

## Changes of past sea level in northeastern Svalbard

The Arctic archipelago of Svalbard has been shaped over thousands of years by the advance and retreat of vast ice sheets. While scientists have a relatively good understanding of the last major glaciation, known as the Last Glacial Maximum, around 20,000 years ago, what happened before remains much less clear. This study investigates a coastal area called Basissletta, on the northeast coast of Spitsbergen, to piece together a more complete picture of how ice sheets and sea levels have changed over the last 70,000 years.

Basissletta is a gently undulating coastal plain covered by marine, glacial and sediments left behind by rivers (*Fig. 1*). Because the area sits between major fjords rather than within them, it was sheltered from the most destructive phases of glacial erosion, meaning that older deposits are unusually well preserved here. This makes it a valuable natural archive for reconstructing past environments.

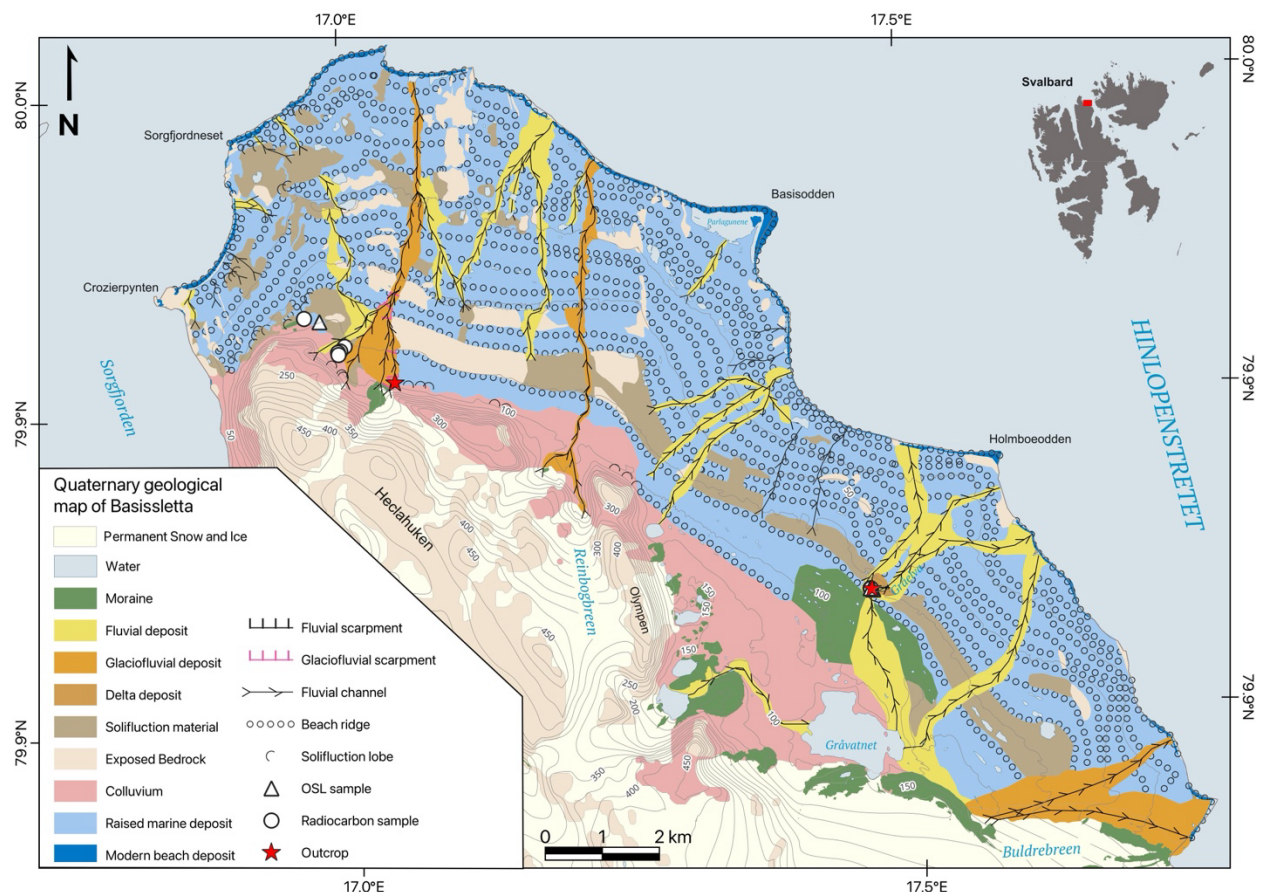


Figure 1. Map showing all the different sedimentary deposits in Basissletta and where samples were taken from along with further investigated areas marked with a red star.

Using a combination of aerial and drone imagery, field observations, and sediment dating techniques, including Optically Stimulated Luminescence (OSL) and radiocarbon dating, both of which measure how long ago sediments were last exposed to light or when organisms were alive, the study reconstructed the history of glaciation and sea level change in the area.

One of the key findings concerns a river delta deposit that turns out to be a composite landform with two distinct phases of formation separated by a gap in the record. The lower, older phase was deposited around 50,000–66,000 years ago, during a period between major glaciations known as the Middle Weichselian Interstadial. The upper, younger phase formed after the last ice sheet retreated, approximately 14,000 years ago, when meltwater again began flowing across the landscape.

The study also identifies two separate periods when sea level was significantly higher than today in this area. The first occurred around 50,000 years ago, following an extensive glaciation that had pushed the Earth's crust downward under the weight of the ice. As the ice retreated, the crust slowly rebounded and the sea flooded low-lying areas, leaving behind beaches and marine sediments at elevations of up to 84 meters above present sea level. The second high sea level event followed the retreat of the last ice sheet around 14,000–12,000 years ago, with beach ridges preserved up to 78 meters above sea level and defining the post-glacial marine limit for the area.

These findings add important new detail to our understanding of how the Svalbard-Barents Sea Ice Sheet behaved during a critical and poorly understood period of Earth's recent glacial history, demonstrating that inter-fjord coastal settings like Basissletta hold invaluable records of past climate and landscape change that have yet to be fully explored.

Master's Degree Project in Geology 45 credits 2026

Department of Geology, Lund University

Supervisor(s): Helena Alexanderson, Zoran Perić & Mark Furze