly certain statement (that doesn't actually include any information about uncertainty). Similarly you could say tropospheric water vapor is an indicator that is used (and explain in Chapter 2 that is increasing and the certainty with which you can say this). [Sarvesh Garimella, United States of America]	Accepted - Figure and caption have been redone for clarity
1-1021	1	38	4	38	4	Many of these trends (without time period indication) are post 1950 rather than "since pre-industrial times". [Albert Klein Tank, Netherlands]	Taken into account - The caption has been revised for clarity.
1-1022	1	38				Fig. 1.3 - On the "Ice" part of the figure, a glaring omission appears to be the lack of mention of either Greenland and/or Antarctica [Government of United States of America]	Rejected - this figure summarized findings from AR4 where such changes were not listed.
1-1023	1	38				Figure 1.3: Figure was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected. [Dirk Thielen, Venezuela]	Noted - thank you.
1-1024	1	39	1	39	1	In addition to Figure 1.4, I suggest that an additional figure be produced to show individual GCM simulations year-on-year from the TAR and AR4 multi-model ensembles (CMIP2 and CMIP3). This will make it clear that the models do simulate interannual variability as seen in the observations. The current version of the figure gives the impression that the IPCC expected temperature to warm continuously year on year, which of course was not the expectation - the projections shown here are just the long-term trend either from averaging the GCMs or using simple climate models. Showing individual GCM simulations with interannual variability will show that interannual variability does emerge from the models, and some showed sequences of consecutive years without major warmings simply as an emergent property of the internal variability. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Taken into account - A figure comparing the individual CMIP3 simulations with the observed data will be added as Supplementary material.
1-1025	1	39	1	39	1	The way in which both model projections and observations are shown is vague. It is more informative to show trends. It is a bit disappointing that a blogger (Lucia Liljegren at The Blackboard) is able to show better comparisons between observed and modeled trends than the IPCC. Please read one of her latest posts http://rankexploits.com/musings/2012/trends-relative-to-models/ and use the same format in the final report. Quite surprisingly this post shows that even if you use 1980 or 1990 as the start year, the observed trends are at the lower range of the multimodel mean and some models are even rejected. Nowhere in AR5 the readers are made alert that this is the case. The three relevant graphs are http://rankexploits.com/musings/wp-content/uploads/2012/11/TrendsJan2000_Sept2012.png , http://rankexploits.com/musings/wp-content/uploads/2012/11/ModelVObservationsJan1990-Sept2012.png , http://rankexploits.com/musings/wp-content/uploads/2012/11/ComparisonSinceJan1980.png [Marcel Crok, The Netherlands]	Noted - information was passed on to Chapter 2.
1-1026	1	39	1	39	2	Figure 1.4 shows that the IPCC Scenarios are very poor in predicting future temperature. Future projections based on them are therefore unreliable [Vincent Gray, New Zealand]	Rejected - This figure has been extensively revised for clarity. The statement by the reviewer is incorrect.
1-1027	1	39	1	39	15	This diagram shows that the Temperature anomaly has been stable for ten years and that none of the previous IPCC Reports predicted it successfully [Vincent Gray, New Zealand]	Rejected - This figure has been extensively revised for clarity. The statement by the reviewer is incorrect.
1-1028	1	39	1	39	17	The gray shading is defined in the Figure caption as the uncertainty band for the HadCRUT4 temperature series. However, the caption also describes each year's uncertainty band for both the observational series as the black whisker, which is said to span the 90% uncertainty range. The black whisker is typically about 0.15C in length (by eyeball). The gray shading, by contrast, spans a much larger range, namely 0.8-1.2 C after 1992. And the shaded area is trending upward over the past decade while the actual temperature data trends slightly downward. How can a 90% uncertainty interval move upward while its mean value stays constant or declines? Also, the gray shading spans such a wide area as to imply that every year's global average temperature since	Taken into account - This figure has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion.

