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Changes in vertical ice extent along the East Antarctic Ice Sheet margin in western Dronning Maud Land – initial field and modelling results of the MAGIC-DML collaboration

Ola Fredin (1,2), Arjen P. Stroeven (3,4), Derek Fabel (5), Nathaniel A. Lifton (6,7), Jorge Bernales (8), Irina Rogozhina (8), Neil F. Glasser (9), Jennifer C. Newall (3,4,6), Jon M. Harbor (3,4,6), Jane L. Andersen (1), Robin Blomdin (3,4), Marc W. Caffee (6,7), Olaf Eisen (10), Clas Hättestrand (3,4), Matthias Prange (8), Sarah E. Sams (6), and Elena Serra (11)

(1) Geological Survey of Norway, Quaternary Geology, Trondheim, Norway (ola.fredin@ngu.no), (2) Norwegian University of Science and Technology, Department of Geography, Trondheim, Norway, (3) Stockholm University, Geomorphology & Glaciology, Department of Physical Geography, Stockholm, Sweden, (4) Stockholm University, Bolin Centre for Climate Research, Stockholm, Sweden, (5) Scottish Universities Environmental Research Centre, Glasgow, UK, (6) Purdue University, Department of Earth, Atmospheric, and Planetary Sciences, West Lafayette, USA, (7) Purdue University, Department of Physics and Astronomy and Purdue Rare Isotope Measurement Laboratory (PRIME Lab), West Lafayette, USA , (8) University of Bremen, Center for Marine Environmental Sciences MARUM, Bremen, Germany, (9) Aberystwyth University, Centre for Glaciology, Department of Geography and Earth Sciences, Aberystwyth, UK, (10) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany, (11) University of Bern, Institute of Geological Sciences, Bern, Switzerland

Constraining numerical ice sheet models by comparison with observational data is crucial to address the interactions between cryosphere and climate at a wide range of scales. Such models are tested and refined by comparing model predictions of past ice geometries with field-based reconstructions from geological, geomorphological, and ice core data. However, for the East Antarctic Ice sheet, there is a critical gap in the empirical data necessary to reconstruct changes in ice sheet geometry in the Dronning Maud Land (DML) region. In addition, there is poor control on the regional climate history of the ice sheet margin, because ice-core locations, where detailed reconstructions of climate history exist, are located on high inland domes. This leaves numerical models of regional glaciation history in this near-coastal area largely unconstrained.

MAGIC-DML is an ongoing Swedish-US-Norwegian-German-UK collaboration with a focus on improving ice sheet models of the western DML margin by combining advances in modeling with filling critical data gaps regarding the timing and pattern of ice-surface changes. A combination of geomorphological mapping using remote sensing data, field observations, cosmogenic nuclide surface exposure dating, and numerical ice sheet modeling are being used in an iterative manner to produce a comprehensive reconstruction of the glacial history of western DML. Here, we present an overview of the project, field evidence for formerly higher ice surfaces and in-situ cosmogenic nuclide measurements from the 2016/17 expedition. Preliminary field evidence indicate that interior sectors of DML have experienced a general decrease in ice sheet thickness since the late Miocene, with potential episodes of increasing thickness in the late Pleistocene (700-300 ka, 250-75 ka). To aid in interpreting these field data, new high-resolution ice sheet model reconstructions, constraining ice sheet configurations during key episodes, are presented.