

# Information and Services on Weather, Climate and Disaster



**WMO OMM**

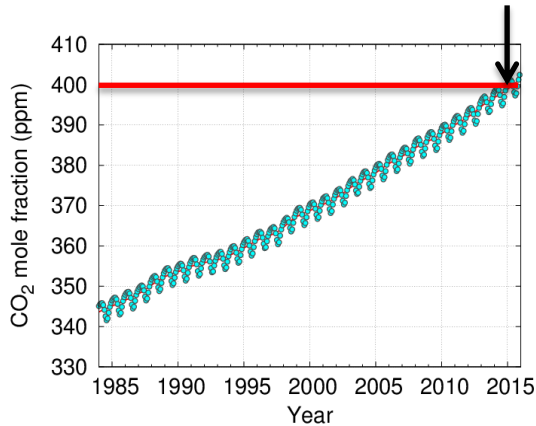
World Meteorological Organization  
Organisation météorologique mondiale

**Boram Lee**  
**World Climate Research Programme**  
**World Meteorological Organization**  
**([blee@wmo.int](mailto:blee@wmo.int))**

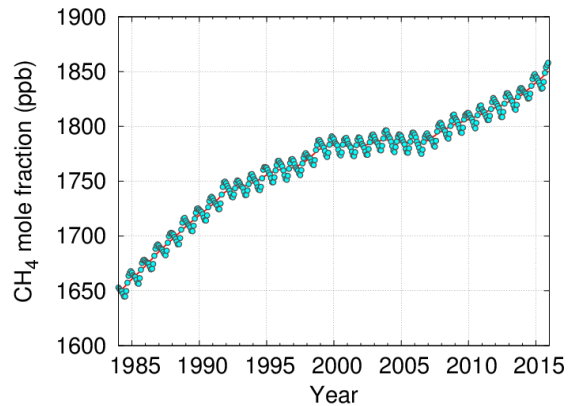
Geneva, 28 March 2017

# Evolution of GHGs 1985-2015

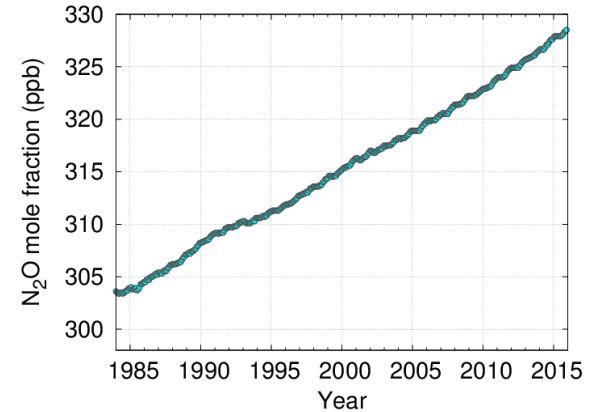
400 ppm



Carbon dioxide (CO<sub>2</sub>)



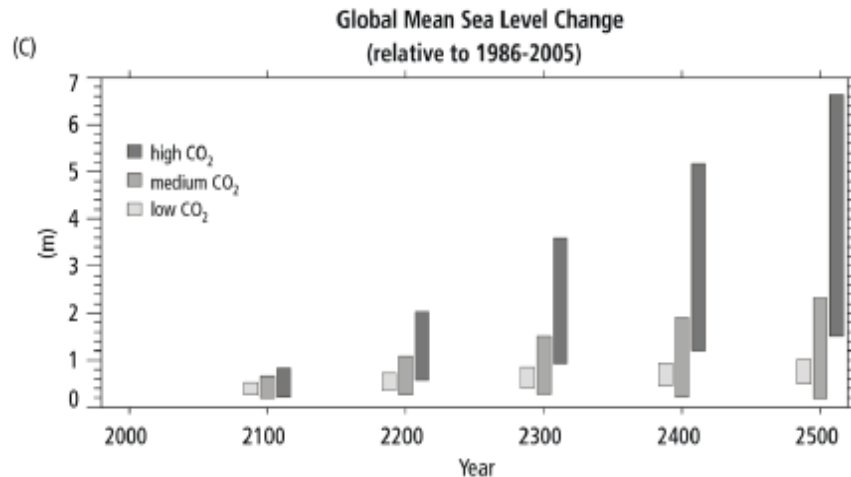
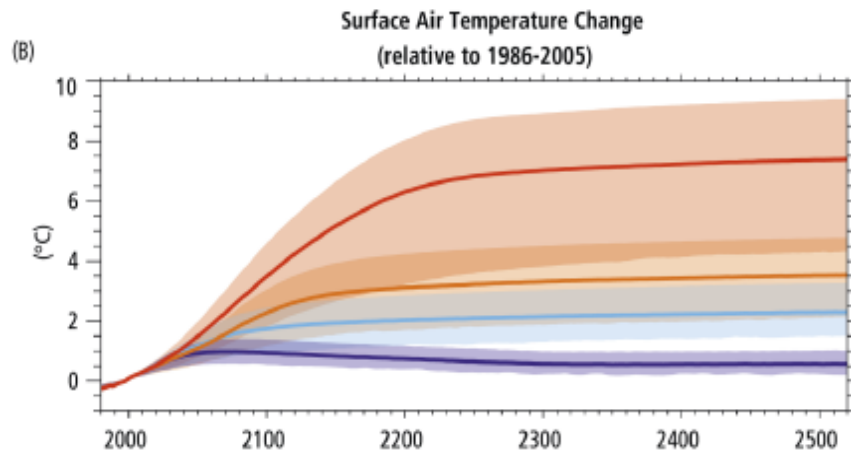
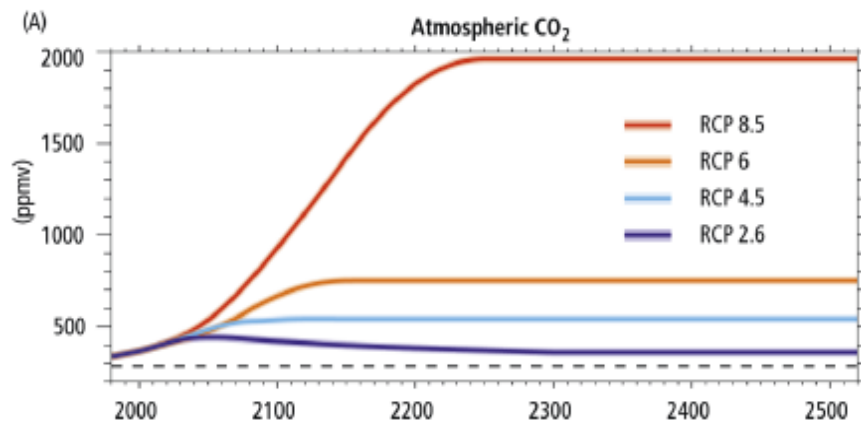
Methane (CH<sub>4</sub>)



Nitrous oxide (N<sub>2</sub>O)

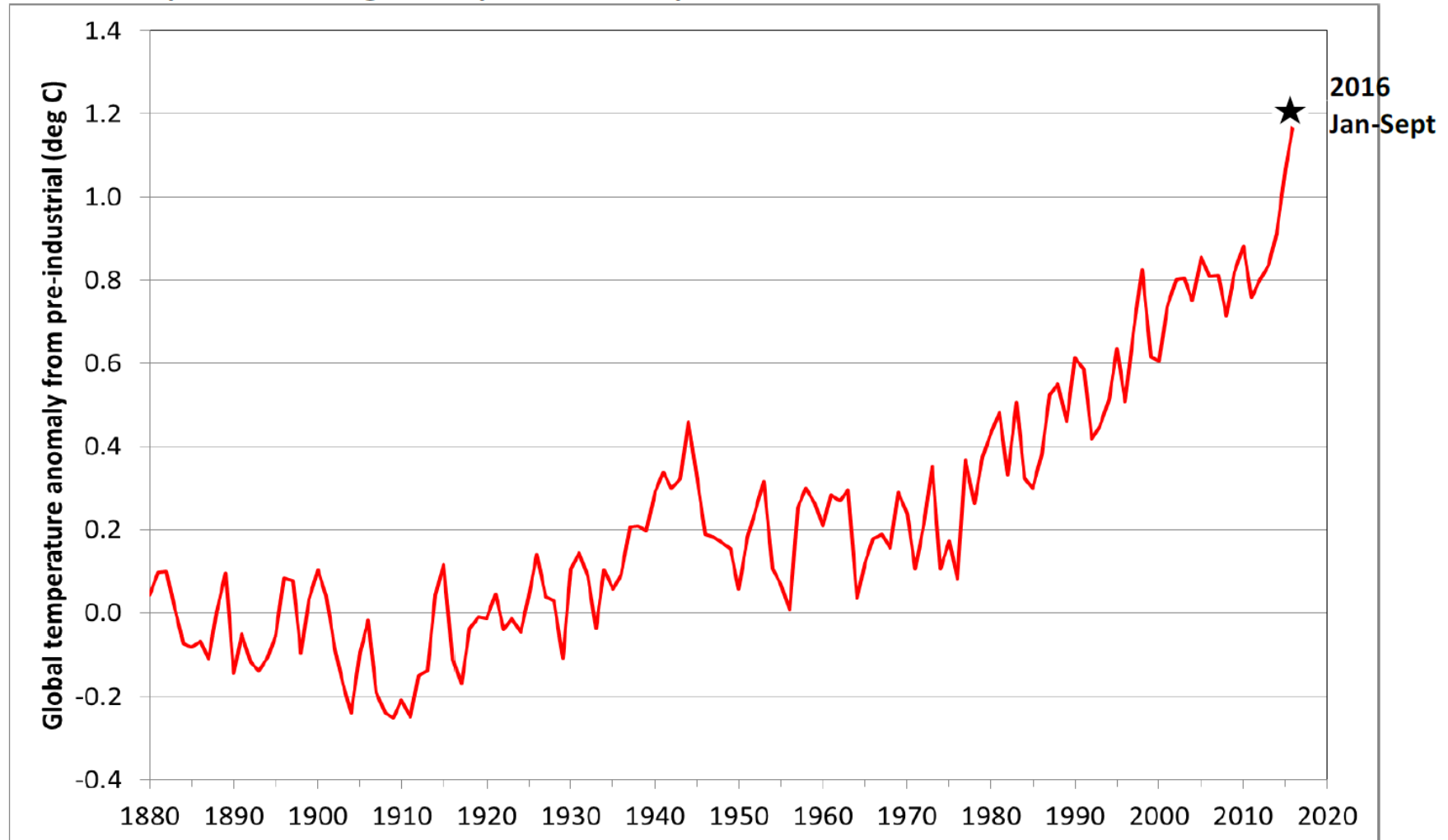
**Globally averaged concentration of CO<sub>2</sub> in the atmosphere reached the milestone of 400 parts per million for the first time in 2015 and surged again to new records in 2016 on the back of the very powerful El Niño event**

