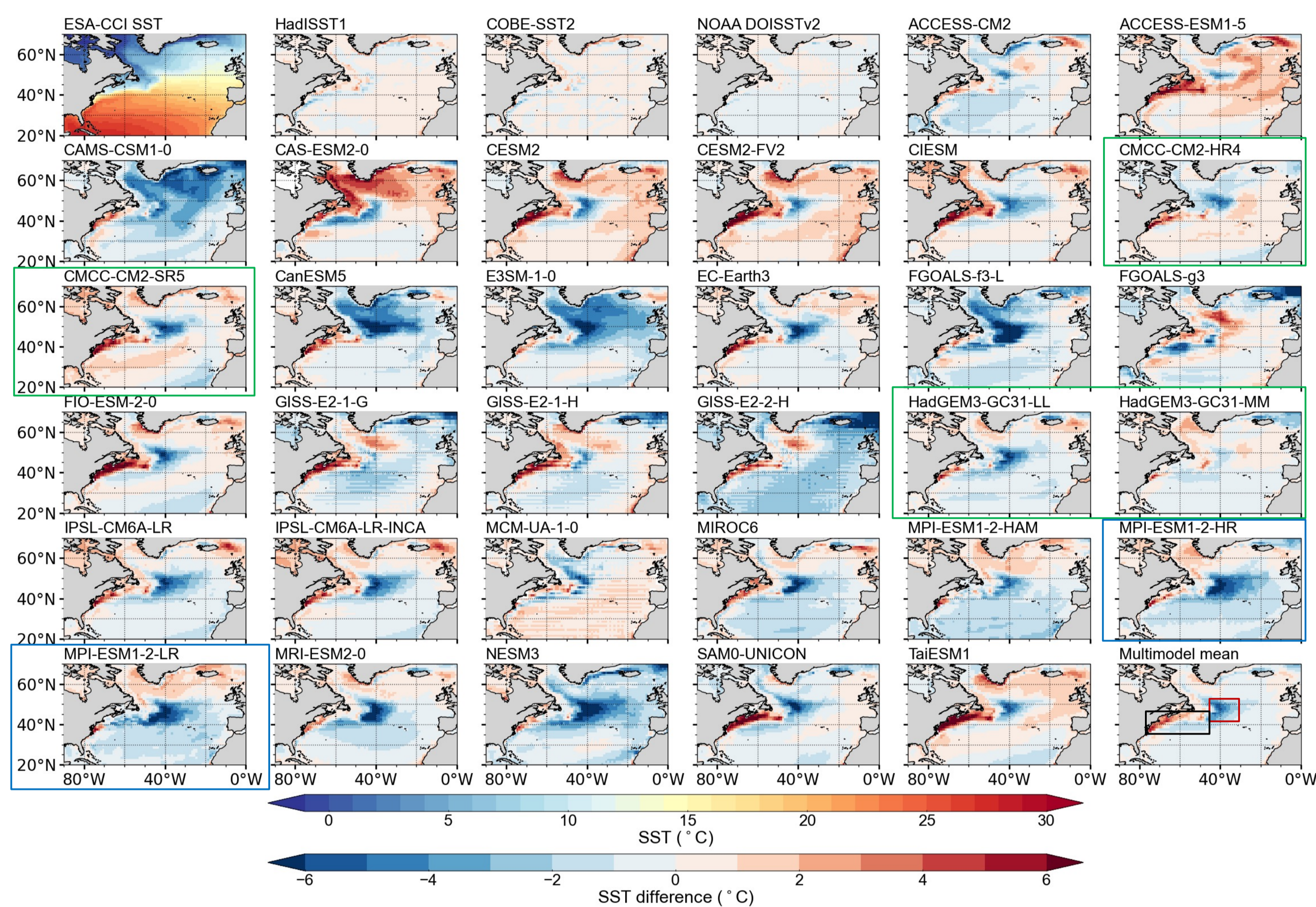


Characterization and causes of North Atlantic cold biases in climate models

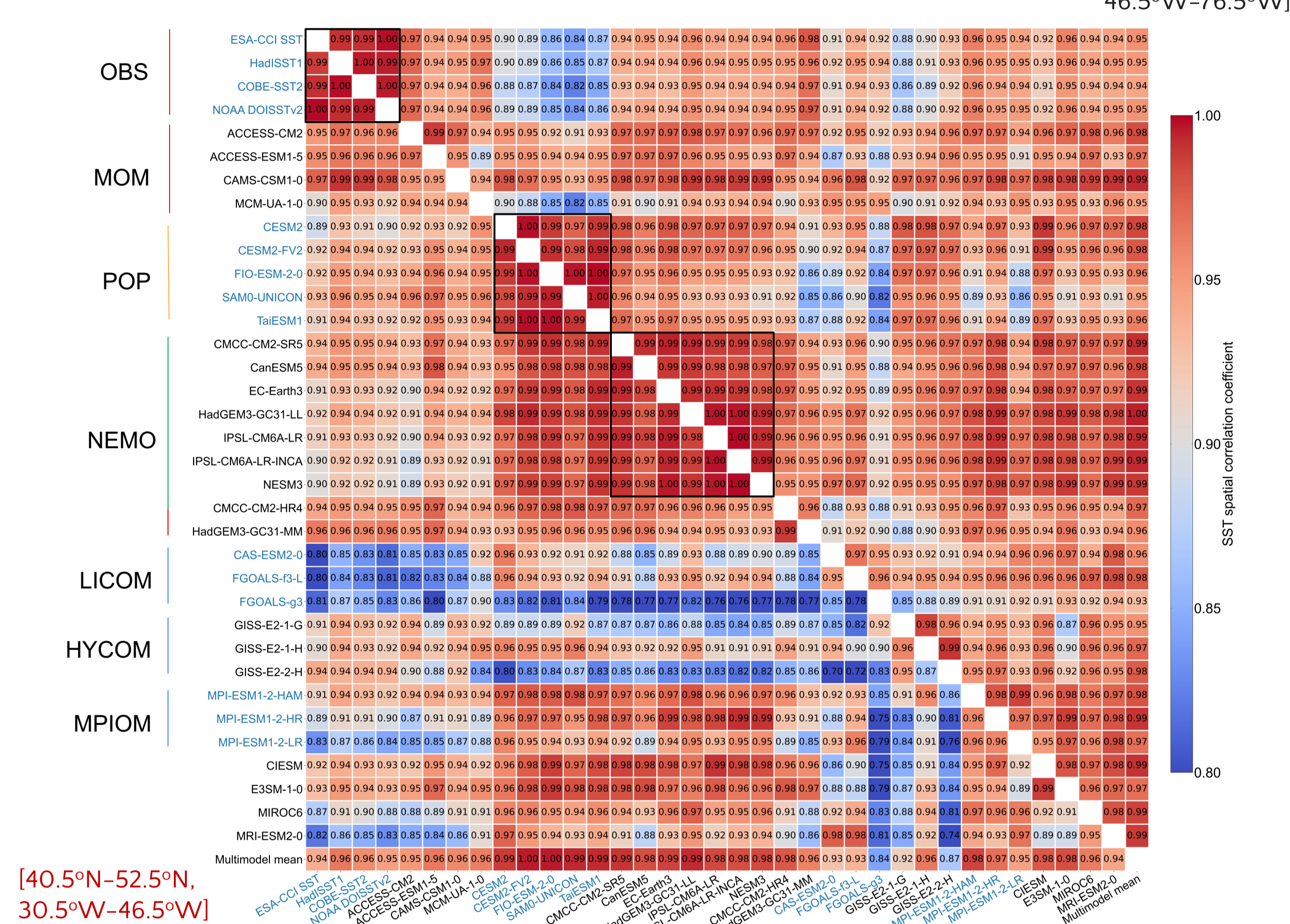
Xia Lin, François Massonnet, Helena Barbieri de Azevedo,
Pablo Ortega, Xiaoming Zhai

Most climate models simulate **temperatures that are too low** in the North Atlantic (NA). These biases are a primary source of concern, as they directly **affect the skill of predictions and the confidence in projections** in the NA, Europe, and the Arctic.

