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New high-resolution aerosol proxy data from the Greenland NEEM ice core covering the last 128,000 years

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High-resolution multicomponent continuous flow analysis (CFA) measurements have been performed over the entire depth of the NEEM ice core in three field seasons 2009-2011. Only in the brittle ice section, covering an age of approx. 4,000–8,000 years, continuous measurements could not be performed due to the bad ice quality which hampered such analyses. On all the other ice, continuous records of tracers for sea salt aerosol (sodium), mineral dust aerosol (calcium), inorganic and biogenic nitrogen compounds (nitrate and ammonium), hydrogen peroxide, and electrolytic conductivity were recorded. Data evaluation and quality control of the raw data of the 2.5 km long ice core have recently been finalised, resulting in the final multi-proxy CFA dataset of the NEEM ice core presented here. It covers the last 128,000 years including the entire (stratigraphically folded) Eemian warm period in Greenland.

Our chemical CFA measurements are performed in a nominal resolution of 0.5 mm, allowing for the resolution of seasonal cycles over the top 1500 m of the ice core. Thus, seasonality of aerosol tracers can be studied as far back as the early Holocene, and to a certain extent even further back in time. The lower part of the ice core, however, including the last glacial period as well as the Eemian ice section, is subject to such strong thinning of the ice that no unambiguous seasonal cycles can be resolved any more. Nevertheless, long-term glacial-interglacial and stadial-interstadial changes on the one side and the peculiarities of the first Greenland Eemian aerosol record in comparison to the Holocene on the other can be investigated in highest resolution.

Here, the new NEEM aerosol proxy records are presented and compared to NGRIP and GRIP CFA records focussed on the early Holocene and last glacial period. Thanks to the particularly high resolution we can furthermore closely investigate the timing and phasing of fast climate transitions such as Termination I and Dansgaard-Oeschger events during the last glacial period.