# 2000-2500? Various emission pathways:



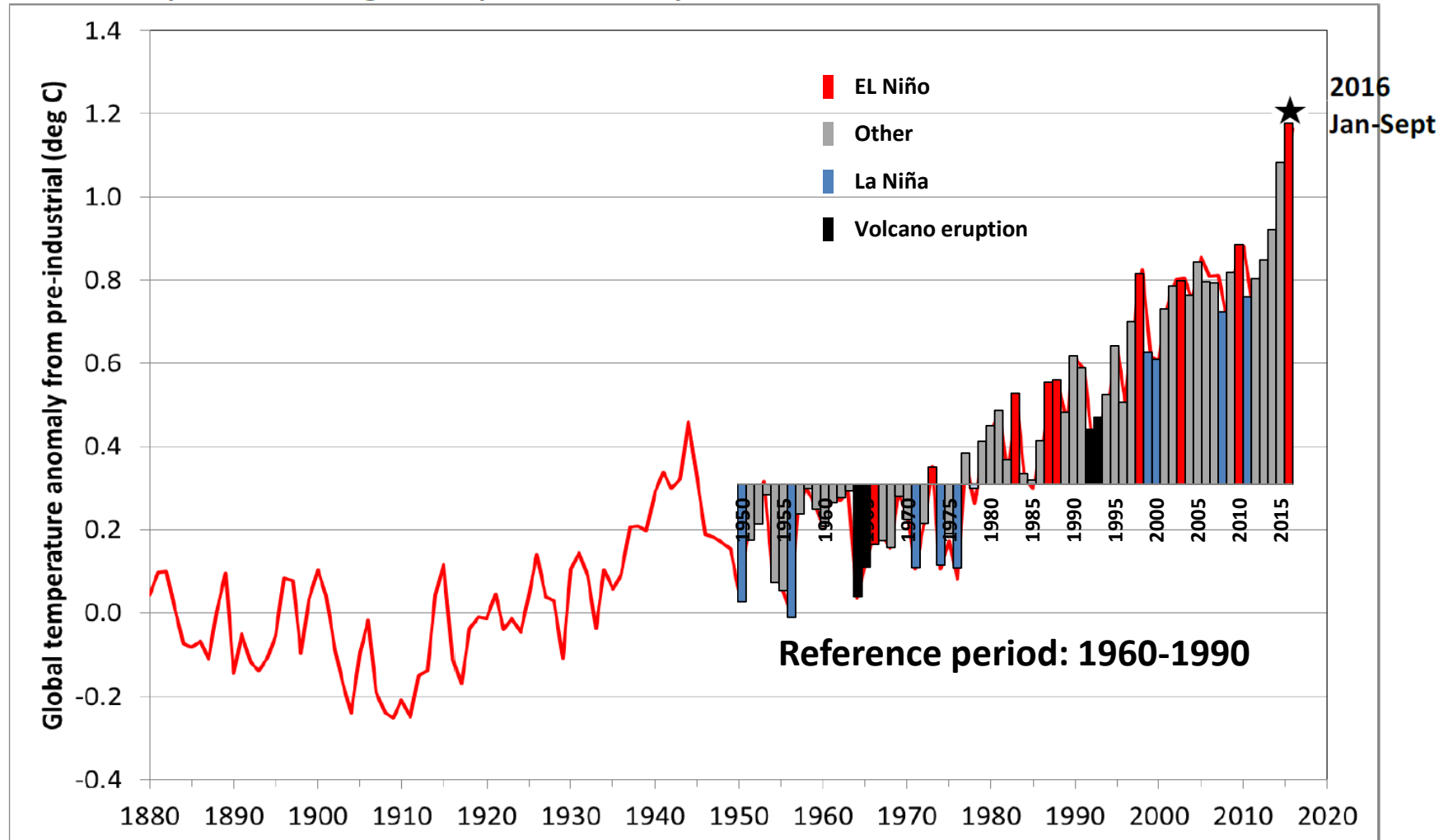
# Rise in global temperatures is accelerating

Global Temperature change from pre-industrial period

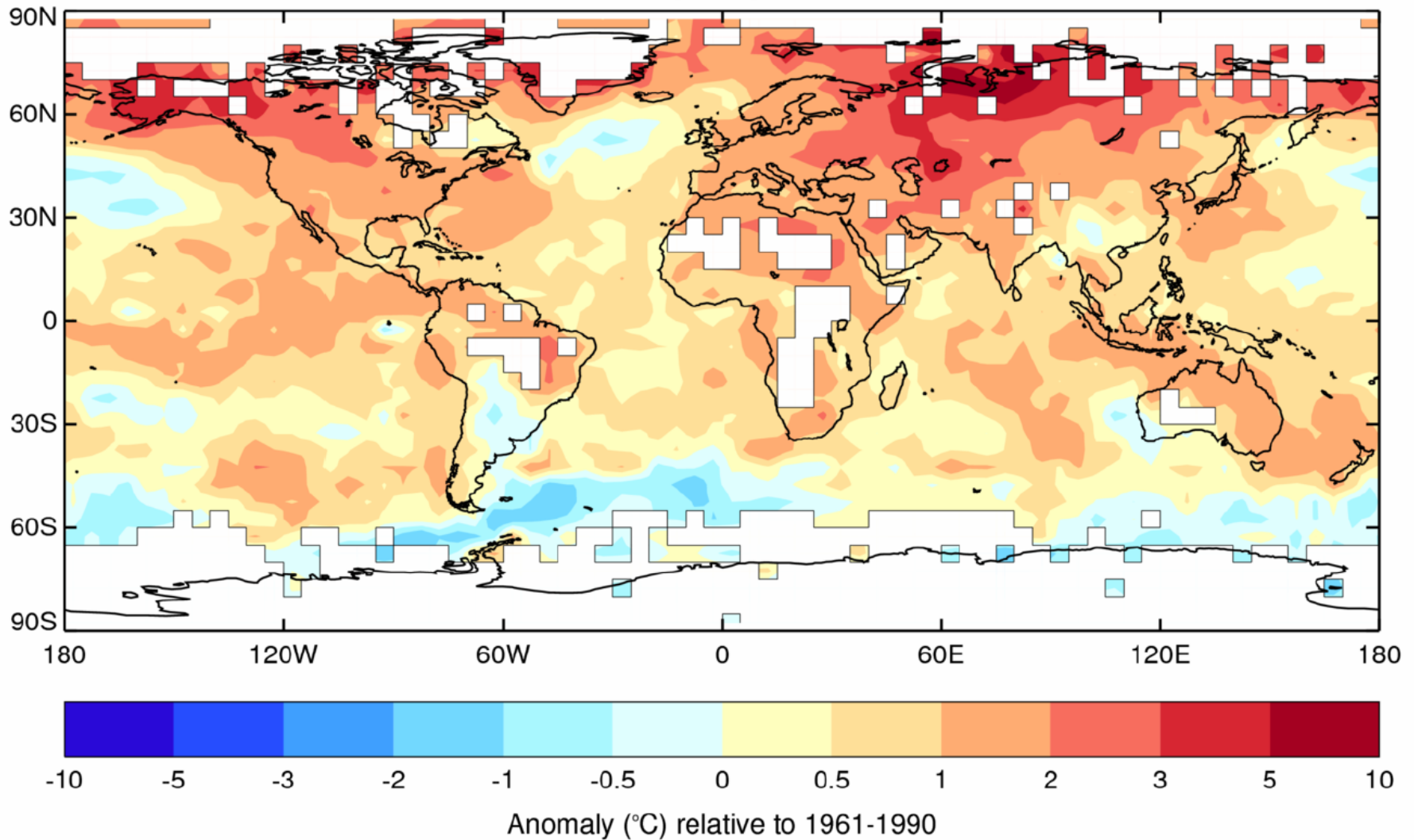


# Rise in global temperatures is accelerating

Global Temperature change from pre-industrial period



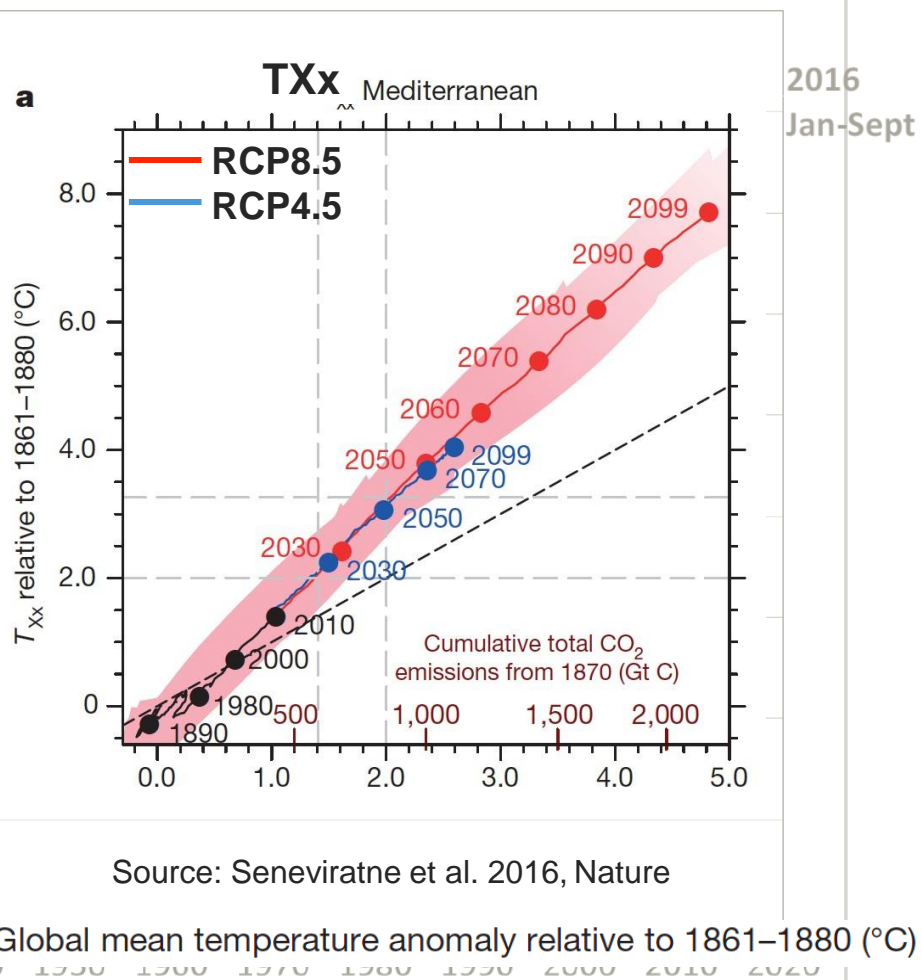
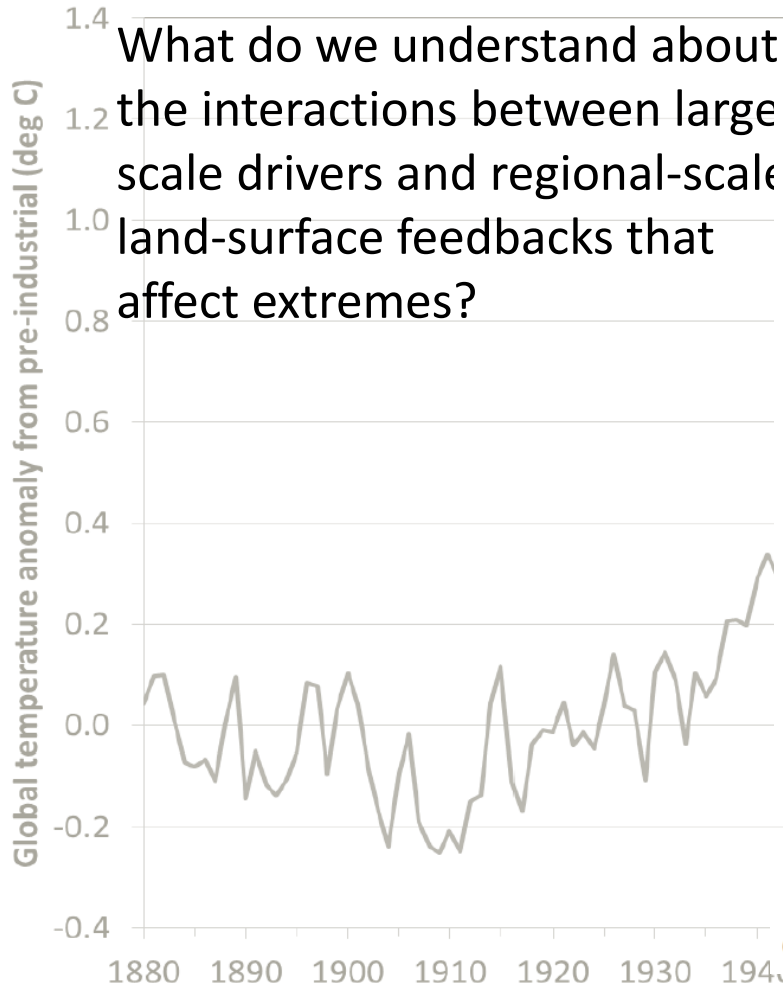
# Global temperature anomalies 2016