SST and SST difference



Spatial correlation coefficient

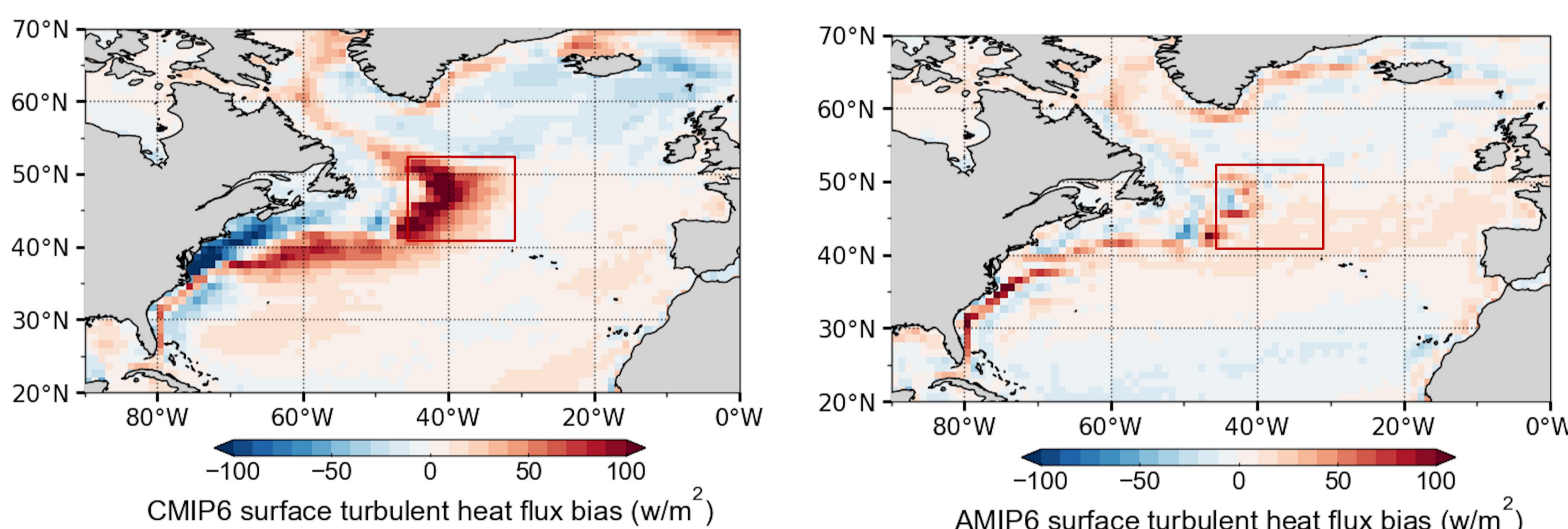


- Four observations are close; Climate models using same ocean models (different versions) show some similarities;
- SST bias is much reduced in HadGEM3-GC31-MM with increased atmospheric (-0.8°) & ocean (-0.25°) model resolution;
- Model skills in cold bias region (red box) and Gulf Stream region (black box) are consistent;

