Geophysical Research Abstracts
Vol. 19, EGU2017-9348, 2017
EGU General Assembly 2017

Bed2017: A new bed topography dataset for Greenland out to the continental shelf

Christopher Williams (1), Stephen Cornford (1), Thomas Jordan (1), Martin Siegert (2), Julian Dowdeswell (3), Steven Palmer (4), Mathieu Morlighem (5), Alba Martin-Español (1), James Cochran (6), Kirsteen Tinto (6), and Jonathan Bamber (1)

(1) University of Bristol, Bristol, UK, (2) The Grantham Institute for Climate Change, Imperial College London, London, UK, (3) Scott Polar Research Institute, University of Cambridge, Cambridge, UK, (4) University of Exeter, Exeter, UK, (5) University of California, Irvine, USA, (6) Lamont-Doherty Earth Observatory, Columbia University, New York, USA

Ice-sheet basal topography is a critical boundary condition for the numerical modelling and understanding of ice-sheet dynamics. Accurate quantification of the combined bed topography and near-coastal bathymetry allows ice-sheet dynamics and ice-ocean interactions to be considered over a range of different spatio-temporal scales for different ice sheet extents. Until now, fjord bathymetry around Greenland has been poorly constrained in many areas, inhibiting attempts to model tidewater-glacier processes (e.g. calving) and ice-ocean interaction. Despite increases in the availability of observational data sets, collected in order to reduce coverage sparsity, many areas remain unsurveyed and due to the inaccessible nature of many near coastal regions around Greenland, this will likely remain the case for the foreseeable future.

Combining the most up-to-date observations and with the inclusion of new geospatial interpolation approaches, we present Bed2017 – the release of a new dataset for the bed topography and near-coastal bathymetry for Greenland and an update on the previously released topography-bathymetry product (Bamber et al., 2013). For grounded ice regions, we incorporate new observational data for bed elevation from the most recent Operation Ice Bridge campaigns (CReSIS airborne Ice Penetrating Radar data 2013-2014). In areas of fast flow we calculate bed elevations using mass-conservation, whereas in areas of slow flow we interpolate bed elevations using geostatistical kriging. In addition to previously included bathymetric datasets, bathymetry is further mapped using recently acquired single- and multi-beam echo sounding datasets – including data from the ongoing NASA Oceans Melting Greenland campaign – as well as airborne gravity inversion data. Where bathymetric data remain absent, we determine fjord bathymetry using a geomorphologically based synthetic approach. This approach synthesises fjord bathymetry based on the assessment of the geometry of multiple terrestrial glacier valley cross-profiles, providing a surrogate until more observations become available.

Bed2017 provides new opportunities for numerical modelling and observational investigation of Greenland ice and near-coastal ocean dynamics, with more realistic topography and bathymetry than has been available to date. In addition to presenting the new dataset and its construction, we use it to calculate the hydrological potential pressure which enables us to reassess predicted subglacial hydrological pathways across the base of the ice sheet in regions with improved data density.