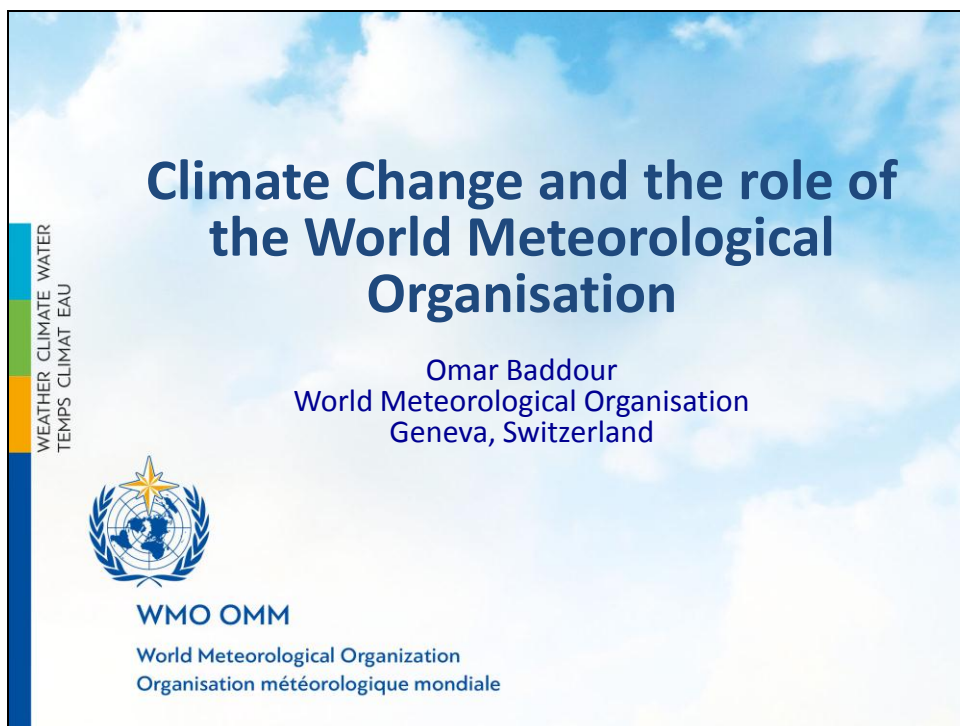


# CLIMATE CHANGE AND THE ROLE OF THE WORLD METEOROLOGICAL ORGANISATION

**OMAR BADDOUR**

World Meteorological Organisation  
Geneva, Switzerland



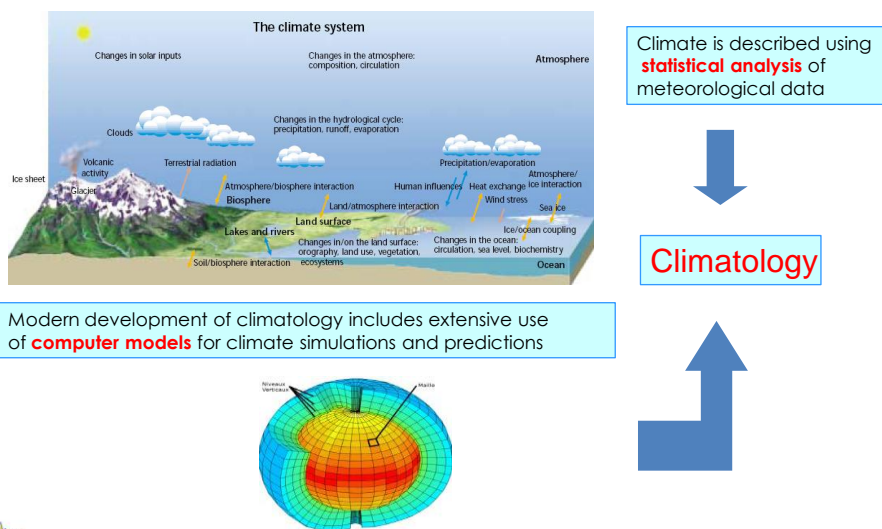
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- 2. Key results on Climate Change** ( From IPCC and WMO)
- 3. The role of WMO; World Climate Programme (WCP)**

1. General background
2. Key results on Climate Change ( From IPCC and WMO)
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### Climatology : A Science for Understanding, Monitoring and Predicting the State of the Climate



