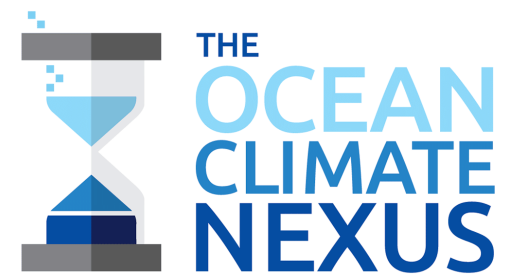
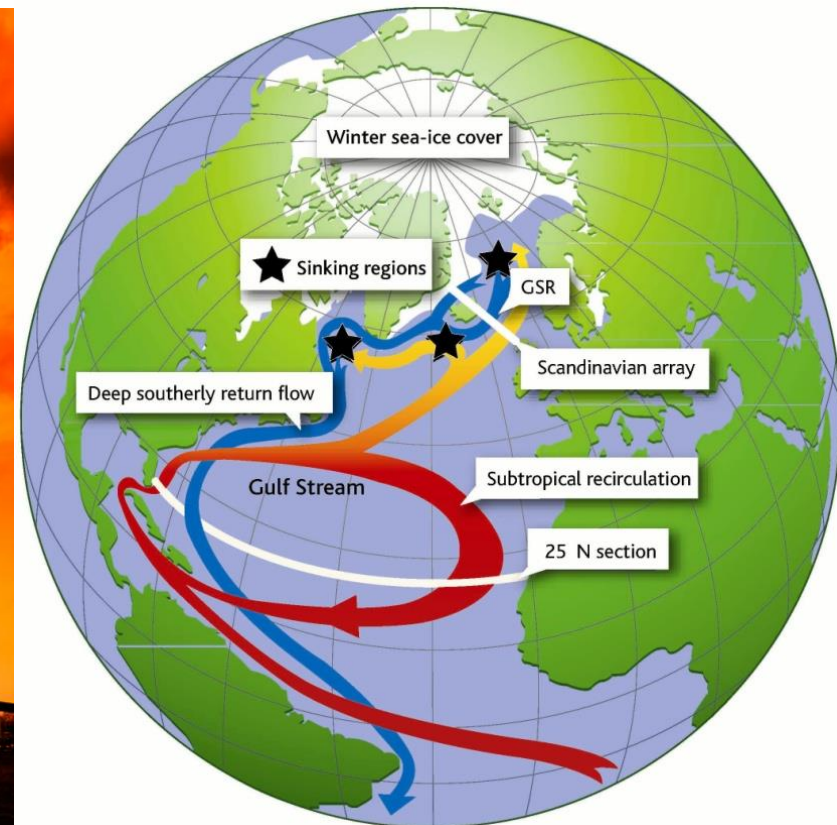


