

Antarctic Melt as a Driver of Climate Trends



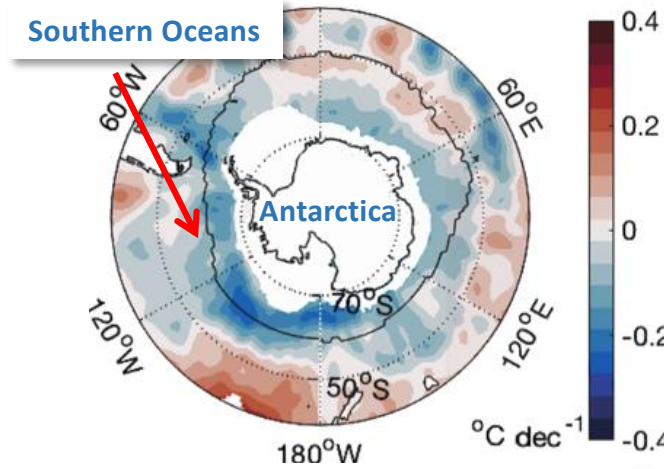
Craig Rye (MIT/GISS)

The Southern Oceans around Antarctica are cooling (see diagram a), while computer simulations suggest that it should have warmed (diagram b). Why? Recent anomalous melt of Antarctica is estimated to be around 750 Gt/yr (2019). Could this be important?

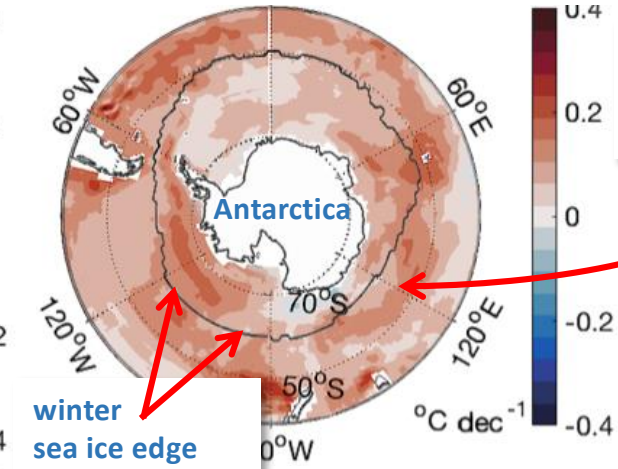
We used the Goddard Institute for Space Studies (GISS) Earth System Model, ModelE, which has an excellent representation of the Southern Ocean. We drove the model with an abrupt increase in melt and examined the response using a Greens Function approach to estimate how this would affect climate projections.

Result: The melt flux does drives Southern Ocean cooling, freshening and sea ice expansion (diagram c), suggesting that this is an important component of the Southern Ocean trends and should be explicitly included in climate model hindcasts and projections.

a) Observed change in Southern Ocean surface temperature (1992-2014)

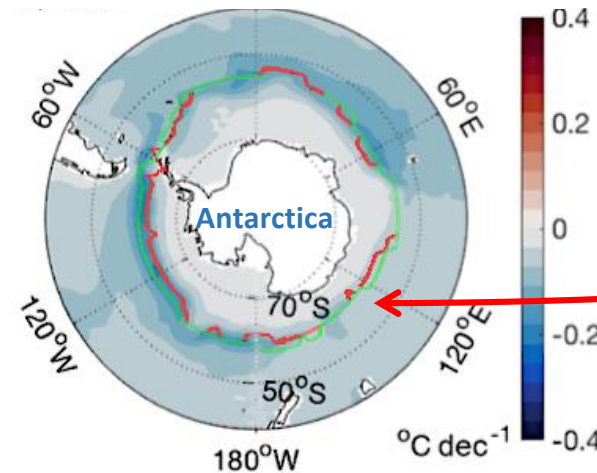


b) Simulated change in standard models.



Models show warming

c) Simulated change in surface temperature from adding melt water.



Sea ice increases from the red line to the green line.