Photos

The Anthropogenic And Climatic Changes Within The Longyear Catchment, Svalbard

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1. Introduction

Between the 16th June and 17th July, we embarked on an expedition to Longyearbyen, a town located in the High Arctic Norwegian archipelago of Svalbard (78°N, 15°E). Our research was conducted on the Longyearbreen glacier and its surrounding catchment.

Longyearbyen is estimated to be heating at six times the global average [1]. The northern Barents Sea, which includes the Svalbard Archipelago is experiencing the fastest temperature increase within the circumpolar Arctic [2] . Therefore, Svalbard was the perfect place to conduct our research.

2. Aims

To investigate the anthropogenic and climatic changes to the Longyear catchment.

Glacial Aims:
- (SF) To investigate the Little Ice Age moraine extent.
- (LB) To investigate the evolution of the supraglacial melt streams over a melt season.

Fluvial Aims:
- (DR) To compare water quality of glacial rivers and non-glacial rivers
- (MN) To investigate the temporal and spatial changes of sediment load and water quality of a glacial melt river.

Biogeographical Aims:
- (SF) To investigate lichen age on a terminal moraine.
- (MM) To investigate vegetation regeneration after glacial retreat.

3. Methods

Fluvial + Glacial:

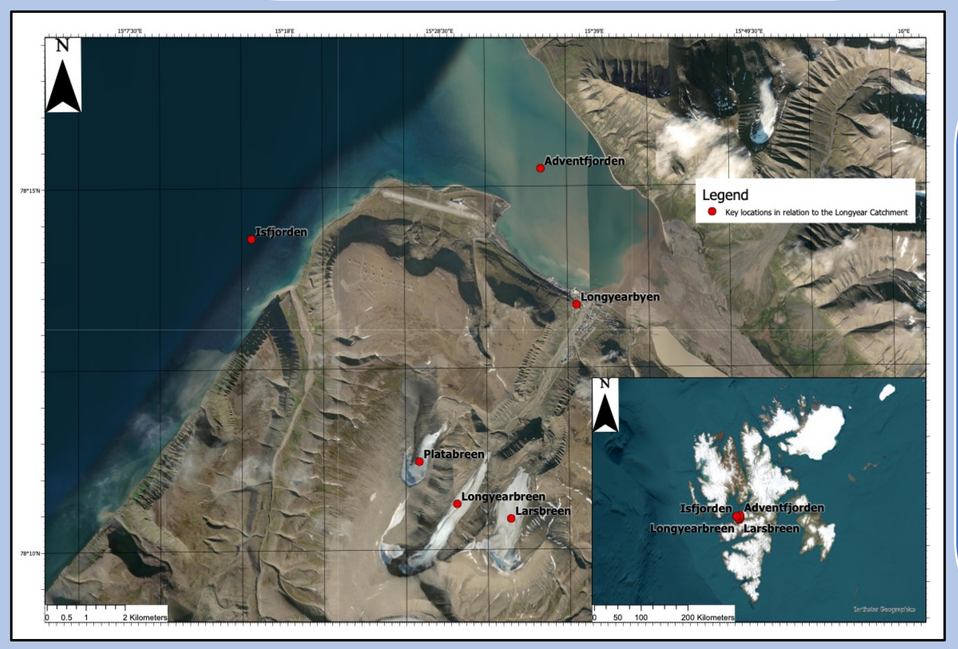
- (MN, DR, LB) Water quality measurements (pH, temp., EC, TDS, ORP).
- (MN, DR, LB) Width, depth, velocity measurements (discharge).
- Coordinates and elevation of site using eTrex GPS.
- (MN, DR) Water samples collected for lab analysis.
  - → Ion concentrations using ICP-OES and Ion Chromatography.
  - → (LB) Suspended sediment analysis.

Biogeographical:

- (SF, MM) Lichenometry readings using calipers.
- (SF) Schmidt hammer readings.
- (SF) Mapping the glacial moraines using an Emlid GPS.

→ To determine moraine age.

- (MM) ~300 Vegetation quadrat surveys.
  - → Species presence-absence table.
  - → Shannon's Biodiversity Index.



4. Expected Outcomes

The overall expected outcomes for the group's research is to understand the glacial, biogeographical and fluvial processes in the Longyear catchment.

Glacial outcomes:
- (SF) As moraine age increases, the weathering to the rocks will be greater.
- (LB) As the melt season continues, the supraglacial channels will evolve at an increased rate.

Fluvial outcomes:
- (DR) Glacial-fed rivers will generate higher water quality and lower ion concentrations than non-glacial-fed rivers.
- (MN) As distance from the glacial terminus increases, the water quality will decrease and the sediment load will increase.

Biogeographical aims:
- (SF) As age of the moraine increases, the lichen size will also increase.
- (MM) As distance from the glacier increases, vegetation cover and diversity will increase.

5. Conclusions

- Rapid changes to the Arctic environment are occurring, with Arctic amplification playing an increasing role due to warmer global temperatures. In the last decade, downward trends for land ice volume and sea ice thickness have continued.
- The Arctic's sensitive climate, hydrological and ecological systems are highly vulnerable.
- With more data being collected, it is clear that the Arctic is being replaced by a warmer, wetter and more variable environment, having global implications.[3]
- Each individual project is relevant as we look at the hydrological, cryospheric, and biogeographical systems in a location representative of other Arctic glacial regions.

References

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Instagram – Svalbard_2023

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