World Meteorological Organization
Organisation météorologique mondiale
Case postale N° 2300
1211 Genève 2
SWITZERLAND

United Nations
Environment Programme
Programme des Nations Unies
pour l'Environnement
P.O.Box 30552 • Nairobi, Kenya

WORLD CLIMATE PROGRAMME PUBLICATIONS SERIES

WMO/UNEP INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

Report of the second session of the IPCC Bureau

Washington, 8 February 1990

IPCC-4

IPCC Secretariat, WMO. Phone: +41 22 7308284/268/254/215 Fax: +41 22 7331270 Telex: 23260 OMM CH

NOTE:

No translation of the Annexes to the report is provided because

i) the material in Annexes A, B, and D is self-explanatory, and

ii) the material in Annex C is meant for the preparation of the reports in English only.

TABLE OF CONTENTS

REPORT OF THE SECOND SESSION OF THE IPCC BUREAU

WASHINGTON D.C., 8 FEBRUARY 1990

1. OPENING OF THE SESSION

1.1 The session was called to order by Prof. B. Bolin, the Chairman of IPCC, at 09:45 hours on Thursday, 8 February 1990, at the Department of State, Washington D.C. At the outset, Prof. Bolin thanked the US State Department for hosting the session.

1.2 The list of participants is attached as Annex A.

2. STRUCTURE OF THE IPCC FIRST ASSESSMENT REPORT

2.1 The IPCC first assessment report will consist of:

a. the three reports of the three Working Groups (WGs), each 200 pages long;

b. the report of the IPCC Special Committee on the Participation of the Developing Countries, 15-20 pages long;

c. the three WG summaries for policy-makers, each 20 pages long;

d. the summary for policy-makers of the Special Committee, 2-3 pages long;

e. organization and structure of IPCC and a description of its modus operandi, hereinafter referred to as the IPCC Work Plan;

f. the synthesized, overall summary of IPCC findings and recommendations, hereinafter referred to as the IPCC Summary, 20-odd pages in length.

Items (c), (d), (e), and (f) will form Part I, while items (a) and (b) will form Part II of the report.

IPCC FIRST ASSESSMENT REPORT = PART I + PART II

PART I	PART II
* IPCC SUMMARY	* WG REPORTS (3)
* POLICY-MAKERS' SUMMARIES (4)	* SPECIAL COMMITTEE
* IPCC WORK PLAN	REPORT

In addition, there is the material developed by the sections/subgroups in the course of their work, which will be called supporting material. The distillation of this material will form the content of the reports of the WGs and the Special Committee.

3. ITEMS FOR DISCUSSION AND APPROVAL AT THE WG/SPECIAL COMMITTEE PLENARIES

3.1 The reports of the Working Groups (each 200 pages long) and of the Special Committee (15-20 pages long) will be approved at their respective plenaries in May-June 1990. The Working Groups may define their own approval process (for example, WG I may accept only those changes that have a sound basis in published scientific literature). Once so approved, they become final. That is, they will not be subject to further review or modification at the fourth plenary of IPCC (Sundsvall, Sweden, 27-30 August 1990).

3.2 The 4 policy-makers' summaries will be submitted for approval at the respective plenaries in May-June 1990 and once approved also become final. However, these may be further discussed - but not modified - at the fourth IPCC plenary (see para 4.1 below).

4. ITEM(S) FOR DISCUSSION AND APPROVAL AT THE FOURTH PLENARY OF IPCC (SUNDSVALL, SWEDEN, 27-30 AUGUST 1990)

4.1 Part I (see para 2.1 c,d,e,f) will be subject to discussion at the fourth IPCC plenary. However, only the draft IPCC summary can be revised there. The results of all discussion at the plenary will be incorporated in the revised IPCC summary.

4.2 Part II will not be subject to discussion or revision at the fourth plenary of IPCC.

5. TRANSLATION OF THE IPCC FIRST ASSESSMENT REPORT

5.1 Part I will be translated by the IPCC Secretariat into the UN languages (Arabic, Chinese, French, Spanish and Russian).

5.2 With respect to the translation of the WG reports:

a. The Government of Canada has kindly agreed to translate into French;

b. The Governments of China and Spain have been formally approached for translation into Chinese and Spanish respectively;

c. Dr. A. Al-Gain, the Vice-Chairman of IPCC, and the Government of Egypt are examining the possibility of translation into Arabic;

d. The Government of the USSR has been approached informally for translation into Russian.

5.3 No decision has been taken with regard to translation of the report of the Special Committee into the UN languages.

6. PREPARATION OF THE DRAFT IPCC SUMMARY

6.1 The IPCC Drafting Committee will prepare the draft IPCC summary. The Committee will consist of the Chairman, Vice-Chairman and Rapporteur of the Panel and the Chairmen of the Working Groups and the Special Committee.

7. SUPPORTING MATERIAL

7.1 Each WG/Special Committee is requested to make a catalogue (authorship, subject matter and address where the report would be available) of all supporting material its subgroups/sections have generated and make it available to the IPCC Secretariat along with 3 copies of all such material. The catalogue will be available from the IPCC Secretariat on request.

7.2 In some cases, the IPCC Secretariat has arranged to publish the supporting material, in the form of WMO/UNEP IPCC reports series, if so requested by the author(s) and if the material is not too voluminous and is supplied in camera-ready form.

8. PEER REVIEWS

8.1 The draft reports of WG I and WG II will undergo peer reviews. These two Working Groups are free to choose the form of the peer review as long as the latter is conducted in such a manner as to assure quality products.