## Data Sources

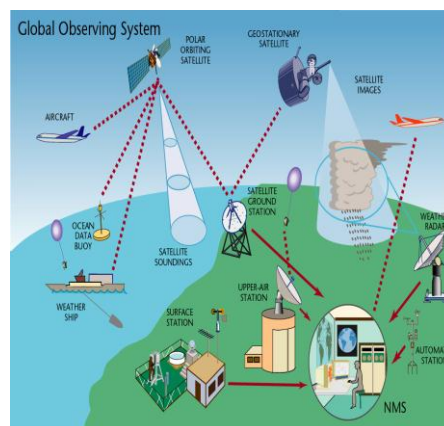
Surface & Ocean in situ  
observing networks

Upper-air networks

Surface remote sensing  
(Radar) networks

Airborne observations

Satellite



## Climate Variability and Climate Change

- Climate varies on annual to decadal time scales  
→ **Climate Variability**
- Changes occurring on extended time-scale (over more than a decade) refer to a changing of the average state of the climate  
→ **Climate Change (IPCC)**



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## **Intergovernmental Panel on Climate Change (IPCC)**

- The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change.
- 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
- It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988



## Intergovernmental Panel on Climate Change (IPCC)

- **The IPCC Working Group I (WG I) assesses the physical scientific aspects of the climate system and climate change.** The main topics assessed by WG I include: changes in greenhouse gases and aerosols in the atmosphere; observed changes in air, land and ocean temperatures, rainfall, glaciers and ice sheets, oceans and sea level; historical and paleoclimatic perspective on climate change; biogeochemistry, carbon cycle, gases and aerosols; satellite data and other data; climate models; climate projections, causes and attribution of climate change.

**The IPCC Working Group II (WG II) assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.** It also takes into consideration the inter-relationship between vulnerability, adaptation and sustainable development. The assessed information is considered by sectors (water resources; ecosystems; food & forests; coastal systems; industry; human health) and regions (Africa; Asia; Australia & New Zealand; Europe; Latin America; North America; Polar Regions; Small Islands).

**The IPCC Working Group III (WG III) assesses options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere.** The main economic sectors are taken into account, both in a near-term and in a long-term perspective. The sectors include energy, transport, buildings, industry, agriculture, forestry, waste management. The WG analyses the costs and benefits of the different approaches to mitigation, considering also the available instruments and policy measures. The approach is more and more solution-oriented.



Climate Change 2013: The Physical Science Basis  
Working Group I contribution to the IPCC Fifth Assessment Report

**Summary for Policymakers**  
Qin Dahe  
Thomas Stocker  
259 Authors from 39 Countries

© Yann Arthus-Bertrand / Alamy

Part 1 of IPCC AR5 released on 27 September 2013

IPCC AR5 Working Group I  
Climate Change 2013: The Physical Science Basis

ipcc  
INTERGOVERNMENTAL PANEL ON climate change

The logos for the World Health Organization (WHO) and the United Nations Environment Programme (UNEP).

## Observed indicators of global climate change (IPCC-5AR, 2013)

### Observed Changes and their Causes

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. {1}

### Observed changes in the climate system

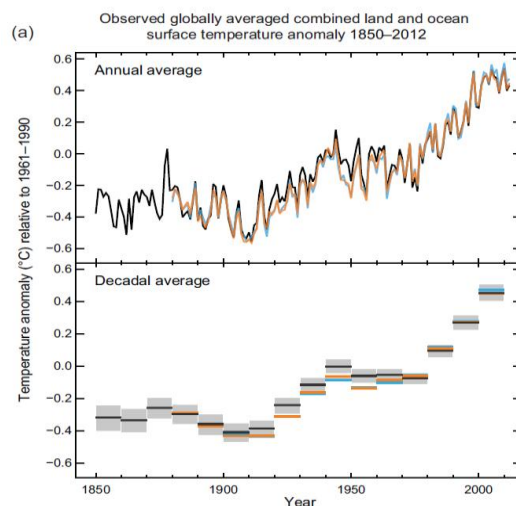
Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. {1.1}

