

# Science understanding and gaps on temperature change

Panmao Zhai, Valérie Masson-Delmotte  
(WGI Co-chairs)

# Slow-onset event

- By decision 1/CP.16, the COP established a work programme under the Cancun Adaptation Framework to consider approaches to address loss and damage associated with climate change impacts;
- Slow-onset events to include:

## Temperature increase

Sea level rise

Desertification

Glacial retreat and related impacts

Ocean acidification

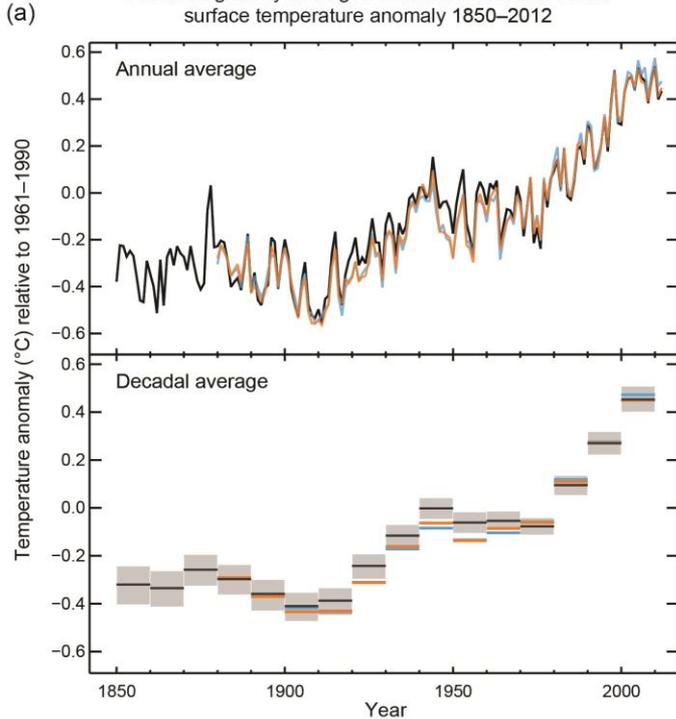
Land and forest degradation

Salinization

Loss of biodiversity

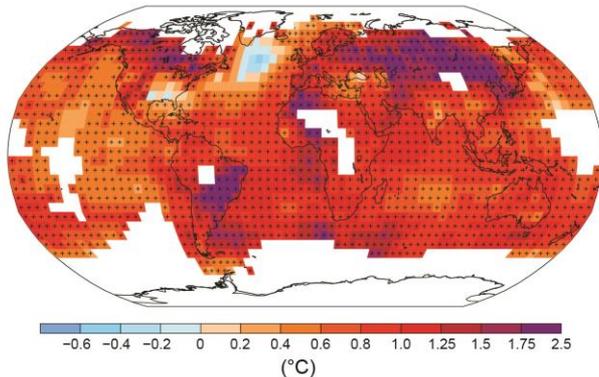
# Observed temperature change from AR5

Observed globally averaged combined land and ocean surface temperature anomaly 1850–2012

