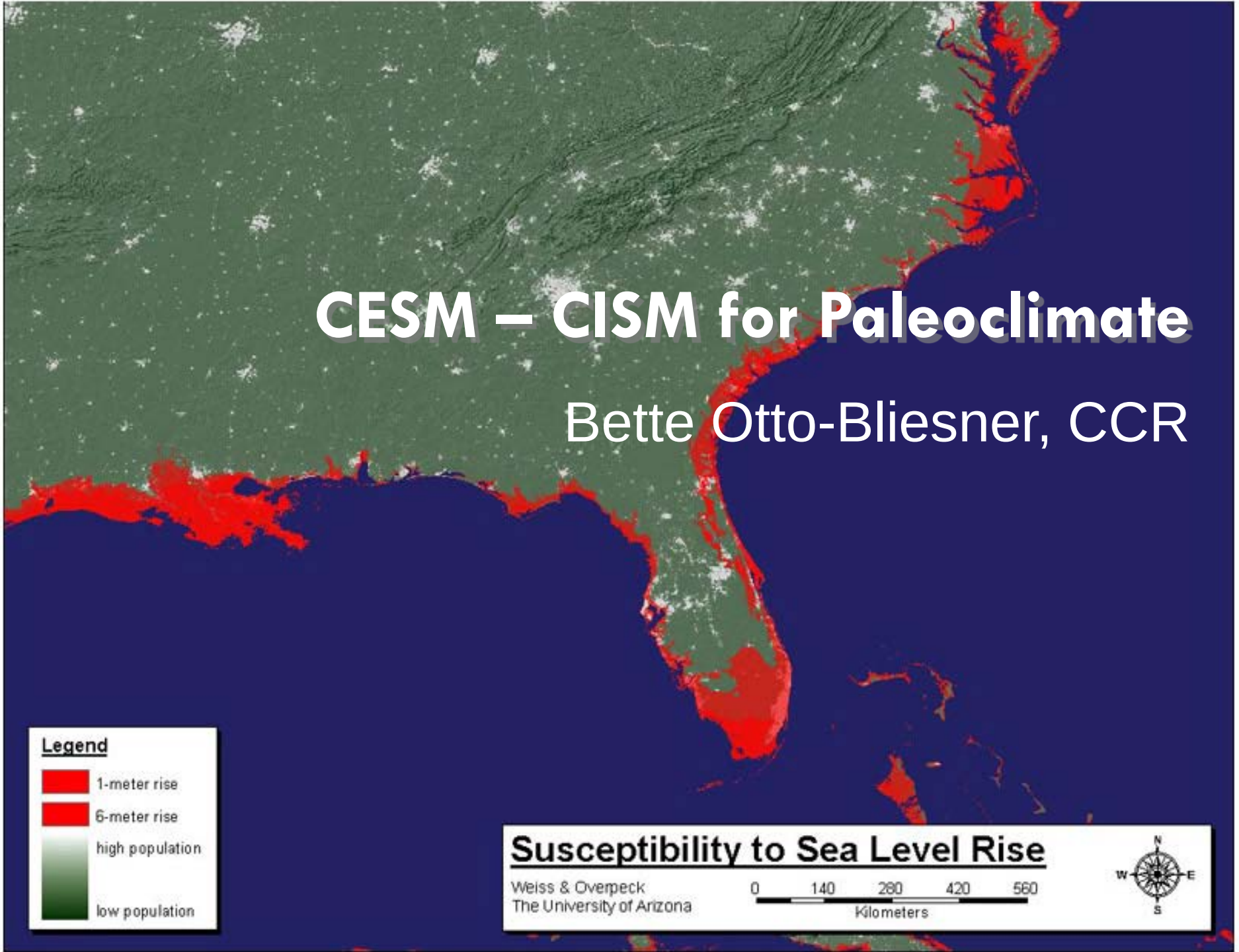
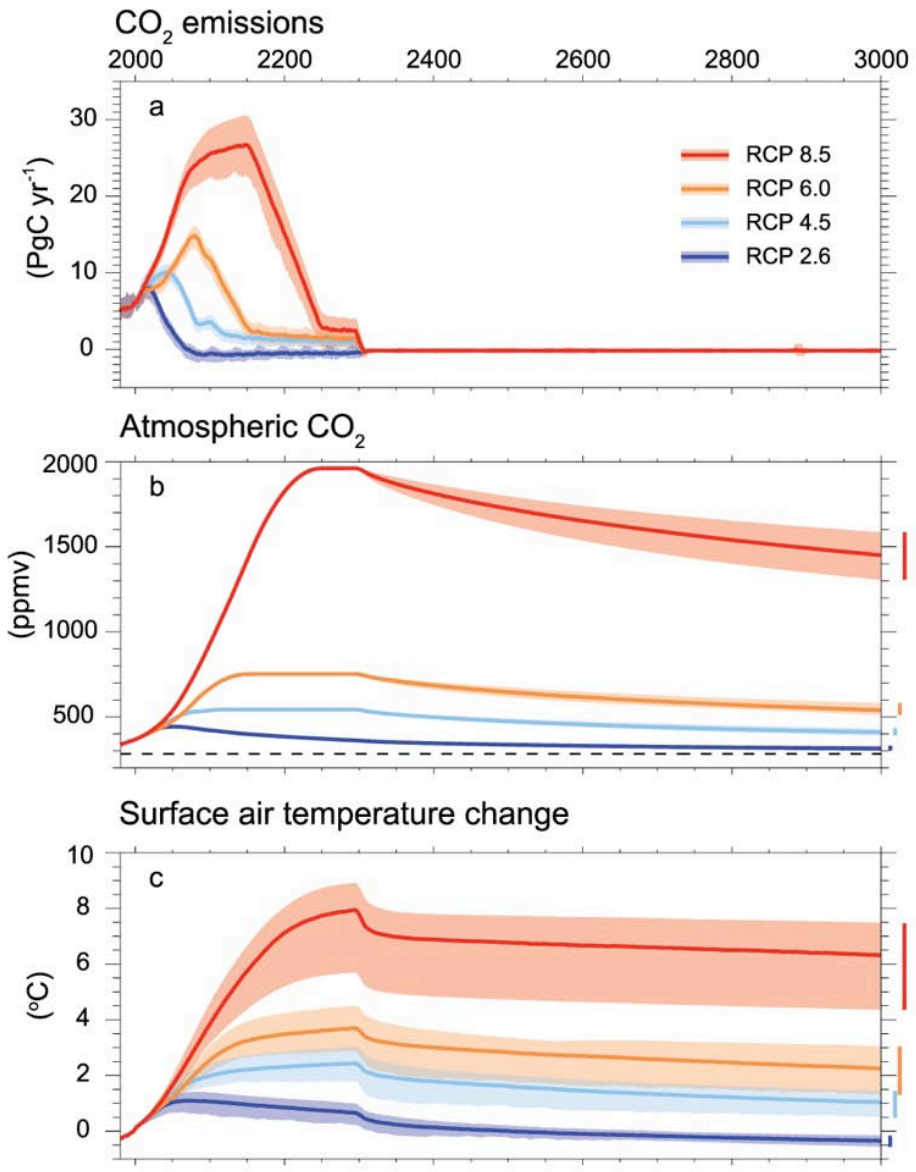


