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Aerosol optical properties in the ABL over arctic sea ice from airborne aerosol lidar measurements

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Between 2009 and 2013 aerosols, sea ice properties and meteorological variables were measured during several airborne campaigns covering a wide range of the western Arctic Ocean. The campaigns were carried out with the aircraft Polar 5 of the German Alfred-Wegener-Institute (AWI) during spring and summer periods. Optical properties of accumulation mode aerosol and clouds were measured with the nadir looking AMALi aerosol lidar covering the atmospheric boundary layer and the free troposphere up to 3000m, while dropsondes provided coincident vertical profiles of meteorological quantities.
Based on these data we discuss the vertical distribution of aerosol backscatter in and above the atmospheric boundary layer and its dependence on relative humidity, dynamics and underlying sea ice properties. We analyze vertical profiles of lidar and coincident dropsonde measurements from various locations in the European and Canadian Arctic from spring and summer campaigns. Sea ice cover is derived from modis satellite and aircraft onboard camera images.
The aerosol load in the arctic atmospheric boundary layer shows a high variability. Various meteorological parameters and in particular boundary layer properties are discussed with their respective influence on aerosol features.
To investigate the effect of the frequency and size of open water patches on aerosol properties, we relate the profiles to the sea ice properties influencing the atmosphere in the upwind region.