



Antarctic ice sheet/shelf variations during Marine Isotope Stage 31

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Recent sedimentary records from the West Antarctic margin and Southern Ocean suggest that ocean temperatures during MIS-31 were several degrees warmer than today in high Southern latitudes. This occurred about 1 million years ago coeval with orbital configurations producing anomalously warm austral summers. There is also evidence at that time of open water instead of ice shelf in the western Ross Sea (Scherer et al., submitted). The lack of a buttressing ice shelf during MIS-31 and perhaps other periods of Southern Hemisphere summer warmth could have had drastic effects on the ice streams that drain West Antarctic ice into the Ross Sea, and on the stability of the West Antarctic interior. Here, we test the response of the Antarctic cryosphere (with an emphasis on the Ross Ice Shelf and West Antarctic Ice Sheet) to MIS-31 orbital forcing, using a combined ice sheet-shelf model in which the grounding line is free to migrate. Climate forcing in response to MIS-31 orbital perturbations is obtained from experiments with a Global Climate Model, which show that annual mean surface temperatures around the Antarctic margin warm by 2-5 degrees C compared to the present. The simulated response of the Ross Ice Shelf, its grounding lines and the West Antarctic Ice Sheet will be compared with well-dated proximal records of MIS-31 from the Ross Sea obtained by the Cape Roberts Project and ANDRILL sedimentary drilling programs.