# Rise in global temperatures is accelerating

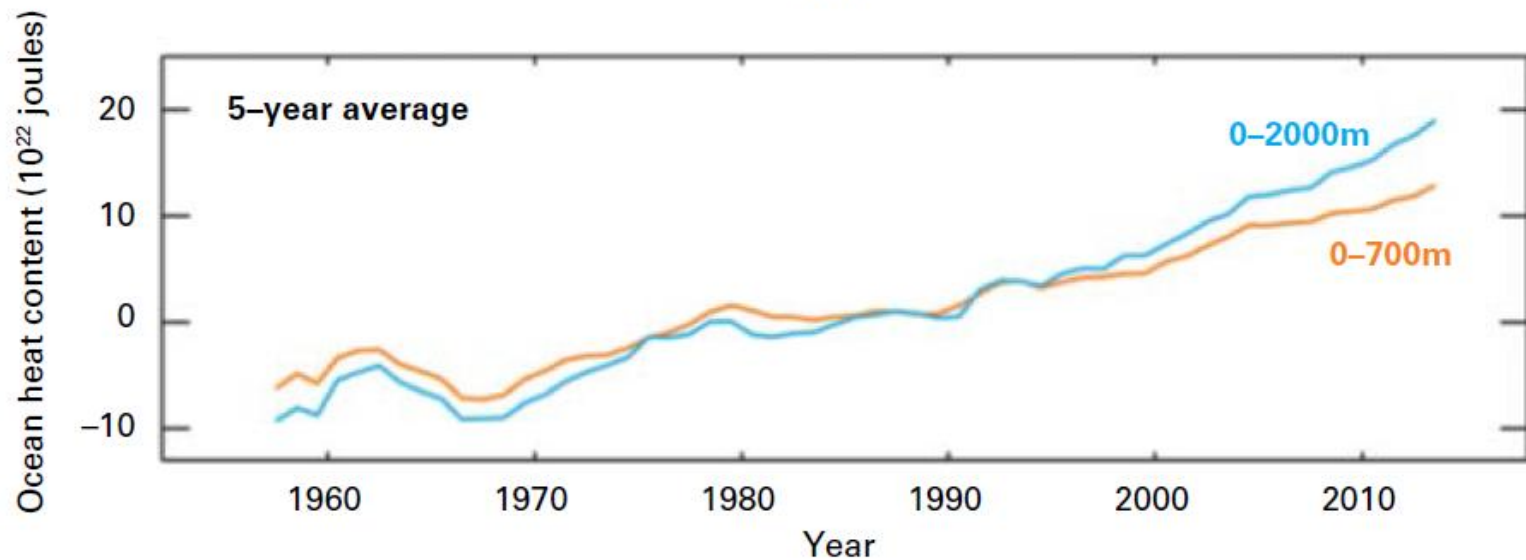
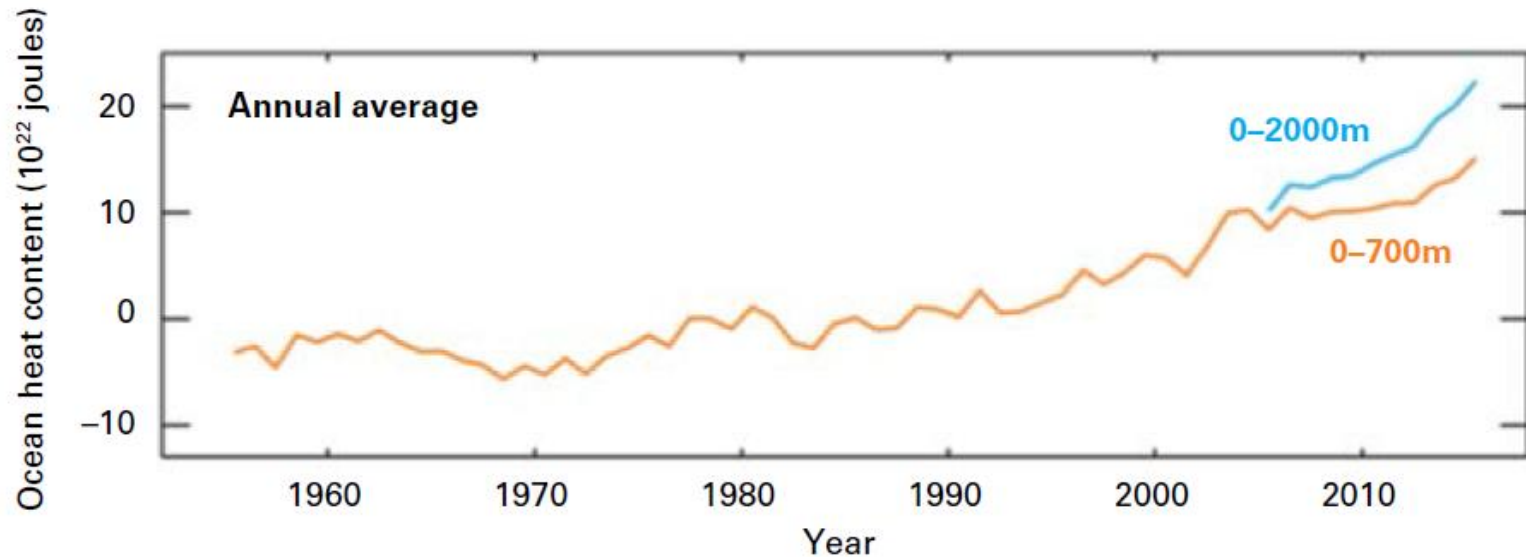
Global Temperature change from pre-industrial period

What do we understand about the interactions between large scale drivers and regional-scale land-surface feedbacks that affect extremes?



