Examining the Effects of Climate Change on Svalbard Glaciers

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1. Introduction

Between the 11th July - 17th August 2016 our team travelled to Longyearbyen, Svalbard, to conduct research into the effects of climate change on four glaciers. Gain or loss of the freshwater stored in Svalbard glaciers has both global implications for sea level and locally the hydrology of rivers and freshwater flux to fjords.

2. Aims

- Examine the mass balance of Longyearbreen Glacier
- Investigate the location of moulins on Tunabreen Glacier
- Survey the mass balance change and moraines of Scott Turnerbreen and Rieperbreen Glaciers

3. Results

Longyearbreen

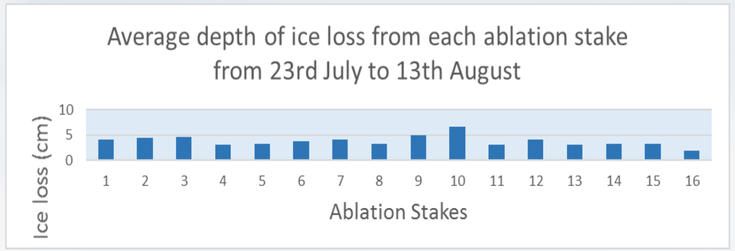
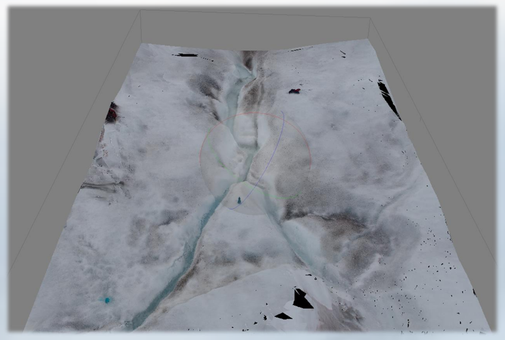


Figure 1: 16 ablation stakes were installed on Longyearbreen to calculate an average ablation over the course of the expedition. The most influential factors for ablation were thought to be debris cover and localised weather conditions.

Figure 2: The short term evolution of three supraglacial meltwater channels was measured. Refreezing and avulsion at higher latitudes alongside the gradient of the glacier are key factor in the trajectory the river takes.



Tunabreen

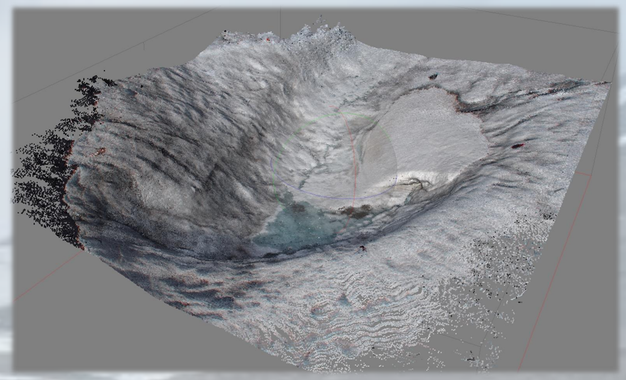


Figure 3: The location of moulins in the crevasse formation zone were mapped. A 3D model of a large scale surface drainage feature upglacier was generated using Structure from Motion .

Scott Turnerbreen and Rieperbreen

Figure 4: A comparison of Scott Turnerbreen from 1993 and 2016. Using a dGPS, points were mapped and elevation was taken in the same place as a study 20 years previous. This will show the amount of retreat and down wasting over the time period.

Figure 5: Fractures in boulders which were measured to examine variations in weathering on the Rieperbreen moraines. Samples were taken from 6 sites on 3 moraines at Rieperbreen.

4. Conclusions

- Evidence from ablation measurements suggest downwasting is the dominant explanation of ice loss on Longyearbreen
- The presence of large scale surface drainage features upglacier from the crevasse formation zone on Tunabreen suggest alternative mechanisms for moulin formation
- Recent climatic warming alongside longer term climatic variations are evident at Scott Turnerbreen and Rieperbreen

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