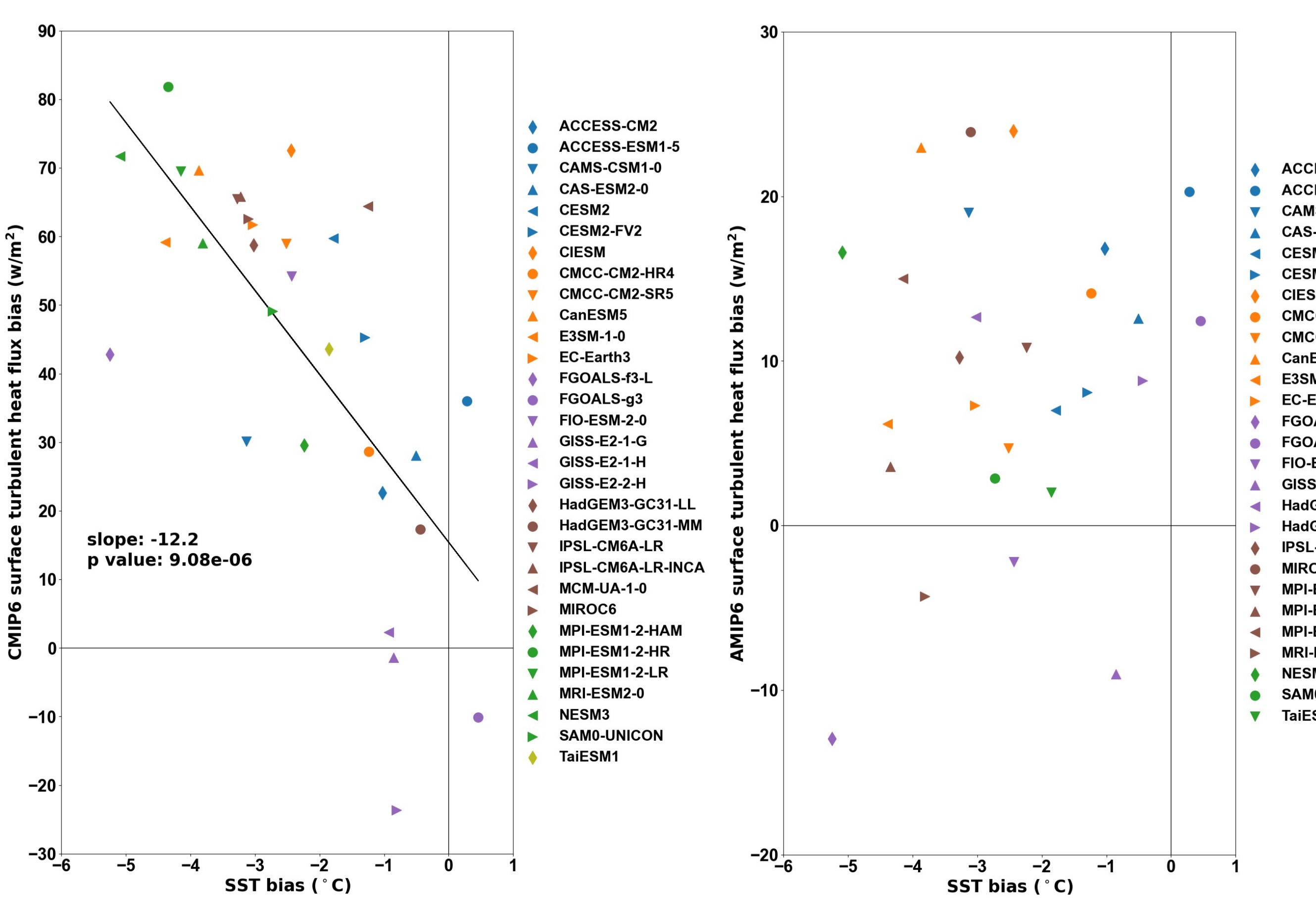
Contributions from Atmospheric and Ocean processes