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						1990 lies within the 90% uncertainty band around the current global average, implying that there has been no statistically significant change in the mean temperature for over 20 years. Worse, the shading continues out to 2015, 3 years past the end of the observations on which it is supposedly based! The caption must be wrong. It looks like the gray shading is the result of applying an uncertainty estimator to the model projections, not the observations. That would make sense of the fact that the models roughly track the middle of the gray shading, but all that would show is that the models roughly match the models. The gray-shaded portion is not well defined, it distracts from the Figure, and seems to have been erroneously constructed. I would suggest it be removed altogether. [Ross McKittrick, Canada]	
1-1029	1	39	1	39	19	Figure 1.4 needs to be accompanied by a narrative that states that the last decade of temperature records can be explained by natural variability on top of a long term warming trend, and that there is a Multi-Decadal trend of warming, i.e. the 2000's were warmer than the 90's. [Government of Australia]	Taken into account - This figure has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion.
1-1030	1	39	1	40	2	The meaning of the gray outlines in these figures is very unclear. [Sarvesh Garimella, United States of America]	Taken into account - This figure has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion.
1-1031	1	39	1	40	9	Figures 1.4 and 1.5 clearly show that all climate projections overestimated the temperature change. Although they are still within the 90% uncertainty band as stressed by the report authors, the measured values are generally on different trend. It would be useful if the authors could rephrase the explanation to those two figures and be more critical to those projections. [Dawei Han, United Kingdom]	Taken into account - This figure (1.4) has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion. Figure 1.5 has been eliminated because it doesn't add sufficiently to the findings.
1-1032	1	39	1			Center the "Year" label. [JOSHUA FISHER, United States of America]	Accepted - figure revised
1-1033	1	39	1			The blue/green combo is hard to differentiate. [JOSHUA FISHER, United States of America]	Rejected - we use the IPCC recommended colours.
1-1034	1	39	2	40	11	Figs. 1.4 and 1.5: Temperature anomalies since 2000 seem to be relatively flat. But models show a steady increase in temperature - perhaps the models are missing some key forcings - aerosols? This has not been adequately highlighted in Section 1.3.1 [Arindam Samanta, United States of America]	Taken into account - This figure (1.4) has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion. Figure 1.5 has been eliminated because it doesn't add sufficiently to the findings.
1-1035	1	39	4	39	17	The caption to Figure 1.4 needs further explanation for the AR4 projection, and what the two different shadings mean. Presumably the darker colour before approx 1998 shows historical simulations including volcanic forcing, which is why they reproduces the 1992 cooling, whereas the lighter colour after 1998 is a purely anthropogenically-forced set of simulations. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Accepted - the colour coding is further explained in the revised caption.
1-1036	1	39	4	39	17	like in the text (page 9, line 26), it should be mentioned in the caption of Fig. 1.4 that TAR and AR4 results are based on MAGICC rather than the actual results from the full 3-dim. models [Jucundus Prof. Dr. Jacobeit, Germany]	Accepted - the information has been added.
1-1037	1	39		39		Fig. 1.4 Please clarify the comment about TAR and AR4 scenario design and why the AR4 bar changes color at this point. [Government of United States of America]	Taken into account - the figure has been extensively revised. The revisions take care of this issue.
1-1038	1	39		42		Figure 1.4-1.8: Range of assessment report projections hard to see because of overlap. Transparency does not help. The outer uncertainty lines should always be visible [Andrew Shao, United States of America]	Accepted - figure revised
1-1039	1	39		48		Acronyms of scenarios should be shortly explained. [European Union]	Rejected - reference was made to the individual assessment reports
1-1040	1	39				Figure 1.4: You present "Temperature anomaly" . You mean the temperature respect to 1961-90. I suppose it is better to write it. You know after publishing the report many scientist use these figures in the presentation, texts and speeches. At that time they will not show the captures. Therefore I recommend you change the description of axis. [Rahimzadeh Fatemeh, Iran]	Accepted - the caption and the axis label has been revised.
