



## Surface Melt and its Effect on Helheim Glacier Dynamics

Morten Langer Andersen (1,2), Meredith Nettles (3), Tine Larsen (1), Pedro Elosegui (4), Gordon S Hamilton (5), Leigh A Stearns (6), Dirk van As (1), Julia de Juan (4), and James L Davis (7)

(1) Geological Survey of Denmark and Greenland, GEUS, Department of Geophysics, Copenhagen K, Denmark (mola@geus.dk), (2) Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark, (3) Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, United States, (4) Institute for Space Sciences, CSIC-IEEC, Barcelona, Spain, (5) Climate Change Institute, University of Maine, Orono, ME, United States, (6) Department of Geology, University of Kansas, Lawrence, KS, United States, (7) Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, United States

When estimating sea level rise, understanding the behavior of the large, fast-flowing outlet glaciers in Greenland is crucial. Based on measurements from an automatic weather station (AWS) on the surface of Helheim Glacier, we have developed a distributed energy balance model for the Helheim catchment, allowing us to estimate the melt volume spatially and temporally. A comparison of the modeled melt to daily surface displacement observed by GPS receivers located on the glacier yields positive temporal correlations. The highest correlation values are found with a lag of one day between the speed changes and the melt signal. We interpret this as a ‘lubrication effect’, i.e. melt water reaching the bed of the glacier and once there, enhancing the flow of the already fast flowing glacier. We seek to understand whether changes in melt water generation play a role in priming the glacier for major calving events that have been shown to coincide with glacial earthquakes. This could happen either through enhanced flow towards the front, or melt water filling crevasses, thereby enhancing calving processes.