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Modeled difference between the Oligocene and Miocene Antarctic ice sheet

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Benthic δ^{18}O records indicate similarly low values during the Middle Miocene Climatic Optimum (17 to 15 Myr ago) as right before the Eocene-Oligocene Transition (33.9 Myr ago). However, since proxy-CO_2 data suggest different values between these times, a change in the CO_2-δ^{18}O relation must have occurred over time between the Oligocene and Miocene. To explain this change, here we focus on Antarctic ice sheet (AIS) volume, which together with deep-sea temperature dominantly generates the progression of Oligocene-Miocene benthic δ^{18}O records. We simulate the AIS using an ice sheet/shelf model forced by climate-model output of the Oligocene and Miocene. We investigate the effect of the Oligocene-Miocene differences in background climate, local Antarctic bedrock topography, and basal conditions, on the equilibrated state of the AIS and its sensitivity to sea-level and climate fluctuations. In our simulations, the AIS becomes thinner, but more extensive from the Oligocene to the Miocene due to a cooling and drying climate. Meanwhile, erosion and tectonics cause a sinking bedrock topography and shrinking continental area above sea level. This leads to a larger part of the AIS being grounded below sea level and an expansion of ice shelves.