# Climate Change

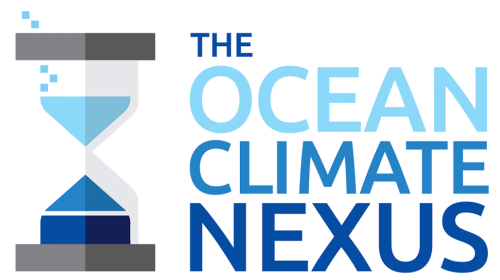


Mojib Latif

GEOMAR Helmholtz Centre of Ocean Research and Kiel University



# Roger Revelle (1957)



**„Human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future.“**

New York Times, 1957

# The global carbon budget

## Fate of Anthropogenic CO<sub>2</sub> Emissions (2003-2012 average)

8.6 ± 0.4 GtC/yr 92%



0.8 ± 0.5 GtC/yr 8%



+

4.3 ± 0.1 GtC/yr  
45%



2.6 ± 0.5 GtC/yr  
27%

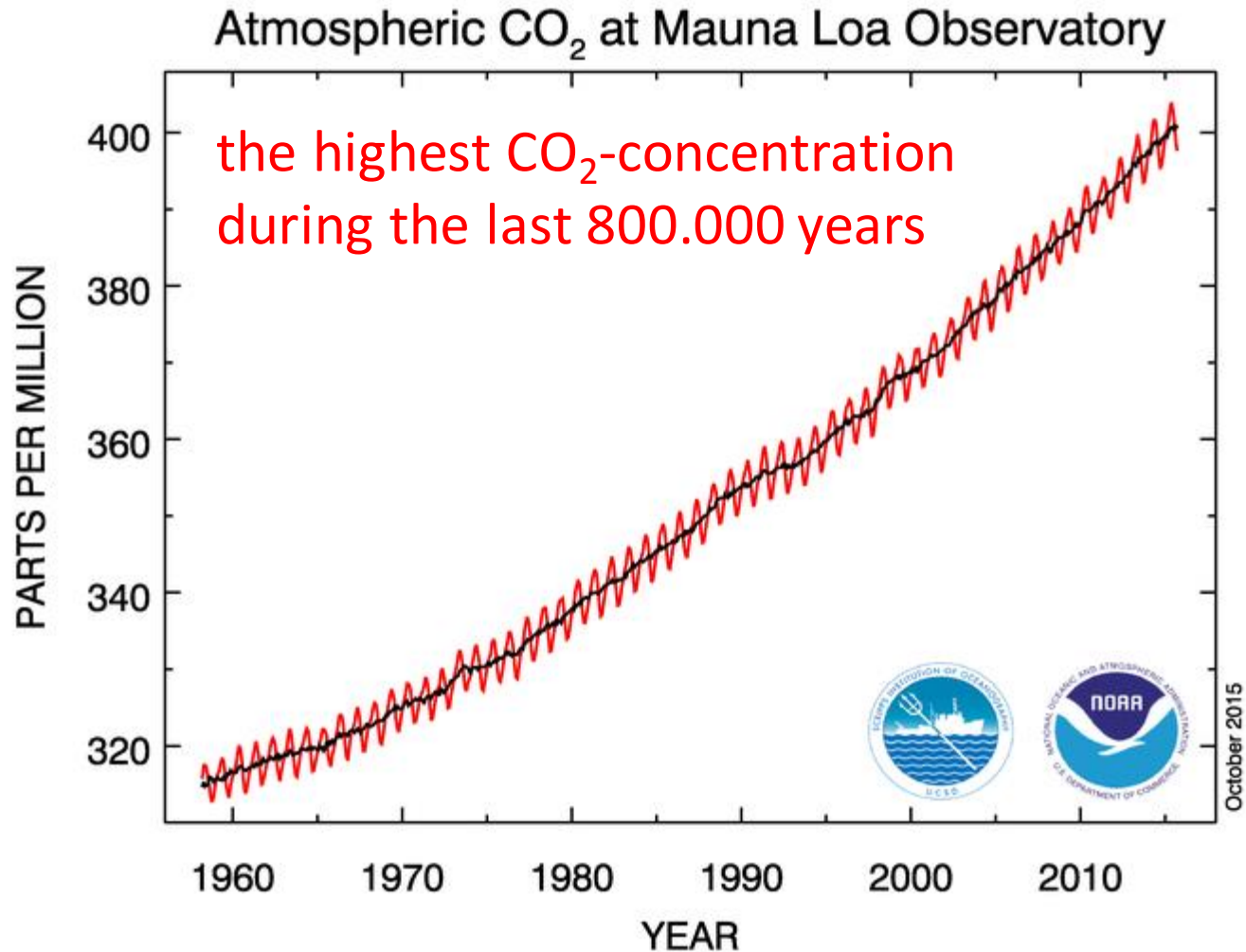


2.6 ± 0.8 GtC/yr  
27%



Calculated as the residual  
of all other flux components

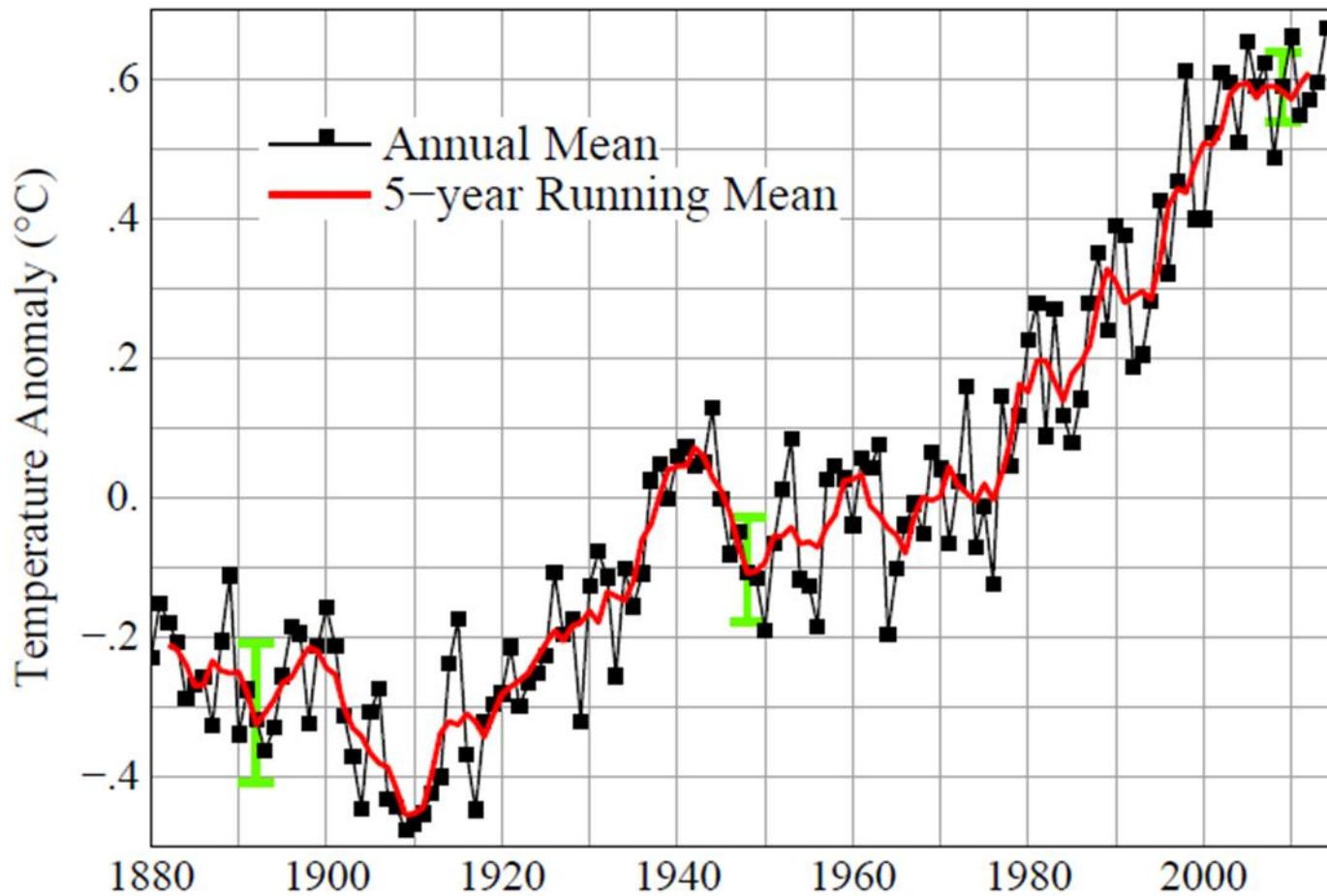
# Carbon dioxide has reached unprecedented levels