8.2 The WG I draft report will be sent for peer review immediately after the Lead Authors' meeting (Edinburgh, 26 February - 2 March 1990). The WG II draft report will be sent for peer review after the Co-chairmen's meeting (Nalchik, 27 February - 2 March 1990). The WGs will indicate the deadlines by which the reviews should be received by them.

8.3 All draft reports (WG + Special Committee) will be distributed to member governments of WMO and UN for review (see Annex B for the date of this distribution). While governments have the right to conduct the reviews in any manner they choose, it would be helpful if such reviews were appropriate, i.e., scientists reviewing the scientific assessment, policy analysts reviewing the policy options, etc.

8.4 The draft reports will also be distributed to the UN and its specialised agencies and other inter-governmental/regional economic organizations. Scientists/experts of standing in non-governmental organizations can receive copies on request.

9. PUBLICATION OF THE IPCC FIRST ASSESSMENT REPORT

9.1 The publication of the report will occur in two volumes: Part I by itself (the thin volume) and Parts I and II combined in one volume (the full volume).

9.2 One camera-ready copy each of each volume (as defined in para 9.1 above) will be delivered to WMO and UNEP for publication and distribution. IPCC requests the Executive Heads to give as wide a distribution as possible to its first assessment report.

10. CREDIT FOR CONTRIBUTORS

The Working Groups and the Special Committee are requested to ensure that the fullest possible credit is given to the contributors (authors as well as reviewers).

11. TIMETABLE FOR THE COMPLETION OF THE IPCC FIRST ASSESSMENT REPORT

The timetable is attached as Annex B to this report.

12. FORMAT

The format to be followed in the preparation of the IPCC first assessment report is attached as Annex C.

13. IPCC ACTIVITIES AFTER COMPLETION OF THE IPCC FIRST ASSESSMENT REPORT

The Working Groups and the Special Committee are requested to identify in their plans activities that need to be pursued after the completion of the first assessment report.

14. NEXT SESSION OF THE BUREAU

While there was some sentiment for another session of the Bureau before the fourth plenary of IPCC, no decision was taken on the matter.

15. REPORT OF THE SESSION

The Bureau agreed that the report of the session needs only to list and annotate the decisions taken at the session. It authorized the Chairman of IPCC to finalize the report.

16. CLOSURE OF THE SESSION

This session of the IPCC Bureau closed at 16:00 hours on Thursday, 8 February 1990.

ANNEX A

LIST OF PARTICIPANTS SECOND SESSION IPCC BUREAU
WASHINGTON, D.C., 8 February 1990

CHAIRMAN

Prof. B. BOLIN
University of Stockholm
Arrhenius Laboratory
10691 - Stockholm
SWEDEN

VICE-CHAIRMAN

Dr. A. AL-GAIN
President MEPA
Meteorology & Environmental
Protection Admininistration
P.O. Box 1358
Jeddah
SAUDI ARABIA

RAPPORTEUR

Mr. J.A. ADEJOKUN
Director
Department of Meteorological Services
PMB 12542
Lagos
NIGERIA

Tel: +2341631792
Tlg: DIMETEOR LAGOS

AUSTRALIA

Dr. John ZILLMAN
Bureau of Meteorology
P.O. Box
1289 K Melbourne
AUSTRALIA

W. McG. TEGART
ASTEC
Australian Science & Technology Council
P.O. Box E439
Queen Victoria Terrace
Canberra, ACT 2600
AUSTRALIA

Tel : +61 62 715655
Tlx : AA 61854
Fax : +61 62 715924 &
733812

Peter HOWARTH
Environment Section
Department of Foreign
Affairs & Trade
Canberra A.C.T. 2601
AUSTRALIA

Nelson QUINN
Department of the Arts, Sports
the Environment Tourism &
Territories
P.O. Box 787
Canberra ACT 2601
AUSTRALIA

BRAZIL

Marcilio Marques MOREIRA
Ambassador
Brazilian Embassy
3006 Massachusetts Av. N.W.
Washington D.C. 20008
USA

Mr. Macedo SOARES
Ministry for External Relations
Ministerio das Relaçoes Exteriores
Departamento de Organismos
Internacionais
70000 Brasilia D.F.
BRAZIL

CANADA

Liz DOWDESWELL
Assistant Deputy Minister
Environment Canada
4905 Dufferin St.
Downsview ONT.
CANADA M34 5T4

Jean G. COTE
Environment Canada
4905 Dufferin St.
Downsview ONT.
CANADA M34 5T4

Brian HERMAN
Deputy Director
Energy & Environment Div.
Department of External Affairs
L.B. Pearson Bldg
125 Sussex Drive
Ottawa, Ontario
CANADA K1A 062

Tel: (613) 992-0503
Fax: (613) 992-6002

CHINA

ZOU JINGMENG
State Meteorological Administration
46, Baishiqiaolu
Beijing
CHINA

LUO XU
Councellor
Permanent Mission to the UN
155 West 66th Street
New York, N.Y.
USA

WANG XIAOMIN
State Meteorological Administration
46, Baishiqiaolu
Beijing
CHINA

DING YIHUI
State Meteorological Administration
46, Baishiqiaolu
Beijing
CHINA

FRANCE

Jean RIPERT
Special Adviser to the
Minister of Foreign Affairs
37, Quai d'Orsay
75007 - Paris
FRANCE