1-1041	1	39				Fig. 1.4: why does the color change for the AR4 projections around 2000? This is confusing! [Dietrich Feist, Germany]	Taken into account - the figure has been extensively revised. The revisions take care of this issue.

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1-1042	1	39				Figure 1.4: 1. a grey line needs to be added to the coloured lines on the right hand side of the graph and to the legend, 2. the eruption of Pinatubo should be indicated to explain the dip in temperature in ~1992 and the caption should mention that only the AR4 experiments captured this event in their historical simulations, 3. in the caption, the difference between the 90% uncertainty range shown by the whiskers on the observed data and the 90% uncertainty estimate captured by the grey shading needs to be better explained. [Government of Canada]	Taken into account - This figure has been extensively revised for clarity. This eliminated the need for the gray areas and the corresponding confusion. The figure caption will be revised to account for your concern.
1-1043	1	39				Fig. 1.4: I continue to argue that this figure is misleading and dangerous, and I am surprised to see the same discussion and figure again in this draft. First, the scenarios in early IPCC reports were incomplete in terms of forcing, and most models did not include all relevant forcings, even up to AR4. The text in TFE3 incorrectly states that Pinatubo was included in the AR4 simulations. Some models did, others not. Why would we expect agreement if the world has not followed those scenarios and if the models did not have all forcings? Second, the figure mixes model response uncertainty and scenario uncertainty by showing ranges across both. Third, aligning the temperature data at a single year makes no sense, the figure may look very different when the average of 20yrs is used to align. Fourth, comparing a model average (or energy balance models without variability) is problematic. Even if the variability band is shown, the visual impression is very different than from a figure which shows individual ensemble members along with observations, as for example in TS.7 or TS.12. But fundamentally IPCC never made predictions but projections, so I argue that this comparison should not be made. I appreciate that the text now discusses some of the above points, but I am worried that this will be interpreted as a verification exercise which is never was intended to be. It is also questionable whether there is any skill of a GCM on these short timescales. One could have taken the best estimate of the transient climate response from the earliest models and from that estimate a trend in degrees/decade, add Pinatubo and some variability, and the result would probably just as good. On these short timescales much of the response is simply commitment warming, and I don't think this verification should give more confidence in the models than we already have from other sources. [Reto Knutti, Switzerland]	Taken into account - The figure has been totally redrawn and revised heavily for better clarity. The current figure is based on a broad consensus reached during the lead author meeting in Hobart.
1-1044	1	39				Fig 1.4: Not clear why TAR and SAR projected ranges go back to 1990, when they only started in 1995 and 2002 respectively? Same in Fig 1.11 [Sonya Legg, United States of America]	Rejected - the scenarios begin in 1990. The publication year of the report is not necessarily the start date of the projections. For example, AR4 projections began in 2001, while the publication of AR4 was in 2007.
1-1045	1	39				I can't speak for those who are colorblind, but I note that a comparison between TAR and AR4 amounts to a comparison between something with green coloration and red coloration. (also for Figures 1.6-1.8) [Paul Stoy, United States of America]	Rejected - we use the IPCC recommended colours.
1-1046	1	39				Question: If anthropogenic CO2 emissions are following most closely the AR4 A1FI scenario, why are the A1B and A1T scenarios being shown in this and other figures? [Paul Stoy, United States of America]	Taken into account - the scenarios used are the ones that give the maximum range. All other scenarios lie in between this range.
1-1047	1	39				Figure 1.4: Figure was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected. [Dirk Thielen, Venezuela]	Noted - thank you.
1-1048	1	40	1	40	2	Figure 1.5 shows that the IPCC Scenarios are very poor in predicting future temperature. Future projections based on them are therefore unreliable/ [Vincent Gray, New Zealand]	Noted - However, Figure 1.5 has been eliminated.
