Geophysical Research Abstracts
Vol. 19, EGU2017-16936, 2017
EGU General Assembly 2017

Modelling subglacial and surface routing for glaciers in Kongsfjord area

Ankit Pramanik (1), Ward Van Pelt (2), and Jack Kohler (3)

(1) Norwegian Polar Institute, University of Oslo, Norway (ankit.pramanik@npolar.no), (2) Uppsala University, Sweden(ward.van.pelt@geo.uu.se), (3) Norwegian Polar Institute, Tromsø, Norway(jack.kohler@npolar.no)

In the Kongsfjorden area of northwest Svalbard, two tidewater glaciers illustrate contrasting dynamic behavior: Kronebreen moves several meters per day while nearby glacier Kongsvegen moves only a few meters per year. Water beneath glaciers has a fundamental impact on ice flow, so we assume that the glacier hydrology system provides a key influence on the contrasting speed of these two glaciers. Furthermore, glacier meltwater exiting these tidewater glaciers has a significant impact on fjord circulation and thereby on the fjord ecosystem. Therefore we seek to elucidate the spatial and temporal evolution of the hydrology system. Direct observation of the system is not feasible; to gain insight into processes controlling water flow in these glaciers, we must use models. Long-term runoff from glaciers in the Kongsfjord watershed is calculated for the period 1961-2016 using a coupled surface energy-balance and firn model (Van Pelt et al., 2015). Meteorological data from the nearby station at Ny-Ålesund is used for climate forcing in the model domain, while mass balance data at four glaciers in the Kongsfjord watershed and MODIS satellite data used to calibrate model parameters. Precipitation and temperature lapse rates are adjusted to match modelled to observed surface mass balance and snow line retreat. The resultant model runoff data for recent years is used as input in a routing scheme involving different time delays for glaciers areas categorized as firn, snow-covered ice, and bare ice. Routing paths are assumed to be controlled by surface elevation and ice thickness. Routing is performed for Kronebreen, the glacier which drains the most significant amounts of freshwater in summer to Kongsfjord, and which has the best coverage of ice thickness data. We also analyze the surface and subglacial routing scheme for the watershed of the land-terminating glacier Brøggerbreen, and compare it with discharge measured in the proglacial stream.