Ms. D. BORIONE
Ministry of Foreign Affairs
37, Quai d'Orsay
75007 - Paris
FRANCE

JAPAN

Toshihiro TAKAHASHI
Director, Energy Resources Division
Foreign Ministry
2-2-1- Kasumigaseki
Chiyodaku
Tokyo
JAPAN

Michio HASHIMOTO
Vice Chairman WG-II
Environment Agency,
1-2-2 Kasumigaseki
Chiyoda-Ku
Tokyo
JAPAN 100

Mr. Y. SHIMIZU
Environment Attache
Embassy of Japan
2520 Massachusetts Av.
Washington D.C. 20008
USA

MALTA

George N. BUSUTTIL
Ministry of Foreign Affairs
Palazzo Parizio
Valletta
MALTA

Anthony BORG
Ministry of Foreign Affairs
Merchants street
Valletta
MALTA

Mr. H. TAYLOR-EAST
Ministry of Foreign Affairs
Palazzo Parizio
Valletta
MALTA

THE NETHERLANDS

Pier VELLINGA
Coordinator National Climate Programme
Ministry of Environment
P.O. Box 450
2260 MB Leidschendam
THE NETHERLANDS
Tel: +31 70 320 93 67
Fax: +31 70 320 18 58

Dr. H. M. FIJNAUT
Royal Netherlands Meteorological Institute
Wilhelminalaan 10
Postbus 201
3730 AE De Bilt
THE NETHERLANDS
Tel: +31 30 206 911
Tlx: 47 096
Fax: +31 20 21 0407

NETHERLANDS

Hans Van der KOOI
Ministry of Foreign Affairs
P.O. Box 20061
2500 EB The Hague
THE NETHERLANDS

NIGERIA

Dr. J. A. ADEJOKUN
Director
Meteorological Dept.
PMB 12542
Lagos
NIGERIA

SAUDI ARABIA

K. ABULEIF
MEPA
P.O. Box 1358
Jeddah
SAUDI ARABIA

SENEGAL

Mr. SECK
Conseiller Technique
Ministère de l'Equipement
BP. 4014
Dakar
SENEGAL

UNITED KINGDOM

Geoff JENKINS
UK Meterological Office
London Road
Bracknell, RG12 2SZ
UNITED KINGDOM

Phillip WARD
Dept of Environment
17115 Romney House
43 Marsham Street
London SW1
UNITED KINDGOM

USSR

Dr. S. KHODKIN
USSR State Committee for
Hydrometeorology
12, Pavlik Morozov Str.
Moscow
USSR

Dr. S.I. MARCHUK
First Secretary
Ministry of Foreign Affairs
Smolenskaya Sennaya 32/34
Moscow
USSR

Dr. M. ZALIKHANOV
USSR State Committee
for Hydrometeorology
12, Pavlik Morozov Str.
Moscow
USSR

Mr. Yu GOLUBEV
USSR State Committee
for Hydrometeorology
12, Pavlik Morozov Str.
123376 Moscow
USSR

Dr. Yuri VAKALYUK
USSR State Committee
for Hydrometeorology
12, Pavlik Morozov Str.
123376 Moscow
USSR

USA

John EASTON
Assistant Secretary
US Department of Energy
1000 Independence Av. SW
Washington DC. 20585
USA

Mr. J. R. SPRADLEY
Department of Commerce
Oceans and Atmosphere
Room 6223
Washington DC 20230
USA

ZIMBABWE

Mrs. R. P. KARIMANZIRA
Deputy Director (Adm)
Dept of Meteorology
PO Box BE 150
Belvedere
ZIMBABWE

UNEP

Peter USHER
Coordinator GEMS Atmosphere
United Nations Environment
Programme
PO Box 47074
Nairobi
KENYA

Dale BOYD
Communications Officer
UNEP
PO Box 47074
Nairobi
KENYA

WMO

Dr. D. N. AXFORD
World Meteorological
Organization
P.O. Box 2300
1211 Geneva 2
SWITZERLAND

Dr. V. BOLDIREV
World Meteorological
Organization
P.O. Box 2300
1211 Geneva 2
SWITZERLAND

IPCC SECRETARIAT

Dr. N. SUNDARARAMAN
Secretary IPCC
c/o WMO
PO Box 2300
1211 Geneva 2
SWITZERLAND

S. TEWUNGWA
Programme Officer IPCC
C/O WMO
P.O. Box 2300
1211 Geneva 2
SWITZERLAND

ANNEX B

TIMETABLE FOR THE COMPLETION OF THE IPCC FIRST ASSESSMENT REPORT

1990

1 May	WG + Special Committee drafts received in the IPCC Secretariat (except for the report of the Energy and Industry Subgroup (EIS) of WG III).
4 May	First mailing of Part II and the 4 policy-makers' summaries without the EIS report (English only).
7 May	EIS report received in the IPCC Secretariat.
10 May	Second mailing of Part II and the 4 policy-makers' summaries including the EIS report (English only).
23-25 May	WG I Plenary, Windsor, UK.
31- 1 June	Special Committee Plenary, Geneva, Switzerland.
4 June	Camera-ready copies (and diskettes)* of the report (a) of WG I and (b) of the Special Committee received in the IPCC Secretariat, together with the policy-makers' summaries.
5 June	Distribution of the report (a) of WG I and (b) of the Special Committee to the translators (the policy-makers' summaries will be translated by the IPCC Secretariat).
28-31 May	WG II Plenary, Moscow, USSR.
11 June	Camera-ready copies (and diskettes)* of the report of WG II received in the IPCC Secretariat, together with the policy-makers' summaries.
12 June	Distribution of the report of WG II to the translators (the policy-makers' summary will be translated by the IPCC Secretariat).
5- 8 June	WG III Plenary, Geneva, Switzerland.

