



Application of LIRIC algorithm to study aerosol transport over Belsk, Poland

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In this work synergy of measurements done by of a LIDAR and a sun-sky scanning photometer is presented. The Lidar-Radiometer Inversion Code (LIRIC) was applied to study periodic events of increased values of the aerosol optical depth (AOD) observed at Belsk (Poland). Belsk is a background site located in a rural area around 50 km south from Warsaw. Events of increased AOD occur mainly during spring and they coincide with events of elevated concentrations of particulate matter (PM₁₀). This phenomenon is observed in all eastern Europe, e.g. in Minsk, and is caused by long range aerosol transport. Our previous work showed aerosol transport from the border between Belarus, Ukraine and Russia in the planetary boundary layer (PBL), and from north Africa in the free troposphere.

The LIRIC algorithm, which uses optical and microphysical properties of the aerosol derived from photometric measurements and LIDAR profiles, was applied to study vertical distribution of fine and coarse modes of aerosol. The analysis of the air mass backward trajectories and models results (DREAM and NAAPS) was also used to determine a possible aerosol type and its source region. This study proved our previous findings. Most of events with increased AODs are observed during spring. In this season the fine mode aerosol is mainly present in the PBL. On the basis of the trajectory analysis and the NAAPS results we presume that it is the absorbing aerosol originating from the regions of seasonal biomass burning in eastern Europe, i.e. the area mentioned above. The events with increased AODs were also found during summer. In this case the fine mode aerosol is transported in the PBL a like to spring season. However, our analysis of trajectories and model results indicated western Europe as a source region. It is probably urban/industrial aerosol. The coarse mode aerosol is transported mainly in the free troposphere as separate layers. The analysis of backward trajectories indicates northern Africa as a possible source region regardless the season. DREAM and NAAPS results suggest presence of mineral dust in this case over Belsk.