CESM – CISM for Paleoclimate

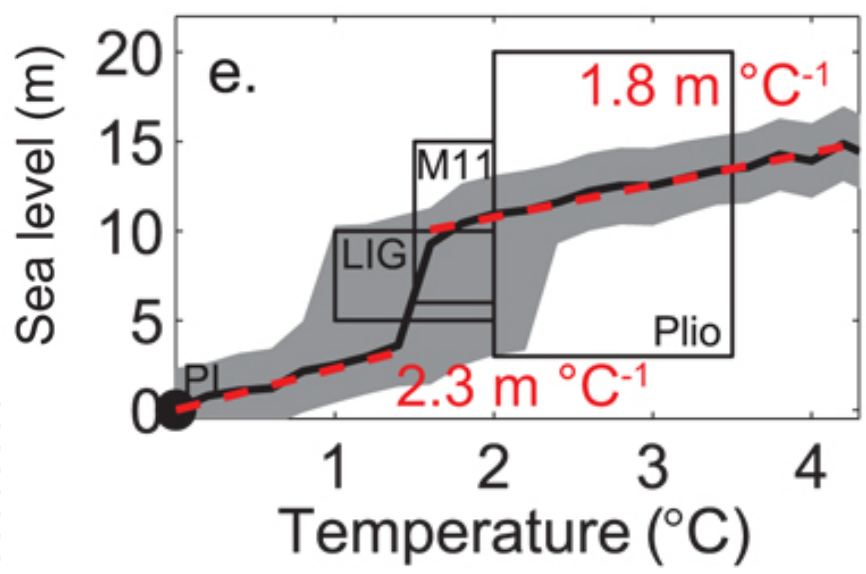
Bette Otto-Bliesner, CCR

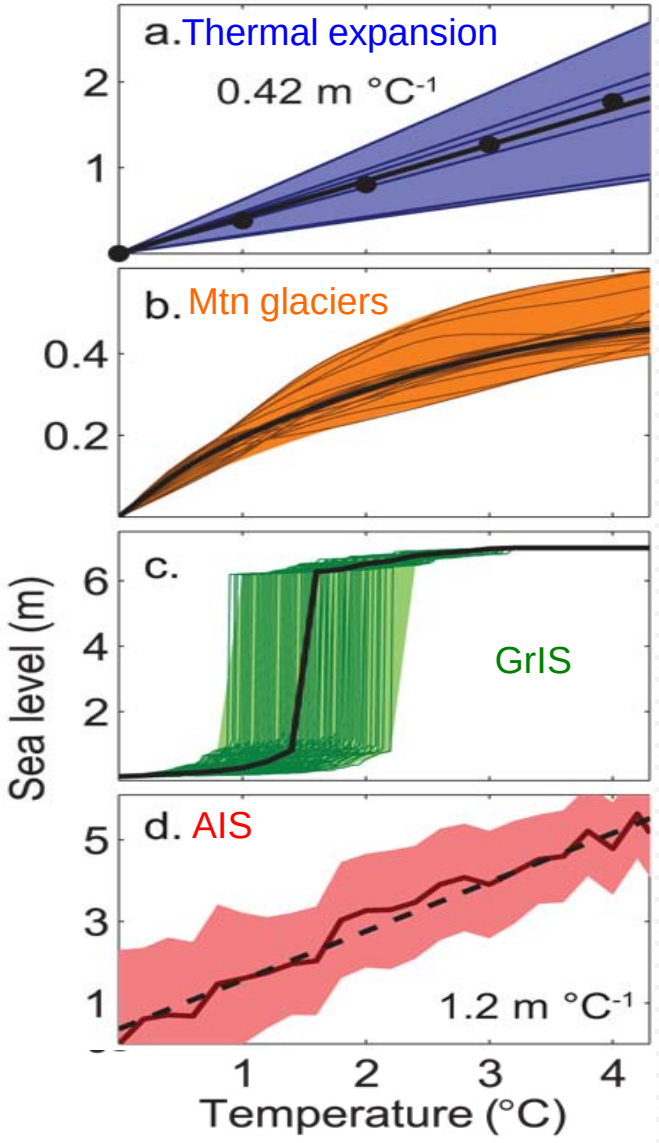
Long-term Future Change



IPCC AR5, Chapter 12

Paleo Perspective: Sea level and Global Warming





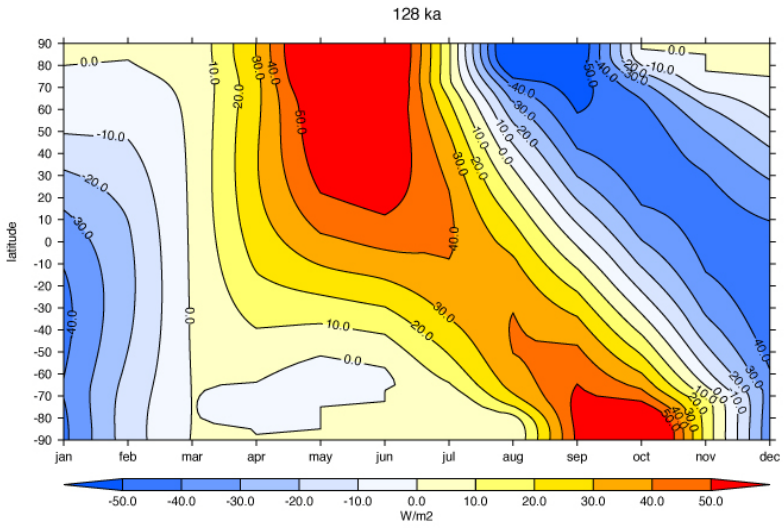
Global mean sea level relative to present:

- Last Interglacial: 5 to 10m
- Pliocene: >present up to 20m
- Last deglaciation: -120m to present