---

* See format guidelines (Annex C) for requirements.

1990

14 June	Camera-ready copies (and diskettes)* of the report of WG III received in the IPCC Secretariat, together with the policy-makers' summary.
15 June	Distribution of the report of WG III to the translators (the policy-makers' summary will be translated by the IPCC Secretariat).
	First mailing of the WG and Special Committee reports and the policy-makers' summaries (in English) to all member governments of WMO and UN and others (intergovernmental organizations, NGO's, individuals) as per IPCC instructions.
18-20 June	IPCC Drafting Committee to complete the draft IPCC summary. Draft IPCC summary to be translated by the IPCC Secretariat.
16 July	All translated material received in the IPCC Secretariat.
23 July	Second mailing of the IPCC first assessment report (containing the draft IPCC summary) to all member governments of WMO and UN and to others as instructed by IPCC.
27-30 August	Fourth Plenary of IPCC, Sundsvall, Sweden.
1 September	IPCC first assessment report completed.

---

* See format guidelines (Annex C) for requirements.

ANNEX C

IPCC FIRST ASSESSMENT REPORT

FORMAT GUIDELINES FOR DRAFTS

(i) Style, layout, etc.

- Page size A4, Typeface: 12 point, HELVETICA.
  Double column, justified (see also iii and vi below).
  Colour available where necessary.

- Use headings and "bullets" where appropriate.

- At the head of each chapter/section, a short, executive summary of the main conclusions may be placed. "Boxes" could also be used to offer basic descriptions of the important concepts or terms, which can be aimed at the non-specialist.

(ii) Numbering

- Sub-sections, etc., should be numbered using a decimal system of increasing precision, e.g:

  Section 9

  9.4 How might sea level change in the future
  9.4.1 Glaciers
  9.4.1.1 Sahara
  9.4.1.2 Gobi
  9.4.2 Ice sheets

- Graphs, diagrams and tables should follow the same numbering system. (This will ease adding, deleting or revising a graph, diagram or table without disturbing the other sections/chapters).

- Each page should be numbered.

(iii) Line numbering for drafts and help to translators for revisions

See attached sample for numbering every line to facilitate communicating revisions to translators. The line numbers should be placed between two characters that do not appear in the text of the report. Examples of such characters are: { } or \ \ or { \. The sequence of the numbering should be as follows:

{1 digit or 2 digit line no.} Tab.

Then while printing the final version, the line numbers can be stripped easily.

o It is suggested that the draft/translators' copies (and diskettes) be double-spaced, single narrow column (see sample). When the text is finalized, it can be cast into single-spaced, double-column format easily by WMO Printing Unit. (See also vi below).

(iv) Referencing

Use the "Science" style of numbers in parentheses (this saves space and improves the flow).

All references should be given in full, in a single appendix at the end (i.e., not for separate sections).

References should be to original papers as well as to other reviews (e.g., Scope) where appropriate. (See attached sample).

(v) Annexes

Should be limited to:

* repetitive figures or tables;
* description of new work (e.g., transient results, climate observations analysis).

(vi) Word processing software

Please provide text on both 5-1/4 inch and 3-1/2 inch diskettes.

Double-spaced, single narrow column line-numbered text on diskettes is acceptable even for the final text.

WordPerfect (up to 5.0) is preferred. However, Lotus, Multimate, Word, and Wordstar are all acceptable.

All McIntosh software acceptable.

Example of Style, Lay-out, etc.

GREENHOUSE GASES AND OTHER FORCING AGENTS

IPCC REPORT SECTION 1 DRAFT

1. INTRODUCTION

1.1 Climate Forcing Agents

(To be prepared by lead authors)
Climate forcing agents: external (sun) internal: - albedo, surface (ice; vegetation; ...) and atmosphere (clouds; tropo-/stratospheric aerosols)

Internal agents may change due to human impact, feedbacks, stochastically.
Emphasis here: anthropogenic change.

1.2 Changes in Greenhouse Gases and Other Climatic Agents

(Contribution 1a: G Pearman)
Increase since pre-industrial time, observations (Figure) for different gases (CO_2, methane, N_2O, CFMs); pre-industrial levels. (Only short summary here).

Sources and sinks for the different gases; natural and anthropogenic sources/sinks. Comparison of the geochemical cycles; only CO_2 is stored (significantly) in other reservoirs (ocean; biota) with which the atmosphere exchanges.

1.3 Changes in Other Climate Factors

(To be added later by other workshop)

2. CARBON DIOXIDE

2.1 The Cycle of Carbon in Nature

CO_2 is a natural constituent of the atmosphere, important for plants (main nutrient besides water) and for climate. Is cycled between various reservoirs: atmosphere, oceans (inorganic C), land biota and marine biota; on geological time scales also sediments.

- Figure and/or Table with reservoir sizes and fluxes.

Shortly discuss size/importance/time scales of reservoirs and fluxes.
Atmospheric CO_2 :

- Figure for atmospheric increase (direct measurements incl. seasonal variations

- Figure with combined ice-core (Siple) - Mauna Loa curve, 1750-1988

Figure X shows a steady increase from year to year and rather regular seasonal variations. The seasonal variations, with a maximum in spring and a minimum in autumn, are a natural phenomenon, sue to the uptake of CO_2 by the vegetation (photosynthesis) in summer and release by decay of plant material in winter. The increase has led to a mean annual value of (350) ppm in 1988, which is about (25) percent above the pre-industrial value.

