How much confidence can we have in our climate models?

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Graph showing global surface temperature change with different emission scenarios and models.
Model Bias

SST bias averaged over 22 CMIP5 models

Wang et al. 2014, Nature Climate Change
Model Bias

Enhancing atmosphere model resolution helps to reducing tropical SST biases

SST biases in KCM versions with low (T42L31) and high resolution (T255L62) its AGCM

after Harlass et al. 2018
Multidecadal to centennial variability

Park and Latif 2008
Lack of understanding of Earth system dynamics

We do not understand the big signals in the past

Ahn and Brook 2008
Lack of understanding of Earth system dynamics

sea level rise since the last ice age

https://www.giss.nasa.gov/research/briefs/gornitz_09/

post-glacial sea level rise

after IPCC AR5
What do we need to do?

• care for (reduce) obvious biases
• process understanding and high resolution modeling
• natural multidecadal to centennial variability
• link to paleoclimate community
• ocean observations