

Using a coupled AOGCM to study the Antarctic climate of the mid-Pliocene warm period

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The mid-Pliocene warm period, 3.3-3.0 million years ago, was a period of sustained warmth before global cooling occurred and a shift to repeated glacial cycles. It was also the most recent time in the history of Earth when atmospheric carbon dioxide levels were similar to those of present day. The study of this period is thus of much importance, given the growing concerns over future climate change associated with anthropogenic emissions of greenhouse gases. In particular, ice coverage in West Antarctica, as well as in Greenland, reduced significantly and there is evidence to suggest a retreat of ice sheet in the coastal areas and in the Wilkes Subglacial Basin of East Antarctica during that time.

In this study, we use the mid-resolution MIROC4m coupled atmosphere-ocean general circulation model and apply ice sheet configuration, land-sea mask and biome distribution from PRISM3 data sets, as set forth in the latest, second phase of the Pliocene Model Intercomparison Project. We conduct a series of experiments, including those which look into a range of atmospheric carbon dioxide levels given the spread in values suggested by various sources of proxy data. We show the degree of warming over Antarctica and how the precipitation responds to changes in the moisture transport.

Keywords: Antarctica, Pliocene, modeling