



Monitoring proglacial geomorphological landforms with Unmanned Aerial Vehicles (UAVs)

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Proglacial areas are highly dynamic and affected by climate change. The dynamics of these landscapes are mainly driven by the varying influence of air temperature, precipitation and melt water on landforms (e.g. glaciers, thermokarst) and sediment distribution processes. This goes along with changes in the spatial extent of geomorphic features. The use of Unmanned Aerial Vehicle (UAV) based monitoring can help to quantify such changes.

During the IAEA funded Interregional Technical Cooperation Project ‘Assessing the Impact of Climate Change and its Effects on Soil and Water Resources in Polar and Mountainous Regions (INT/5/153)’, in the period from 2015 until 2018, nine flight campaigns were conducted in six polar and high mountain field sites: King George Island (Antarctic), Aldegonda (Spitsbergen), Gongga Shan (China), Artesonraju (Peru), Huayna-Potosí (Bolivia), Elbrus (Russia). Five different UAV models were used to map the field sites with areas between 2 and 28 km². The recorded images were used to produce high resolution orthophoto maps and digital surface models (DSM). While orthophoto maps were generated at spatial resolutions of 3 – 20 cm ground sample distance (GSD), for the DSMs GSDs of 15 – 100 cm could be achieved. These products form a reference for a detailed knowledge base of the conditions at the field site at the time of the campaign. Additionally, these snapshots in time can form the baseline to monitor future (and past) changes in proglacial areas. Furthermore, the orthophoto maps and digital surface models can lead to the development of geomorphological maps for identifying, delimiting and quantifying geomorphological processes.

We present an overview on the results of the UAV-based mapping in the project and show approaches for the use of this datasets. The specific challenges of UAV operations in the harsh conditions of high mountains and polar environments will be discussed as well.