Geophysical Research Abstracts
Vol. 20, EGU2018-5063, 2018
EGU General Assembly 2018

Seasonal ice dynamics of the Northeast Greenland Ice Stream

Saurabh Vijay (1), Shfaqat Abbas Khan (1), Sebastian Bjerregaard Simonsen (1), Anders Kusk (1), Anne Munck Solgaard (2), and Anders Anker Bjørk (3)

(1) DTU Space, Technical University of Denmark, Lyngby, Denmark (sabvj@space.dtu.dk), (2) Geological Survey of Denmark and Greenland (GEUS), Copenhagen, Denmark (aso@geus.dk), (3) Centre for GeoGenetics, Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark (andersb@snm.ku.dk)

Previous studies about the seasonal ice dynamics of the marine-terminating glaciers of Greenland and their dynamic mass losses are limited by the temporal resolution of the existing data. Sentinel-1 radar mission opens the possibility for continuous monitoring of glaciers with very high spatial and temporal details. This study focus on the Northeast Greenland Ice Stream (NEGIS), which consists of three main outlets, 79 North glacier (79N), Zachariae Isstrøm (ZI) and Storstrømmen Glacier (SG). While both 79 North and Storstrømmen have floating tongues, Zachariae Isstrøm is mostly grounded. In this study, we present the seasonal ice dynamics of these three outlets of NEGIS as well as their implications on bedrock displacements during 2015-2017. We derive surface velocities using SAR offset tracking applied over Sentinel-1 SAR data. We use radar backscatter from Sentinel SAR data to mark the onset of surface melt and the extent of the melt season. Moreover, we include the changes in ice front from Sentinel SAR data, surface elevation changes from Cryosat-2 data and GPS derived bedrock displacements in our analysis. We find that among these outlets, ZI is the fastest varying between 5.6 m/day and 7.0 m/day during 2015-2017. 79 N fluctuates between 3.6 m/day and 4.2 day, while the velocity of SG is less than 1 m/day throughout our observation period. All three of them speed up with the onset of surface melt and attain maximum velocity in the middle of the melt season. Afterwards they slowdown and attain minimum velocity at the end of the melt season followed by either moderate winter speedup (ZI) or stable flow (79 N, SG). This indicates the surface melt induced changes in the subglacial hydrology governs the seasonal flow dynamics of these outlets. We also notice dynamic thinning from Cryostat-2 data and corresponding elastic displacements (detected by GPS) of the bedrock due to ice mass unloading of the crust.