



Climate change in Sudan and related tasks for the science. Extreme events and Managing Risks

Outreach Event on the Role and Activities of the Intergovernmental Panel on Climate Change (IPCC) Sudan Khartoum, 12 – 13 August 2018

> Dr. Abdalla Khyar U of K - IES

Climate of in Sudan

The climate ranges from arid in the north to tropical wet-in the south.

Desert regions in central and northern Sudan are among the driest and the sunniest places on Earth. The sunshine duration is always uninterrupted year-round and soar to above 4,000 hours in the best cases per year, or about 91% of the time and the sky is cloudless all the time.

The bright sunshine duration hours vary from 11.3 hours in Wadi Halfa to 5.3 hours in Ed Damazine.

Temperatures do not vary greatly with the season at any location; the most significant climatic variables are rainfall and the length of the dry season. Variations in the length of the dry season depend on which of two air flows predominates, dry northeasterly winds from the Arabian Peninsula or moist southwesterly winds from the Congo River Basin and the Atlantic Ocean. The rainfall increases from north to south and the annual amount is zero millimeters in the extreme north of the country rising to 500 mm in central Sudan, to more than 800 mm in the southern parts of the country.

OOPM EDT 25-JUN-08

Sources of moisture

Η

2008 AccuWeather, Inc.

AccuWeather.com

Η

Temperature Anomalies



Dongola Minimum temperature anomalies





El Gadarif Maximum temperature anomalies





Elfasher Minimum temperature anomalies

Elfaser Maximum Temperature Anomalies





Edamazine Minimum temperature anomalies

Edamazine Maximum temperature anomalies





Khartoum Minimum temperature anomalies

Khartoum Maximum Temperature Anomalies



Rainfall Anomalies

Dongola Rainfall Anomalies



Elgadarif Rainfall Anomalies



Elfasher Rainfall Anomalies



Ed Damazeen Rainfall Anomalies



Khartoum rainfall anomalies





Sudan rainfall climate normal for the period 1941-1970

Sudan rainfall climate normal for the period 1951-1980



Sudan rainfall climate normal for the period 1961-1990



Sudan rainfall climate normal for the period 1971-2000

SUDAN NORMAL RAINFALL IN MM FOR THE PERIOD 1941-1970 COMPARED TO 1971-2000

(Source: Sudan Meteorological Authority, 2002)



Earth's climate has changed over the past century. The atmosphere and oceans have warmed, sea levels have risen, and glaciers and ice sheets have decreased in size. The best available evidence indicates that greenhouse gas emissions from human activities are the main cause. Continuing increases in greenhouse gases will produce further warming and other changes in Earth's physical environment and ecosystems. The science behind these statements is supported by extensive studies based on four main lines of evidence:

Physical principles

established more than a century ago tell us that certain trace gases in the atmosphere, such as carbon dioxide (CO 2) and water vapour, restrict the radiant flow of heat from Earth to space. This mechanism, known as the 'greenhouse effect', keeps Earth's surface and lower atmosphere considerably warmer than they would otherwise be.

➤The record of the distant

past (millions of years) tells us that climate has varied greatly through Earth's history. It has, for example, gone through ten major ice age cycles over approximately the past million years.

Measurements from the recent past

(the last 150 years) tell us that Earth's surface has warmed as atmospheric concentrations of greenhouse gases increased through human activities, and that this warming has led to other environmental changes.

Climate models

allow us to understand the causes of past climate changes, and to project climate change into the future. Together with physical principles and knowledge of past variations, models provide compelling evidence that recent changes are due to increased greenhouse gas concentrations in the atmosphere.

How to understand the climate change and variability through the new progress in the science of climate prediction?

- •Through improving the statistical and dynamical models to predict the seasonal rainfall and temperature;
- Improve the network of the observing system by using the new satellite generation and remote sensing for weather monitoring and risk zones;
- Develop the General Circulation Models (GCMs) to study the interaction between the atmosphere and oceans and their effect on the climate system.

What does science say about options to address climate change?

Societies face choices about how to respond to the consequences of future climate change. Available strategies include reducing emissions, capturing CO2, adaptation and 'geoengineering'. These strategies, which can be combined to some extent, carry different levels of environmental risk and different societal consequences. The role of climate science is to inform decisions by providing the best possible knowledge of climate outcomes and the consequences of alternative courses of action.

EXTREME CLIMATE EVENTS

- Sudan had experienced several cases of natural disasters caused by extreme climate events.
- During the twentieth century, Sudan had witnessed several major drought in 1913, 1940, 1954 a wide spread severe drastic drought in 1983-1984 and a localized drought in the west of Sudan in 1990
- Also the country had witnessed floods caused by the overflow of the Nile River and heavy localized torrential rains in the years 1946, 1988, 1994, 1996, 1997-1999- 2001-2003- 2006 and 2007 – 2010, 2012, 2014, 2016, 2017, impacts were loss in lives and properties
- The frequency of the extreme climate events has increased during 1990-20017





Dust storm at Khartoum May 2012 after noon

Torrential Rains

Blue Nile Floods

CONTRACTOR OF TAXABLE PARTY.

DESCRIPTION OF

Managing the risks: flash floods

Risk Factors

rapid growth of informal settlements

weak building construction

settlements built near rivers and blocked drainage areas Risk Management/Adaptation

Reduce poverty

Strengthen building Improving Drainage System Early Warning System

Managing the risks: Drought

Risk Factors More variable rain Population Growth Ecosystem degradation Poor health and education system Risk Management Improve water management Sustainable farming practice Drought resistant crops Drought forecasting

Socioeconomic impacts

- **Climate change leads to drought which implies to:**
- Limitation in natural resources.
- * Food security collapse. A security collapse. A security collapse. A security collapse. A security collapse.
- Solution Floods > imply to migration of people from rural and remote areas to the cities which causes stress on service infrastructure > spoil stability and security conditions
- ♦ Spreading of epidemic and vector diseases production declines consequently affects the GDP.

Thanks