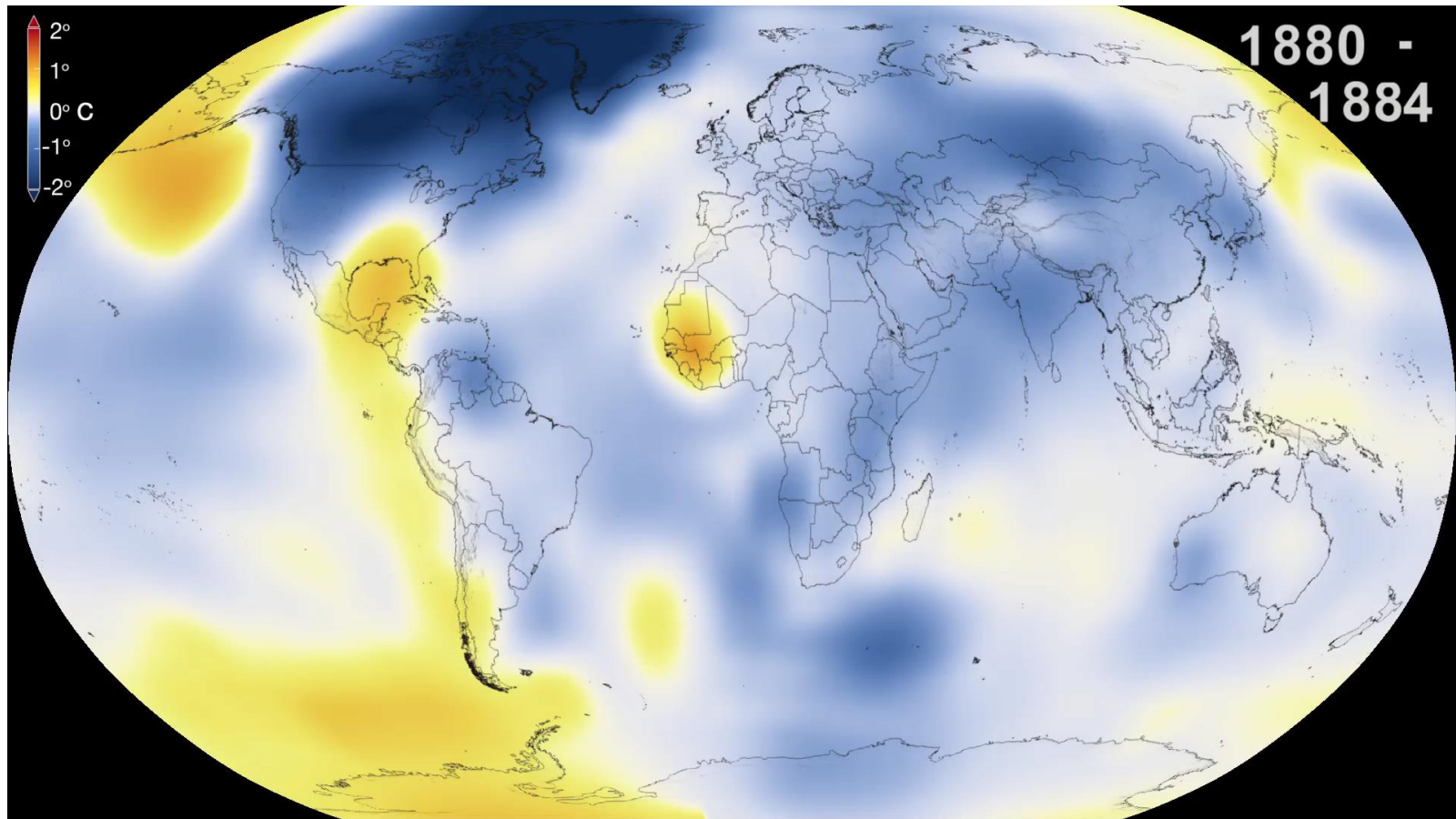


# Global warming

Global Land–Ocean Temperature Index



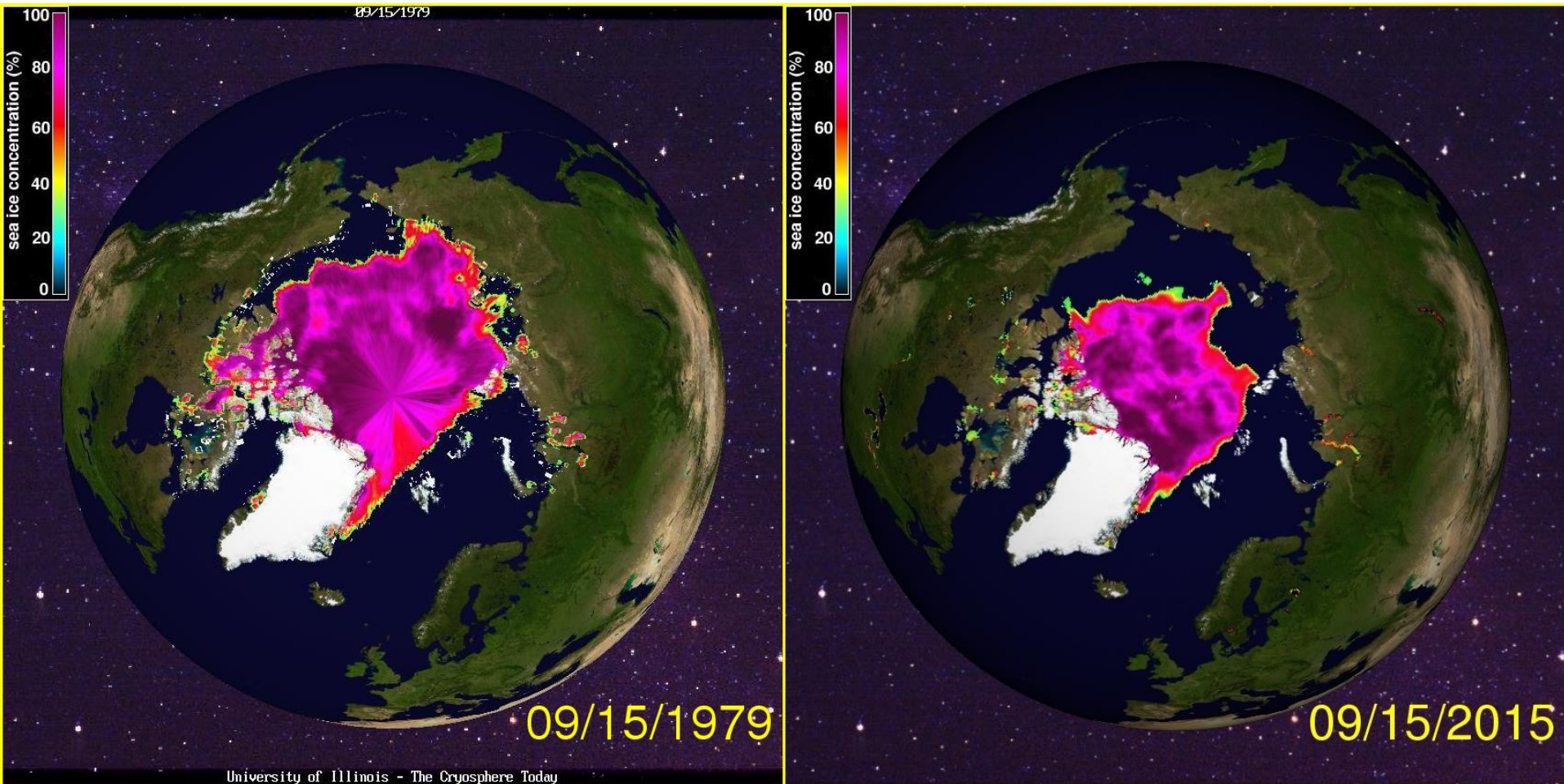
# Near-surface surface temperature since 1880



5-yr running averages (relative to 1951-1980)