### Impacts of climate change

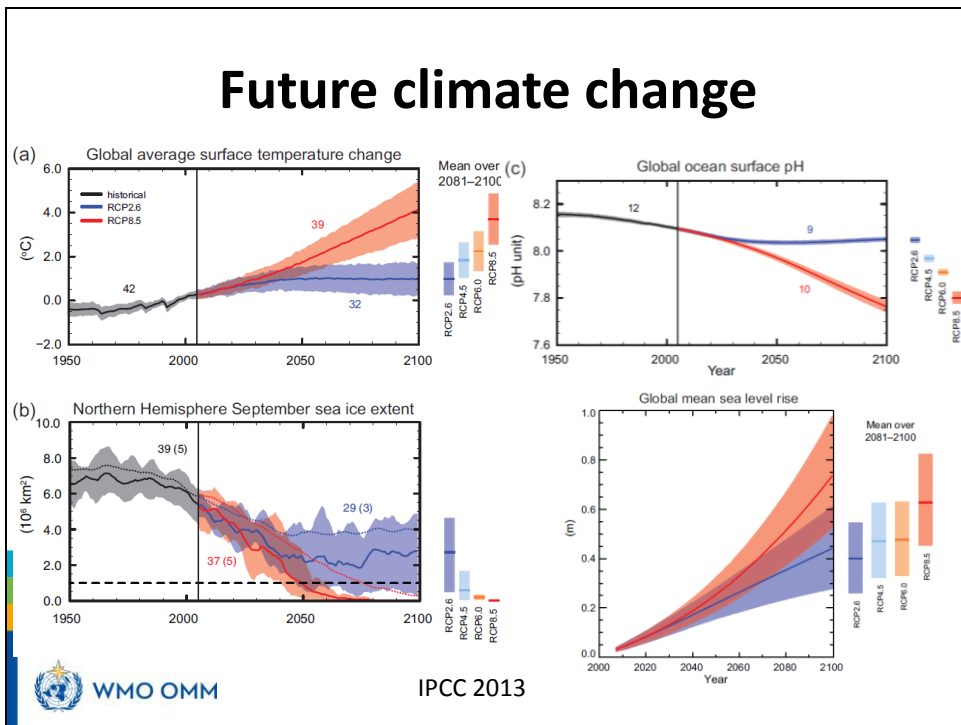
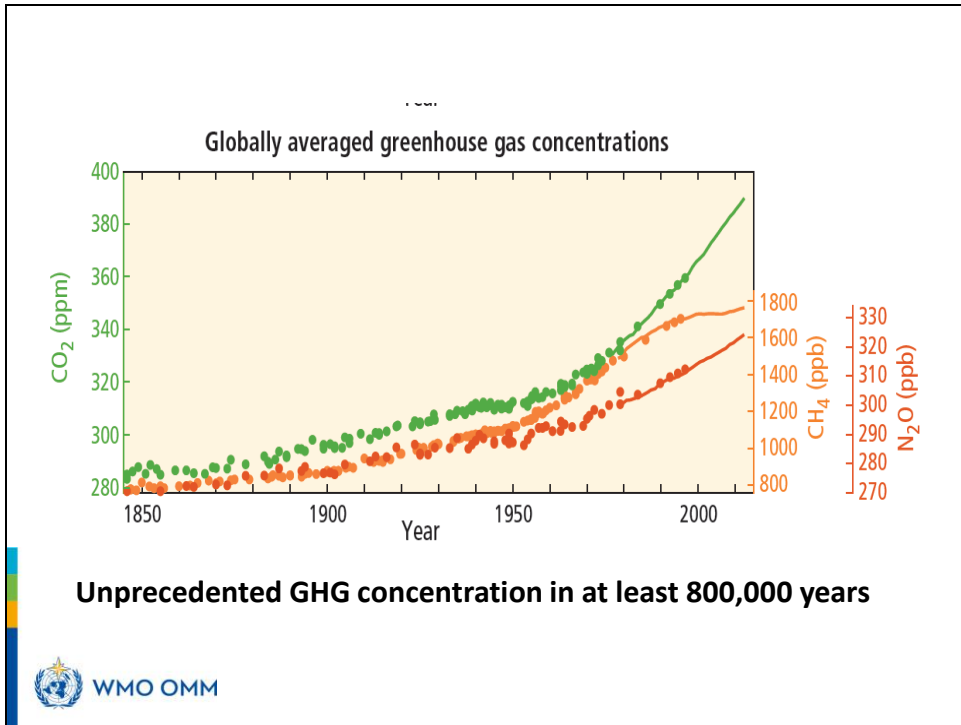
In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate. {1.3.2}



