

Project acronym: ArcticFan

Project title: Comparison of geomorphology and dynamics of alluvial and colluvial fans and cones in the Arctic based on examples from Greenland, Svalbard and Iceland

Project leader: Aleksandra Tomczyk, Adam Mickiewicz University, Poland

Discipline: Earth Sciences & Environment

Station(s): Zackenberg Research Station (Greenland)

This project aims to use an unmanned aerial vehicle (UAV) to produce very high-resolution digital elevation models (DEMs) and orthophotos to study morphometry, geomorphology and surface deposits of alluvial and colluvial fan and cones. The project requests access to Zackenberg Research Station to produce database of fan geomorphology and morphometry in this area of Greenland. This work will add to a larger study of fan development which is conducted by PI and Co-I based on field-sites in Svalbard and Iceland. The main assumption of the project is that the development of the alluvial and colluvial fans and cones in the Arctic is a response of the landscape to glacier recession and relief relaxation related to it; and that the intensity of this response is modified by various local factors (such as topography, geology, climatic conditions). Main research objectives are: 1) To use a high-resolution remote-sensing imagery and direct field-based surveys to map distribution and morphological types of fans at the catchment-scale. 2) To map geomorphology and surficial deposits for selected fans based on detailed DEMs and orthophotos from UAV 3) To calculate morphometric parameters of different types of fans 4) To determine to what extent the surface morphology of fans was modified by secondary processes using results of geomorphological mapping, sedimentological analysis and pattern-based classification of orthophotos. 5) To determine the role of local factors in modification of fan morphometric characteristics based on comparison of fans located nearby the Zackenberg Station, Greenland, with datasets from Svalbard and Iceland.

The specific project objectives of our visit to Zackenberg station were: 1) To perform flights using small unmanned aerial vehicle (UAV aka drone) over selected alluvial fans collecting low-altitude aerial photographs in order to create high-resolution (cm-scale) orthoimages and digital elevation models (DEM). 2) To survey ground control points using dGPS to achieve precise georeferencing of the UAV-generated data. 3) To map geomorphology and surficial deposits in landform-spatial-scale based on created orthoimages and DEMs in order to create a base data set for further research focused on quantification of landscape changes. 4) To perform a field-based component of mapping in the valley-scale to identify dominant types of fans and processes operating on their surfaces in order to provide a training sample set for regional mapping based on remote sensing data.