24

Seasonality of Antarctic water masses in HiGEM

Yanxin Wang, Karen Heywood, David Stevens and Gillian Damerell

Centre for Ocean and Atmospheric Sciences ,School of Environmental Sciences, University of East Anglia

PICCOLO

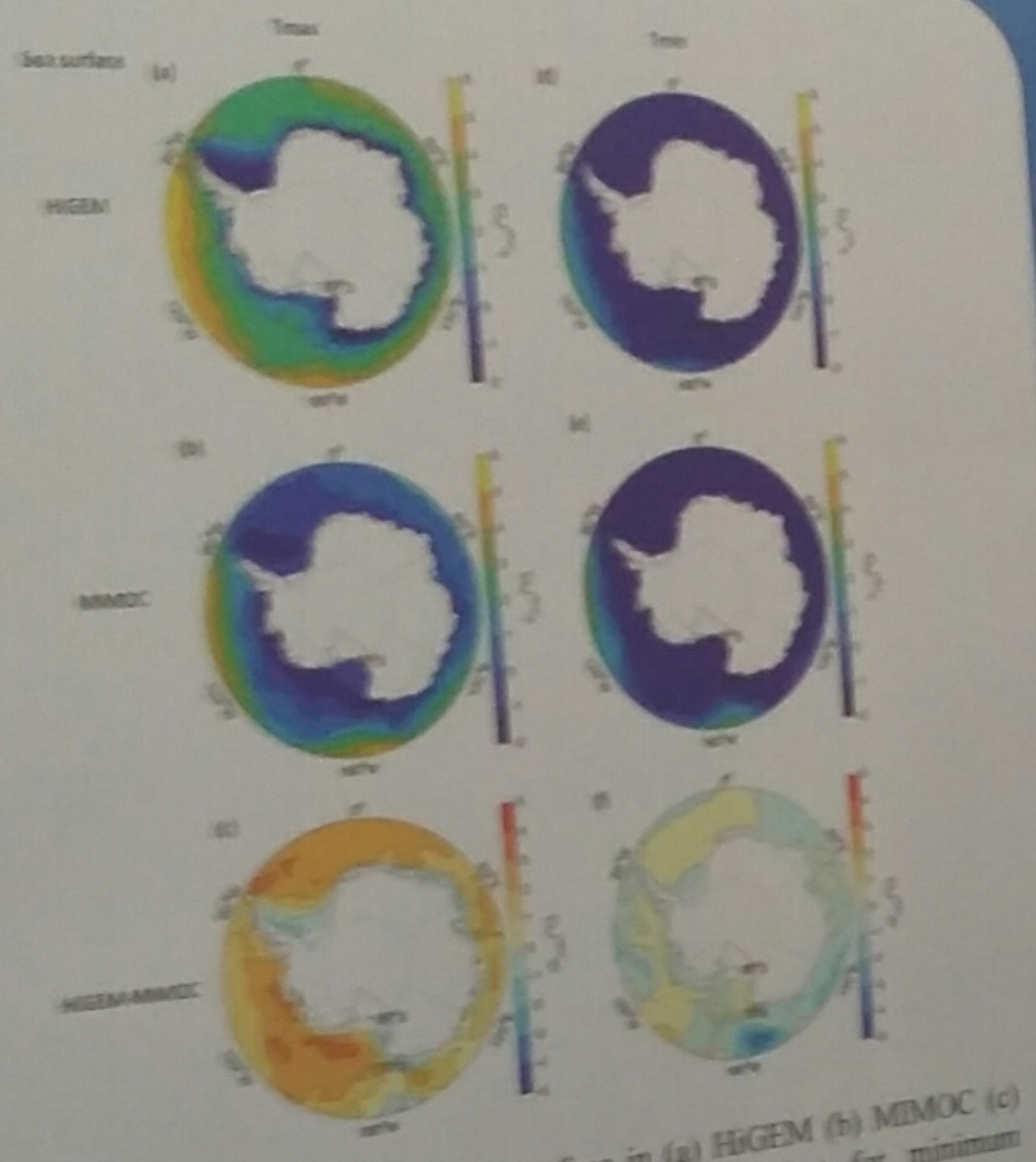
roduction

mate models are the primary tools for investigating the response of the mate system to various forcings, and for assessing future climate on seasonal centennial time scales. It is crucial therefore to evaluate the performance of ese models. Model simulation of the seasonality of ocean temperature is an nportant aspect of model skill because seasonal extrema are important for ater mass formation.

