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ISMIP6 future projections for the Greenland 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 Goelzer et al. 2020), we describe the ISMIP6 Greenland 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. The simulated mass loss by 2100 is 133.0 ± 40.7 mm SLE (mean $\pm$ 1-sigma uncertainty; SLE: sea-level equivalent) for the RCP8.5/SSP5-8.5 pathway that represents "business as usual", and it is 48.6 ± 6.2 mm SLE for the RCP2.6/SSP1-2.6 pathway that represents substantial emissions reductions. The large difference between the results for the two pathways highlights the importance of efficient climate change mitigation for limiting sea-level rise. Further, results obtained with forcings from the newer CMIP6 global climate models consistently produce larger mass losses than those obtained with the older CMIP5 global climate models.