There exists now a whole network of CO_2 monitoring stations (contribution 1b: R Gammon). Secular increase observed at all stations, without exception. Rel. small difference between individual stations due to distributions of sources and sinks at the surface and to atmospheric transport (contribution 2: M Heimann).

- Figure with CO_2 input from fossil fuels (Rotty function)

Man-made CO_2 sources: fossil fuel combustion, deforestation and land use: not very well known.
Fossil fuel combustion: total emission known to ± 10%.
Geographic distribution: northern /southern hemisphere difference; large difference between countries, depending on state of economic development (examples) (contribution 3: M Heimann).

Deforestation and land use: The total release of carbon to the atmosphere from changes in land use, primarily deforestation, between 1850/60 and 1986 was about 115 ± 25 GtC. Figure 1 shows the contributions of the temperate

zones and the tropics to the total biotic flux. Although the greatest releases of carbon in the nineteenth and early twentieth centuries were from lands in the temperate zone, the major source of carbon during the last several decades has been from deforestation in the tropics. The maximum annual flux from the temperate regions, about 0.5 GtC, was never as large as the current tropical release. Estimates of the flux in 1980 range from 0.4 to 2.5 GtC (Houghton et al, 1985, 1987, 1988; Detwiler and Hall, 1988). Virtually all of this flux was from the tropics; lands outside the tropics are believed to have been close to balanced with respect to carbon (Melillo et al, 1988). Since 1980 there has been no systematic appraisal of deforestation in the tropics, but the few regions for which data exist suggest that the annual flux is higher now than it was in 1980.

Carbon Isotopes: Anthropogenic emissions different in isotopic composition from atmospheric CO_2 (describe), -> isotopic composition of atmospheric CO_2 expected to change with time is actually observed (Suess effect) (contribution 5: U Siegenthaler)

- Figure: decreases of ^{14}C and $\partial\ ^{13}C$ in atmosphere??

2.2 How much CO_2 remains in the atmosphere?

Airborne fraction: During the period 1860 top 1986, xxx ± yy GtC (Gigatons of carbon; 1Gt = 1 billion metric tons; the pre-industrial atmospheric CO_2 concentration of 280 ppm corresponds to 594 GtC) were released into the atmosphere due to fossil fuel combustion; the current rate of release is 5.5 GtC per year. The amount of CO_2 produced by deforestation and land use in the same period is, according to the best estimates, 150±50 GtC, and the corresponding current rate 1.6±0.8 GtC (Bolin, 1985). (R Houghton - check!) The atmospheric increase from 280 ppm to (350) ppm in 1986 corresponds to an airborne fraction of (41) percent of the total emission. The increase since the start of the Mauna Loa measurements (1958) corresponds to about (55) percent of the fossil CO_2 released during that period. The actual emissions, including the contributions from biomass destruction, were larger and thus the actual airborne fraction smaller, ca (...) %.

In order to predict what the future atmospheric CO_2 increase will be for a given scenario of fossil energy consumption and deforestation, one must know how the airborne fraction will be. For a first-order guess, some authors have simply assumed that 50 % of the annual emissions remain in the atmosphere. It must, however, clearly be stated that this is indeed nothing more than a first order guess, because the airborne fraction depends on the time history of the emissions. For instance, if all emissions were suddenly stopped, the atmospheric concentration would not stay constant, as would follow of a constant fraction of the annual emissions remained airborne, but it would decline, because the deeper layers of the ocean would continue to take up excess CO_2 from the atmosphere. For this reason, it is necessary to understand in detail the mechanisms governing the oceanic uptake of excess CO_2, ie. the transfer of CO_2 from the surface to the deep ocean.

The role of the ocean

The increase of the CO_2 concentration in the atmosphere can precisely be monitored by direct measurements. This is so, because the atmosphere away from surface sources and sinks is relatively well mixed, with a global mixing time of the order of one year, so that measurements done at any two background stations yield the same annual mean CO2 concentration value within one or a few ppm. In the ocean, this is different: the CO_2 system is influenced by biological, chemical and physical processes and exhibits therefore significant spatial and temporal variability. Therefore, a large number of high-precision data is needed to directly observe the uptake of carbon in the ocean.

- Mention direct observations of surface water pCO_2 (Takahashi, Brewer) increase and attempts to reconstruct the ΣCO_2 increase in the ocean (Chen, Brewer). (Contribution 6: P Brewer or R Gammon).

Example for Referencing

prolonging the excess moisture surplus of spring well into summer or by causing further drying once the surface moisture shows a deficit.

Because of the highly parameterized nature of hydrology in these models, the corresponding lack of appropriate observed data, and the highly complex nature of surface hydrology, it is difficult to determine the correct model calibration for these processes. Runoff data based on annual mean stream flow, even though not quite appropriate for comparison with runoff as computed by the models, indicate that the NCAR model has soil-moisture amounts that are too low, while the GFDL model may have somewhat too much soil moisture in the control case. If this is a reasonable estimate, the analyses in this paper suggest that, when both models use the highly parameterized bucket method, the NCAR model is underestimating summer dryness from increased CO_2, while the GFDL model is somewhat overestimating summer dryness.

