MASTER THESIS CALL

EO-based Monitoring of the Dynamics of Austfonna Ice Cap, Svalbard

Progressive glacier retreat in the face of global warming has far-reaching consequences for humans and the environment. Regarding adaptation strategies, there is a constant need for accurate information on the state and the evolution of glaciers and ice sheets worldwide. Traditional glacier monitoring is based on glaciological in situ measurements extrapolated to larger spatial scales. In contrast, geodetic mass balance estimation based on remotely sensed elevation data enables area-wide data collection. Interferometric synthetic aperture radar (InSAR) systems are not affected by limitations due to illumination and cloud cover, which is a major advantage, especially in the polar regions. Since 2010, the TanDEM-X mission has been acquiring single-pass X-band InSAR data at a high spatial resolution of 0.4 arcseconds at a global scale. However, the data suffers from an elevation bias up to several meters due to signal penetration, which mainly depends on snow and ice characteristics as well as on the continuously changing acquisition geometry.

Austfonna ice cap, Svalbard
Sentinel-2 Image © ESA

In this context, the master thesis aims to investigate the dynamics of Austfonna ice cap, Svalbard over the last decade using penetration-corrected TanDEM-X Digital Elevation Models (DEMs). A pre-developed and successfully applied approach to correct the penetration bias will be applied to a time-series dataset of TanDEM-X DEMs to derive height and mass changes. The results will be validated against reference elevation datasets (e.g., ArcticDEM, ICESat) as well as in-situ measurements and discussed in relation to climate-relevant influencing factors.

This work will be carried out at the **Department of Land Surface Dynamics at the German Remote Sensing Data Center (DFD) of the German Aerospace Center (DLR**) in Oberpfaffenhofen near Munich in cooperation with the **Svalbard Integrated Arctic Earth Observing System (SIOS) Knowledge Centre**.

Research Questions

- Can the penetration bias correction for TanDEM-X DEMs, which was developed for Greenland, be transferred to Svalbard for reliable estimations of glacier height changes?
- How has the Austfonna ice cap changed over the observation period in terms of extent, height, and mass? What factors account for these changes, and what conclusions can be drawn regarding future trends? Are the results consistent with other studies, or does this study yield new insights?

Your Qualifications

- Currently pursuing a master's degree in the geosciences (e.g., geography, geoinformatics) with a focus on remote sensing
- Excellent programming skills in Python
- A strong interest in SAR interferometry, glaciology, and climate impact research
- High degree of initiative as well as strong communication and teamwork skills
- Good written and spoken English skills, as well as solid written and spoken German skills

We are looking for someone who can start in September. If you are interested, please send a brief message outlining your background and previous experience to **sahra.abdullahi@dlr.de**.

We look forward to meeting you!