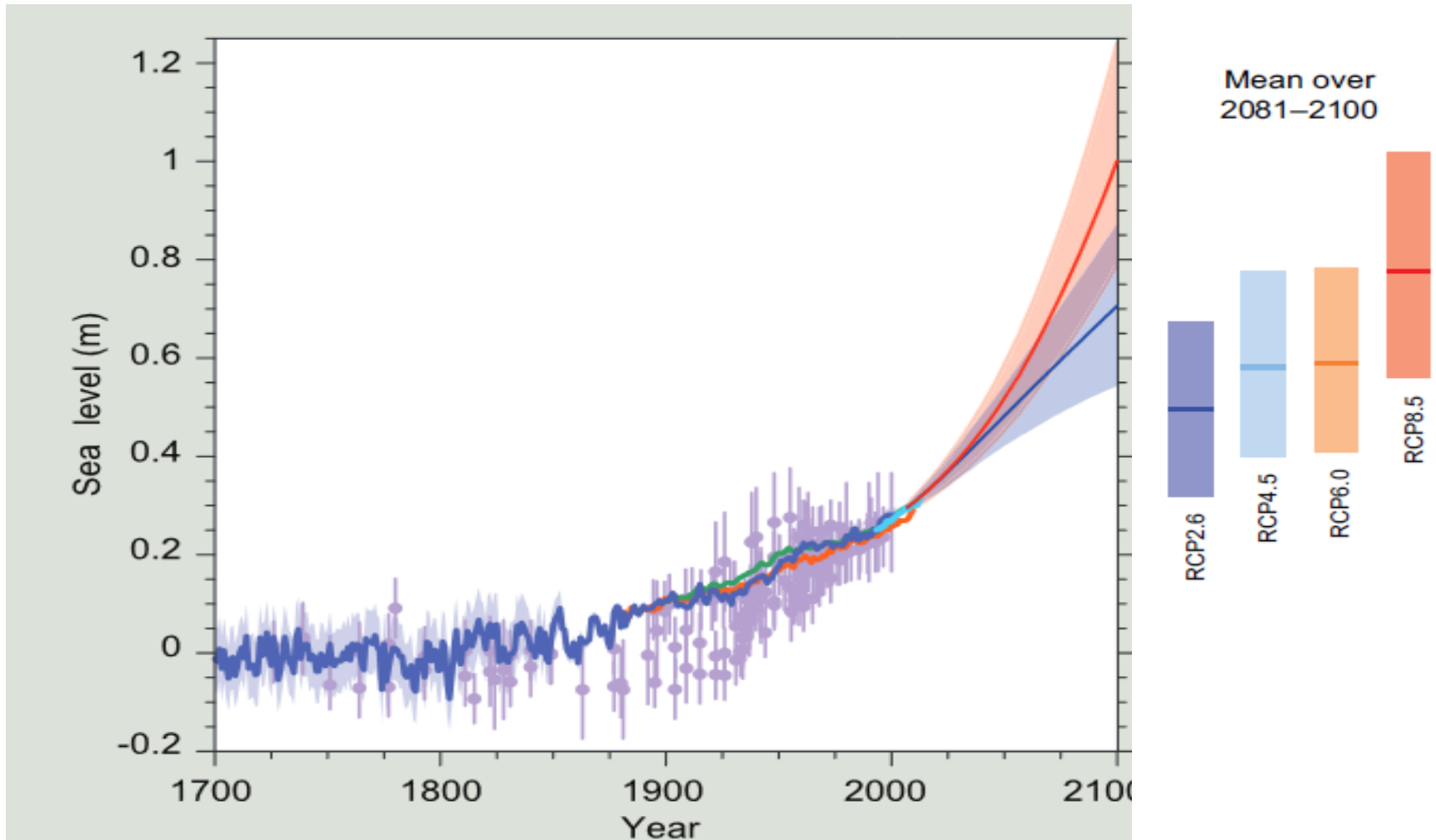
Source: Seneviratne et al. 2016, Nature

# Ocean heat content



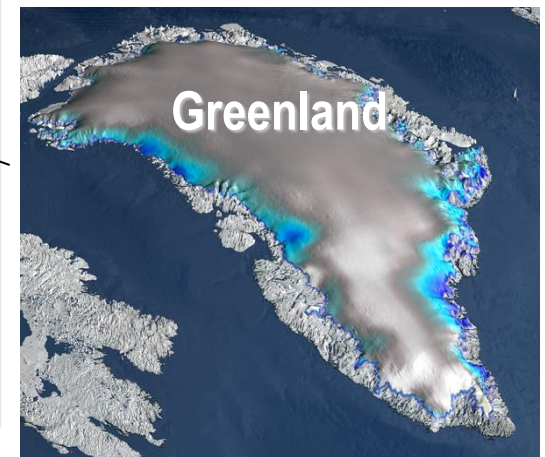
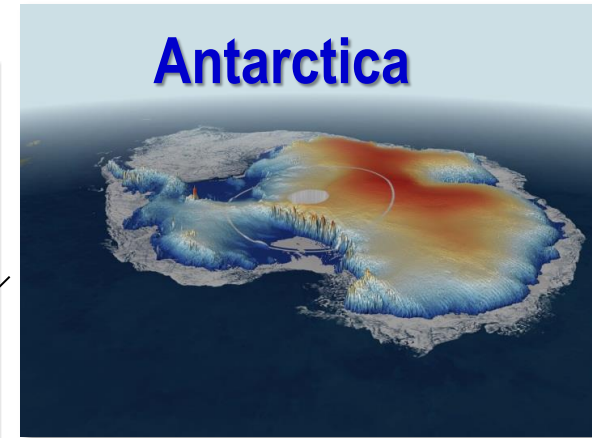
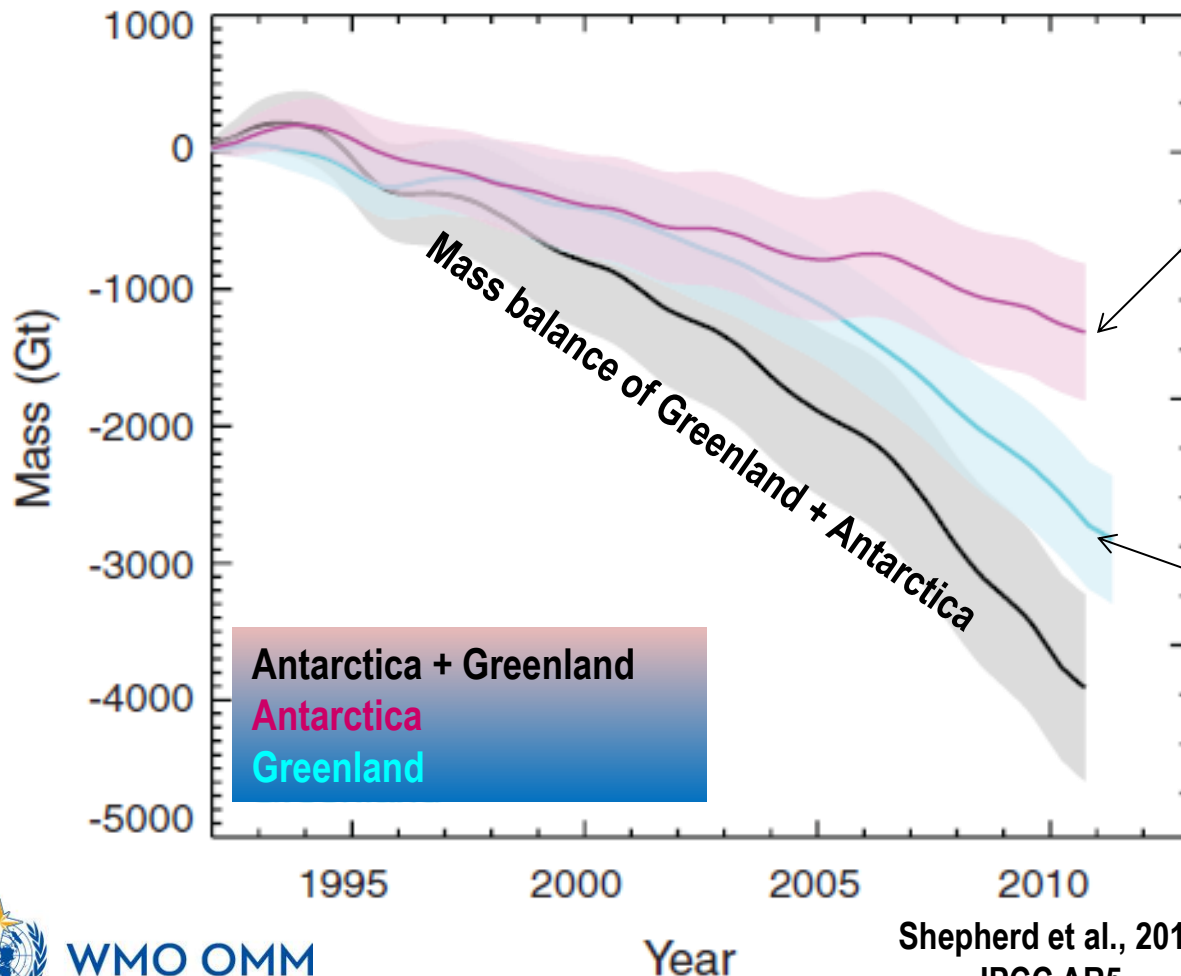