1-1049	1	40	1	40	10	Regarding Figure 1.5 and the accompanying text, which apparently focuses only on the AR4 model runs, the same problem arises: the text does not match the diagram. Over the interval shown the observed temperatures are more or less constant and the model projections go upward at an accelerating rate, so that by the end, the observed data are at or below the low end of the range of warming projections. The gray shading is again a mystery. The caption suggests the same definition as in Figure 1.4, but the Figure shows the shading continues into the future, suggesting it is an uncertainty band around model runs, not observations. So it provides no support for the idea that the observations match the models. [Ross McKittrick, Canada]	Taken into account - Figure 1.5 has been eliminated.
1-1050	1	40				Figure 1.5: same as Figure 1.4 [Rahimzadeh Fatemeh, Iran]	Taken into account - Figure 1.5 has been eliminated.

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1-1051	1	40				Figure 1.5: As with comments on Figure 1.4, the grey shading should be included in the legend and on the right side of the graph. [Government of Canada]	Taken into account - Figure 1.5 has been eliminated.
1-1052	1	41	1	41	2	Figure 1.6 shows that the IPCC Scenarios are moderately good in predicting future atmospheric carbon dioxide. Model projections based on them therefore have a moderate level of plausibility [Vincent Gray, New Zealand]	Noted - Thank you, but your comment does not fully reflect the understanding of the science.
1-1053	1	41				Figure 1.6: Same as Figure 1.4 [Rahimzadeh Fatemeh, Iran]	Rejected - this comment relates to comment 1040, suggesting to add anomaly to the axis-label; this is not the case for Figure 1.6.
1-1054	1	42	1	42	2	Figure 1.7 shows that IPCC Scenarios are completely unable to forecast future levels of atmospheric methane. Model projections based on them are therefore completely unreliable. [Vincent Gray, New Zealand]	Rejected - That CH4 stopped increasing for a decade was indeed not considered in the projections, but CH4 is back to increasing. The error for CH4 emissions in the projections only causes a minor error in the projections of climate change. Obviously the reviewer has very poor understanding of the climate system. As stated for CO2 and T, the model projections were never intended to be accurate at these early time in the projected changes.
1-1055	1	42	1	42	11	Shows that methane projections have been wrong in every IPCC Report [Vincent Gray, New Zealand]	Rejected - See above.
1-1056	1	43	1	43	2	Figure 1.8 shows that the IPCC Scenarios are poor in predicting future N2O levels. Future projections based on them are therefore unreliable. [Vincent Gray, New Zealand]	Rejected - Actually current values are well within the range of the projections. Such an editorial comment is not only inaccurate it demonstrates a real lack of knowledge of the climate system.
1-1057	1	44				This type of schematic has now appeared in several IPCC reports and I think we need to move on from this simplistic view shown here. It's pretty clear from the other AR5 chapters that temperatures have and will not simply reflect changes in variance so I don't think it's useful to include Fig. 1.9b. Arguments surround whether increases in mean are also accompanied by changes in scale and shape which significantly affect extremes (see Ch 2-49 L49-56) but there is little argument that temperatures have or will change only in their variance. SPM3c of SREX also provided a view of how skewness changes might affect temperature extremes (not just precipitation) and I think this is a much more useful schematic to show here. So my suggestion is to remove Fig. 1.9b and replace it with something resembling SREX SPM Fig. 3c. [Lisa Alexander, Australia]	Taken into account - We will redo the caption to mention change in shape and will examine the graphic. SREX actually shows the same variance figure (figure 3b).
1-1058	1	44				Figure 1.9: If the kurtosis of distribution change, you observe some impacts. You may present the presumably changes in this case too. [Rahimzadeh Fatemeh, Iran]	Agreed - but the concept of kurtosis is too advanced for an illustration in Chapter 1
1-1059	1	44				Figure 1.9. It says "See Zhang and Zwiers (2012)". See Zhang and Zwiers for what??? For further details...? [Belén Martín Míguez, Spain]	Accepted - the caption has been revised for clarity.
