



The impact of carbon dioxide changes on Miocene Antarctic ice sheet variability

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During the early to mid-Miocene, benthic $\delta^{18}\text{O}$ records indicate large volume fluctuations of the Antarctic ice sheet (AIS) on multiple time scales. Hitherto, research has focussed on how CO_2 and insolation changes control the volume of an equilibrated AIS. However, the variability of transient AIS dynamics remains largely unexplored. Here, we study AIS variability under a range of CO_2 levels during the Miocene, using an ice sheet-shelf model forced by climate model output. In addition to steady state simulations, we conduct transient experiments by using an index method to interpolate between different forcing climate states. We find that the Miocene AIS responds more quickly to a warming than to a cooling climate. Furthermore, when CO_2 levels remain below (above) 450 ppm, we simulate a mono-stable large (small) AIS. Only after crossing this boundary, we detect a bi-stable AIS and associated large ice volume variability.