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# From a polar to a marine environment: has the retreat in Arctic sea-ice led to a shift in aerosol optical properties?

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The loss of Arctic sea-ice has been well documented and has been shown to be increasing in recent decades. One effect of a reduction in sea-ice extent is the exposure of more of the ocean to wind. Given sea spray aerosols arise as a result of bursting bubbles and wind-induced wave breaking, there is a potential for the primary production of these aerosols to increase. Amongst the monitoring sites in the Arctic region, the observatory on mount Zeppelin, Ny-Ålesund on Svalbard, has the potential to be greatly affected by marine aerosols. The importance of aerosols, as near-term climate forcers, in the Arctic region is well established, but research, based on long-term datasets, into changes in their seasonality and inter-annual variability is lacking.
This study exploits a unique and multi-decadal data series of aerosol optical properties (available since the late-nineties). The observatory has one of the longest running continuous data sets and thus offers the possibility to study long-term observations and trends in aerosol data. This study makes use of aerosol optical properties from an integrating nephelometer (TSI Inc., model 3563) measuring the particle light scattering and back scattering at three wavelengths (450, 550, 700 nm). Intensive properties, including the Ångström exponent and backscattering ratio, are added to the analysis to study the inter-annual and seasonal trends in particle light scattering and help shade light on the overall contribution from coarse mode aerosol particles to light scattering. In addition, this study uses back-trajectory analysis to study changes in air mass origin of air parcels arriving at Zeppelin observatory. Optical properties and accumulated time over different land types are combined to detail the sources of light-scattering aerosols. Analysis of seasons on a multi-decadal timescale provides insights into the influence sea-ice retreat may be having on aerosol optical properties.
First and preliminary results show a consistent reduction in Ångström exponent of the particle light scattering over the last 20 years, indicating an increase in the overall contribution of coarse mode particles such as sea salt, while particle light scattering, back scattering, and backscattering ratio showed no distinct change in magnitude over the last 20 years. Currently the 20 years of air mass back-trajectory calculations are being evaluated and added to the analysis.