Protocol 2. Intermediate Meeting Master Thesis, 03.04.2019

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Presenting status of work/ Discussion:

- **Automated Data Retrieval/Preprocessing of Sentinel Data**

Structure of the program works well and is scalable: Program reads outline of area of interest as polygon and DEM in 10 m Resolution and creates Glacier Directory for each Glacier in format similar to OGGM/Crampon: 3 NetCDF files in matching format, with Sentinel Images for all dates of interest, solar illumination angles and DEMs in local grid for each glacier

- **Ekstrand Terrain Correction**:

There are some uncertainties/inconsistencies in the literature on how the correction is performed but the version that most people agreed on was implemented. Problem: Correction shows barely any impact, no effect on cast shadows (same effect was reported by P. Rastner). There are two options: Improved methods are available but rather difficult and time-consuming to implement, so not feasible for this project. Another possibility is to use the terrain corrected Level 2-A BOA images from Sentinel (performed with a terrain correction that is unkown to us), but the correction contains many oversaturated areas and artificially de-homogenizes the image, making a classification even more difficult and would result in even higher amounts of data and slow down the algorithm significantly. Albeit not ideal, we therefore decide to continue with the results that we have now.

- **Cloud Map S2 Cloudless:**

Machine-learning based S2 cloudless package by Sentinel Hub was adapted to work with the NetCDF files of the code. Results are very good, cloud masks produced are (from a first impression) much better than all other available options. Interpolation/Thresholding from cloud probability to binary map has the option to adjust thresholds and interpolation to find an ideal set of parameters for a cloud mask (possibility to remove single isolated pixels as they are probably a misclassification). The legal aspects of employing a third-party python package in the code was discussed and needs further investigation.

- **Thresholding to remove impact of too big glacier masks/ dark corners on glaciers:**

Thresholding after F.Paul implemented, also seem to remove shaded areas (not intended initially but helpful for classification). Needs some more work, thresholding appears to be too dark, probably only using a NDSI threshold would be more flexible for our purposes.

- **Snow Mapping with Otsu-Threshold:**

Works good on partially covered glacier but fails with very high snow cover/undistinguishable snow line (as expected). Ideas Discussed: Look at “How binary” a histogram is as a quality label for the Otsu-classification. Employing information from other bands than the NIR band for better results

- **Snow Mapping after Naegeli:**

Snow/ Ice / Ambiguous area (primary surface type evaluation) is implemented, currently working on secondary surface type evaluation.

- *Other points discussed:*

Progress currently matches well with time schedule

Rescheduling later intermediate meetings and final presentation due to 3 weeks field work in Mongolia