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Past sea-level data from Lakse Bugt, Disko Island, West Greenland from ground-penetrating radar data

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Beach-ridge deposits have been used as sea-level indicators in numerous studies from temperate coastal regions. However, their present surface morphology in arctic regions may not accurately correspond to past sea-level, because subsequent surface erosion, solifluction processes and/or later sediment deposition may have altered the surface significantly. The internal structure of these beach ridges, however, is often well-preserved and thus constitutes an important key to reconstruction of past sea levels as seen elsewhere.

In the present study, high-resolution reflection GPR data and high-precision topographic data were collected at Lakse Bugt (Disko Island, West Greenland) using a shielded 250 MHz antennae system and a RTK-Trimble R8 DGPS, respectively. Three transects were collected across a sequence of fossil, raised beach ridge deposits, and two transects were obtained across modern beach deposits at the shoreline of the mesotidal regime. Along all radar profiles we observed downlap reflection points, which we interpret to represent the boundary between sediments deposited on the beachface and sediments deposited in the upper shoreface regime. Both the upper shoreface and the beachface deposits exhibit reflection patterns dipping in the seaward direction. The beachface deposits show the strongest dip. At or just below the downlap points strong diffractions are often observed indicating the presence of a layer containing stones. These stones are large enough to generate significant signal scattering. At the present day beach a sharp transition defined by the presence of large stones is observed near the low tide water level: cobbles characterize the seaside, while the land side is characterized by sand and gravel. Therefore, it seems reasonable to conclude that downlap points observed in the GPR data serve as indicators of past low-tide levels (at the time of deposition). The downlap points show a consistent offset with respect to present surface topography indicating that the beach ridge deposits are well-preserved in our study area.

Samples taken for OSL dating have not been dated yet. Instead, a first order age model for the investigated area is based on extrapolation of dating made by others at different sites on Disko Island. This extrapolated age model is used in a first attempt to reconstruct relative sea-level change at Lakse Bugt.