Strontium isotopic imprint of Saharan dust during the Last Glacial Maximum in the NEEM ice core, Greenland

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Strontium concentrations and its isotopic compositions ($^{87}Sr/^{86}Sr$) are reported in NEEM (North Greenland Eemian Ice Drilling) ice core, Greenland, covering a period of ~8 to 30 kyr before present with climate record from the Last Glacial Maximum (LGM) to the early Holocene. Sr concentrations were measured by an inductively coupled plasma sector field mass spectrometry (ICP-SFMS; Element2, Thermo Scientific) coupled with an APEX micromebulization desolvation system (APEX, HF, ESA, USA). Sr isotopes were analyzed using a thermal ionization mass spectrometer (TIMS; TRITON, Thermo Scientific).

Our data are the first high-resolution record of Sr concentration and isotopic composition obtained from the Greenland deep ice core, providing the characteristics of climate-related changes in concentrations and isotopic compositions of Sr. Previous isotopic studies suggested that the source of dust deposited in Greenland originated from Chinese deserts during the cooler periods and/or from glacial sediments adjacent to Greenland in warmer periods of the glacial period. However, the isotopic compositions of Sr determined in NEEM ice core show that dust in Greenland could have originated from the Sahara and Taklamakan deserts during the cold Greenland Stadial (GS) periods and from the area around Greenland including Canada after deglaciation. During the GS2, corresponding to the LGM, the main sources of Greenland dust was Gobi desert and/or Saharan dust. In addition, our data reveal that dust from northern (or northeast) Sahara was dominantly transported to Grrenland during the LGM, while the inputs of dust from the northwest Sahara was negligible. This may be due to the atmospheric circulations prevailing at that time, resulted in the favorable long-range transport of dust from northern Sahara to Greenland.