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Real-time measurements of fine & ultrafine sulfate aerosols in the marine Arctic atmosphere during springtime: Insights to Cloud Condensation Nuclei (CCN) sources

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Real-time measurements of Fine (A.D. < 800nm) and Ultra-Fine (A.D. < 200nm) ion composition of aerosols have been performed for a 2-week period during the late spring 2008 in the Arctic marine atmosphere (Ny Alesund, Spitzberg, Norway).
These measurements were achieved using a modified PILS-IC system (Orsini et al., Atmos. Environ., 2003) enabling sequential measurements of the major anions (Cl, SO4, NO3) every 6min and were completed, for aerosol chemistry, by PM1 filter sampling for the determination of ions (anions, cations) and organic carbon (OC) content.
These real-time measurements have shown that sulfate was the major contributor of the fine and ultra-fine aerosol mass and the major contributor to CCN. Consequently, organic aerosols are likely to play a minor role as CCN in the Arctic atmosphere at that time of the year (which corresponds to the oceanic productivity maximum). This is supported by the fact that production mechanism of marine organics is assumed to be similar to sea salt aerosols and that sea salt aerosols were not detectable in the ultrafine size fraction (<200 nm).
Of particular interest, the ratio of UltraFine-to-Fine sulfate has shown a strong variability (ranging from 20 to 70%), that is not connected to Relative Humidity (e.g. growth to water uptake onto sulfate particules). On the other hand, this variability has shown to be in accordance with the MSA/SO4 mass ratio, which ratio is often used as a surrogate to trace the contribution of biogenic versus anthopogenic sulfate; higher ratios corresponding to higher contribution of biogenic sulfate (originating from the oxidation of DMS).
The results presented suggest that, in the Arctic atmosphere (during late spring), biogenic sulfates are likely to produce CCN more efficiently than anthropogenic sources.