6.133 Evidence for Biogenic Influence on Summertime Arctic Aerosol.

Early Career Scientist

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Abstract:

The Arctic is a complex and poorly understood aerosol environment, impacted by strong anthropogenic contributions during winter to spring, and by regional sources in cleaner summer months. Our understanding of summertime Arctic aerosol and cloud remains incomplete, in part due to a scarcity of measurements focusing on the role of regional sources in shaping aerosol chemical and physical properties. To aid in addressing these uncertainties we made measurements of aerosol physical and chemical properties aboard an aircraft, as part of the NETCARE project, allowing measurements from 60 to 3000 meters over ice and open water. This summertime campaign was based in the Canadian High Arctic, at Resolute, NU (74°N), in a general time period and location that was shown to have high biological activity in the surface ocean. Here, we focus on observations of

submicron aerosol composition from an aerosol mass spectrometer. Under stable and clean atmospheric conditions with relatively low carbon monoxide and black carbon concentrations (< 100 ppb_v and < 50 ng/m^3, respectively), we observe organic aerosol (OA)-to-sulfate ratios ranging from ~0.5 to greater than 6 with evidence for enhancement within the lower boundary layer. OA at lower altitudes tended to be less-oxygenated, with lower O-to-C and higher H-to-C ratios, compared to OA observed aloft. Methanesulfonic acid (MSA), a marker for the contribution of ocean-derived biogenic sulphur, was also observed in submicron aerosol. MSA-to-sulfate ratios ranged from near zero to ~0.3 and tended to increase within the lower boundary layer, suggesting a contribution to aerosol loading from the ocean. While there are contributions from both primary and secondary aerosol across the size distribution, in some cases enhanced concentrations of OA and MSA were associated with aerosol growth. With these observations we explore the composition and formation processes contributing to cloud condensation nuclei in the summertime Arctic.