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Holocene environmental conditions in South Georgia - a multi-proxy study on a coastal marine record

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The Holocene environmental history of the sub-Antarctic island of South Georgia so far has been reconstructed from lake sediments, peat records and geomorphological observations. The data available indicate a postglacial ice retreat, which reached the coastal areas around the early Holocene. Climate reconstructions for the Holocene, on the other hand, provide a more complex picture, which may partly result from the influence of local effects.
We present preliminary results of a multi-proxy study on a sediment core recovered in early 2013 from a coastal marine inlet (Little Jason Lagoon) in Cumberland West Bay. The results include elemental data (high resolution XRF-scans, total organic carbon (TOC), nitrogen, and sulphur, lipid biomarkers, and macrofossil data. The sediment core comprises a c. 11m long sequence, which contains a complete record of postglacial sedimentation in the inlet. Its base is formed by a diamicton, indicating a former glaciation of the site, which is overlain by well-stratified sediments passing over into more massive muds in the upper past. A radiocarbon age from the organic-rich sediments above the diamicton provides a first estimate of 9700 14C years BP for a minimum age of ice retreat.
We use the elemental data to infer changes in clastic input (e.g., K/Ti ratios), productivity (TOC) and water salinity (Cl counts) in the course of the Holocene. While Little Jason Lagoon has a connection to the sea today (sill depth c. 1 m), a decrease in Cl counts downcore points to fresher conditions in the early part of the record. This could be an indicator for changing relative sea level and/or changes in the amounts of freshwater inflow from the catchment. Macroscopic plant remains and lipid biomarkers (n-alkanes, n-fatty acids and sterols) provide information on the terrestrial vegetation in the catchment and its changes through time as well as on the influence of marine conditions in the lagoon. We suggest that the record from Little Jason Lagoon provides an important link between terrestrial and marine archives of Holocene environmental change in South Georgia.