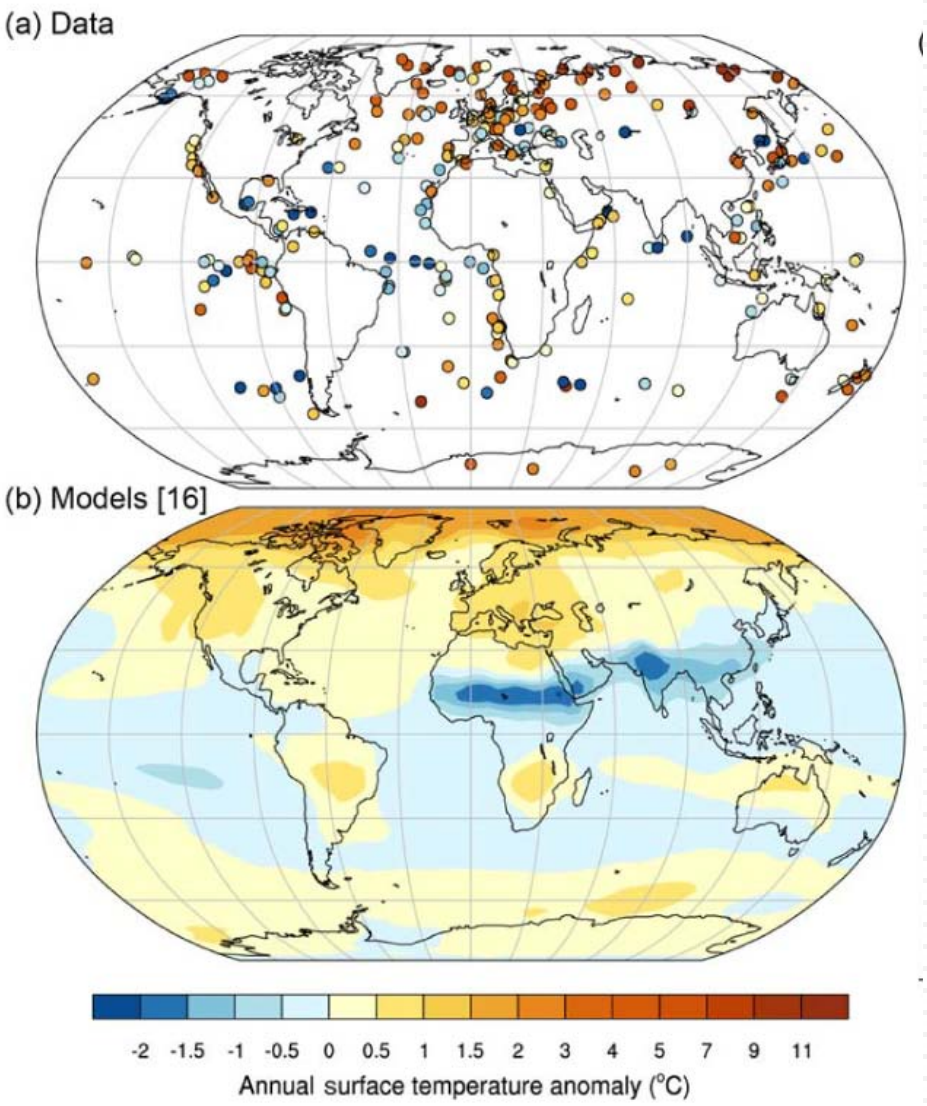
IPCC AR5, Chapter 13

Last Interglacial (128 to 116 thousand years ago)

