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THE HIGH RESOLUTION RECORD OF ATMOSPHERIC SELENIUM RECOVERED FROM GREENLAND SNOW

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Selenium concentrations were determined in a continuous series of 70 snow samples collected from a 3.2 m snow pit at northwestern Greenland together with soluble ions such as sodium (Na^+), calcium (Ca^{2+}), methanesulfonic acid (MSA), sulfate (SO_4^{2-}) and oxygen isotope ratio ($\delta^{18}\text{O}$). The Se concentrations in the snow samples at the low pg/g level were successfully determined using the inductively coupled plasma sector field mass Spectrometry (ICP-SF-MS) with an APEX high-sensitivity inlet system and ACM membrane desolvation module. The well defined depth profiles of $\delta^{18}\text{O}$, Na^+ and Ca^{2+} indicated that the snow pit samples covered the time period from spring 2003 to summer 2009.

A strong variability in Se concentrations, ranging from 7.2 to 45.1 pg/g, are observed with generally higher values during winter and spring and lower values during summer and fall. Concentrations of Se showed rather significant correlations with Ca^{2+} ($r=0.400$) and non-sea salt SO_4^{2-} ($r=0.447$), indicating that significant anthropogenic Se input to the snow is likely controlled by the seasonality of transport efficiency of anthropogenic Se from the source regions of Asia. The high Se/MSA ratios and crustal enrichment factors are generally coincident with relatively high Se concentrations. This supports that a significant part of Se present in the snow layers is primarily attributed to anthropogenic inputs.