Acknowledgments. We acknowledge the kind cooperation of Syukuro Manabe and Richard Wetherald at GFDL in allowing us to use their results in this comparison. Useful comments from Wetherald, John Mitchell, and Michael MacCracken have been taken into account in the final manuscript. We thank Lynda VerPlank for managing the model runs, Ann Modahl for text editing, Cynthia Vangor Emory for word processing, and Melanie Pappas for drafting the figures.

REFERENCES

Anthes, R. A., 1984: Enhancement of convective precipitation by mesoscale variations in vegetative covering in semi-arid regions. *J. Climate Appl. Meteor.*, 23, 541–554.

——, and Y.-H. Kuo, 1986: The influence of soil moisture on circulations over North America on short-time scales. *Jerome Namias Commemorative Volume, Namias Symp.*, La Jolla, Scripps Institution of Oceanography Ref. Ser. 86-17, University of California, 132–147.

Barnston, A. G., and P. T. Schickedanz, 1984: The effect of irrigation on warm season precipitation in the southern Great Plains. *J. Climate Appl. Meteor.*, 23, 865–888.

Briegleb, B. P., P. Minnis, V. Ramanathan and E. Harrison, 1986: Comparison of regional clear-sky albedoes inferred from satellite observations and model computations. *J. Climate Appl. Meteor.*, 25, 214–226.

Das, P. K., and H. S. Bedi, 1981: A numerical model of the monsoon trough. *Monsoon Dynamics*, Sir J. Lighthill, and R. P. Pearce, Eds., Cambridge University Press, 351–363.

Hansen, J., A. Lacis, D. Rind, G. Russell, P. Stone, I. Fung, R. Ruedy and J. Lerner, 1984: Climate sensitivity: Analysis of feedback mechanisms. *Climate Processes and Climate Sensitivity. Geophys. Monogr. No. 29*, Maurice Ewing, Vol. 5, 130–163.

Kellogg, W. W., and Z.-C. Zhao, 1988: Sensitivity of soil moisture to doubling of carbon dioxide in climate model experiments: Part I. North America. *J. Climate*, in press.

Lvovitch, M. I., and S. P. Ovchinnikov, 1964: *Physical-Geographical Atlas of the World.* Acad. of Sciences, USSR, and Chief Administration of Geodesy and Cartography, State Geodetic Committee, Moscow, 298 pp. [In Russian].

Manabe, S., 1969: Climate and the ocean circulation: I. The atmospheric circulation and the hydrology of the earth's surface. *Mon. Wea. Rev.*, 97, 739–774.

——, and R. J. Stouffer, 1980: Sensitivity of a global climate model to an increase in CO_2 concentration in the atmosphere. *J. Geophys. Res.*, 85, 5529–5554.

——, and R. T. Wetherald, 1987: Large-scale changes of soil wetness induced by an increase in atmospheric carbon dioxide. *J. Atmos. Sci.*, 44, 1211–1235.

——, —— and R. J. Stouffer, 1981: Summer dryness due to an increase in atmospheric CO_2 concentration. *Clim. Change*, 3, 347–386.

Meehl, G. A., 1984: Soil moisture, a simple mixed layer ocean and the Southern Hemisphere semiannual oscillation in the NCAR Community Climate Model. *Studies in Climate*, H. van Loon, Ed., NCAR/TN-227+STR, National Center for Atmospheric Research, NTIS No. PB84 196385, 115–150.

——, and W. M. Washington, 1985: Sea surface temperatures computed by a simple ocean mixed layer coupled to an atmospheric GCM. *J. Phys. Oceanogr.*, 15, 92–104.

Mitchell, J. F. B., 1983: The hydrological cycle as simulated by an atmospheric general circulation model. *Variations in the Global Water Budget*, A. Street-Perrott et al., Eds., D. Reidel, 429–446.

——, and G. Lupton, 1984: A 4 × CO_2 integration with prescribed changes in sea surface temperatures. *Progress in Biometeorology*, 3, 353–374.

——, C. A. Wilson and W. M. Cunnington, 1987: On CO_2 climate sensitivity and model dependence of results. *Quart. J. Roy. Meteor. Soc.*, 113, 293–322.

Namias, J., 1959: Persistence of mid-tropospheric circulation between adjacent months and seasons. *The Atmosphere and the Sea in Motion*, B. Bolin, Ed., Rossby Memorial Vol., 240–248.

Physick, W. L., 1980: Numerical experiments on the inland penetration of the sea breeze. *Quart. J. Roy. Meteor. Soc.*, 106, 735–746.

Rind, D., 1982: The influence of ground moisture conditions in North America on summer climate as modeled in the GISS GCM. *Mon. Wea. Rev.*, 110, 1487–1494.

Rowntree, P. R., and J. A. Bolton, 1983: Simulations of the atmospheric response to soil moisture anomalies over Europe. *Quart. J. Roy. Meteor. Soc.*, 109, 501–526.

Schlesinger, M. E., and J. F. B. Mitchell, 1985: Model projections of the equilibrium climatic response to increased carbon dioxide. *Projecting the Climatic Effects of Increasing Carbon Dioxide*, M. C. MacCracken, and F. M. Luther, Eds., U.S. Dept. of Energy, DOE/ER-0237, 81–147.

Shukla, J., and Y. Mintz, 1982: Influence of land-surface evapotranspiration on the earth's climate. *Science*, 215, 1498–1500.