- Different **orbital forcing** than today



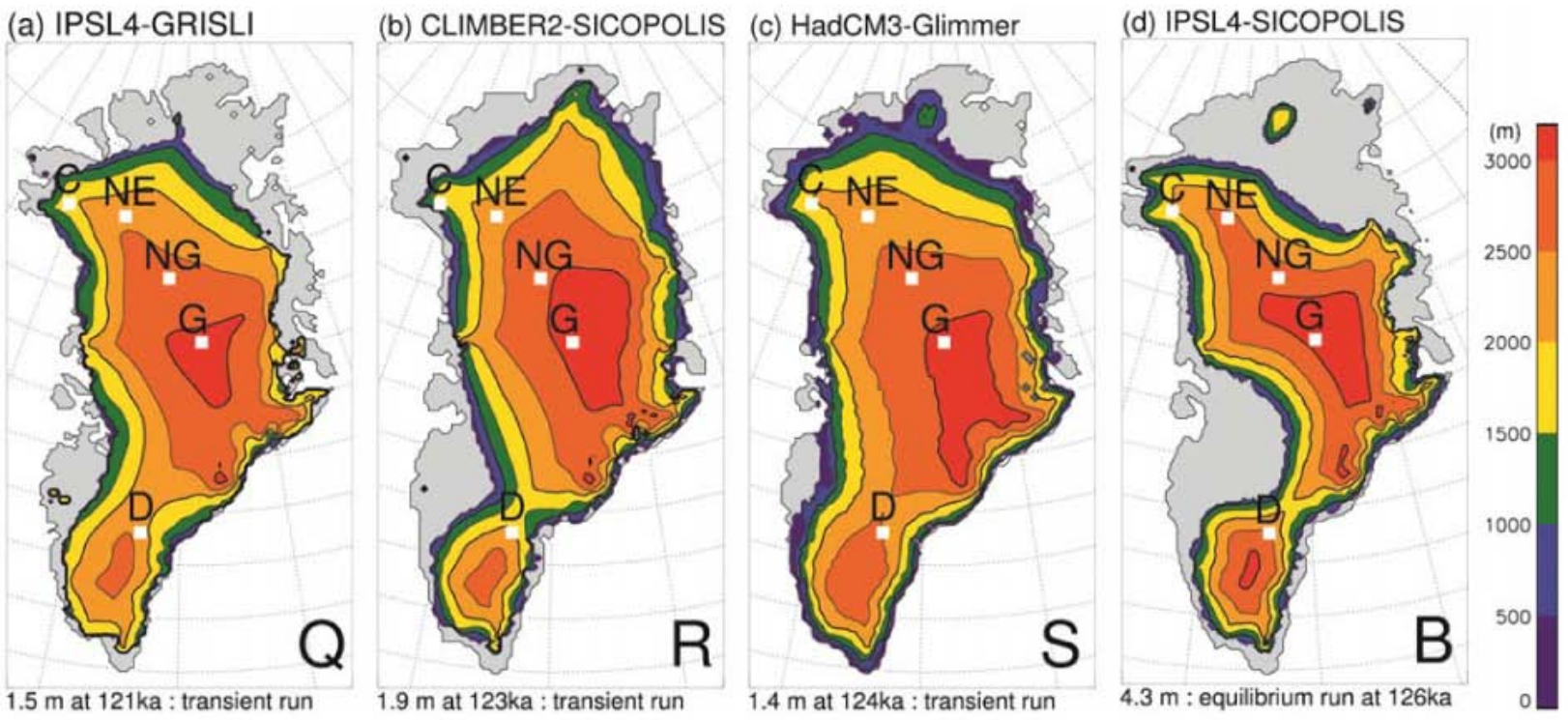
- **High-latitude surface temperature**, averaged over several thousand years, **at least 2° C warmer** than present.



IPCC AR5, Chapter 5

