

6.205 Indirect Evidence on the Composition and Origin of Ultrafine Atmospheric Particles in the High Arctic.

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Abstract:

Long-term observations show that nanoparticle formation, i.e., nucleation events are common in the summer-time high Arctic^{1,2}, and are linked to local photochemical activity. However, theories disagree on the chemical precursors of resulting nanoparticles and on the species involved in their subsequent growth, thereby making it difficult to predict their impact on climate. Inorganic compounds can be produced by oxidation of sulfur dioxide emitted mostly from lower latitudes³ or marine organosulfur species⁴, whereas organic compounds can be produced from marine condensable species² or microgel fragments⁵. To identify which species are involved in nanoparticle growth in the high Arctic and thus better characterize their composition, here we report measurements of their size distribution and for the first time the volatility of monodisperse particles having diameters ≤ 200 nm. The volatility measurements suggest that organic compounds are not present on nanoparticles to any large extent. The air mass origin identified for the events observed in this study, by means of back trajectories, is located over the central Polar Region where no anthropogenic influence is expected. Along with gas concentration and meteorological data, our observations provide strong evidence that a predominant fraction of the 12-nm particle population is ammoniated sulfates.

References:

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