Slivitsky, M., 1978: *Hydrological Atlas of Canada.* Canadian National Committee for the International Hydrological Decade, Minister of Supply and Services, Ottawa, 34 pp.

Walker, J., and P. R. Rowntree, 1977: The effect of soil moisture on circulation and rainfall in a tropical model. *Quart. J. Roy. Meteor. Soc.*, 103, 29–46.

Washington, W. M., and G. A. Meehl, 1984: Seasonal cycle experiment on the climate sensitivity due to a doubling of CO_2 with an atmospheric general circulation model coupled to a simple mixed layer ocean model. *J. Geophys. Res.*, 89, 9475–9503.

——, and C. L. Parkinson, 1986: *An Introduction to Three-Dimensional Climate Modeling*, University Science Books, 422 pp.

Webster, P. J., 1983: Mechanisms of monsoon low-frequency variability: Surface hydrological effects. *J. Atmos. Sci.*, 40, 2110–2124.

——, K. M. Lau and L. Chou, 1977: Mechanisms effecting the state, evolution, and transition of the planetary scale monsoon. *Pure Appl. Geophys.*, 115, 1463–1491.

Wilson, C. A., and J. F. B. Mitchell, 1987: A 2 × CO_2 climate sensitivity experiment with a global climate model including a simple ocean. *J. Geophys. Res.*, in press.

Wilson, M. F., A. Henderson-Sellers, R. E. Dickinson and P. J. Kennedy, 1987: Sensitivity of the Biosphere-Atmosphere Transfer Scheme (BATS) to the inclusion of variable soil characteristics. *J. Climate Appl. Meteor.*, 26, 341–362.

Winstanley, W. D., 1974: Seasonal rainfall forecasting in West Africa. *Nature*, 248, p. 464.

Yeh, T.-C., R. T. Wetherald and S. Manabe, 1984: The effect of soil moisture on the short-term climate and hydrology change—A numerical experiment. *Mon. Wea. Rev.*, 112, 474–490.

Sample of Line Numbering

{1} Section 10

{2} 10 Rise in potential sea level

{3} 10.1 Deserts

{4} Deserts are the result of etc etc etcare the result of

{5} etc etc etcare the result of etc etc etcare the result of etc etc

{6} etcare the result of etc etc etcare the result of etc etc etcare

{7} the result of etc etc etcare the result of etc etc etcare the result

{8} of etc etc etcare the result of etc etc etcare the result of etc

{9} etc etcare the result of etc etc etcare the result of etc etc etc

{10} 10.1.1 Antarctica

{12} The great Antarctic Desert started to form etc etc etcstarted to

{13} form etc etc etcstarted to form etc etc etcstarted to form etc etc

{14} etcstarted to form etc etc etcstarted to form etc etc etcstarted to

{15} form etc etc etc

{10} 10.1.2 Greenland

{12} The Greenland Desert started to form etc etc etcstarted to

{13} become obvious

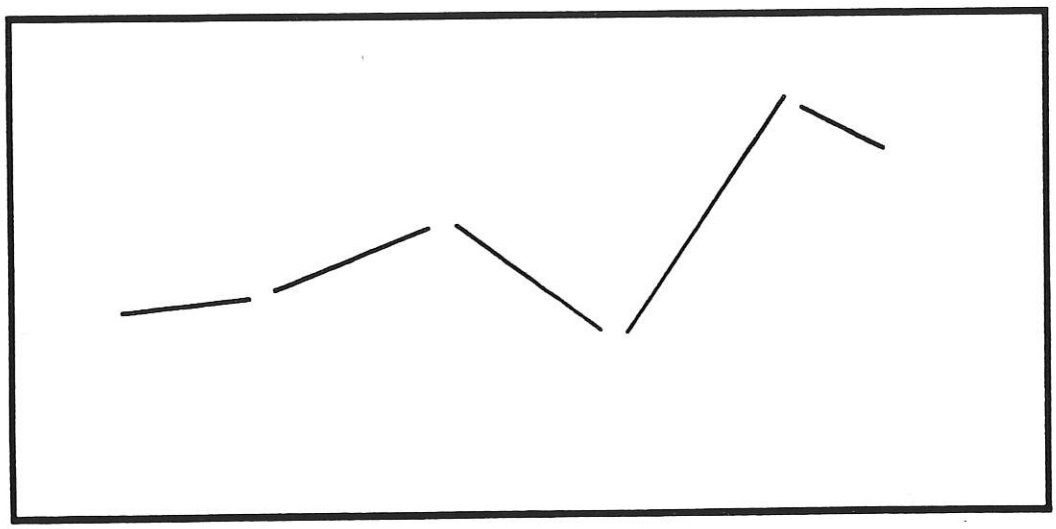

***Figure 10.1.7** The great Antarctic Desert :water vapour*

{12} form etc etc etcstarted to form etc etc etcstarted to form etc etc

{14} etcstarted to form etc etc etcstarted to form etc etc etcstarted to

{15} form etc etc etc

ANNEX D

LIST OF IPCC MEETINGS

Date	Venue	Meeting/activity	Organization
AUGUST			
8	Toronto	Ecosystems subgroups	IPCC WGI/WGII
SEPTEMBER			
11-15	Berne	Workshop: Greenhouse Gases Subgroup	IPCC WGI
18-20	Toronto	Meeting of Subgroup on Cryosphere and Permafrost	IPCC WGII
18-21	Tokyo Japan	Subgroup on Energy, Industry, Transportation, Settlements and Human Health	IPCC WGII
21-22 (postponed)	Paris	Agriculture and Forestry Subgroup	IPCC WGII/OECD*
25-26	Pangbourne, UK	Workshop: Sea level rise Subgroup	IPCC WGI/Univ. of East Anglia
28-29	Paris	IPCC Special Committee on Developing Countries	Govt. of France/ IPCC
28-29	Geneva	Energy and Industry Subgroup	IPCC WGIII
OCTOBER			
2-6	Geneva	Second session	IPCC WGIII
2-6	Moscow	Climate Change and World Fisheries: Subgroup on World Oceans and Cryosphere	IPCC WGII
9-11	Joensuu	Workshop on Boreal Forests: (AFOS)**	IPCC WGIII