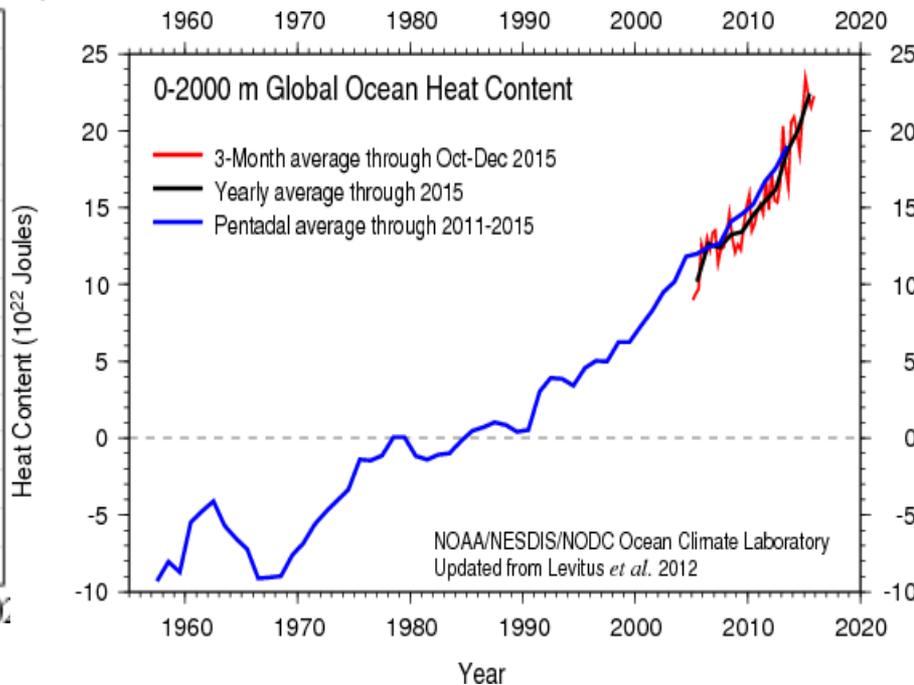
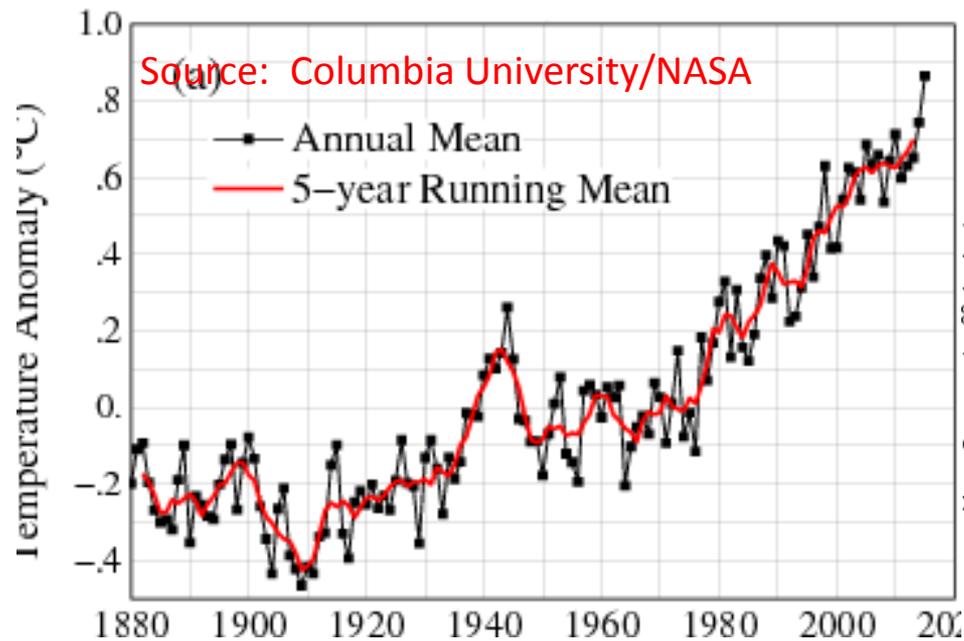


- ❖ Warming of the climate system is unequivocal
- ❖ Each of the last three decades has been successively warmer at the surface than any preceding decade since 1850.
- ❖ In situ observation gaps exist over land and ocean, especially in the earlier period.
- ❖ Reference period: ?

