Physical and chemical properties of aerosols and their impact on radiative forcing during iAREA campaigns (Ny-Alesund, Spitsbergen)

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IAREA project was created to derive new knowledge and techniques regarding the role of absorbing aerosols in Arctic. Hence, field campaigns were carried out under iAREA project during 2014 and 2015 in Ny-Alesund, Spitsbergen.

In the following presentation we would like to present the results of three iAREA spring campaigns provided between 2014 and 2016, however putting an emphasis on the iAREA2015. We used a variety of instruments consisting of in-situ and remote sensing measurements, specifically: Nephelometer 3563, Microtops II Sun Photometer, particle counters system SMPS + APS as well as Aethalometer AE31. We also provided vertical profiling of meteorological properties as well as black carbon concentration and particle size distribution along the path of tethered-balloon system ranging, on average, to 1.5 km. In addition, AWI Aerosol Raman Lidar KARL together with Near-range Aerosol Raman Lidar (NARLa) were operating at the same time.

Regarding the measurement results from iAREA2015, the average value of scattering coefficient was found to be at 7.13 ± 3.05 [Mm^{-1}] level, which seems to be lower in comparison to the 2014 spring season. In addition, absorption coefficient of 0.41±0.31 [Mm^{-1}] was similar to the value from the previous iAREA2014 campaign, however revealing very different characteristics of both seasons. Spring 2014 was mainly dominated by Sea Spray events - 2015, on the other hand, was represented by an Arctic Haze advection. During the campaign weather conditions were wormer, moister and windier regarding the climatological values.

Subsequently, a detailed discussion over the Arctic Haze event occurring between Apr 7 and 10 2015 will be presented. A case study reviles that the source of air masses with enhanced black carbon concentration exceeding 150 ng/m3 on a daily average in combination with very high fine to coarse particle number concentration ratio of 3000, mostly were advected from the European part of Russia in the light of the HYSPLIT back trajectories model. In addition, a chemical analysis of the aerosol structure will be presented as well as its influence on the radiation fluxes using atmospheric radiative transfer model MODTRAN5.