

Consequences of a Deeper Bed for Marie Byrd Land Stability

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Stability of the West Antarctic Ice Sheet (WAIS) has been a subject of much research since the marine ice sheet instability was proposed. Data collection and analysis have focused primarily on the Amundsen Sea embayment and the Siple Coast, coastal regions whose retreat will ultimately provide the avenue for ice loss from the continent's interior. Despite having only limited geophysical data collected inland from the coast, Marie Byrd Land (MBL) has been treated as a regional high in bed topography in all major mapping efforts of Antarctica. This high reduces the long term variability of ice over MBL; models using the currently prescribed bed show little change in ice volume or its spatial distribution on MBL in the last 5 million years. RES data collected by Operation Ice Bridge during the 2009-2010 Antarctic field season show ice thicknesses that locally exceed previous estimates by more than a kilometer, and indicate a much deeper and more complex bed for the region surrounding the Executive Committee Mountains. Improved ice thickness measurements indicate an additional 19,400 km³ of ice (4.94 cm SLE) within WAIS. Using new bed topography generated from these data, along with the model outlined in Pollard and DeConto (2012), we refine the estimates of ice retreat into Marie Byrd Land, providing new insight into the sea-level contribution of WAIS in the event of complete collapse.