# Sea level rise is accelerating: where to go?

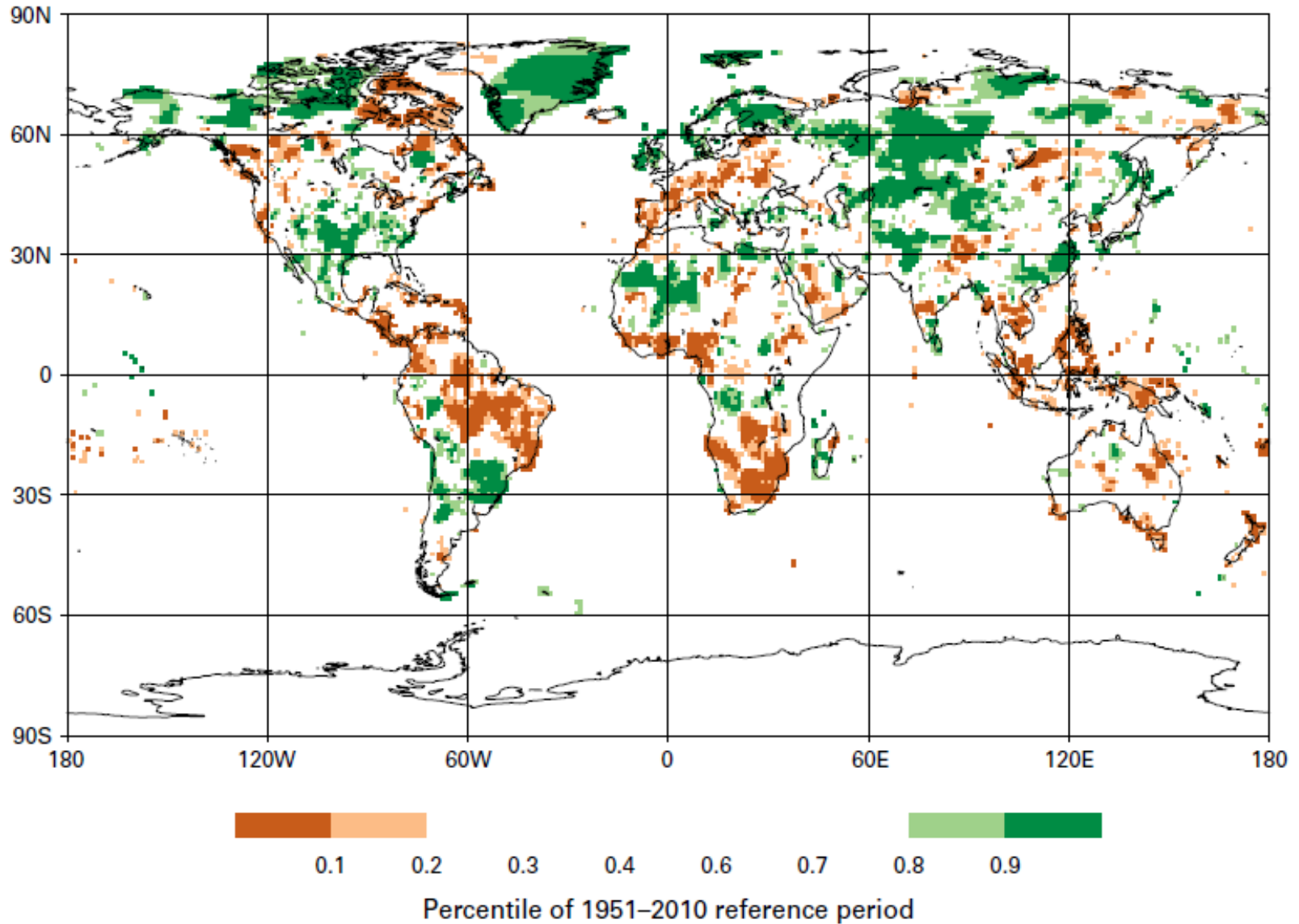


# Ice mass loss from Greenland and Antarctica measured by space techniques since 1990 (in Gt)

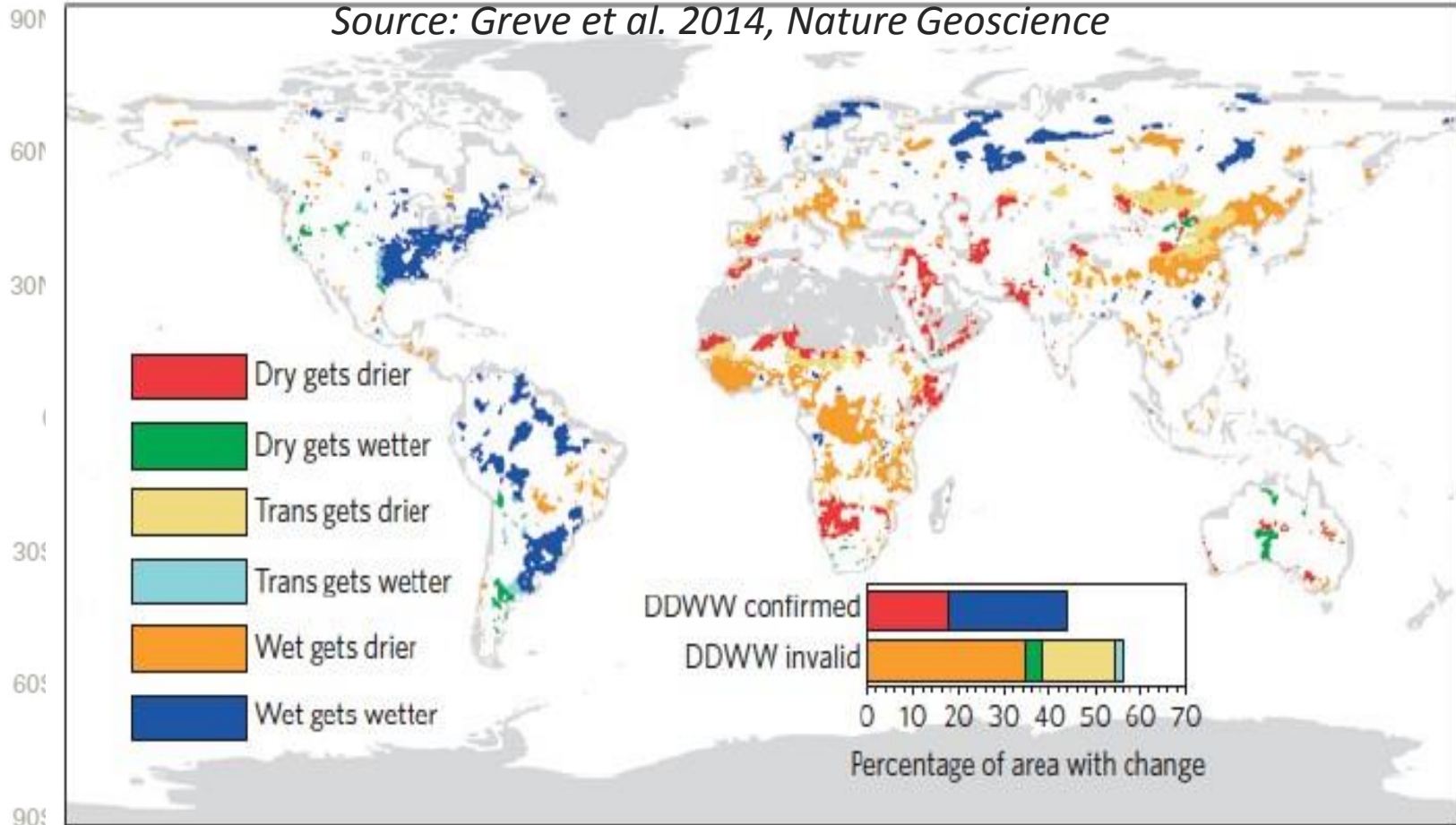
→ mass loss acceleration since early 2000s



# Precipitation anomalies 2015



# Precipitation anomalies in the future?

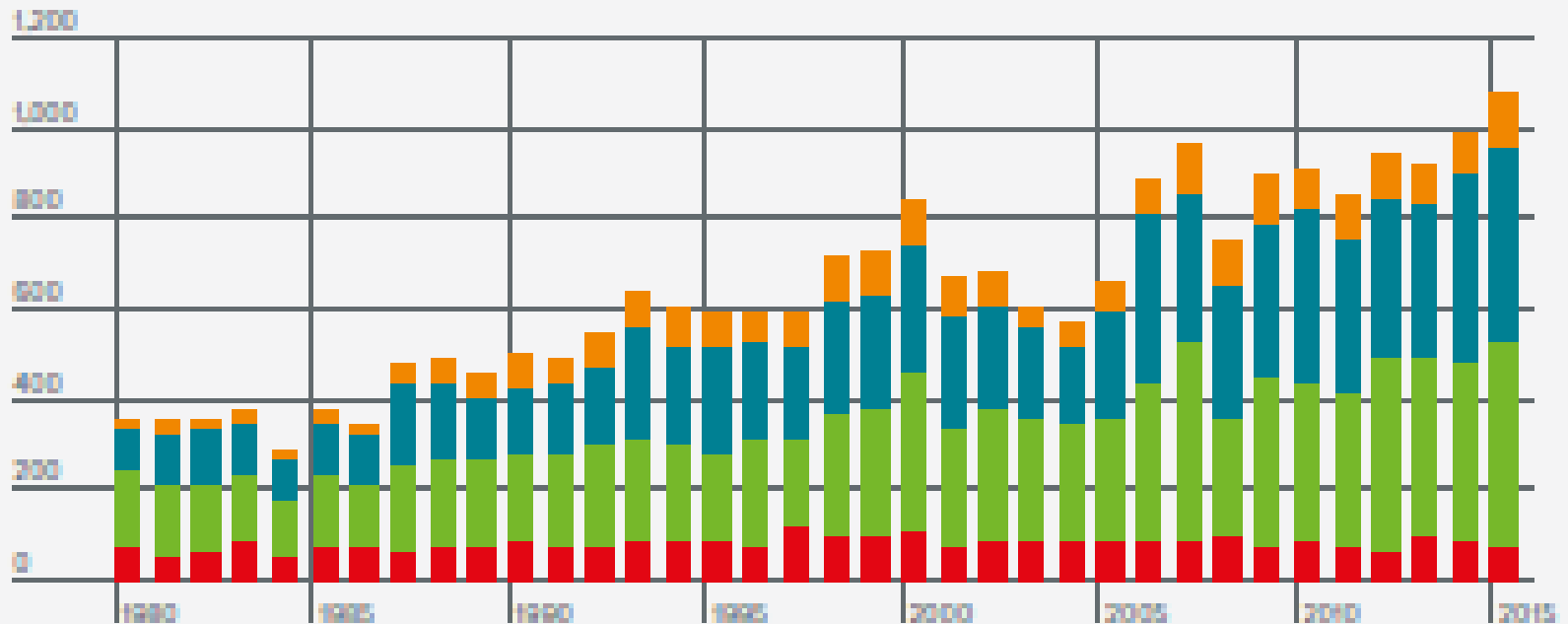


**“dry gets drier, wet gets wetter”?**

**Analysis of observed robust drying trends (from 1948-1968 to 1985-2005) shows strong regional variation in validity**

# Growing number of weather related disasters

Number of loss events 1980-2015



**Geophysical events:**  
Earthquakes, tsunamis, volcanic activity

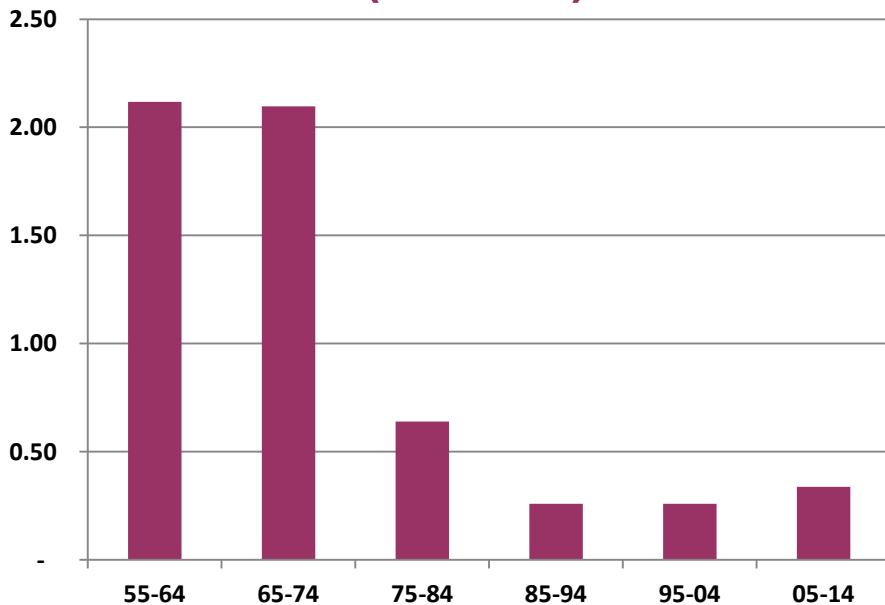
**Meteorological events:**  
Tropical storm, extratropical storm, convective storm, local storm

**Hydrological events:**  
Flood, mass movement

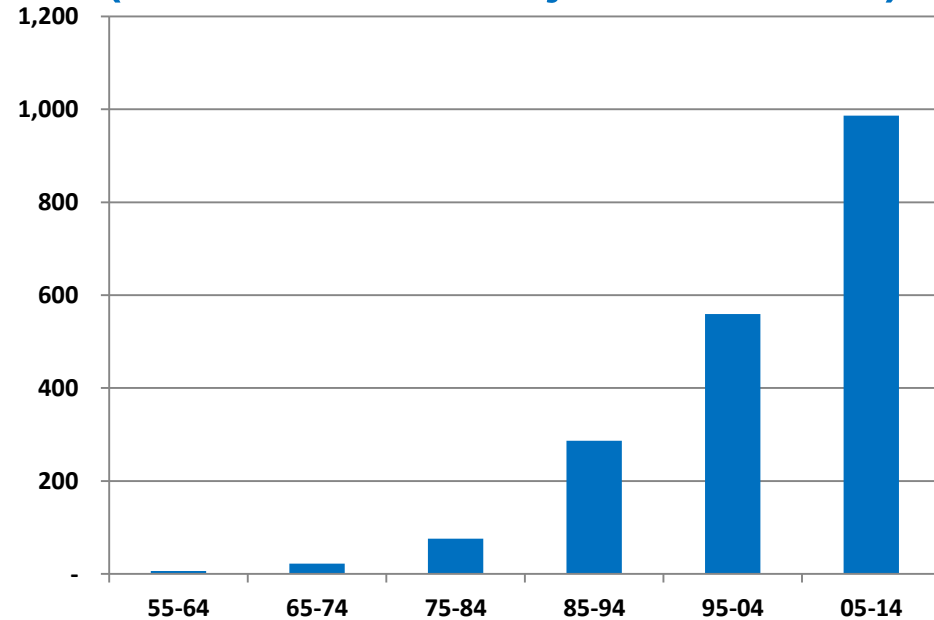
**Climatological events:**  
Extreme temperatures, drought, wildfire

