Project acronym: VIKING

Project title: Vibroseis imaging of Konsgvegan's internal structure and thermal regime

Project leader: Emma Smith, The Alfred Wegener Institute, Germany

Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Sverdrup Research Station (Svalbard/Norway)

The project will take place at Sverdrup Station (Ny-Ålesund). We will study a surge-type glacier (Kongsvegen) within return day trip distance of the station. Kongsvegen is a well-studied surge-type glacier in the Kongsfjord area of northwest Svalbard; with mass-balance, borehole and radar measurements having taken place there in recent years. Surge-type glaciers alternate between long periods of slow ice flow (quiescent phase), in which ice mass builds up in the accumulation area, followed by a short phase with significantly higher ice speeds in which the stored mass is transported rapidly down-glacier (surge phase). The most recent measurements of Kongsvegen, from summer 2018, show a significant increase in glacier surface speed, suggesting a full surge is imminent, which presents an exceptional opportunity to understand the transition from quiescence to full surge.

Here we propose to use active source seismic surveys to study the internal structure, thermal regime and basal properties of Kongsvegen. All these factors are known to govern glacier surge but are not well studied with in situ data. Measurements will be carried out along selected profiles in the ablation and accumulation area, this will allow comparison of the data from these two areas at the on-set of a surge. Seismic waves will be created at the glacier surface by a specialised non-invasive vibrating seismic source. The waves propagate downward and are reflected from internal layers within the ice, at the interface between the glacier ice and bed and below the bed; allowing measurement of the internal ice structure, temperature profile and sediment structure and thickness below the ice. This will provide us with unique information about the physical conditions of the glacier at the onset of a surge phase, which is the key to better understanding how surge-type glaciers contribute to global sea level rise in a changing climate.