Geophysical Research Abstracts
Vol. 20, EGU2018-16254, 2018
EGU General Assembly 2018

Combining airborne in situ and ground-based lidar measurements for attribution of aerosol layers

Anna Nikandrova (1,2), Ksenia Tabakova (1,2), Antti Manninen (1,2), Riikka Väänänen (2), Tuukka Petäjä (1,2), Markku Kulmala (1,2), Veli-Matti Kerminen (1,2), and Ewan O'Connor (3)

(1) Institute for Atmospheric and Earth System Research / Physics (anna.nikandrova@helsinki.fi), (2) Faculty of Science, University of Helsinki, Finland, (3) Finnish Meteorological Institute, Helsinki, Finland

Airborne campaign took place in Hyytiälä (southern Finland) in April and September 2014. A Cessna FR172F aircraft was modified to carry several instruments including a Scanning Mobility Particle Sizer (SMPS) and Optical Particle Sizer (OPS). The flight tracks were above Hyytiälä at altitudes below 4 km and at a quite low speed (<200 km/h), which allowed measurements with good temporal and spatial resolution.
Simultaneously, a High Spectral Resolution Lidar (HSRL) was deployed in Hyytiälä from March to September 2014 as a part of the US DoE ARM (Atmospheric Radiation Measurement) mobile facility during the BAECC (Biogenic Aerosols – Effects on Cloud and Climate) Campaign. Both datasets were combined with radiosonde profiles and backward trajectories to explore aerosol properties in the boundary layer (BL) and layers aloft of the rural environment. For case studies we selected three sequential clear sky days and one partly cloudy day. Several elevated aerosol layers were observed during both case studies. Spatial variability in the aerosol concentrations was the lowest in the BL due to turbulent mixing, however, mixing was not as homogeneous during partly cloudy day. Greater variability in the elevated layers suggests a lack of mixing in these layers. The highest aerosol particles concentration in all size ranges was found predominantly in the boundary layer. New particle formation was observed in the boundary layer, and nucleation mode particles were detected in the elevated layers during clear sky case. Arrival heights of backward trajectories did not always correspond to the observed layers' heights, thus, trajectories should be used with caution in the future.