Modeling the evolution of the Antarctic ice sheet driven by basal melting at different sea levels using the three-dimensional ice sheet model SICOPOLIS

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The Antarctic ice sheet is the largest fresh-water storage at present, whose geometry and volume have changed in response to climate changes like glacial-interglacial cycles. These changes are controlled by the surface and basal mass balance of the Antarctic ice sheet and the surrounding sea level, which affects grounding line migration, but the relative importance of these changes on the response of the Antarctic ice sheet is still not clear. In this study, we use the three-dimensional ice sheet model SICOPOLIS to investigate steady-states of the Antarctic ice sheet at given basal melting rates beneath ice shelves and sea levels. A series of numerical experiments with various basal melting rates beneath ice shelves from 0 to 200 m/yr and various sea levels from 0 to -150 m relative to the present are performed, starting from both a Last Glacial Maximum (LGM)-like and a present-day ice sheet as initial conditions. The different steady-state responses of the ice sheet will be discussed by analyzing the ice sheet mass balance and mass flux.