Temporal variation of PM10 concentration and properties in Istanbul 2007-2015

Rosa M Flores, Nefel Kaya , Övgü Eşer , and Şehnaz Saltan
Marmara University, Environmental Engineering Department, Istanbul, Turkey (rmflores@mtu.edu)

The study of temporal variation of atmospheric aerosols is essential for a better understanding of sources, transport, and accumulation in the atmosphere. In addition, the study of aerosol properties is important for the understanding of their formation and potential impacts on ecosystems and climate change. Istanbul is a Megacity that often shows exceedance in particulate matter (PM) standard values, especially during the winter season. In this work, temporal variations of hourly ground-level PM10 concentrations, aerosol optical depth (AOD), aerosol index (AI), vertical distribution, and mineral dust loadings were investigated according to air mass trajectory clusters in Istanbul during 2007-2015. Aerosol properties (i.e. AOD, AI, and vertical distribution) and mineral dust loadings were retrieved from satellite observations and the BSC-DREAM8b model, respectively. Air mass backward trajectories and clustering were supplied by NOAA-HYSPLIT model. Mineral dust transport events were characterized according to the exceedance of a dust loading threshold value. The total number of mineral dust transport events ranged from 115 to 183 during the study period. The largest number of mineral dust transport events were observed in 2008 and 2014. However, the highest ground-level PM10 measurements were observed in 2012-2013 with approximately 70% of the daily average concentrations exceeding the air quality standard of 50 μg m-3. Overall, 5-6 air mass trajectory clusters were able to resolve over 85% of the total spatial variance. These trajectories vary in frequency and direction throughout the years, however, the main trajectories favor aerosol transport from N, NE, NNE, and S, and SE. Evaluation of mineral dust loading and PM10 concentrations is helpful for successful development and implementation of air quality management strategies on local levels.