Geophysical Research Abstracts
Vol. 18, EGU2016-5222, 2016
EGU General Assembly 2016

Field Investigation of Surface-Lake Processes on Ice Shelves: Results of the 2015/16 Field Campaign on McMurdo Ice Shelf, Antarctica

Doug MacAyeal (1), Alison Banwell (2), Ian Willis (2), and Grant Macdonald (1)

(1) Department of Geophysical Sciences, University of Chicago, USA, (2) Scott Polar Research Institute, University of Cambridge, United Kingdom (afb39@cam.ac.uk)

Ice-shelf instability and breakup of the style exhibited by Larsen B Ice Shelf in 2002 remains the most difficult glaciological process of consequence to observe in detail. It is, however, vital to do so because ice-shelf breakup has the potential to influence the buttressing controls on inland ice discharge, and thus to affect sea level. Several mechanisms enabling Larsen B style breakup have been proposed, including the ability of surface lakes to introduce ice-shelf fractures when they fill and drain, thereby changing the surface loads the ice-shelf must adjust to. Our model suggest that these fractures resulted in a chain-reaction style drainage of >2750 surface lakes on the Larsen B in the days prior to its demise. To validate this and other models, we began a field project on the McMurdo Ice Shelf (MIS) during the 2015/16 austral summer. Advantages of the MIS study site are: there is considerable surface melting during 3-6 weeks of the summer season, the ice is sufficiently thin (< 30 m in places) to allow observable viscoelastic responses to relatively small loads, and it is close to a center of logistical support (McMurdo Station). Here we show initial results from the field campaign, including GPS and water-depth observations of a lake that has filled and drained over multiple week timescales in previous austral summers. We also report on the analysis of high-resolution WorldView satellite imagery from several summers that reveals the complexity of surface meltwater movement in channels and subsurface void spaces. Initial reconnaissance of the largest surface-lake features reveal that they have a central circular depression surrounded by an uplifted ring, which supports one of the central tenets of our ice-shelf flexure theory. A second field season is anticipated for the 2016/17 austral summer.