GISTEMP, NASA

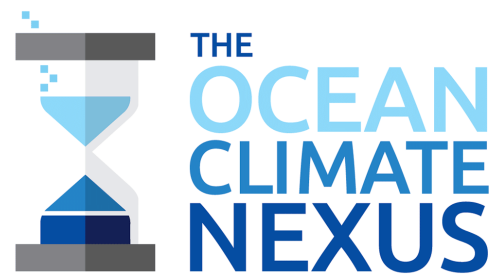
# Arctic sea ice



...decline of about 30% since the start of the satellite measurements in 1979



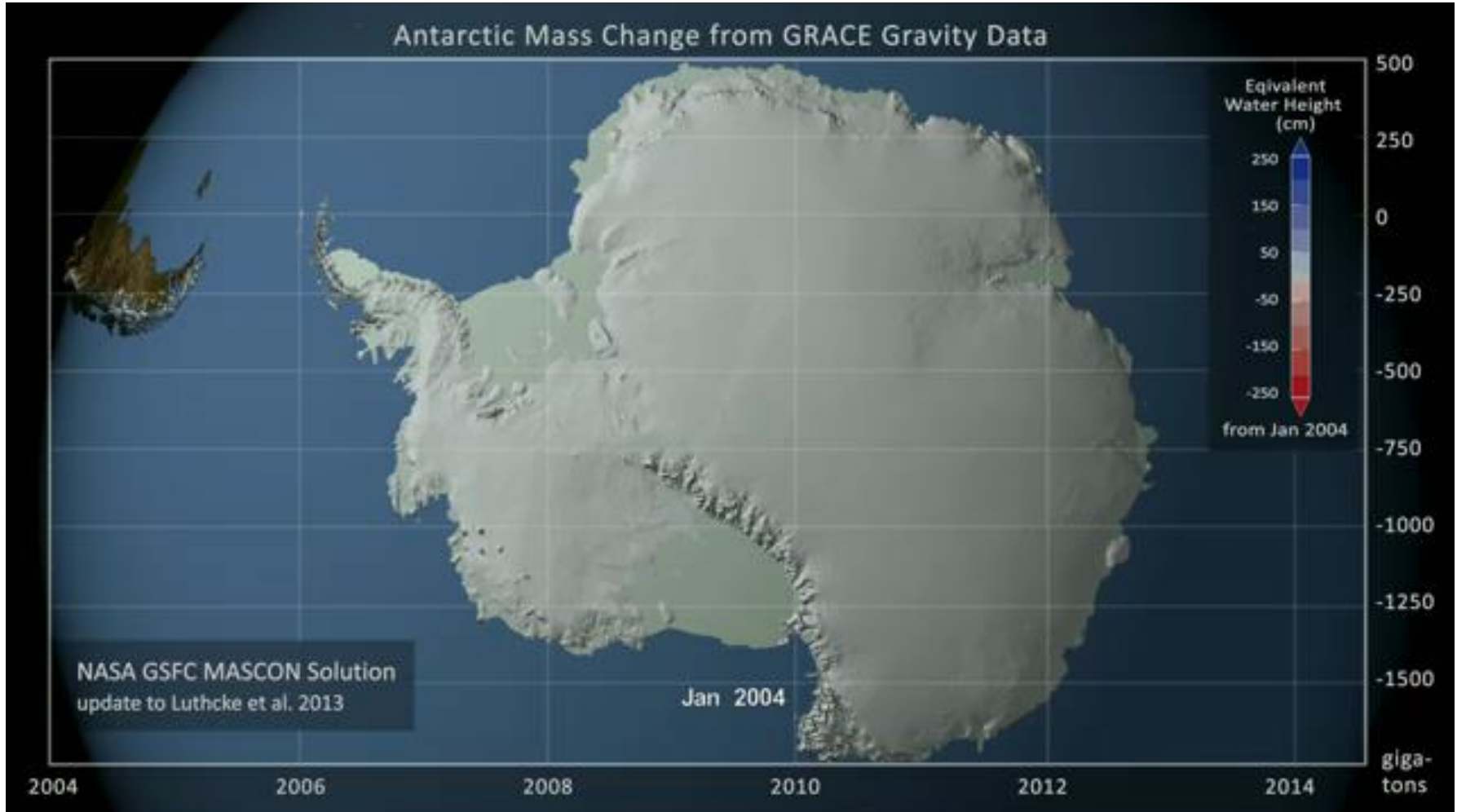
# Greenland's ice sheet melts



NASA 2015

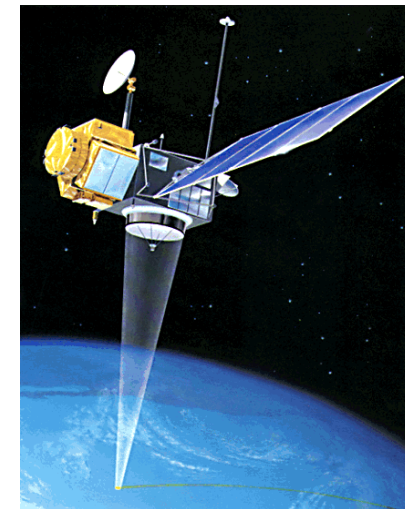
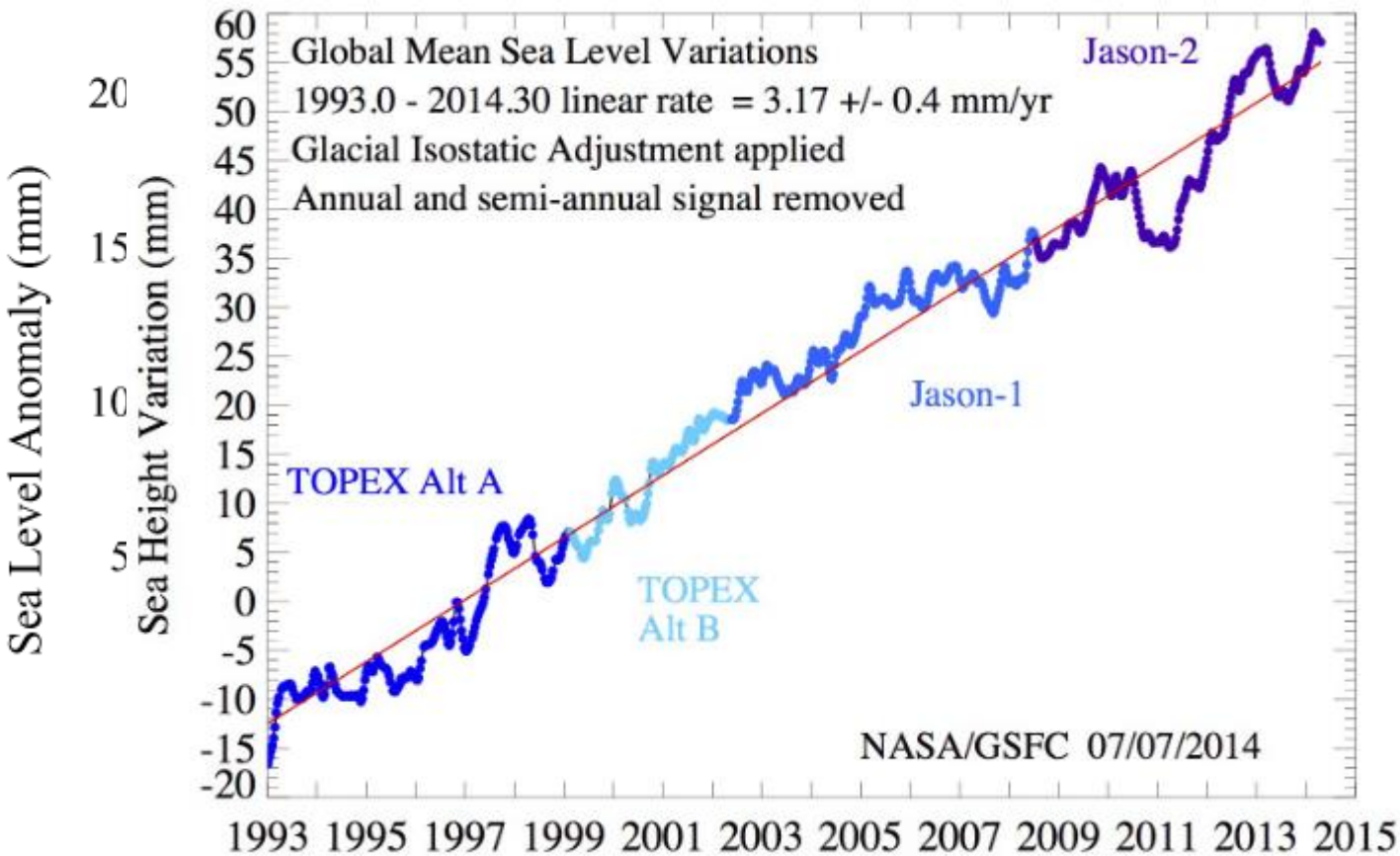