Simulation of GrIS and implications for sea level

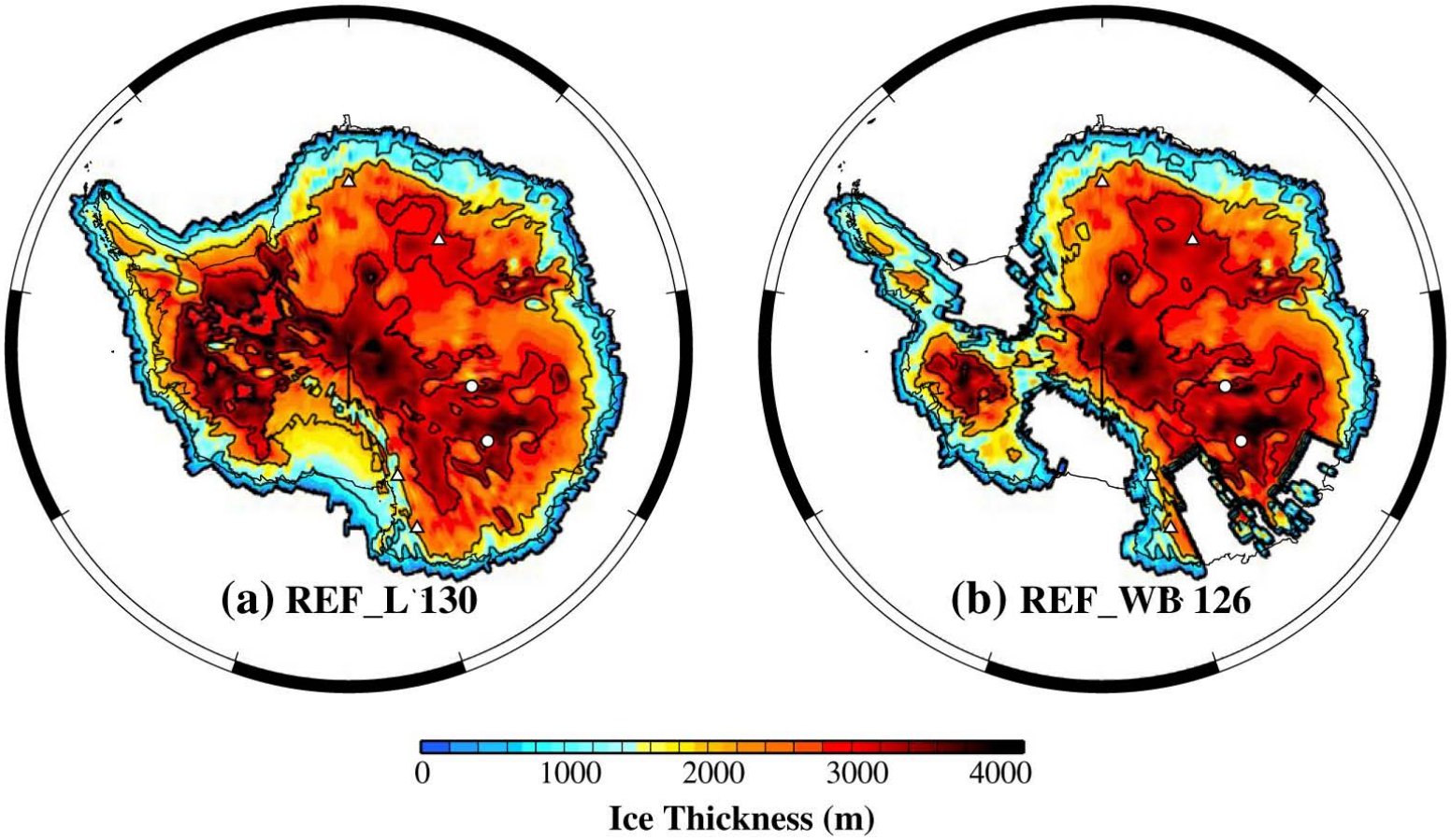
- During the last interglacial period, the **Greenland ice sheet** ***very likely*** contributed between **1.4 and 4.3 m** to the higher global mean sea level …