## Observed indicators of global climate change



IPCC 2013

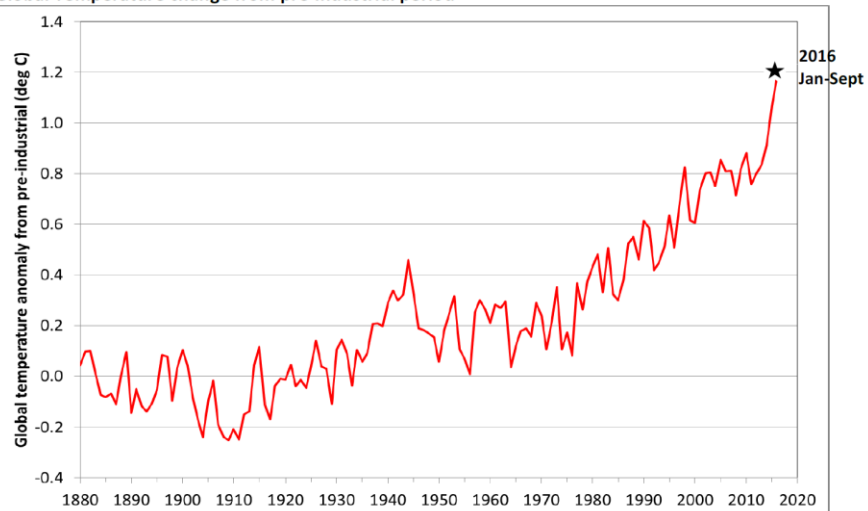


## Key finding from WMO annual climate reports 2015 and 2016

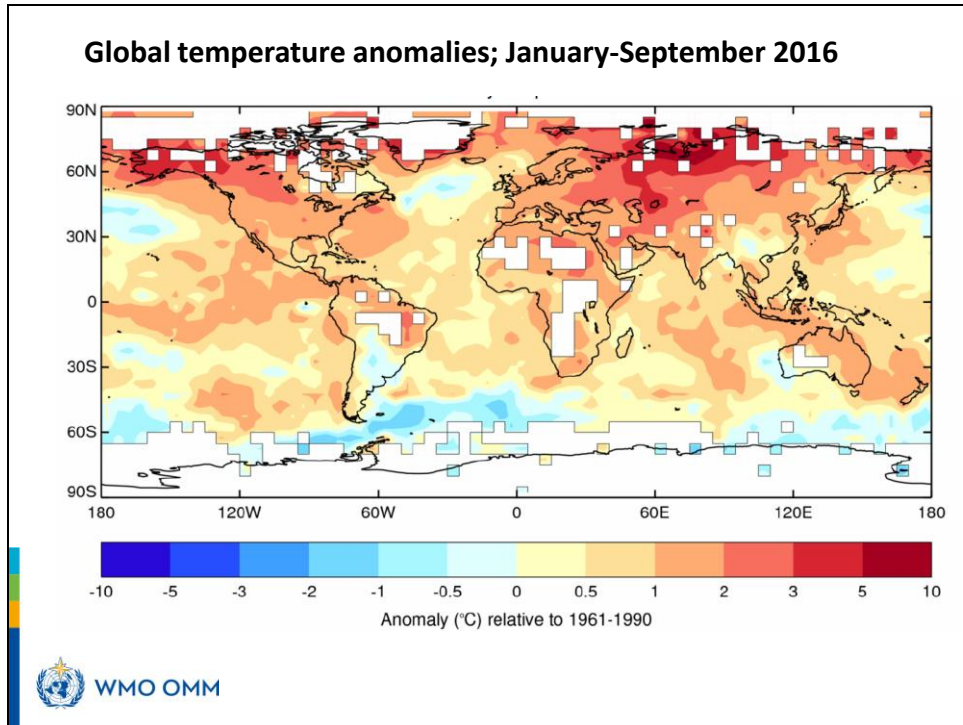


