Geophysical Research Abstracts
Vol. 18, EGU2016-3989, 2016
EGU General Assembly 2016

Totten Glacier catchment bed erosion indicates repeated transitions between a modern-scale and a retreated ice sheet

Alan Aitken (1), Jason Roberts (2,3), Tas van Ommen (2,3), Duncan Young (4), Nicholas Golledge (5,6), Jamin Greenbaum (4), Don Blankenship (4), and Martin Siegert (7)

(1) The University of Western Australia, School of Earth and Environment, Perth, Australia (alan.aitken@uwa.edu.au), (2) Australian Antarctic Division, Kingston, Tasmania, Australia , (3) Antarctic Climate & Ecosystems Cooperative Research Centre, The University of Tasmania, Hobart, Tasmania, Australia., (4) University of Texas Institute of Geophysics, The University of Texas at Austin, Austin, Texas, USA , (5) Antarctic Research Centre, Victoria University of Wellington, Wellington 6140, New Zealand., (6) GNS Science, Avalon, Lower Hutt 5011, New Zealand, (7) The Grantham Institute and Department of Earth Science and Engineering; Imperial College London, London, United Kingdom

The Totten Glacier is the outlet for one of the most voluminous catchments in East Antarctica, and shows signs of vulnerability to change. The upstream portions of this catchment include the topographic lows of the Sabrina Subglacial Basin (SSB) and the Aurora Subglacial Basin (ASB), which are surrounded by highland regions. The SSB and ASB each are susceptible to marine instabilities. Here we analyse the subglacial topography of the SSB and the thickness of the underlying sedimentary basin to understand the erosive history of the SSB as a proxy for past ice sheet dynamics. We show that the history of this catchment involves long periods with the ice sheet margin located close to today's, and similarly long periods with the ice sheet margin located hundreds of kilometres further inland. The intervening region is less eroded, suggesting erosion through several repeated transitions between these states, but without prolonged residence. Using numerical ice sheet models, we constrain the likely sea-level contribution of these ice-sheet states. In a retreat from modern scenario, up to 150 km of retreat (∼90cm of sea level rise) can be accommodated within the modern-scale state. Further retreat involves marine ice sheet instabilities that drive the ice-sheet extent to the retreated state (2-3 m of sea level rise). Ongoing retreat involves collapse into the ASB, associated with sea level rise in excess of 4m.