IPCC AR5, Chapter 5

Last Interglacial Antarctic Ice Sheet configuration

- … implying with ***medium confidence*** an additional **contribution from the Antarctic ice sheet.**



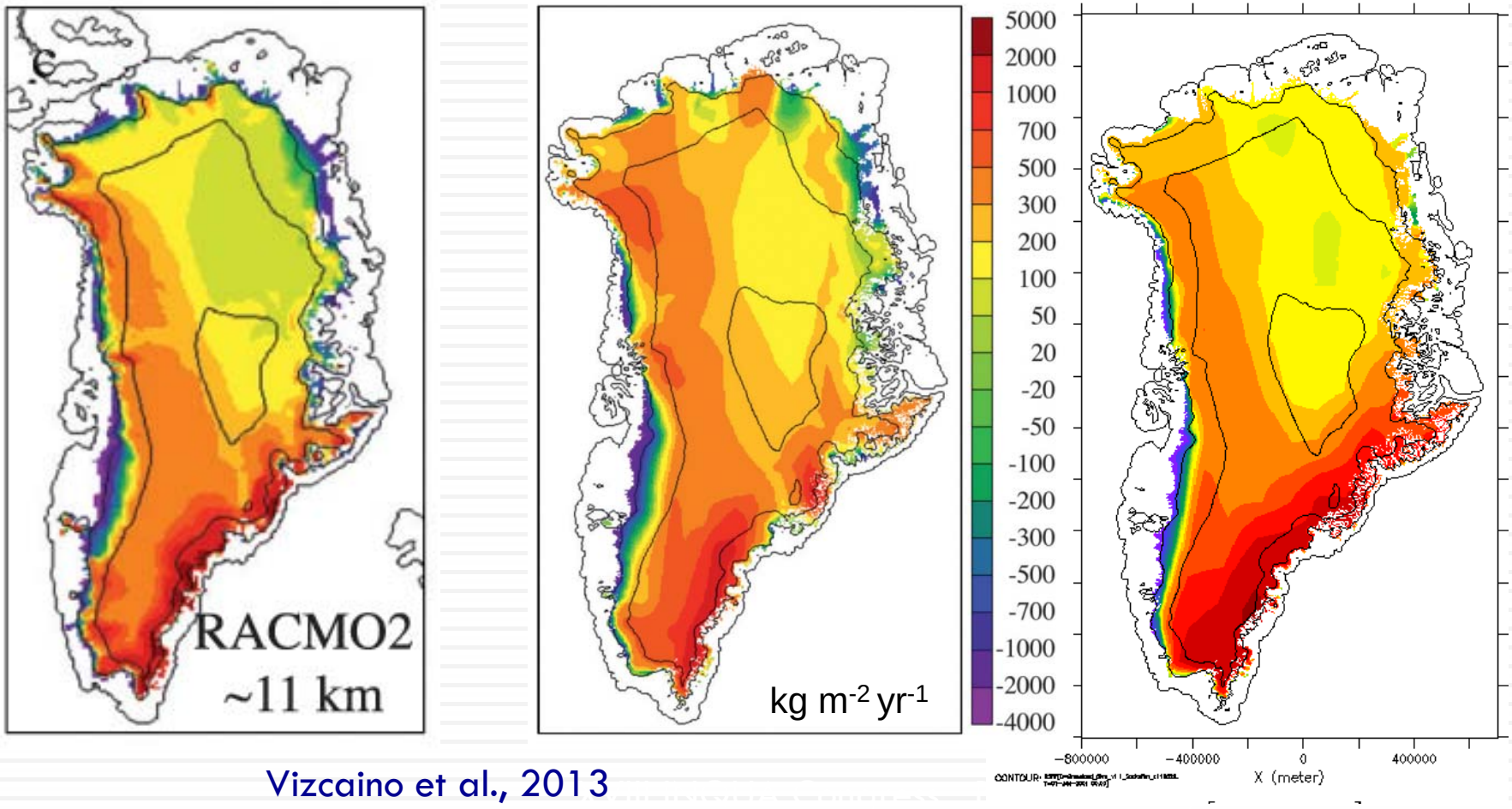
Bradley et al., 2013