# Impacts of hydrometeorological and climatological hazards (1955–2014)

## Human losses by decade (millions)

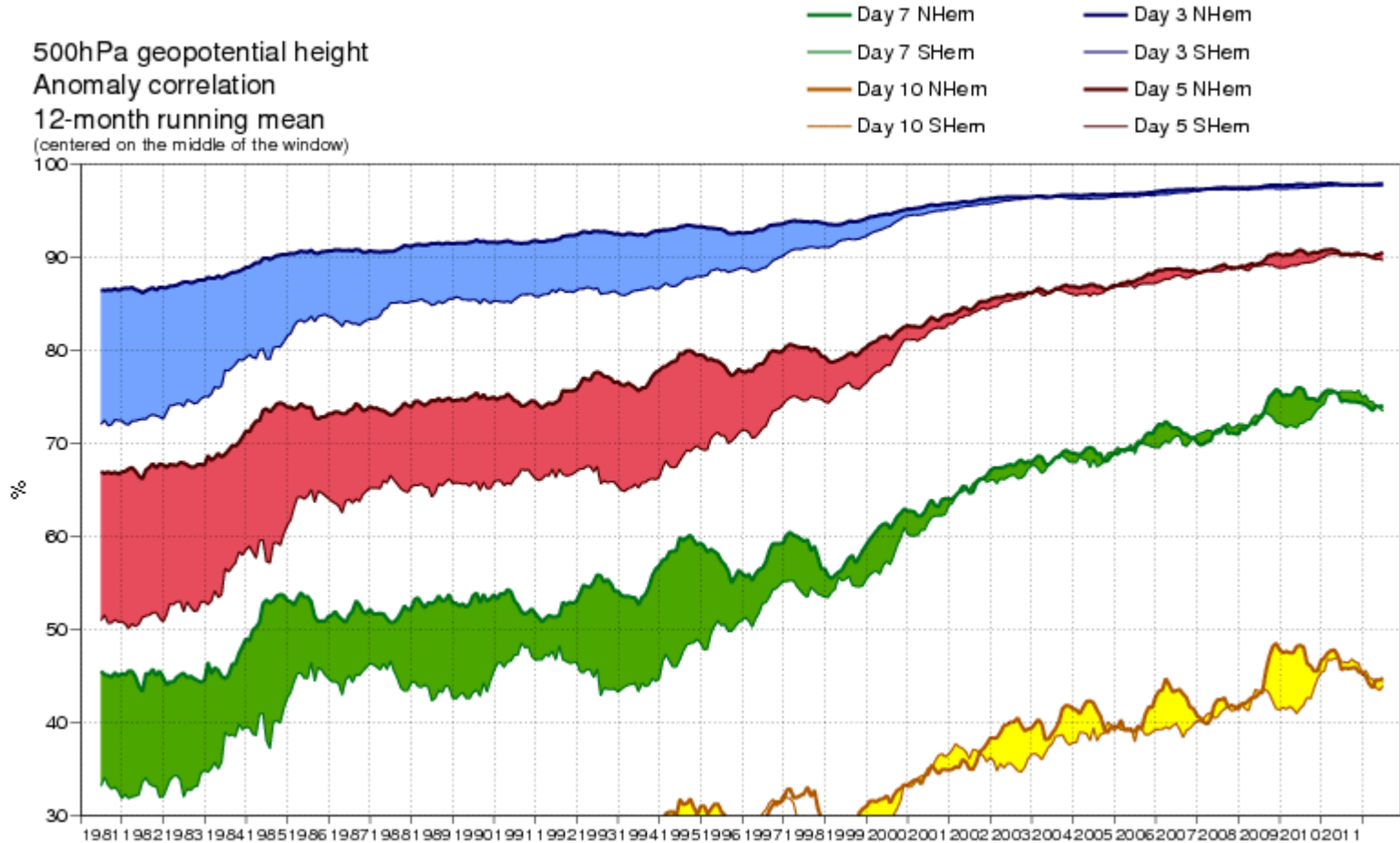


## Economic losses by decade (billions of US\$ adjusted to 2013)



**Reduction of the number of victims thanks to greater effectiveness of early warning systems and prevention measures**

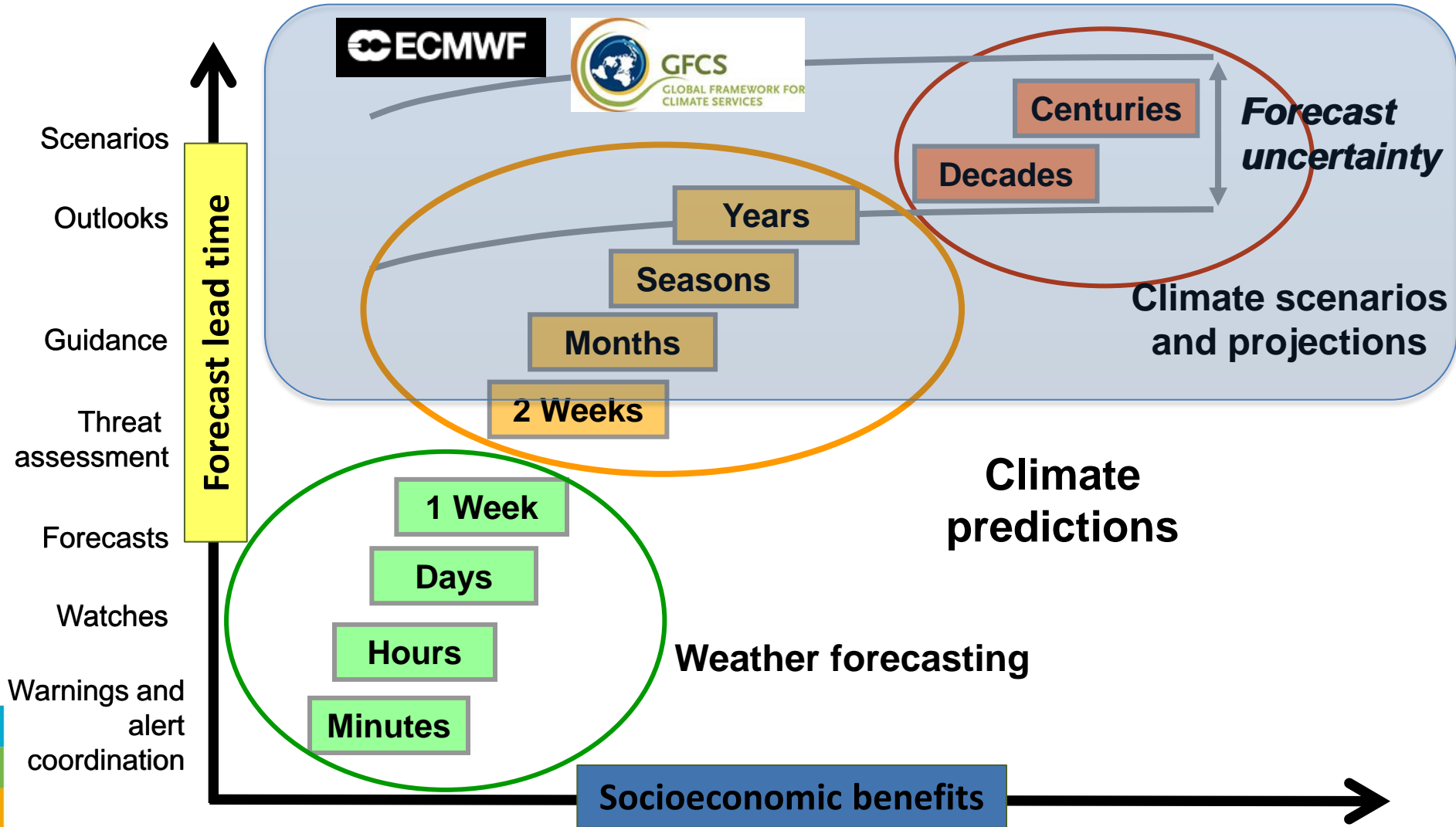
# Improved weather forecasts



**Improvements in anomaly correlation of 500 hPa height forecasts of the European Centre for Medium-Range Weather Forecasts (ECMWF) for the northern and southern hemispheres linked to the increase in satellite observations and skill of numerical models**



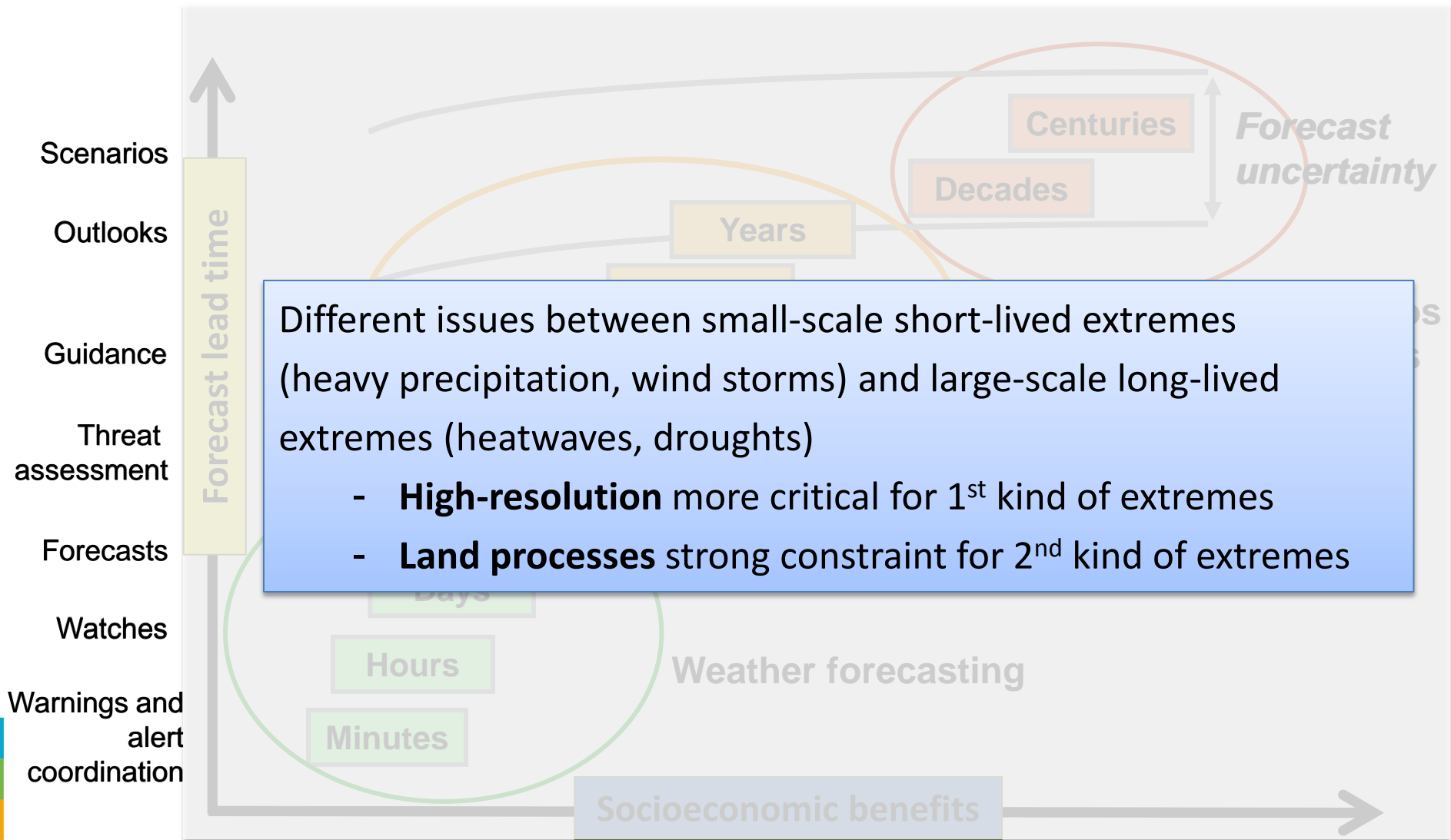
# Weather to climate: seamless framework for GFCS