Data & Methods

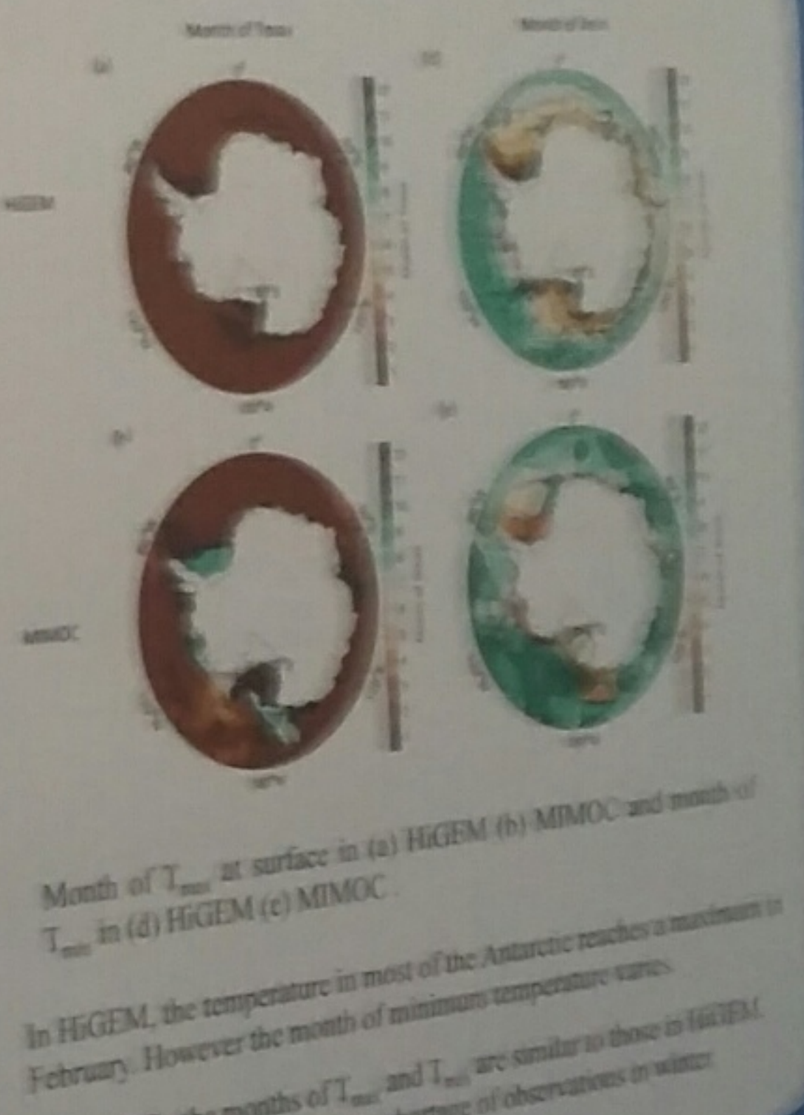
Maximum and minimum ocean temperatures are compared in HiGEM (High Resolution Global Environmental Model) and MIMOC (Monthly Isopycnal/Mixed-layer Ocean Climatology).

HiGEM is a coupled climate model featuring an ocean with a 1/3°x1/3° horizontal resolution, which is capable of capturing multi-scale climate processes. The MIMOC monthly climatology mostly reflects the modern ocean state during 2007-2011 and has a 0.5°x0.5° resolution.



Maximum temperature (T_{max}) at surface in (a) HiGEM (b) MIMOC (c) HiGEM minus MIMOC. (d-f) Same as (a-c), but for minimum temperature (T_{min}).

T_{max} in HiGEM is warmer than that in MIMOC mainly because surface shortwave flux is too large in HiGEM. The bias in T_{min} is much smaller than in T_{max} due to much of the water being close to freezing point in winter.