‘Proof-of-concept’ with CESM-CISM1(one-way coupling)

Preindustrial (1850AD)

CESM(CAM4) – FV1x1

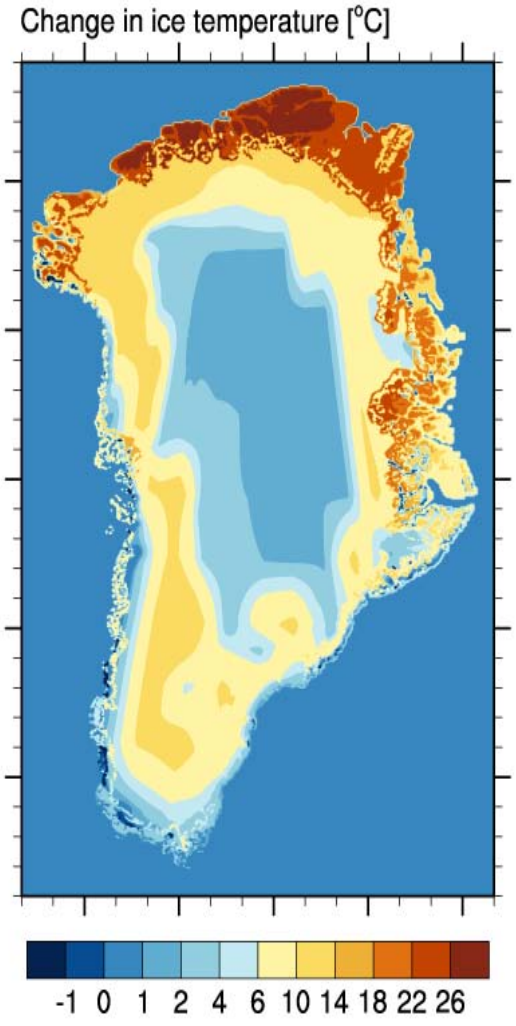
CESM(CAM5) – FV2x1

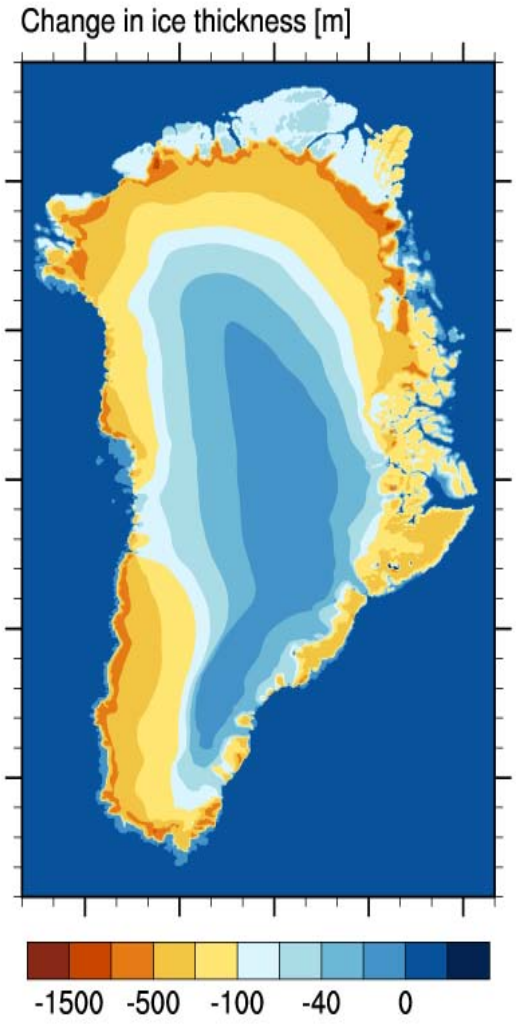


Vizcaino et al., 2013

‘Proof-of-concept’ with CESM(CAM5)-CISM1(one-way coupling)