Adapted from NOAA, 2011

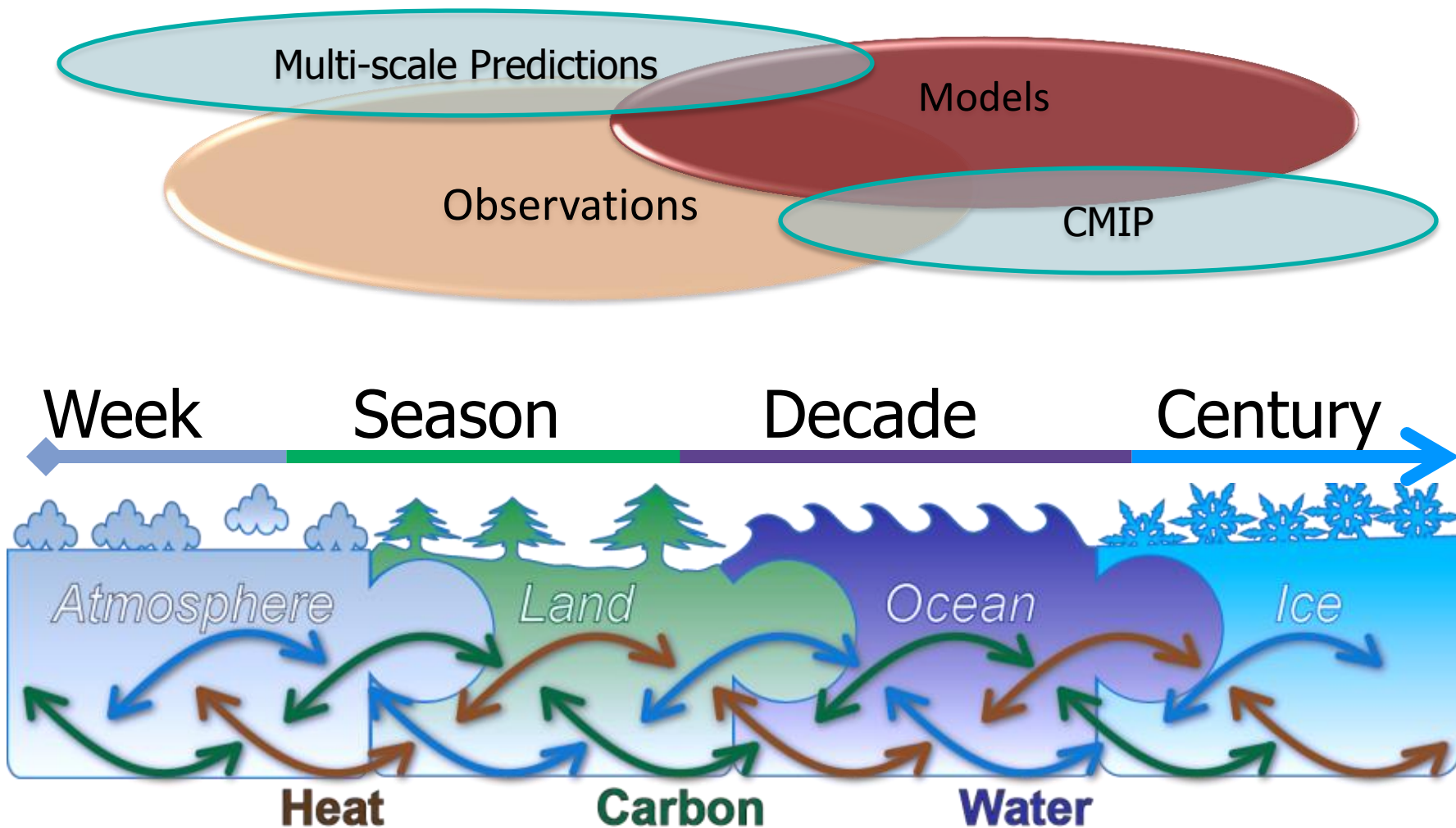


# Weather to climate: where are we with Extremes prediction?



Adapted from NOAA, 2011

# World Climate Research

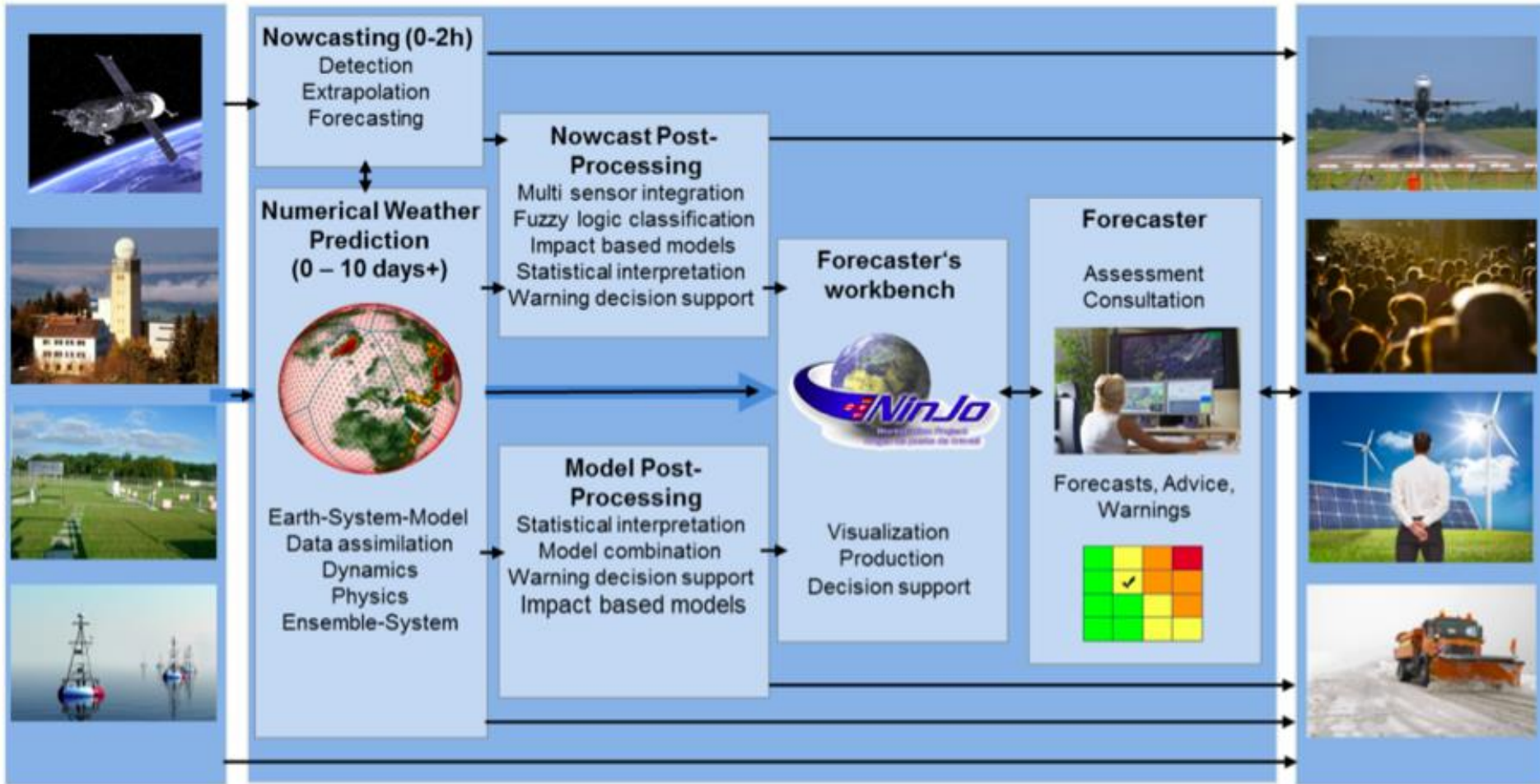


# Towards impact-based forecasting

Observations

Nowcasting / Forecasting

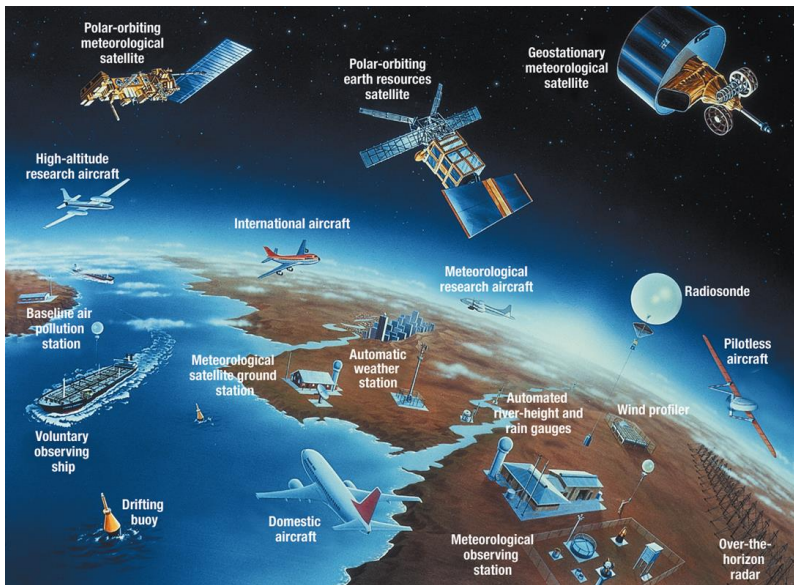
Customers



# World Meteorological Organization



- UN Specialized Agency on weather, climate & water
- 191 Members, HQ in Geneva
- 2<sup>nd</sup> oldest UN Agency, 1873-
- Coordinates work of ~5000 national experts from meteorological & hydrological services and academia
- Co-Founder and host agency of IPCC (1<sup>st</sup> World Climate Conference)
- Co-Founder of UNFCCC (2<sup>nd</sup> World Climate Conference)



# WMO Mission/key activities

1. **World climate**
2. **Weather, disasters & safety**
3. **Oceans and water resources**
4. **Data & technology**
5. **Strengthening of the national service capabilities**
6. **Atmospheric research**
7. **Efficient governance**

