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Characterization of aerosols in the Norwegian subarctic region (ALOMAR station): optical properties, size distributions and nucleation events

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During 2008 summer, a field campaign has been carried out at the Arctic Lidar Observatory for Middle Atmosphere Research, ALOMAR, on Andøya island close to the town of Andenes (69°16 N, 16°00 E, 380 m a.s.l.), approximately 300 km north of the Arctic Circle. The campaign was part of the contribution of the Atmospheric Optics Group of the Valladolid University (GOA-UVa) to the International Polar Year, in the framework of the POLARCAT (Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models of Climate, Chemistry, Aerosols, and Transport) project. This GOA-UVa's field campaign has been developed to obtain experimental data for local aerosols, its optical characteristics and its size distributions. For this purpose, different instruments were simultaneously installed in the station facilities. Several interesting events were observed, including a strong desert event and smoke from biomass burning due to forest fires. In this work we present a general overview of measurements for aerosol characterization with special emphasis on the data from the nucleation and other interesting events observed.

The light scattering and the light absorption coefficients at 550 nm had a measured hourly mean value of 5.41 Mm^{-1} and 0.40 Mm^{-1}, respectively. The scattering and the absorption Ångström exponents are used for the analysis of the spectral shape of the coefficients for several wavelength pairs. The Ångström exponents calculated for the 450 nm/700 nm wavelength pair lay in the range between 0.20 and 3.07 for scattering and in the range between 0.01 and 0.97 for absorption. The single scattering albedo presented a mean value of 0.91 and in this work we present the relations between this parameter and the scattering / absorption coefficients and Ångström exponents.

The number of particles was registered using a scanning mobility particle sizer (SMPS), an aerodynamic particle sizer (APS) and an ultrafine condensation particle counter (UCPC). The submicrometer, micrometer and total concentrations presented hourly mean values of 1277 cm^{-3}, 1 cm^{-3} and 2463 cm^{-3}. The shape of the median size distribution and the modal correlations were investigated for all the campaign days and for selected episodes. The average shape for all the days was bimodal in the submicrometer fraction.

We related the optical and the microphysical parameters to each other, and the median results will be presented for the campaign and in a more detailed way for days with events of special interest.

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