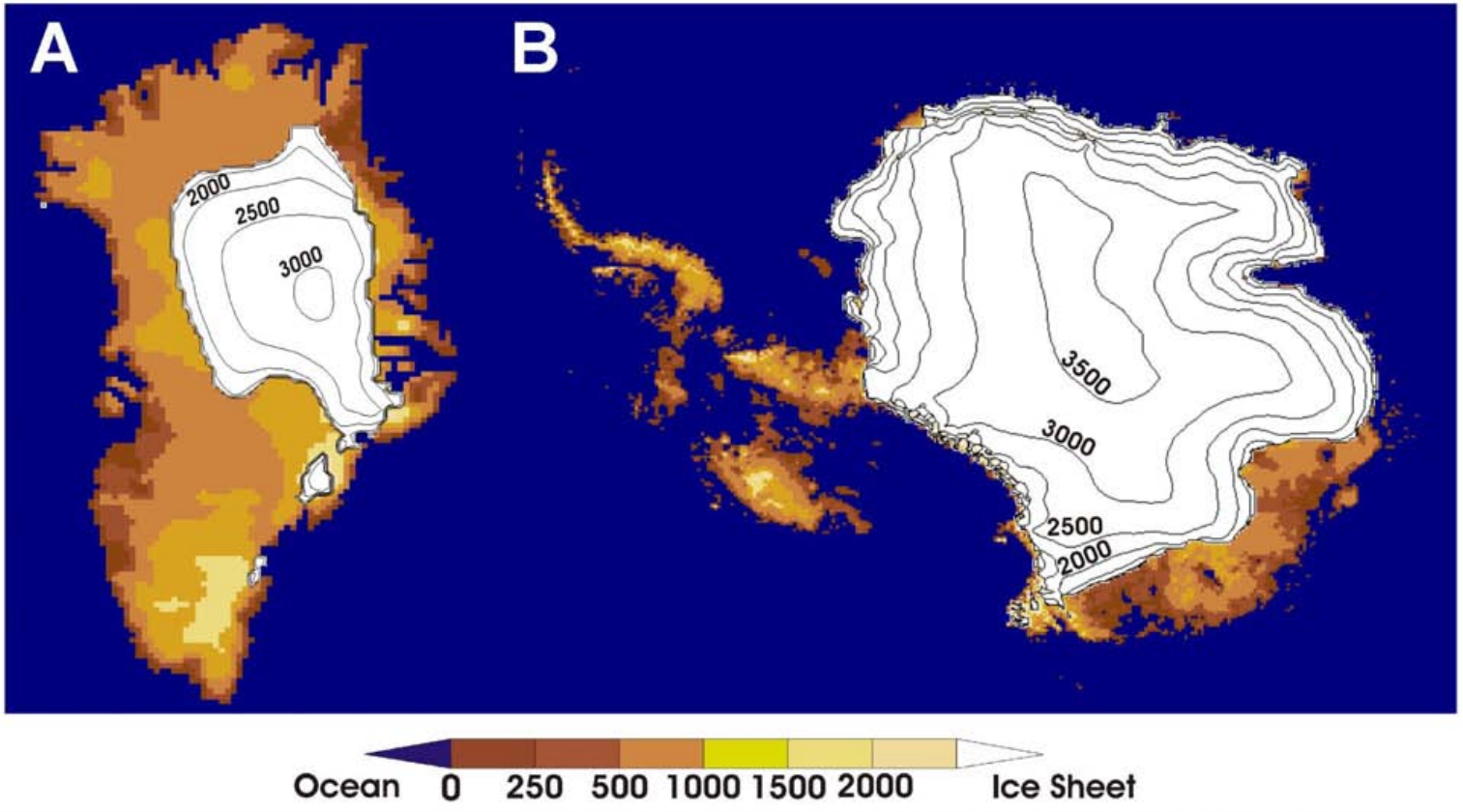
Last Interglacial (128 kyr BP) minus Preindustrial





Mid-Pliocene (3.3 to 3.0 million years ago)

- Atmospheric CO_2 350 to 450 ppm
- Global mean surface temperatures 1.9° C to 3.6° C higher than for pre-industrial climate
- Sea level greater than present up to +20m



Haywood et al., 2010

Grand Challenge: Glacial-Interglacial Cycles

Supplementary Video V1.

Simulated ice sheet change for the last 400 kyr with IcIES-MIROC model

Abe-Ouchi et al., 2013