## Rise in global temperatures is accelerating

Global Temperature change from pre-industrial period



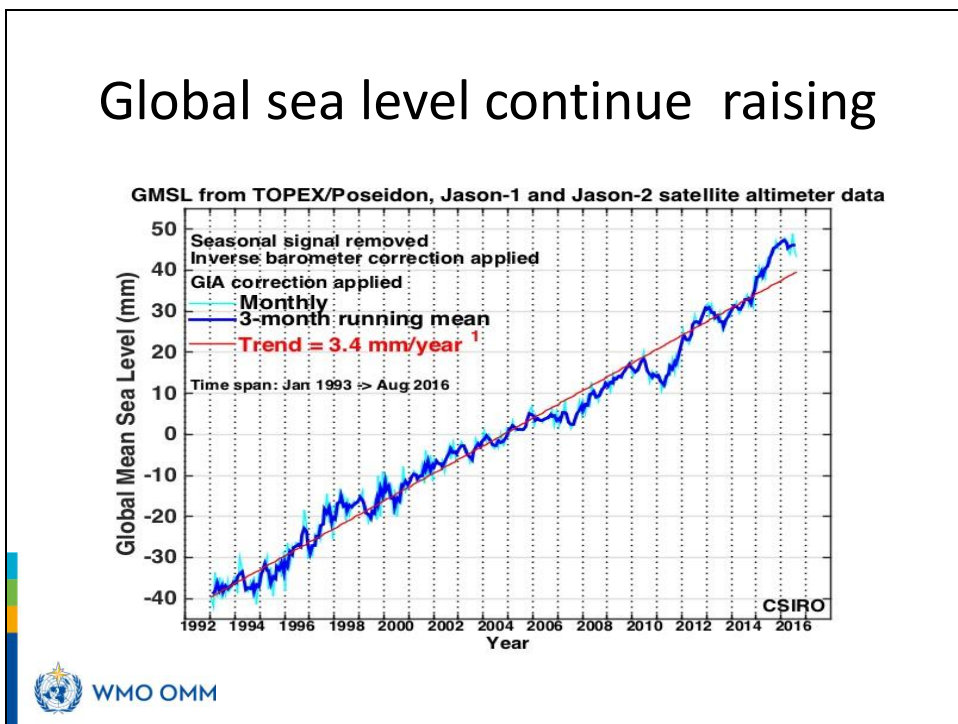
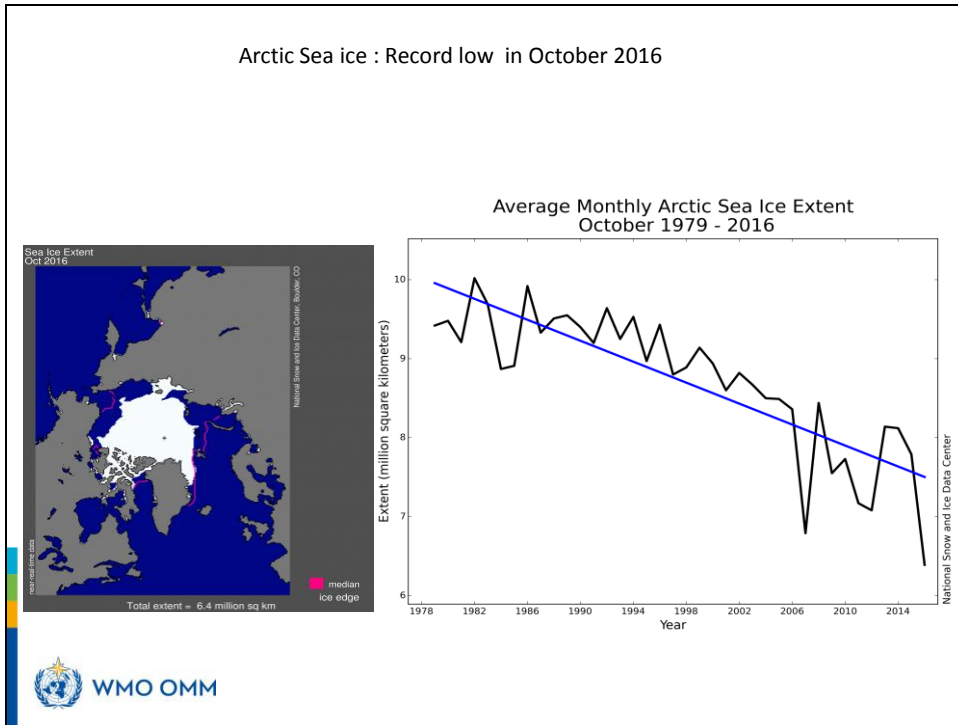




