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# Future Antarctic bed topography and its implications for ice sheet dynamics

Surendra Adhikari (1,2), Erik Ivins (1), Eric Larour (1), Helene Seroussi (1), Mathieu Morlighem (3), and Sophie Nowicki (4)

(1) Jet Propulsion Laboratory, Caltech, USA, (2) Geological and Planetary Science, Caltech, USA , (3) University of California – Irvine, USA , (4) NASA Goddard Space Flight Center, USA

A recently improved ice loading history suggests that the Antarctic Ice Sheet (AIS) has been generally losing its mass since the last glacial maximum. In a sustained warming climate, the AIS is predicted to retreat at a greater pace primarily via melting beneath the ice shelves. We employ the glacial isostatic adjustment (GIA) capability of the Ice Sheet System Model (ISSM) to combine these past and future ice loadings and provide the new solid Earth computations for the AIS. We find that the past loading is relatively less important than future loading on the evolution of the future bed topography. Our computations predict that the West Antarctic Ice Sheet (WAIS) may uplift by a few meters and a few tens of meters at years 2100 and 2500 AD, respectively, and that the East Antarctic Ice Sheet (EAIS) is likely to remain unchanged or subside minimally except around the Amery Ice Shelf. The Amundsen Sea Sector of WAIS in particular is predicted to rise at the greatest rate; one hundred years of ice evolution in this region, for example, predicts that the coastline of Pine Island Bay approaches roughly 45 mm/yr in viscoelastic vertical motion. Of particular importance, we systematically demonstrate that the effect of a pervasive and large GIA uplift in the WAIS is associated with the flattening of reverse bed, reduction of local sea depth, and thus the extension of grounding line (GL) towards the continental shelf. Using the 3-D higher-order ice flow capability of ISSM, such a migration of GL is shown to inhibit the ice flow. This negative feedback between the ice sheet and the solid Earth may promote the stability to marine portions of the ice sheet in the future.