

Glacial Lakes as Forms Sensitive to Seasonal Change using the Example of a lake in the Ragnarbreen Foreland, Central Spitsbergen

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Abstract

Glacial lakes are some of the more prominent evidence of progressive, contemporary climate change. Their development is directly linked to the overgrowth of glacial water inflow over drainage, leading to accumulation in the proglacial zone. Research on Svalbard has shown that the increase in the total area of glacial lakes in this Arctic archipelago is greater than the average increase from other glaciated regions of the world – relative to the end of the Little Ice Age (Shugar et al. 2020; Wieczorek et al. 2023).

Ongoing observations of glacial lakes around the world show that they are important forms of freshwater retention that, due to their instability (dams built of unconsolidated moraine material or ice), can significantly influence the landscape shape of the runoff zone as well as the Arctic coasts themselves (Wołoszyn et al. 2022).

Ongoing observations on the glacial lakes of Svalbard indicate that an important element in understanding the mechanics controlling their evolution is to pay attention not only to long-term evolution but also to seasonal changes in this fragile Arctic landscape.

So using a UAV, we carried out flights over a lake in the Ragnarbreen foreland in central Spitsbergen. High-resolution satellite data were also used for full data compilation. The compilation of these remotely sensed data allowed us to identify sites that had evolved over the course of one year. These results were further supported by meteorological data and field observations on the geomorphology of the run-off area. The main element that caught our

attention is the significant mass movements associated with the melting of dead ice located in the moraine.

Dead ice in moraines has a significant destabilising effect on these structures and ultimately on the potential for Glacial Lakes Outburst Floods. This research is intended to help better predict the geohazards associated with glacial lakes. This research was supported by the Polish National Science Centre under project GLOWS [2023/49/N/ST10/01075].

References

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