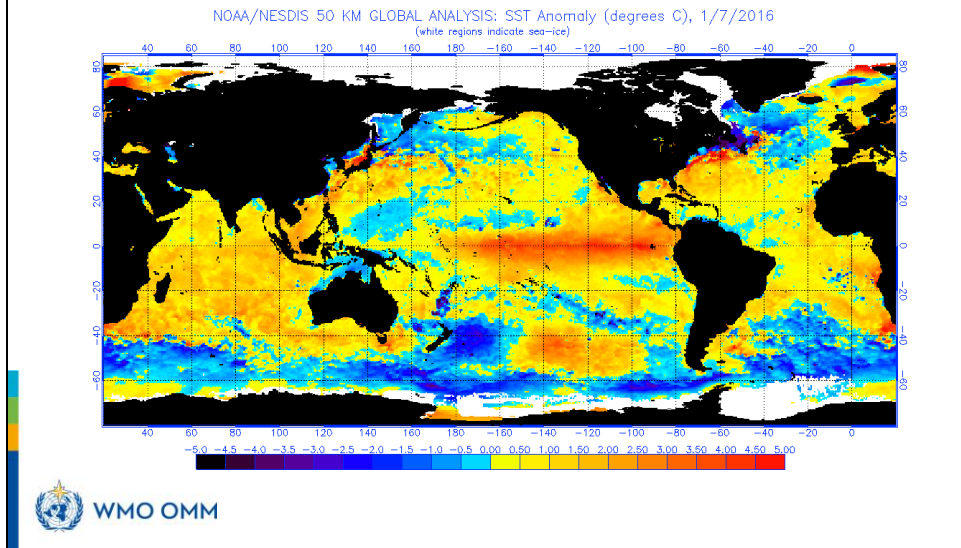
### Green House Gas (GHG) concentrations reached record in 2015

	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
Global abundance in 2015	400.0±0.1 ppm	1845±2 ppb	328.0±0.1 ppb
2015 abundance relative to year 1750 <sup>a</sup>	144%	256%	121%
2014–2015 absolute increase	2.3 ppm	11 ppb	1.0 ppb
2014–2015 relative increase	0.58%	0.60%	0.31%
Mean annual absolute increase during last 10 years	2.08 ppm yr <sup>-1</sup>	6.0 ppb yr <sup>-1</sup>	0.89 ppb yr <sup>-1</sup>

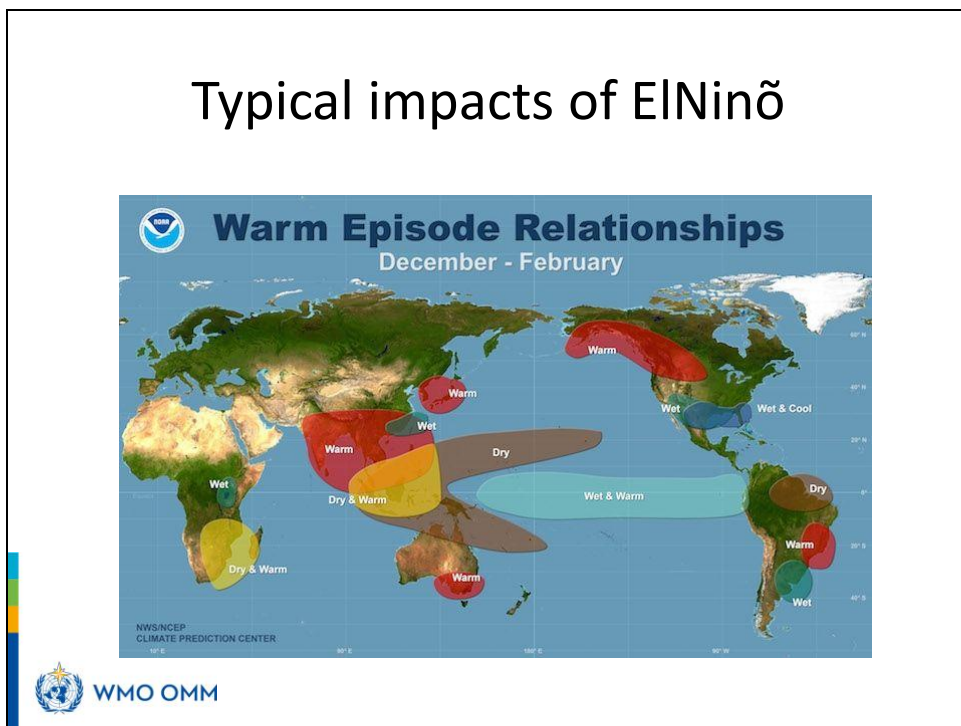
WMO OMM



## One of the strongest El-Nino Event



## Typical impacts of ElNiño



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2. Key results on Climate Change ( From IPCC and WMO)
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## **The role of WMO ; World Climate Programme (WCP)**

