

Surface structure and ice velocities in the Northeast Greenland Ice Stream (NEGIS): Assessment of interior velocities derived from satellites by in-situ GPS.

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#### Abstract

The Northeast Greenland Ice Stream (NEGIS) extends around 700 km from its onset near the ice divide to the coast in Northeast Greenland. It drains a sector of approximately 16% of the ice sheet area through its three main outlets, 79th Fjord, Zachariae and Storstrømmen. The mass loss from the sector has increased since 2003, but the dynamics of the interior part of NEGIS and its sensitivity to marginal mass loss is not well known. Here we present the results from in-situ GPS mapping of surface velocity collected in an area located approximately 150 km from the ice stream onset near the EastGRIP deep drilling site (75°38'N, 35°60'W, 2700 masl). A >20 station GPS strain net was established and observed for consecutive years in 2015-2019. The area extends 35 km along the NEGIS and 40 km across, covering the entire 25 km wide cross-section of NEGIS and extending across both shear margins to the slower moving regions outside the ice stream. The ice flows with a uniform surface speed of appr. 57 m/yr within a >10km wide central flow band. We compare with a list of satellite-based surface velocity products. We assess the accuracy of these products and for each product we determine the offset and accuracy compared to the GPS observations, as well as the smoothing needed to remove obtain optimal accuracy. Finally, we use the remote sensing products to discuss the ice dynamics and structure of the NEGIS ice stream with particular focus on the shear margins and the flow ripples that form within the fast flowing NEGIS perpendicular to the flow.