surface heat flux

2001-2014 MMM CMIP6 & AMIP6 surface turbulent heat flux (THF) bias

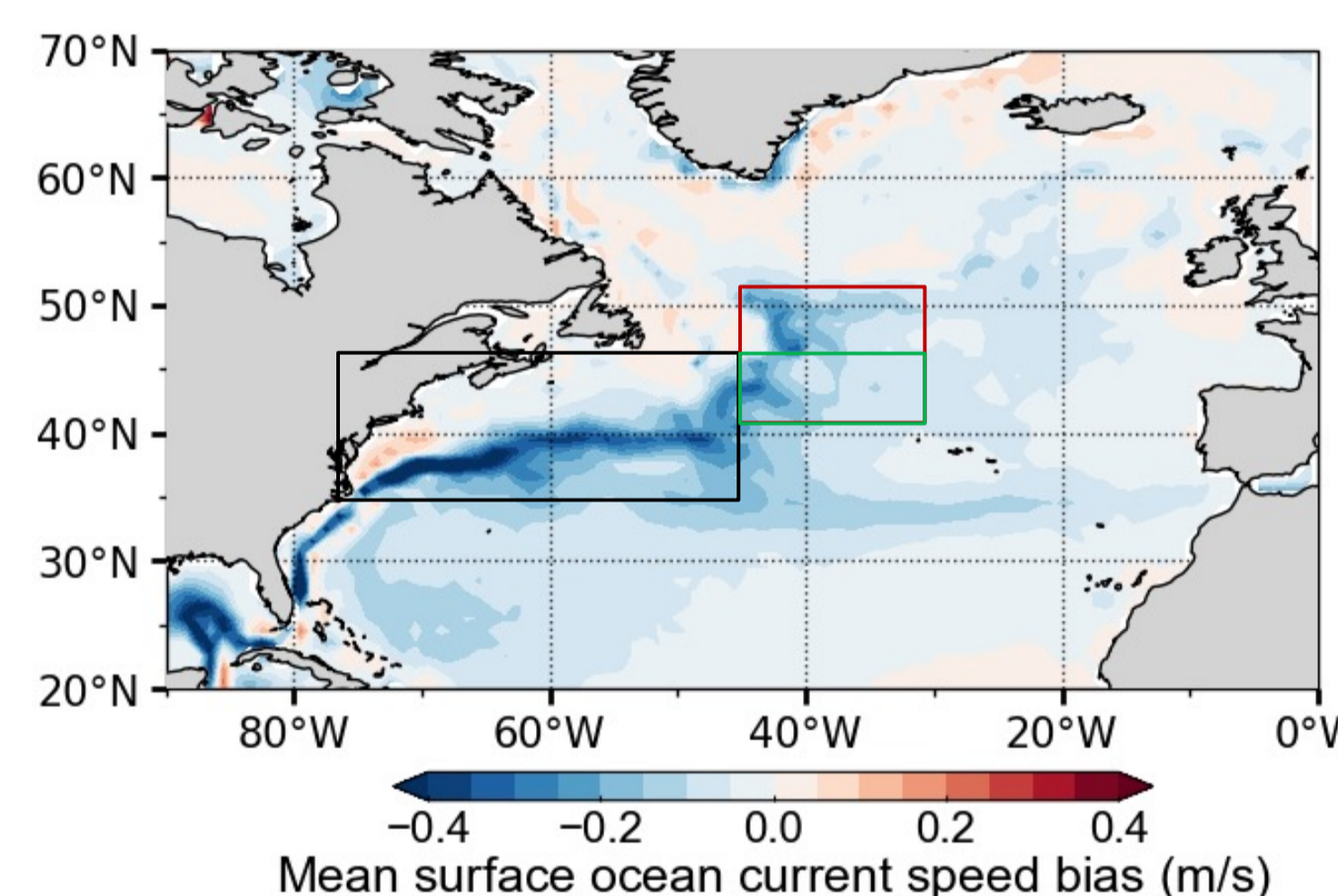


CMIP6 SST bias vs. CMIP6 & AMIP6 THF bias
-SST bias induced turbulent heat flux bias