1-1060	1	44				Figure 1.9: Figure was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected. [Dirk Thielen, Venezuela]	Noted - thank you.
1-1061	1	45	2	45	8	Fig. 1.10: Confused by the use of terms (likely, very likely etc) to describe confidence. From previous sections (1.4.2), Fig. 1.12, and Table 1.1, it appears that likely, very likely etc are used to describe quantified uncertainty, whereas low, medium, high etc are used for confidence. Please clarify. [Arindam Samanta, United States of America]	Accepted - text revised; nomenclature was changed from AR4 to SREX
1-1062	1	45				Fig. 1.10 is very problematic since some of the assessments for extremes have been revised since AR4 and/or SREX. For instance the projections of heavy precipitation are "very likely" in AR5 (TFE 9 Table 1) which agrees with AR4 but not SREX. This needs to be reconciled between the various chapters and to avoid confusion amongst readers. I realise that Ch 1 is an introduction to the rest of the report but somehow it needs to be clarified that some of the confidence levels for extremes have been revised subsequent to AR4 and SREX. [Lisa Alexander, Australia]	Rejected - We don't see the importance of this comment to what is in Chapter 1.

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1-1063	1	45				Figure 1.10: Figure was checked for inconsistencies with own professional experience and competency. No relevant disagreements were detected. [Dirk Thielen, Venezuela]	Noted - thank you.
1-1064	1	46	1	46	1	An explanation is needed as to why Church et al (2011) using A1B is used in this figure rather than just AR4 projections? [Government of Australia]	Accepted - an explanation is added in the figure caption.
1-1065	1	46	1	46	12	See my comments on Chapter13. Tide gauge measurements are too variable to be averaged sensibly. They are not global and there is evidence that curenly they are not increasing [Vincent Gray, New Zealand]	Noted - see Chapter 13 for detailed discussion
1-1066	1	46		46		Fig. 1.11 - Can the authors clarify why, unlike in similar Figures 1.4, 1.6-1.8, projections for AR4 are not shown? Rather, projections are shown or FAR, SAR, TAR and then Chrch et al. (2011). It seems an explanation in the caption and text might be warranted. [Government of United States of America]	Accepted - an explanation is added in the figure caption.
1-1067	1	47	1	47	2	Figure 1.11 shows that the IPCC Scenarios are poor in predicting future Sea levels. Future projections based on them are therefore unreliable. [Vincent Gray, New Zealand]	Rejected - see 1-1054
1-1068	1	47				Fig. 1.12. The criteria for defining likelihood of trends and confidence level (very high, low....) need to be mentioned clearly. Whether the robustness was decided based on the number of papers available on the topic or the class of journal or the publisher of the journal/impact factor of the journal or the number of samples/number of years/the reputation of group reporting the measurements etc? [Umesh Kulshrestha, India]	Rejected - See Table 1.1 and Mastrandrea et al. 2010.
1-1069	1	47				Figure 1.2. Why the steamship? Are you suggesting that in a greenhouse warmed world steamships will emit more aerosols? This borders on the absurd. [Stephen E Schwartz, United States of America]	Accepted - This comment refers to page 37. Figure modified.
1-1070	1	48	0	48	0	This figure is archetypal of numerous figure throughout the whole SOD - it has a plethora of similar colours and is perhaps overly complex. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account - Fig. 1.13 is being extensively revised and Table 1.2 is deleted
1-1071	1	48		48		Fig. 1.13 Since the flux of carbon is the crux of this issue, it would seem reasonable to include flux measurements in the list of surface observations. [Government of United States of America]	Accepted - the carbon flux measurements are added.
1-1072	1	48				I like this figure very much. It may be a very good reference figure for any related fields. [Rahimzadeh Fatemeh, Iran]	Noted - thank you.
