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ABSTRACT

Evaluation of changes in dynamic of Jakobshavn Glacier (West Greenland) based on satellite images analyses.

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Ice streams are responsible for over 20% of drainage of the Greenland Ice Sheet, Jakobshavn Glacier is the biggest of them and alone is draining about 6% of the ice sheet. It is also the fastest moving glacier that currently exist. Its mean velocity is 20,6 m per day, but can be much greater at times. The highest velocity noted so far was 54 m per day in July 2014. Highest velocities are noted in the mean axes of the glacier, near the glacier calving front. Velocity changes in annual cycles, always reaching its minimum during winter when sea ice dams Jakobshavn fjord, and slows down calving at the glacier margin.

Between 2000 and 2001 a sudden change of glacial front position was noted. The position of the glacier front was fairly stable from 1940 to 2000 and then in five short years it retreated about 8 km to then stabilise at its current position. This project is aiming to answer the question what caused this huge change. Although finding a single factor is clearly impossible within the complex glacial system that is the Greenland Ice Sheet, sets of meteorological, hydrological, morphological and satellitia data were analysed and cross referenced bringing some clarity to the matter.

No field work in Greenland was done in the cause of this project. All meteorological, hydrological and morphological data were previously published or acquired from NOAA (National Oceanic and Atmospheric Administration) or DMI (Danish Meteorological Institute). The position of the ice margin and equilibrium altitude line were mapped based on satellite images from Landsat missions. The feature tracking method was used to compare two pairs of satellite images from the same year. Due to snow and/or cloud cover only a few images from the Jakobshavn area were suitable for further analysis. Seven satellite images from Landsat missions were selected, all of them from the ablation season. All analysed data were from the period 1985-2015 in order to get a full picture of environmental settings before, during and after the sudden change of the glacier front position.