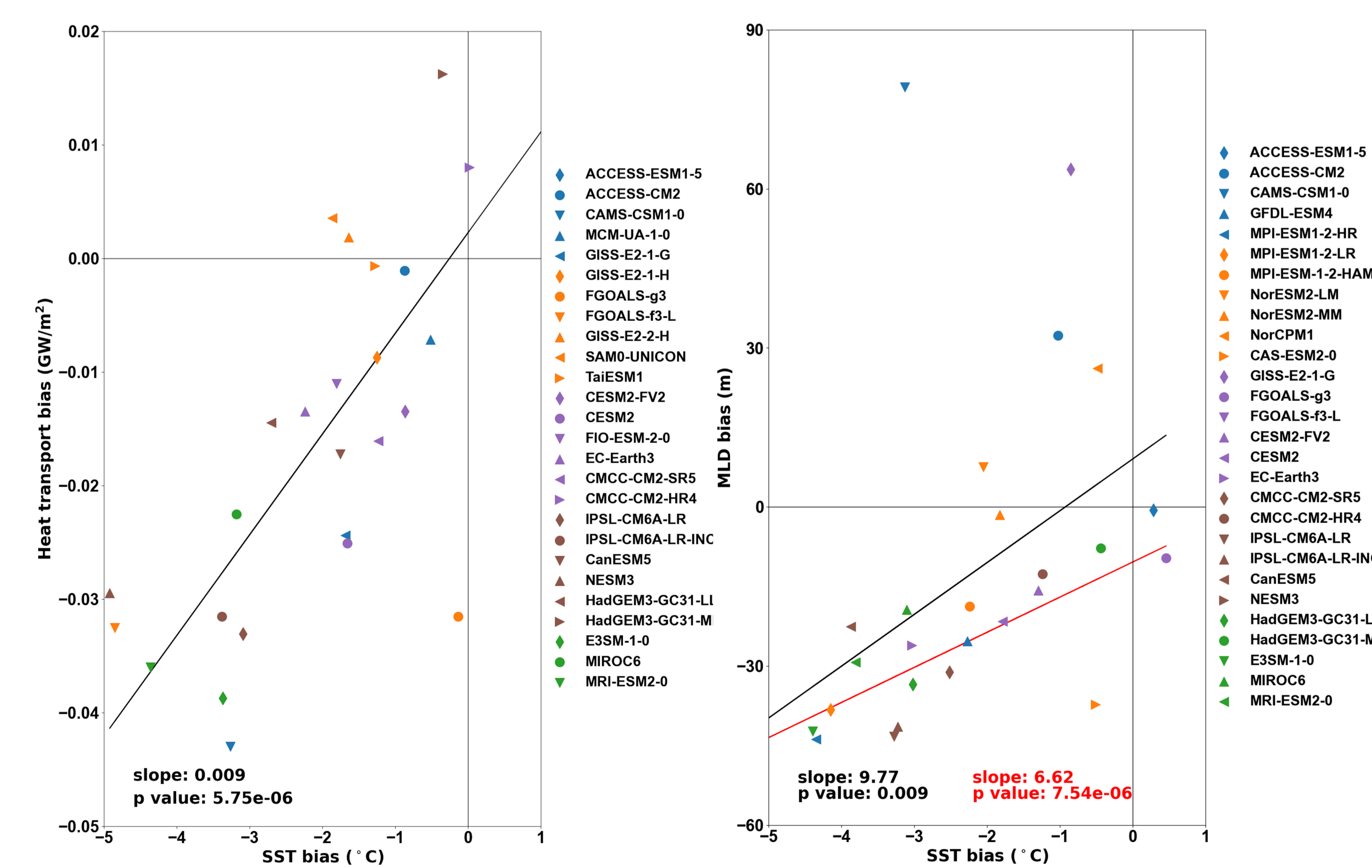
horizontal heat transport and vertical mixing

2001-2014 MMM CMIP6 surface ocean current speed bias



- Weak Gulf Stream induced weak heat transport and cold SST bias
- MLD bias is not a reason

CMIP6 SST bias vs. heat transport bias across 46.5°W
CMIP6 SST bias vs. MLD bias



Any comments/questions? Get in touch! xia.lin@uclouvain.be

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