*International collaboration on climate data and analysis*

- ✓ On provision and exchange of climate data sets
- ✓ For guidance on assessing climate change nationally and globally
- ✓ Training and capacity development



### Data Rescue, Quality Control Homogenization, and Analysis of Climate Extremes

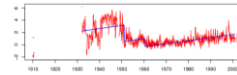
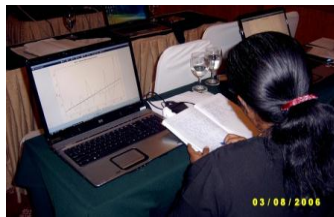
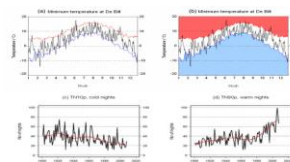


Fig 3: An example of data inhomogeneity in daily maximum anomalies series for station number 644530, Osovo, in the Republic of Congo. The homogeneity testing software detected two large inhomogeneities in 1959 and 1960. To avoid having these inhomogeneities artificially bias the results, data prior 1960 was removed from the analysis, including a few isolated observations in 1910. The rest of the series is considered to be homogeneous.



## WMO Guide to Climatological Practices

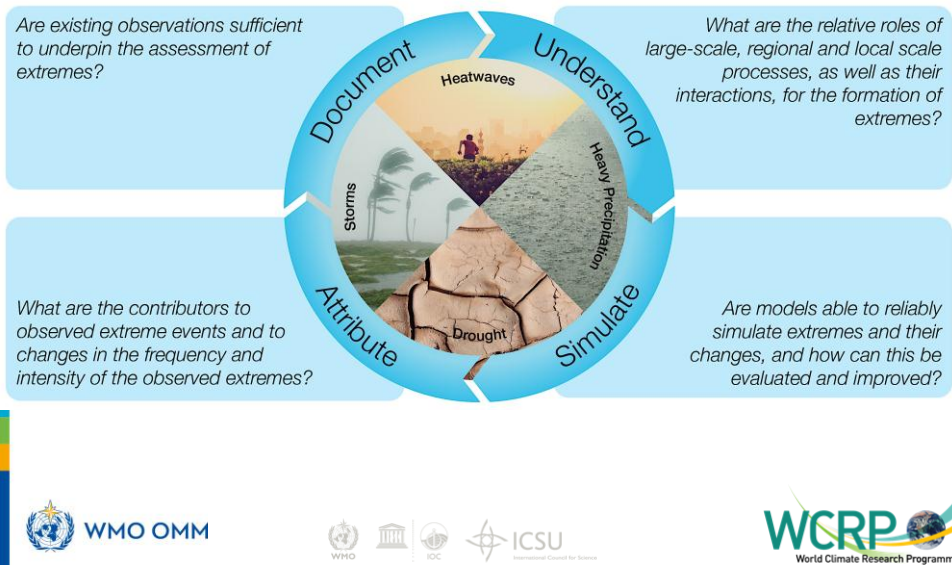
### 6 Chapters

1. Climatology
2. Climate Observations and networks
3. Climate Data Management
4. Characterizing climate from data sets
5. Statistical methods for analysing climate data
6. Climate services and products

[http://www.wmo.int/pages/prog/wcp/ccl/guide/guide\\_climat\\_practices.php](http://www.wmo.int/pages/prog/wcp/ccl/guide/guide_climat_practices.php)



## 4 research questions on Climate & Weather Extremes



## WMO Research Award for Young Scientists



Since 1970, the Award has been granted annually by WMO in order to encourage young scientists, particularly in developing countries, to undertake outstanding research work in all fields of meteorology and hydrology. The award has been granted to young scientists from more than **20 different countries**.

<http://public.wmo.int/en/about-us/awards/wmo-research-award-young-scientists>





WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU

Thank you  
Terima kasih  
شكرا

[obaddour@wmo.int](mailto:obaddour@wmo.int)



WMO OMM  
World Meteorological Organization  
Organisation météorologique mondiale