A 60-year record of atmospheric sulfate and nitrate depositions preserved in the high-accumulation dome ice core, South East Greenland

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Southeastern Greenland has a dome whose elevation is higher than 3000 m a.s.l. with high accumulation rate (about 1 m yr^{-1}) in water equivalent, which is suitable conditions for reconstructing past environmental changes with a high-time resolution. In this study, we measured major ion fluxes in 90 m ice core drilled from the SE-Dome region in 2015, and obtained records of annual ion fluxes from 1957 to 2014. High average NO_3^- flux (68.9 mg m^{-2} yr^{-1}) with low $\delta^{15}N$ value in the SE-Dome ice core suggests negligible effect of the post depositional NO_3^- loss. Thus, the SE-Dome region is one of the best locations for reconstructing nitrate fluxes. Decreasing trend of non-sea-salt (nss) SO_4^{2-} flux from 1970 to 2010 follows well that of anthropogenic SOx emission from North America, suggesting that the SO_4^{2-} flux in SE-Dome ice core mainly records anthropogenic emission of SOx from North America. In contrast, the decadal trend of NO_3^- flux in SE-Dome ice core differs from the decreasing trend of anthropogenic NOx emission in North America. The exact cause of the apparent non-linear relationship remains unclear but a formation of ammonium nitrate particles enhanced by SOx reduction appears to be an important mechanism as suggested by excess ammonium flux over sulfate. Our NO_3^- flux record is similar to other ice cores in Greenland high elevation sites on 5-yr running average, suggesting that NO_3^- concentrations records from these ice cores are reliable.

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