Potential Antarctic contributions to future sea level through the eyes of the SeaRISE Project

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The SeaRISE (Sea-level Response to Ice Sheet Evolution) project addressed a major weakness in sea-level projections identified in the IPCC Fourth Assessment Report in 2007: the inability of then-current ice sheet models to credibly project contributions to future sea level from the dynamic response of ice sheets. SeaRISE used ten ice sheet models to study sensitivity of the Greenland and Antarctic ice sheets to a wide range of prescribed changes to their surface mass balance, the melt rate beneath their floating margins and to the rate of basal sliding. Results exhibited a large range in their contributions to global sea level change. Somewhat surprisingly, in most cases dependence of the ice volume lost on the strength of the forcing was close to linear. Thus, combinations of forcings could be closely approximated by summing the contributions from single forcing experiments. Greenland proved to be more sensitive than Antarctica to likely atmospheric changes in temperature and precipitation, while Antarctica was seen to be most sensitive to basal melting of its ice shelves. An experiment approximating the IPCC's RCP8.5 scenario produced first century contributions to sea level of 22.3 and 6.6 cm from Greenland and Antarctica, respectively, with a range among models of 62 and 17 cm, respectively. By 200 years, these projections increased to 53.2 and 20.5 cm, respectively, with ranges of 80 and 62 cm.

The presentation will focus on the Antarctic contributions especially from West Antarctica which most models indicated was the region most vulnerable to large ice losses. The spatial patterns will be examined to illustrate both broad similarities across the suite of models, as well as the manifestations of differences in how the models interact with the surface, basal and oceanic environments. The end result is a clear demonstration of the importance of having accurate representations of the oceanic influence on the fringing ice shelves of Antarctica.