The warm climate of the Mid to Late Pliocene as seen in MIROC climate modelling experiments

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These past few years has seen much interest in the modelling of the warm climate of the Mid to Late Pliocene, approximately 3 million years ago. This period represents the most recent time in the earth's history when atmospheric carbon dioxide levels were comparable to those of today. In this sense, it has drawn much attention because of possible parallels with near future climate, helped by the availability of proxy datasets from the ocean and other sources. Recent interest has been further fuelled by The Pliocene Model Intercomparison Project (PlioMIP) which has brought together the paleodata analysis group, PRISM, and various international climate modelling groups to expand the scientific community's knowledge of this period. Now into its second phase, PlioMIP has set out specific protocols for climate model experimental design, utilizing the latest datasets related to Pliocene vegetation, soils, ice distribution and ocean bathymetry, while concentrating on a time-slice to limit temporal uncertainty
We ran several Pliocene climate modelling experiments using the atmosphere-ocean coupled model, MIROC4m. These include experiments using the boundary conditions specified in the first phase of PlioMIP in addition to one which has incorporated most of the latest datasets from the second phase. Zonal mean surface air temperatures increase by about 10 deg C at high latitudes, accompanied by a decrease in the equator-to-pole temperature gradient. As with many other climate models, the polar amplification appears smaller than that suggested by proxy data in PlioMIP. Initial results from experiments using the latest boundary conditions, in particular a closed Bering Strait, suggest that this amplification is further weakened.

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