# West Antarctic ice sheet melts



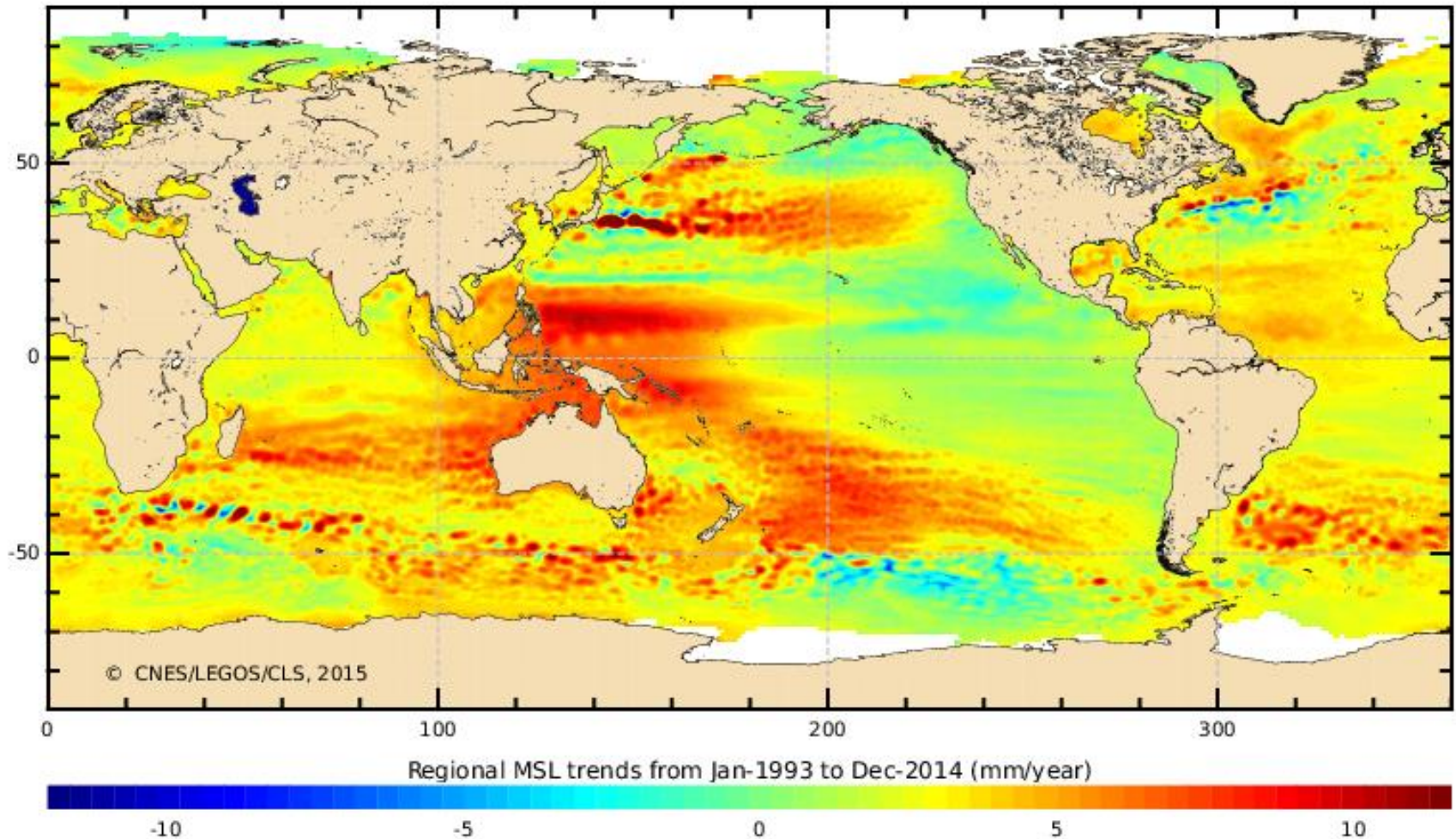
# Sea level rise

## Global Mean Sea Level Change



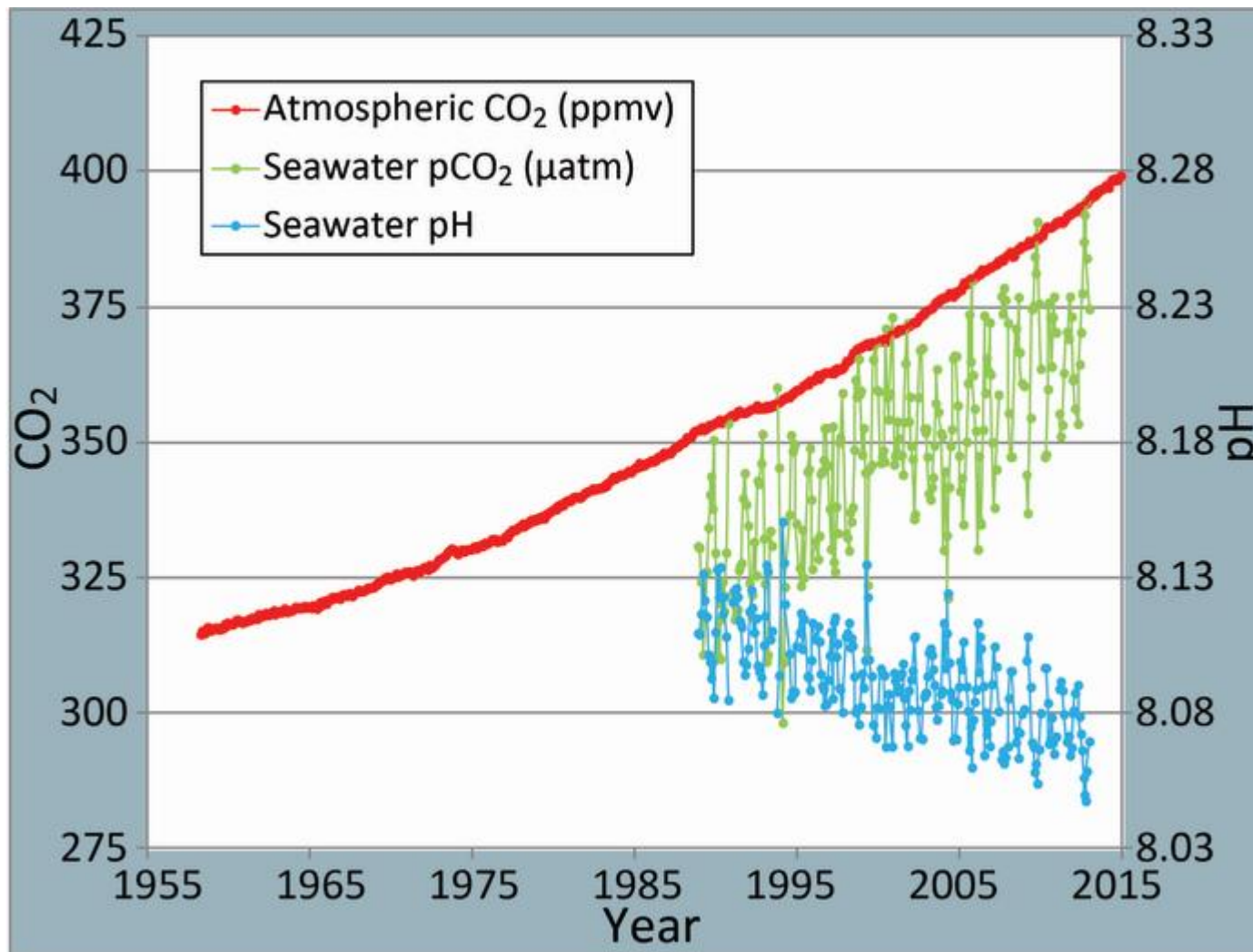
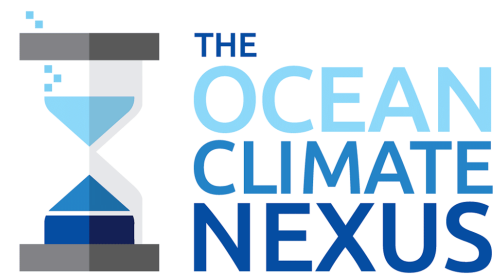
# ...regional variation is large