(b) Observed change in surface temperature 1901–2012



# Updated Monitoring on changes in global mean temperature and ocean heat content

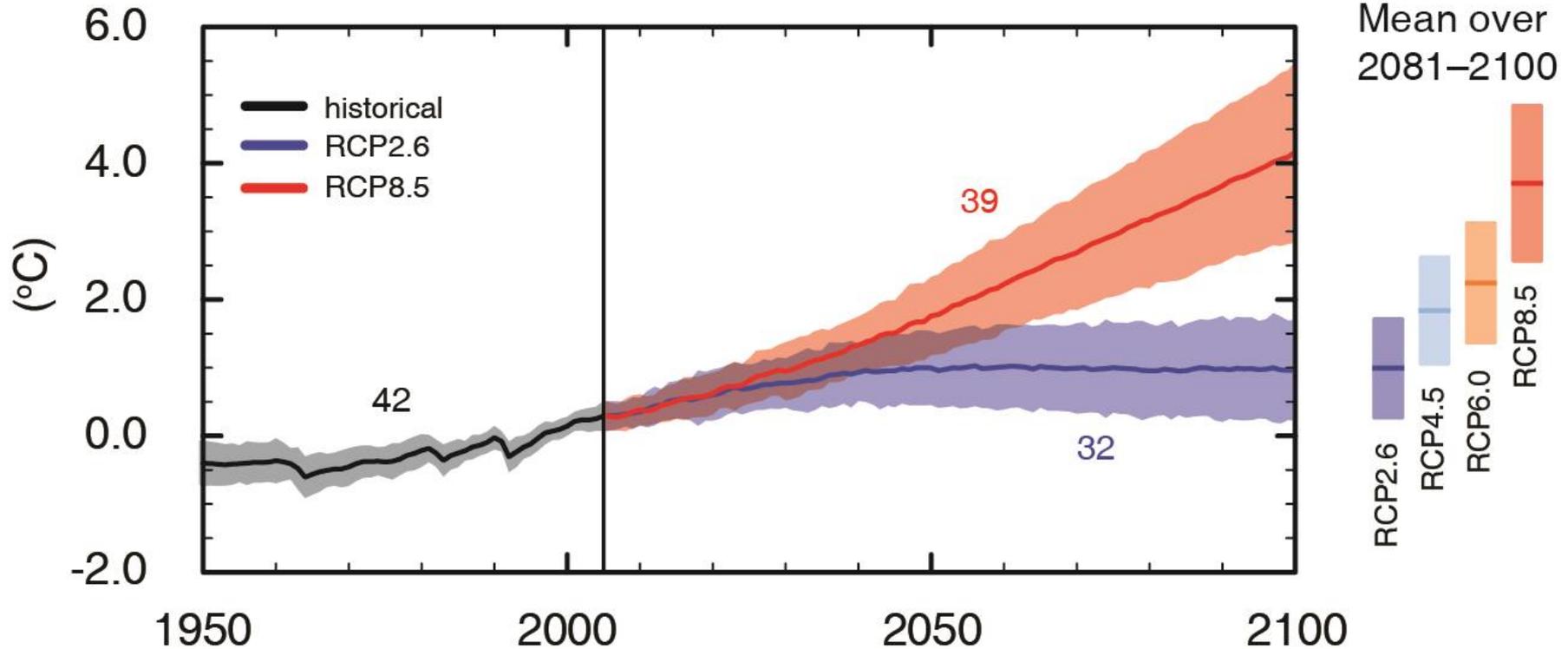


- ❖ Recent observations reaffirm that the warming trend continues despite the previous debate on warming hiatus!

# Projected temperature Changes

(a)

Global average surface temperature change

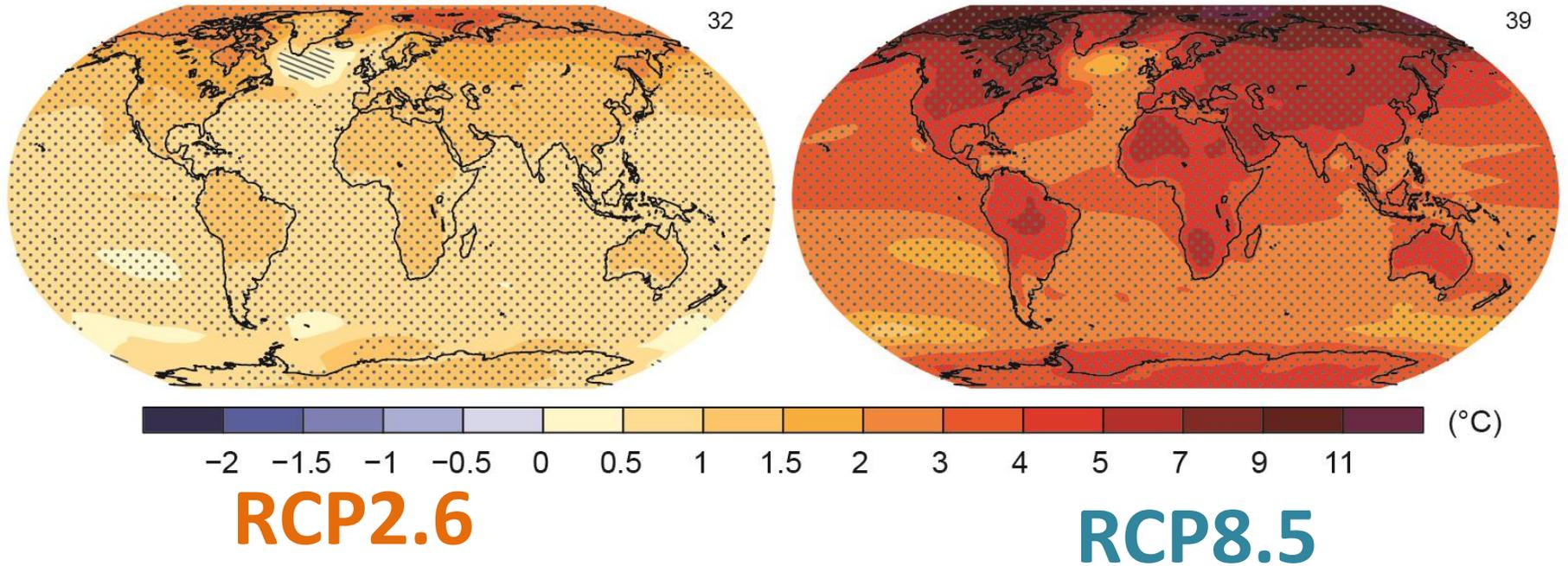


- ❖ GMST change for the end of the 21st century is likely to exceed  $1.5^{\circ}$  C relative to 1850 to 1900 for all RCP scenarios except RCP2.6.
- ❖ Projection uncertainty needs to be narrowed and reference period to preindustrial level expression should be more clear!

# Projected surface temperature change

a) Change in average surface temperature (1986–2005 to 2081–2100)

Fig. SPM.8



- ❖ **Warming will continue** but exhibit interannual-to-decadal variability and will not be regionally uniform !

# Emerging Science and Challenges

- ❖ Change in diurnal temperature ranges, growing season, regionality are important aspects for impact assessments, but there exist gaps in understanding their changes!
- ❖ Future projections in temperature in combination with precipitation at regional scale are crucial for impact assessments. They rely on the ongoing research on CMIP5-CMIP6, and CORDEX.
- ❖ Emerging research on GMST and regional impacts, but existing open questions about rates of changes and scenario (overshoot).
- ❖ New findings on climate sensitivity , suggesting higher sensitivity, from aerosol and cloud processes, important for multi-model spread, response to forcing, and emission scenarios compatible with targets.

**Thanks so much for your attention!**