

Cenozoic variations of the Antarctic Ice Sheet: a model-data mismatch?

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Cenozoic variations of global ice volume deduced from deep-sea-core benthic $\delta^{18}\text{O}$ records are compared with results from 3-D ice sheet-climate models. After the initial growth of major Antarctic ice at the Eocene-Oligocene boundary ~ 34 Ma, $\delta^{18}\text{O}$ records indicate numerous excursions throughout the Oligocene and early Miocene with timescales of $\sim 10^4$ to 10^6 years and amplitudes of ~ 20 to 80 meters of sea level. During most of this period, atmospheric CO_2 levels in proxy records were low, around 1x pre-industrial (PAL). These observations conflict with coupled model results that once a large East Antarctic ice sheet formed at 34 Ma, CO_2 levels must have varied in the ~ 3 x to 4x PAL range to induce significant retreat and re-growth. Several mechanisms are discussed that could possibly have caused large ice-volume fluctuations, all of which are speculative.