linear trend in sea level 1993-2014 from satellites

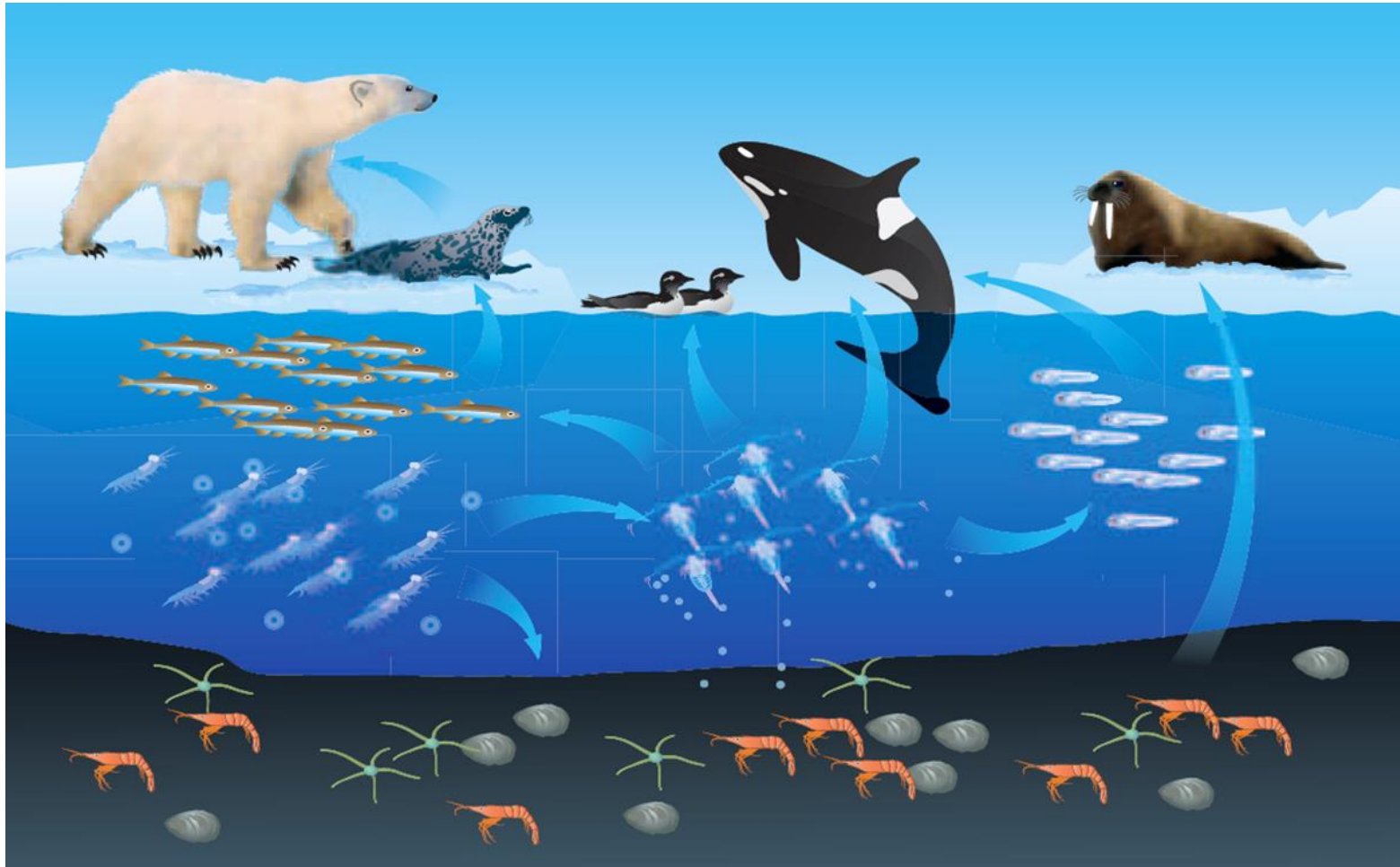




# Data from Hawaii

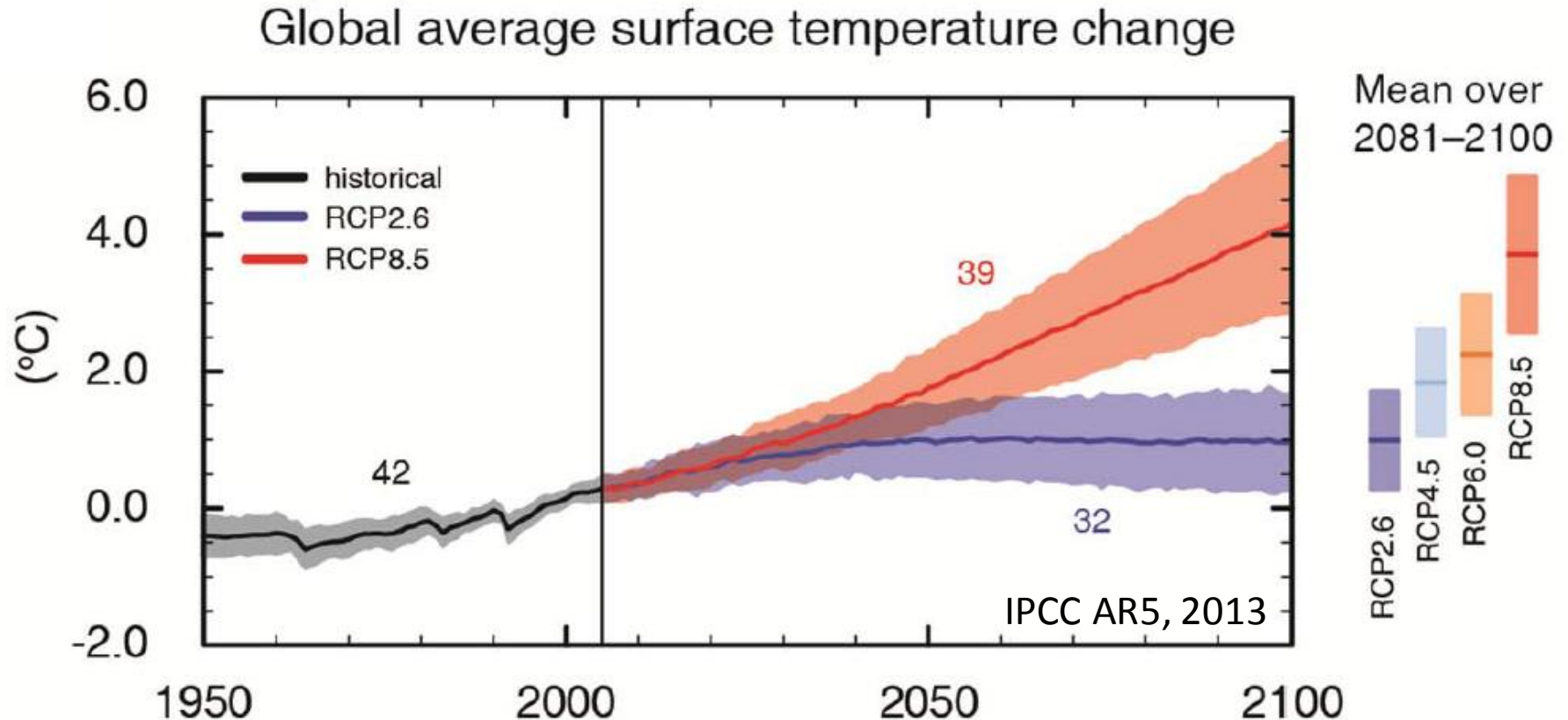
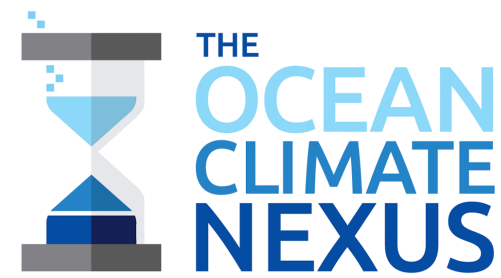


