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Ground-based remote sensing of aerosol properties using the Emission FTIR NYAEMFT and the Raman-Lidar KARL in Ny-Ålesund, Spitsbergen (78°N)

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Abstract

Arctic amplification, the phenomenon that the Arctic is warming faster than the global mean is still not fully understood. The Transregional Collaborative Research Centre TR 172 -- Arctic Amplification: Climate Relevant Atmospheric and Surface Processes (AC^3) funded by the DFG contributes towards this research topic.

This excessive Arctic warming is both a consequence and a driver of rapid changes in the Arctic and in part created by aerosol feedbacks. Since different aerosol types have different climate effects, the observation of aerosols is urgently needed in the Arctic. Thus, for the purpose of measuring aerosols in the troposphere, a Fourier-Transform InfraRed spectrometer (FTS) for measuring down-welling emission measurements and a Raman-Lidar are operated at the AWIPEV research base in Ny-Ålesund, Spitsbergen (78°N).

The height of the aerosol layer, aerosol backscatter, extinction, depolarization, the lidar ratio and the color ratio are measured by the Raman-Lidar. Based on that information, a retrieval algorithm, LBLDIS, for aerosol types (dust, sea salt, black carbon and sulfate), optical thickness and effective radius is modified and used for analyzing the emission spectra measured by the FTS.

Combining the two observations, the aerosols can be observed more comprehensively. The most probable origin of the dominant aerosol types is explored by tracking the origin of air masses through back-trajectory calculations using the FLEXPART atmospheric transport model.