

A 2700-yr alkenone-based temperature record from Amsterdamøya, Svalbard

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The Arctic region is undergoing warming greater than at any other time in the instrumental record, due in part to anthropogenic global warming. In order to anticipate future changes we must document and understand the response of the Arctic climate system to past forcing mechanisms. The Svalbard Archipelago in the High Arctic occupies an important location for studying patterns and causes of Arctic climate variability; however, available paleoclimate records from Svalbard are of restricted use due to limitations of existing climate proxies. Here we present a 2700-yr multidecadal-scale record of summer temperature based on alkenone paleothermometry from the sediments of a lake on the island of Amsterdamøya, on the Svalbard Archipelago. The age model for the composite sediment record is based on ²¹⁰Pb and ¹⁴C ages from sediment cores recovered in 2012. We find that the alkenone-inferred summer lake water temperatures of the past 50 yr were unmatched at this location in the course of the past 2700 yr, including during the Medieval Climate Anomaly. We also find that summers during the historical glacier advances of the 18th and 19th centuries on Svalbard were not unusually cold, even though glaciers occupied their maximum or near-maximum late-Holocene extent at this time. Our results broadly agree with another alkenone-based lake water temperature reconstruction from western Svalbard and provide evidence that increased wintertime precipitation, rather than cold temperatures, was responsible for the 18-19th Century glaciations on Svalbard and that increased heat transport into the Arctic via the West Spitsbergen Current began ca. A.D. 1600.