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Early-spring aerosol characterization across multiple Arctic stations

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The Arctic region is characterized by complex interactions between aerosols, clouds and precipitation. Ground-based observations of atmospheric optical properties are usually comprised of photometric aerosol optical depth (AOD) measurements and lidar extinction and backscatter profiles. The night-time AODs obtained with star- and moonphotometry have been extremely limited in the Arctic region.

The first part of the paper is based on the synchronous starphotometry and lidar measurements obtained at Eureka (Canada, 80°N, 86°W) and Ny Alesund (Spitsbergen, 79°N, 12°E) in late winter-early spring periods of 2011 and 2012. We present several examples of process-level events as well as the winter to spring climatological dynamics of cloud-screened optical depths. The particular cases include aerosol, thin-cloud, ice crystals and polar stratospheric cloud events. An integral part of the process-level analysis, which ultimately informs the seasonal analysis, is the synergistic interpretation of the spectral, temporal and spatial information content of the passive and active data.

In the second part of the paper we present the preliminary results obtained from the intercomparison field campaign at Barrow (Alaska, 71°N,156°W) that took place in spring 2013. The instrumentation suit included high-spectral resolution lidar, a starphotometer and a moonphotometer.