1-1073	1	48				Fig.1.13: "etc." in marine observations needs to be detailed a little bit [European Union]	Taken into account - Fig. 1.13 is extensively revised and Table 1.2 is deleted
1-1074	1	48				Fig. 1.13: This is an incredibly busy and colorful figure. The upper part is nice but the inset is distracting, the lower part is very busy with all the acronyms. Suggest to reduce the minimum, avoid color backgrounds, avoid insets, etc. to improve clarity. [Reto Knutti, Switzerland]	Taken into account - Fig. 1.13 is extensively revised and Table 1.2 is deleted
1-1075	1	49	1	49	2	Replace this figure with a simple timeline. The height of the columns is seemingly meaningless. [Sarvesh Garimella, United States of America]	Rejected - more explanation is given for the figure including the meaning of the height of the columns.
1-1076	1	49	4	49	7	Need some text to indicate what the height of the cylindrical markers means. Is it resolution/complexity, or proportion of computation time, or something else? [James Renwick, New Zealand]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.
1-1077	1	49		49		Figure 1.14 : Why distinguishing two types of aerosols (sulfate and others) while mentioning all the atmospheric processes as a single entity ? It is disproportionated (especially as the atmospheric component includes many processes, some of them being in the models since the beginning of climate modeling while others are just starting to be included). [Sandrine BONY, France]	The figure is being redrawn and revised, along with the figure caption and related text.
1-1078	1	49				Fig 1.14. It's unclear what the height of the cylinders in this figure represent. A clarification is warranted OR all cylinders should be the same height (i.e., simply circles with no 3D). [Government of United States of America]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.
1-1079	1	49				Fig. 1.14: What is the height of these things indicating? I propose to avoid 3D, shade/light and simply as much as possible. [Reto Knutti, Switzerland]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.
1-1080	1	49				The heights of the cylindars in Figure 1.14 are not informative [Paul Stoy, United States of America]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.

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1-1081	1	49				Figure 1.14: unclear what the height of the cylinders denote. Number of models? Resolution? [Elie Verleyen, Belgium]	Accepted - more explanation is given for the figure including the meaning of the height of the columns.
1-1082	1	50	1	50	9	Is a resolution of 87.5 x 87.5 km the common typical resolution? Having a look at MPI-ESM-LR, MIROC-ESM-CHEM or NORESM1-M I can not believe that. A resolution of 30 x 30 km for higher resolution models is also optimistic. After 4 IPCC-reports with funny numbers the truth would be helpful (see figure 1.4 in IPCC-AR4 WG1). Would there be any use for 50km RCM with those both numbers? [Frank Kreienkamp, Germany]	Accepted - text and figure caption revised
1-1083	1	51	1			The black line missing from key in this figure. [Government of Australia]	Accepted - figure revised
1-1084	1	51	4	51	8	Figure 1.16 shows anthropogenic RF (rather than anthropogenic plus natural) which I believe for the RCPs (and SRES too perhaps) is a reflection of the derivation used for Figure 12.3 rather than numbers from either of the two Annex II Tables (AII.6.9 or AII.6.10) as might be assumed from the caption. It would be good to tidy up this traceability issue at the Final Draft (between Chapters 1, 12 and Annex II). [Tim Johns, United Kingdom of Great Britain & Northern Ireland]	Rejected - Data used here are not part of Annex II and are therefore not compared
1-1085	1	52	1	52	5	1800-2500 MUST BE 1800-2100 ONLY [YEHIA HAFEZ, Saudi Arabia]	Rejected - this is not correct.
1-1086	1	52		54		For the RCP figs - do you really want to go so far into the future? There are things to explain if you do - such as negative co2 emisisions [Piers Forster, United Kingdom of Great Britain & Northern Ireland]	Rejected - There is already text about the negative emissions. The extension of the figures is important for long term assessment.
