

ISMIP6 future projections for the Antarctic ice sheet with the model SICOPOLIS

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Abstract

The Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6) brings together a consortium of international ice-sheet and climate modellers to simulate the contribution from the Greenland and Antarctic ice sheets to future sea-level rise. In this document (supplementary to Seroussi et al. 2020), we describe the ISMIP6 Antarctica Tier-1 and Tier-2 experiments carried out with the ice-sheet model SICOPOLIS. First, we conduct a paleoclimatic spin-up over the last glacial-interglacial cycle until the year 1990. In this spin-up, we employ a nudging technique for the topography and aim at optimizing the match between simulated and observed surface velocities by adjusting the amount of basal sliding for individual drainage systems. Then, we carry out a historical run to bridge the gap between 1990 and 2015. The future climate projections run from the beginning of 2015 until the end of 2100. Results reveal a non-uniform response of the Antarctic ice sheet: for both employed future climate scenarios (RCP8.5/SSP5-8.5, RCP2.6/SSP1-2.6), mass losses and gains occur, depending on the specific forcing (provided by CMIP5 and CMIP6 global climate models). This is due to the counteracting effects of increasing ocean temperature (leading to a loss) and increasing precipitation (leading to a gain). For RCP8.5/SSP5-8.5, the ensemble mean is a mass loss of 18.5 mm SLE (sea-level equivalent) by 2100, and for RCP2.6/SSP1-2.6 it is 8.4 mm SLE. However, the uncertainty range is quite large, including the possibility of a mass loss of more than 100 mm SLE under RCP8.5/SSP5-8.5.