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Projecting Antarctica's contribution to future sea level rise from basal ice-shelf melt using linear response functions of 16 ice sheet models (LARMIP-2)

Anders Levermann (1,2,3) and the LARMIP-2 team

(1) Potsdam Institute for Climate Impact Research, Potsdam, Germany (anders.levermann@pik-potsdam.de), (2) LDEO, Columbia University, New York, USA, (3) Institute of Physics and Astronomy, Potsdam University, Potsdam, Germany

The sea level contribution of the Antarctic ice sheet constitutes a large uncertainty in future sea level projections. Here we apply a linear response theory approach to 16 state-of-the-art ice sheet models to estimate the Antarctic ice sheet contribution from basal ice shelf melting. In order to allow for comparison, the methodology is exactly the same as in an earlier study (Levermann et al., ESD 2014), but with 16 instead of 5 ice sheet models. We include uncertainty in the atmospheric warming response to carbon emissions (full range of CMIP-5 climate model sensitivities), uncertainty in the oceanic transport to the Southern Ocean (obtained from the time-delayed and scaled oceanic subsurface warming in CMIP-5 models in relation to the global mean surface warming), and the observed range of responses of basal ice shelf melting to oceanic warming outside the ice shelf cavity. This uncertainty in basal ice shelf melting is then convoluted with the linear response functions of each of the 16 ice sheet models to obtain the ice flow response to the individual global warming path. The model mean for the observational period from 1992 to 2017 is 9.2 mm with a likely range between 4.5 mm and 19.4 mm compared to the observed sea level contribution from Antarctica of 7.4 mm and a standard deviation of 3.9 mm (Shepherd et al., 2018). We provide the projections for all four RCP scenarios.