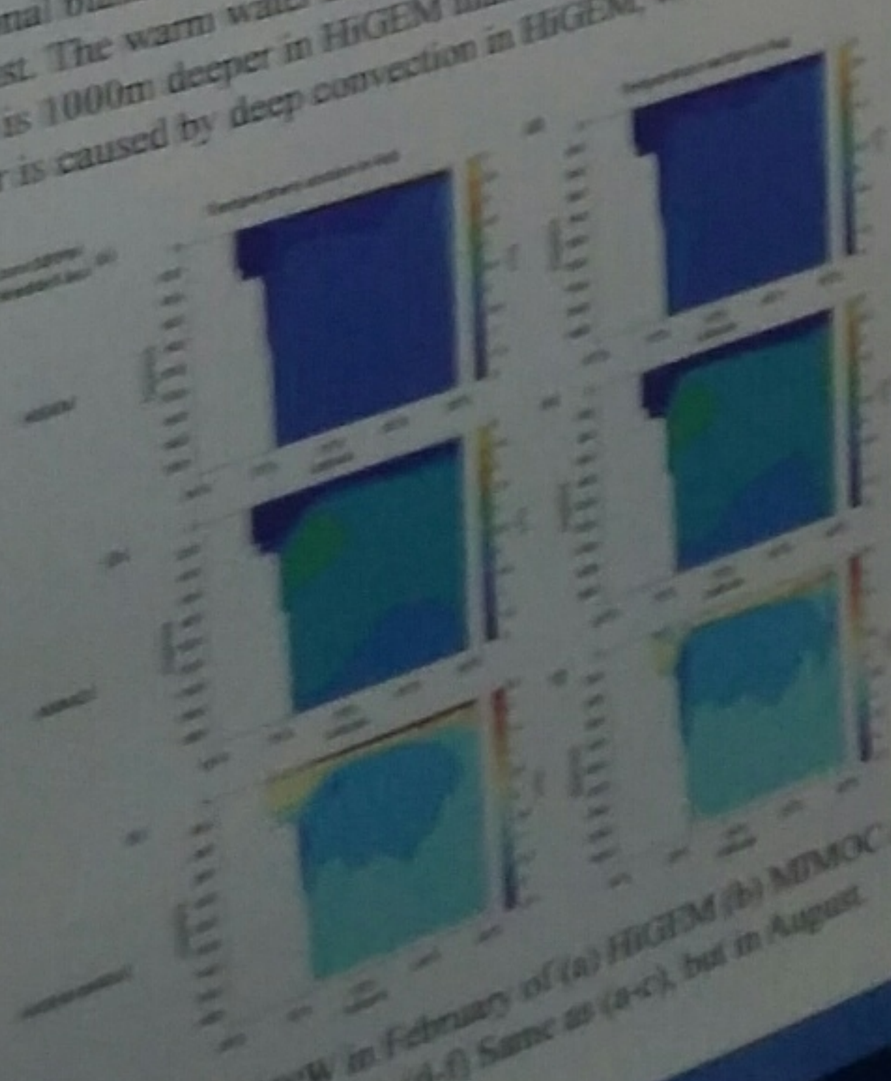
Month of T_{max} at surface in (a) HiGEM (b) MIMOC and month of T_{min} in (d) HiGEM (e) MIMOC.

In HiGEM, the temperature in most of the Antarctic reaches a maximum in February. However the month of minimum temperature varies.

In MIMOC, the months of T_{max} and T_{min} are similar to those in HiGEM. Differences may be caused by a shortage of observations in winter.

Temperature section in Weddell Sea

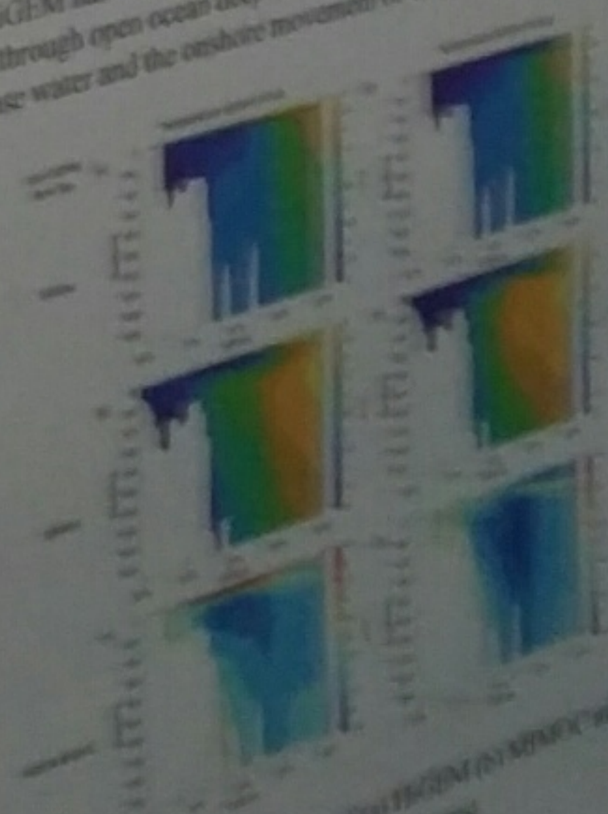
Seasonal biases in HiGEM are considered by comparing February and August. The warm water carried by the Weddell Gyre near the continental shelf is 1000m deeper in HiGEM than that in MIMOC. The cold bias of deep water is caused by deep convection in HiGEM, which rarely occurs in reality.



Temperature at 30°W in February of (a) HiGEM (b) MIMOC and (c) HiGEM minus MIMOC. (d-f) Same as (a-c), but in August.

Temperature section in Ross Sea

The Winter Water layer in HiGEM is too shallow in August, which means that HiGEM has very little Winter Water in February. HiGEM forms deep water through open ocean deep convection, while MIMOC shows the existing of dense water and the onshore movement of deep water.



Temperature at 180°W in February of (a) HiGEM (b) MIMOC and (c) HiGEM minus MIMOC. (d-f) Same as (a-c), but in August.