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Exploring the impact of uncertainty in ice dynamics and climatic forcing on the simulation of Antarctica during the Last Glacial Period

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During the last glacial cycle, the Antarctic Ice Sheet (AIS) has passed from an interglacial state, warmer than present day (PD), slowly into a glacial state, known as the Last Glacial Maximum (LGM) and then deglaciated on a faster timescale into the Holocene and PD conditions. Although we have proxy data of the size and extent of the ice sheet for the LGM, neither the oceanic temperatures of the Southern Ocean, nor the precipitation fields are well constrained. Also the time evolution of the ice volume during the glacial cycle is not fully clear. It is well assumed that it follows a sawtooth pattern, but from a modelling perspective different combinations of parameters and boundary conditions can give rise to plausible Antarctic configurations. Here we aim to study the uncertainty in AIS evolution resulting from ice-sheet model parameters, as well as the imposed climatic fields used as forcing. For this purpose we use the three-dimensional thermomechanical hybrid ice-sheet-shelf model Yelmo, which treats ice dynamics via the shallow-ce and shallow-shelf approximations, and accounts for basal melt below ice shelves and a subgrid parameterisation for treatment of the grounding line. We will focus on the effect of different climatic fields, such as precipitation and oceanic temperatures, as well as the effect of different enhancement factors and basal drag choices for reproducing consistent Antarctic configurations in the LGM and the PD. Improving our understanding of the effect of different ice-dynamics configurations in various climatic scenarios will help to better understand the past evolution of the AIS and potentially constrain its future evolution as well.