---

* OECD - Organization for Economic Co-operation & Development
** AFOS - Agriculture and Forestry Subgroup WGIII

18-20	Boston	Workshop: Greenhouse gases (non-CO_2)	IPCC WGI
23-24	USA	Workshop: Ecosystems	IPCC WGI
26-27	Geneva	Hydrology and Water Resources Subgroup	IPCC WGII
30-31	Bonn	Workshop on Temperate Forests (AFOS)	IPCC WGIII
30-1 Nov.	Geneva	Resource Use & Management Subgroup	IPCC WGIII
31-3 Nov.	Geneva	Second session	IPCC WGII
NOVEMBER			
2-3	Geneva	Agriculture & Forestry Subgroup	IPCC WGIII
6-7	UK	Workshop: Ecosystems	IPCC WGI
20-21	Bath UK	Paleo-analogue Climate Forecasting	IPCC WGI/WGII
27-1 Dec.	Miami	Coastal Zone Management Subgroup	IPCC WGIII
29-1 Dec.	Broadway UK	Climate Trends Subgroup	IPCC WGI
DECEMBER			
11-15	Brisbane Australia	Subgroup on Model Predictions and Validation	IPCC WGI
12-14	Washington	Agricultural Emissions: AFOS	IPCC WGIII

SECTION B: 1990

JANUARY			
4-5	Reading UK	Workshop: Relative Importance of Climate Forcing Agencies	IPCC WGI
9-12	Sao Paulo Brazil	Workshop: Tropical Forests, WGIII (AFOS)	Govts. of USA/ Brazil/IPCC WGIII
10-11	Washington D.C.	Workshop Comparison of Observations and Simulations	IPCC WGI

11-12	Woods Hole USA	Section 10 Lead Authors	IPCC WGI
17-19	Asheville USA	Section 7 Lead Authors	IPCC WGI
22-24	Bracknell UK	Section 1 Lead Authors	IPCC WGI
25-26	Utrecht Netherlands	Section 9 Lead Authors	IPCC WGI

FEBRUARY

2	Washington	Informal officers RSWG meeting	IPCC WG III
5-7	Washington	IPCC, Third Session	Govt. of USA/IPCC
8	Washington	IPCC Bureau, Second Session	Govt. of USA/IPCC
8-9	Washington	Energy and Industry Subgroup	IPCC WGIII
9	Washington	IPCC Special Committee on Developing Countries Second Session	Govt. of USA/IPCC
19-23	Perth Australia	Coastal Zone Management Subgroup	IPCC WGIII
26-2 Mar.	Edinburgh UK	Lead Authors' Meeting	IPCC WGI
26-2 Mar.	Nalchik USSR	Co-chairmen meeting	IPCC WGII

APRIL

5-6	Paris	Special Committee/ Drafting Group	IPCC Special Committee
23-25	Geneva	Resource Use and Management Subgroup	IPCC WGIII
26-27	Geneva	Subgroup on Agriculture, Forestry and other Human activities	IPCC WGIII

MAY			
23-25	Windsor, UK	Second session, approval of report of the WG	Govt. of UK/ IPCC WGI
28-31	Moscow	Third session, approval of report of the WG	Govt. of USSR/ WGII
31 May - 1 June	Geneva	Special Committee/ open ended group	IPCC Special Committee
JUNE			
5-8	Geneva	Third Session, approval of report of the WG	IPCC WGIII
18-20	Geneva	Drafting Committee	IPCC
AUGUST			
27-30	Sundsvall, Sweden	IPCC fourth session, approval of first assessment report of IPCC	Govt. Sweden/IPCC
OCTOBER			
29-7 Nov.	Geneva	Second World Climate Conference	WMO/UNEP/UNESCO ICSU

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

IPCC

CHAIR: SWEDEN, VICE CHAIR: SAUDI ARABIA
RAPPORTEUR: NIGERIA

IPCC BUREAU

(15 MEMBERS)
CO-ORDINATING BODY DURING IPCC INTERSESSIONALS

WORKING GROUP I
SCIENCE

CHAIR: UK
VICE-CHAIRS:
BRAZIL
SENEGAL

WORKING GROUP II
IMPACTS

CHAIR: USSR
VICE-CHAIRS:
AUSTRALIA
JAPAN

WORKING GROUP III
POLICY

CHAIR: USA
VICE-CHAIRS:
CANADA
CHINA
MALTA
NETHERLANDS
ZIMBABWE

SPEC. COMMITTEE
DEVELOPING Cs.

CHAIR: FRANCE
ALGERIA
BRAZIL
INDIA
INDONESIA
JAPAN
KENYA
NORWAY
USA
USSR

WMO/UNEP JOINT IPCC SECRETARIAT
(LOCATED AT WMO, GENEVA)