



Snow cover mapping and validation

Snow cover in mountain regions is relevant as a water balance storage component and it impacts the surface energy budget and ecosystem, too. Hence, snow variability and changes are of crucial importance for our understanding of climate change effects. The Arctic is especially vulnerable in this respect and at the same time most difficult to study due to sparse in situ data caused by large, remote and inaccessible areas.

Remote sensing can provide a useful information to assess both extent and depth of snow cover. Particularly in recent years the advent of high-resolution satellite data allows for an assessment of snow distribution that is better than ever before. On the other hand, precipitation grids from downscaled and improved regional climate models exist. So far, a detailed, validated estimation of performance and accuracy of both remote sensing products and regional climate models for snow cover mapping across scales is lacking.

We have access to a high-quality dataset of in-situ measured snow properties (snow depth, densities, grain size, temperatures, etc.) in a Low-Arctic environment in West Greenland for the period 2008-2020, that has been collected in the framework of the Greenland Ecosystem Monitoring programme (www.g-e-m.dk).

The aim of the proposed MSc thesis is to compare the available field data with different remote-sensing snow products and regional climate model results. In terms of remote sensing, particularly data from Sentinel-1 (active microwave sensor, SAR) shall be investigated. Strengths and weaknesses as well as the ability to assess spatial variability shall be discussed. In a second stage after the quality assessment, also the combination of data sources shall be investigated, e.g., with ICESAT-2 or model output from regional climate models (RCMs). The representativeness of field measurements can be addressed and an improved estimate of snow as a storage component and its role in the low arctic water balance will be a useful result. Furthermore, the validated results will allow to better constrain spatial gradients of snow cover and hence allow for an estimate of precipitation gradients, too.

We are looking for an enthusiastic MSc student interested in climate change, snow dynamics and meteorology, with a good technical understanding, preferably in remote sensing.

Useful links/refs

<https://doi.org/10.1038/s41586-020-2258-0>

<https://www.nature.com/articles/s41467-019-12566-y>

https://g-e-m.dk/fileadmin/g-e-m/GEM/Report_Cards_2019_low.pdf

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