# Change in ocean pH



estimated change in sea water pH caused by human created CO<sub>2</sub> between the 1700s and the 1990s, from the Global Ocean Data Analysis Project (GLODAP) and the World Ocean Atlas

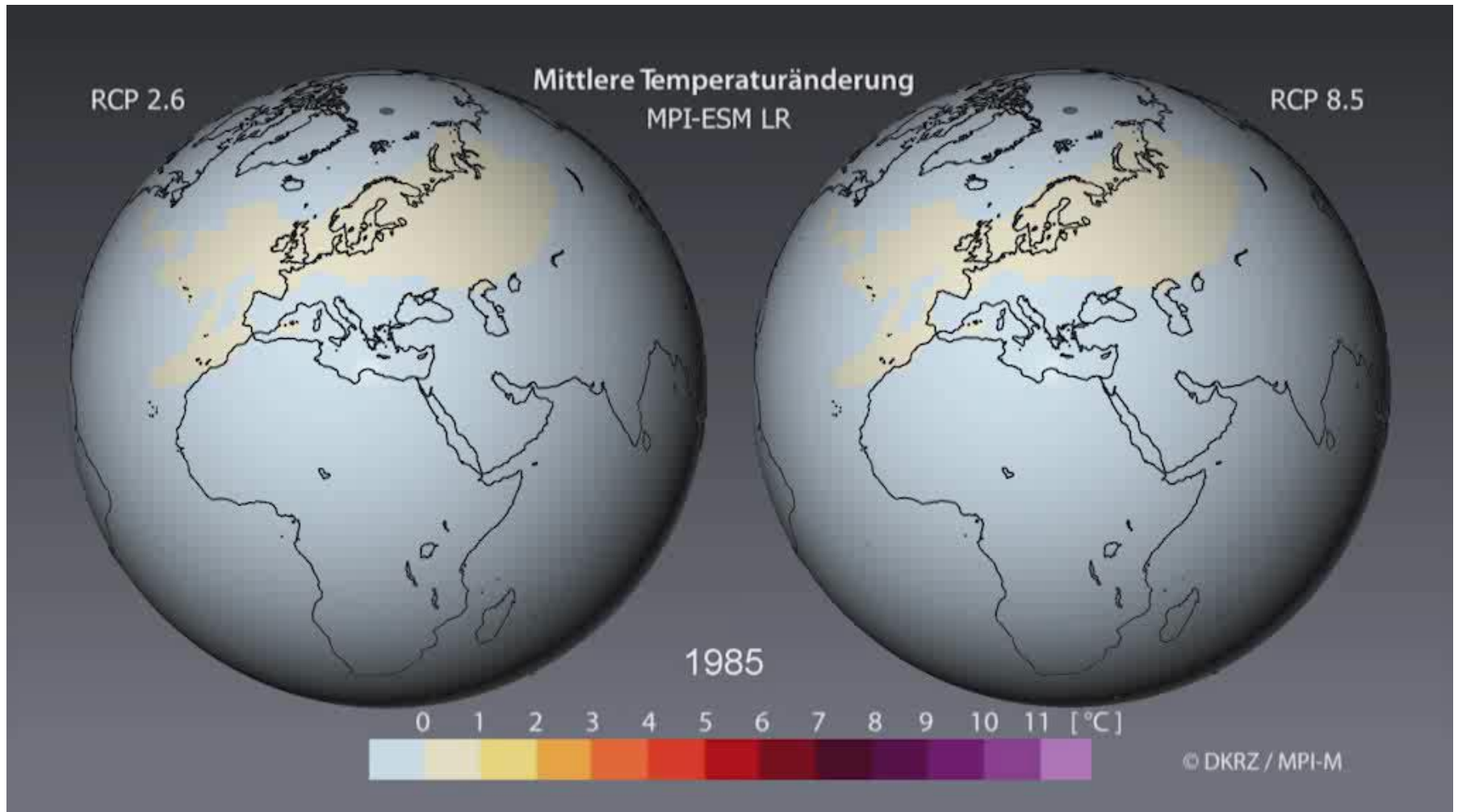
# The latest IPCC projections



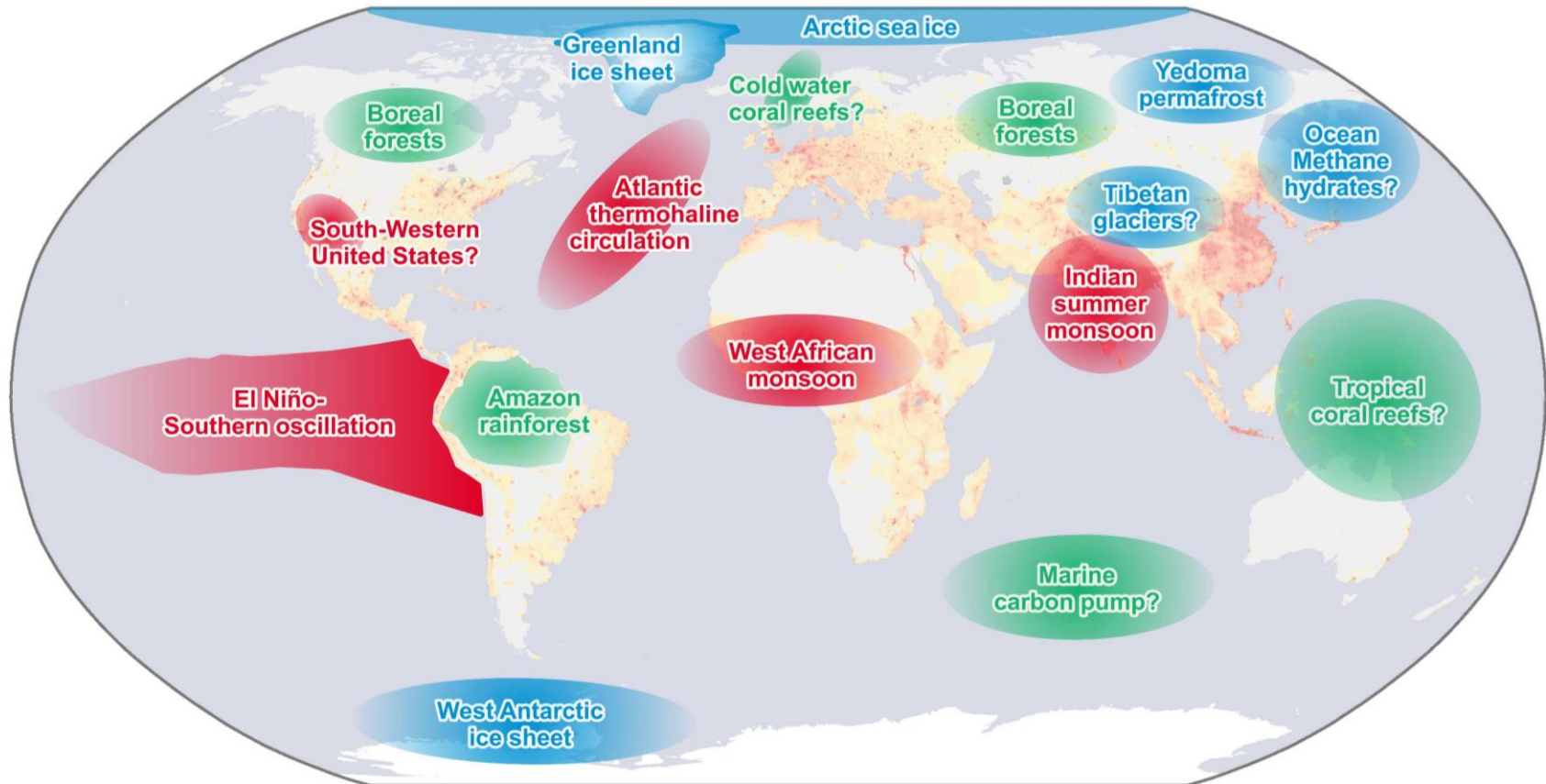
How will climate change regionally?