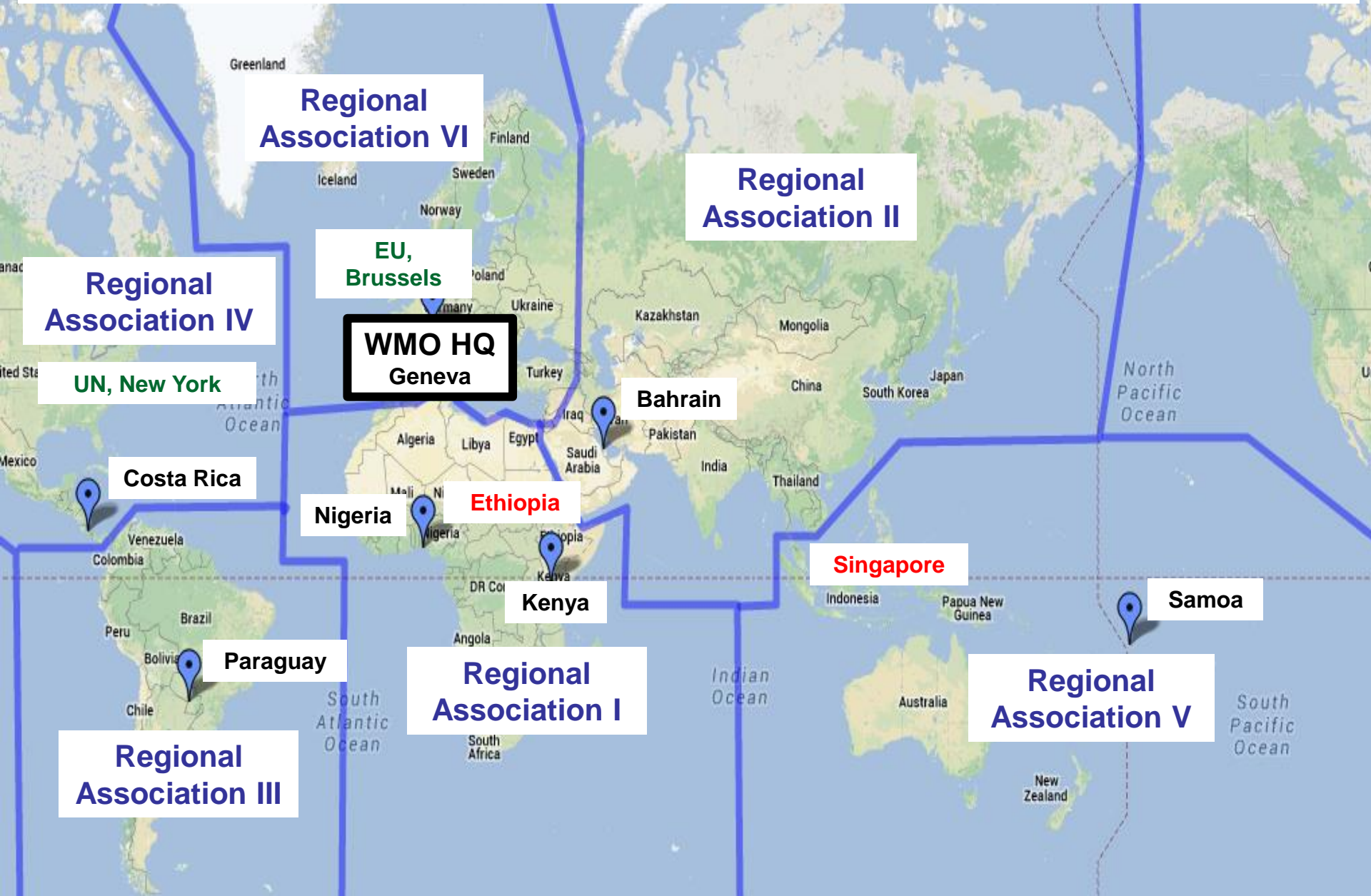


# WMO Regional Structure, ~1000 national experts

Regional office

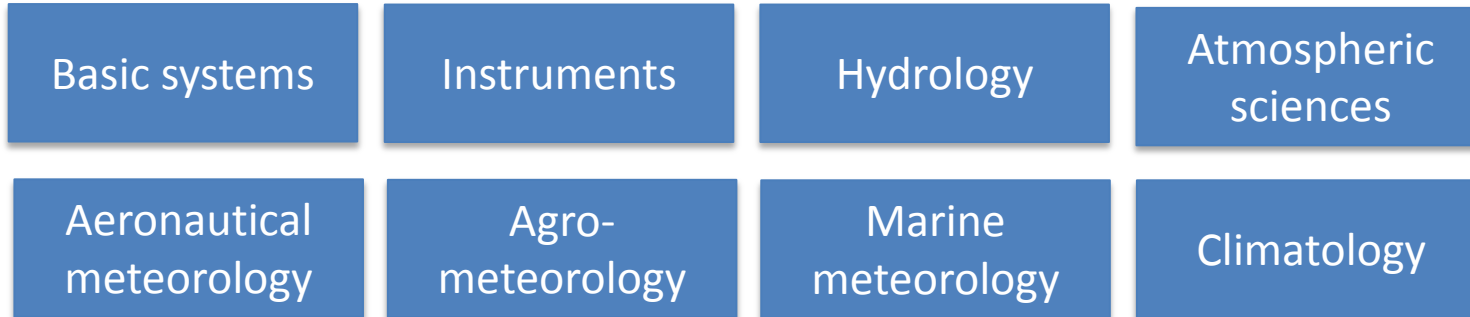
New 2017

Liaison offices



# Scientific and technical work of WMO

Technical commissions, ~2500 contributing experts



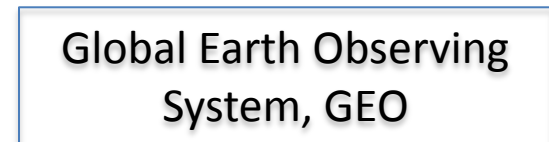
WMO funded, co-hosted programs



WMO co-hosted, secretariat WMO Staff



Partnership, in WMO building



# WMO strategic priorities for 2017-23

## UN level

- Climate expertise
- Disaster expertise
- El Niño/La Niña
- Partnerships with international organizations

## Organizational level

- Public-Private partnership, definition of roles
- Visibility of WMO & NMHS: climate, disasters, water resources





# SUSTAINABLE DEVELOPMENT GOALS/WMO



**1** NO POVERTY

Weather resilience



**2** ZERO HUNGER

Climate change & services



**3** GOOD HEALTH AND WELL-BEING

Weather & Climate Extreme information



**4** QUALITY EDUCATION



**5** GENDER EQUALITY

Gender-sensitive services



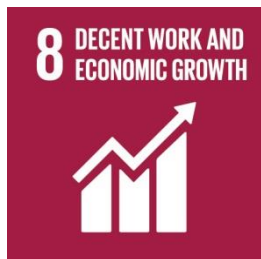
**6** CLEAN WATER AND SANITATION

Water resource management



**7** AFFORDABLE AND CLEAN ENERGY

Solar, wind & hydro use



**8** DECENT WORK AND ECONOMIC GROWTH

Climate resilience



**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE

Big data, innovations

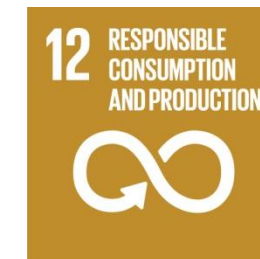


**10** REDUCED INEQUALITIES



**11** SUSTAINABLE CITIES AND COMMUNITIES

Air quality, heat waves, flooding, Drought...



**12** RESPONSIBLE CONSUMPTION AND PRODUCTION



**13** CLIMATE ACTION

DRR, Adaptation, carbon & climate monitoring / prediction



**14** LIFE BELOW WATER

Sea level rise, climate<->oceans



**15** LIFE ON LAND

Climate change <->ecosystems



**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

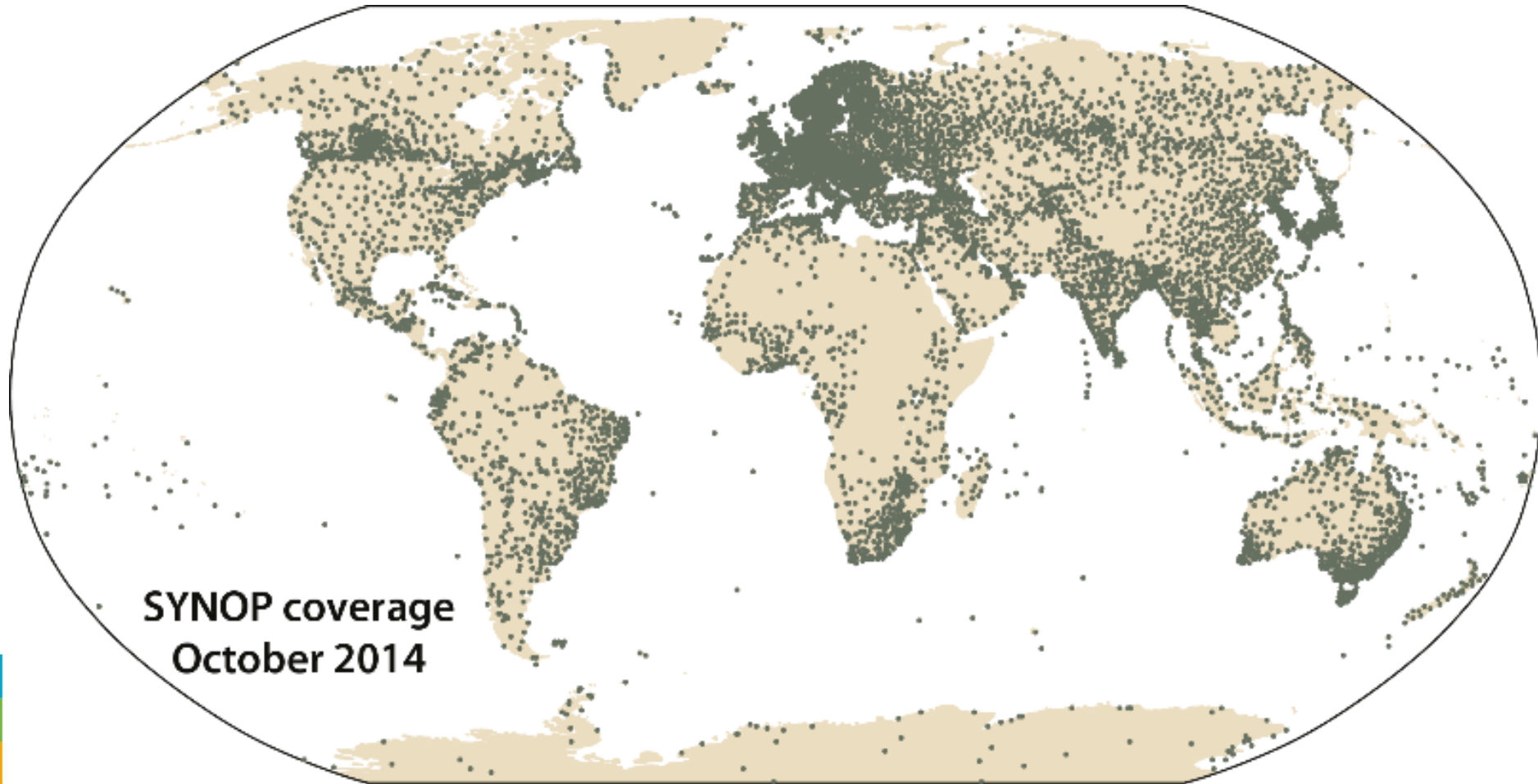
Climate driven conflicts



**17** PARTNERSHIPS FOR THE GOALS

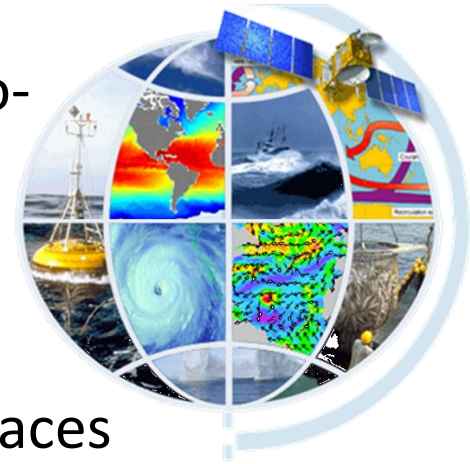
Resources for climate adaptation & DRR

# Functioning surface observing stations in 2014



# What WMO can offer?

- Country presence: 191 Members, National Meteorological and Hydrological Services led by WMO PRs
- High-level know-how at developed country NMHSs: Service skills, observing systems, IT, customer interfaces
- Culture of sharing know-how worldwide, twinning
- Advisory and coordination services for donors to avoid misinvestments to ensure sustainability
- Good knowledge of the status & needs of Members



# Thank you



WORLD  
METEOROLOGICAL  
ORGANIZATION