

High Resolution Snow Depth Mapping with Unmanned Aerial Vehicle (UAV) using Structure-from-Motion (SfM) and Kinematic dGPS: Comparison of Two Methods for Arctic Application

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ABSTRACT

In order to improve snow monitoring at the global scale using satellites, there is an urgent need to improve monitoring on a spatial scale smaller than satellite images to better understand the governing process controlling its spatial and temporal distribution. The main objective is thus to map snow depth using Unmanned Aerial Vehicle (UAV) adapted to Arctic conditions. 1) We produced Digital Surface Model (DSM) from 2D images using Structure-from-Motion Algorithm software. Two DSMs are needed, one with snow and one without snow. From that, the difference between the two can be computed in a GIS and produce a snow depth map. Secondly, high resolution mapping with UAV implies dGPS system for acquisition of ground control points. We decided to try a technique that uses kinematic dGPS from an antenna mounted on a snowmobile to measure dGPS points representing the snow surface. Then, by interpolating all the points using kriging interpolation into a DSM, a snow depth map was produced with the same snow off DSM used in 1) from UAV images in the summer.

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