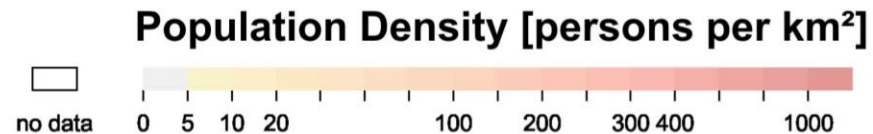
# Which world do we want?



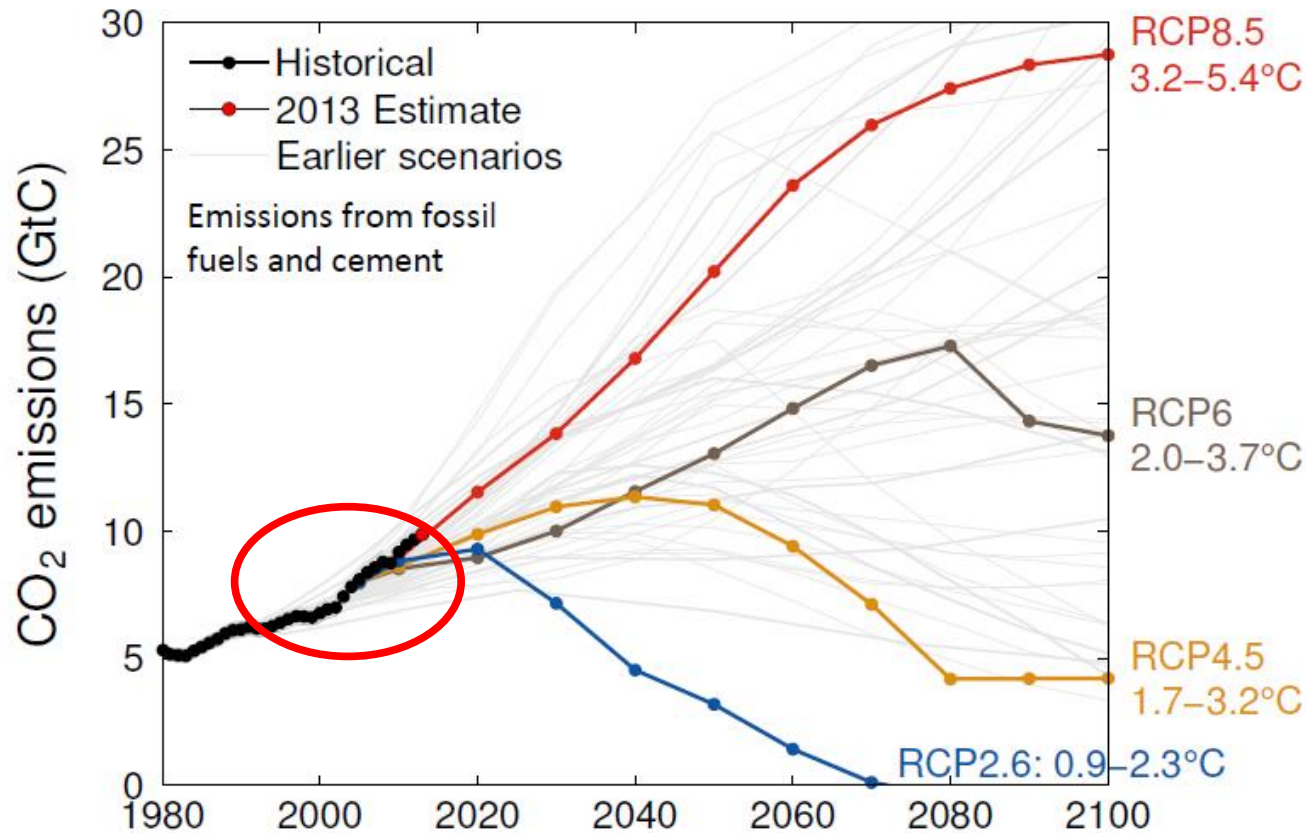
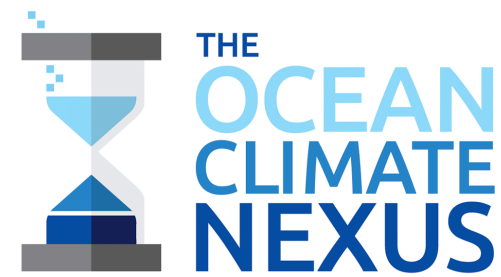
# Tipping elements in the Earth system



-  Ice Masses
-  Circulation Systems
-  Ecosystems



# We are following the worst case scenario



Global Carbon Project 2013

**plus 61% relative to 1990**



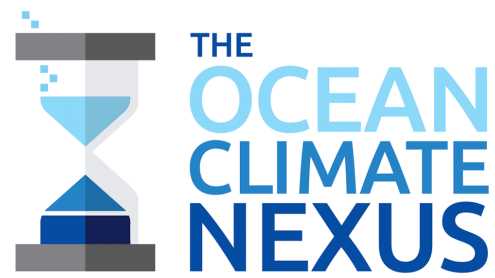
# Where do we stand?



there is still no binding protocol in reach that will be signed by all countries and that will protect the Earth's climate

# What is required?

---



- Stabilization of global greenhouse gas emissions by 2020
- Decarbonization of the world economy by 2070 (at the latest)
- Invest heavily in renewable energies, involve the financial sector
- Carbon capture and storage (CCS) is no option!
- Climate engineering is no option!

**Paris, please save the planet!!!**