1-1087	1	52				Box 1.2 Figure 1: "supporting the original names of the 4 pathways" - caption doesn't stand alone, this is not understandable without reading the text. [Sonya Legg, United States of America]	Accepted - text and caption revised
1-1088	1	53				Box 1.2, Figure 2: Space allowing, it would be useful to show emissions for key species (CO2, CH4, SO2). [Government of Canada]	Taken into account - the CO2 emissions are shown in Box 1.2 Figure 3. For further information see Annex II.
1-1089	1	54	4	54	5	The behavior of SCP6to4.5 is not similar to that of the other curves in figure 3b. I think that this apparently strange behavior should be explained or at least mentioned in some way in the text, even if in the original paper all detailed explanation is given. [Claudio Cassardo, Italy]	Accepted - text revised
1-1090	1	54	4	54	5	Please consider also to include a figure which better shows the emissions scenarios in more near-term (up to 2100). An updated figure similar to Figure 5 in the IPCC Expert meeting report, 19-21 September 2007, could be used. You should also consider to mark the 0-line with a dashed line in the right panel to visualize clearly that RCP2.6 assumes negative emissions from approximately 2070/2080. [Government of NORWAY]	Accepted - the figure will be revised.
1-1091	1	55	1	55	1	I think this is a misleading diagram because it gives the impression that we can quantify emissions uncertainty - which is something that we can not do. However, I think it does give the right message about the relative importance natural internal variability, in contrast with the text. [Francis Zwiers, Canada]	Taken into account - We clarify the text so that sub-decadal variability is more clearly affected by natural variability. We discuss in the figure caption and text that the true uncertainty in scenarios could be larger.
1-1092	1	55	1	55	11	Does not dare to put in the tempeature figure for the decade 2000 to 2012 because the temperature stabilized [Vincent Gray, New Zealand]	Rejected - This issue is discussed in the text. Decadal averages, using data up to 2008, will only have data centred at 2003 (since we cannot generate a 10 year average for any years after that point). This plot comes from a paper published in 2009, and thus does not contain data past this point. however this is a skematic figure, so we extend the figure.
1-1093	1	55	1	55	11	FAQ 1.1, Fig. 1: is it appropriate to assume a constant range for natural variability (orange part)? May be this is not so important for the particular question addressed in this figure. However, to avoid misleading interpretations, it would be useful to indicate that this constant range for natural variability is not a general fact but just an assumption for convenience. [Jucundus Prof. Dr. Jacobeit, Germany]	Taken into account - The methodology of Hawkins and Sutton assumes constant interannual variability. This is clarified in figure caption.
1-1094	1	55	10	55	11	I think this statement, that "climate response uncertainty can grow when a new process is discovered to be relevant", is fundamentally incorrect. The spread of the ensemble of projections that are produced when additional processes are accounted for may change - but presumably that new range represents an improved quantification of the uncertainty that is inherent in every projection. To draw the analogy with weather	Accepted - figure caption revised.

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						forecasting - an overconfident forecast is not one that is useful. So I think a better message to convey would be that climate models need to include representations of all processes that are relevant to the evolution of the projection target of interest in order to accurately quantify the uncertainty in the projection, and that more recent models (ESMs) do that more comprehensively than previous models (AOGCMs). The complexity that is required is presumably, at least in part, a function of the projection target (e.g., global mean temperature, where it might possible to ignore some local or regional feedback processes, vs regional or local mean temperature, where those simplifications would be harder to defend). [Francis Zwiers, Canada]	
1-1095	1	55				FAQ 1.1, Fig 1 - The y-axes need labels. The caption also needs to include an explicit reference to the baseline time period to which these anomalies relate. [Government of United States of America]	Accepted - figure is revised, although it is meant to be a skematic, not a detailed prediction
1-1096	1	155	4	155	11	There needs to be some explanation of why the observations (black line) don't show the full interannual variability, and also why the line stops at about 2003. This risks criticism of trying to hide the lack of warming in recent years. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Accepted - figure caption revised.