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New aerosol measurements from the Greenland NEEM ice core

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A large number of aerosol constituents have been measured over the whole Greenland NEEM ice core in three extensive field seasons between 2009 and 2011. Here we present records of sodium, calcium, dust particle numbers, ammonium and nitrate in 1.1 m depth resolution gathered by Continuous Flow Analysis (CFA). Compared to GRIP data, the new records are extended in terms of measured species; in contrast to NGRIP, they now cover also large parts of the Holocene, except the brittle zone (corresponding to 4.5 - 7.5 ka BP in the NEEM ice core).

At first glance surprisingly good correspondences between the three ice cores are found within their overlapping parts. This shows that they represent rather large-scale than regional signals for all considered aerosol constituents. Stadial and interstadial patterns are corresponding in great detail with largest amplitudes in mainly mineral dust derived species such as soluble calcium and insoluble particles. This variability is somewhat lower for the mainly marine derived sodium and virtually inexistent in nitrate. The latter remains constant over the whole last glacial-interglacial cycle. Ammonium representing biogenic sources shows lower glacial than interglacial levels opposite to sodium, calcium and dust. The largest ammonium differences between the three ice cores are found in the cold glacial periods around 20 ka and 65 ka BP. Apart from that, they correspond nicely.

While concentration levels in some parts of the deepest ice might represent Eemian conditions, unexpected signal characteristics are observed at a closer look. This probably prevents a reliable examination of aerosol variability on shorter time scales in this part of the ice core.