Geophysical Research Abstracts
Vol. 20, EGU2018-10732, 2018
EGU General Assembly 2018

Highly temporally resolved response to seasonal surface melt of the Zachariae and 79N outlet glaciers in northeast Greenland

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The seasonal response to surface melting of the Northeast Greenland Ice Stream outlets, Zachariae and 79N, is investigated using new highly temporally resolved surface velocity maps for 2016 combined with numerical modeling. The seasonal speedup at 79N of 0.15 km/yr is suggested to be driven by a decrease in effective basal pressure induced by surface melting, whereas for Zachariae its 0.11 km/yr seasonal speedup correlates equally well with the breakup of its large ice mélange. We investigate the influence 76 km long floating tongue at 79N, finding it provides little resistance and that most of it could be lost without impacting the dynamics of the area. Furthermore, we show that reducing the slipperiness along the tongue-wall interfaces produces a velocity change spatially inconsistent with the observed seasonal speedup. Finally, we find that subglacial sticky spots such as bedrock bumps play a negligible role in the large-scale response to a seasonally enhanced basal slipperiness of the region.