Seasonal Variations in the Chemical Composition of Size Segregated Aerosols for Northwestern Black Sea Atmosphere of Turkey

F.Öztürk[1], S.H. Ngagine[1], M. Keleş[1]

[1]Environmental Engineering Department, Abant Izzet Baysal University (AIBU), Golkoy Campus, 14030, Bolu, Turkey

Keywords: Aerosols, EC, OC, Metals, Major Ions

Presenting Author: halif1992@gmail.com

Bolu is located at the Northwestern Black Sea region of Turkey with a population 230,000. About 60 % of the city is covered by forests and mountains. Frequent air pollution episodes are observed at the city center particularly in winter time due to low boundary layer height and ventilation. There is an ongoing debate on which properties of particulate matter is significant in determining human health impact. Harrison and Yin (2000) put forward that bulk chemical composition and particle size distribution are the important and inter-related factors influencing the toxicity of the particulate matter.

Weekly size segregated PM samples were collected in a station at the city of Bolu between July 2015 and January 2016. A cascade impactor was used for the collection of weekly PM samples on pre-fired quartz filters in eight different size ranges (9.0-10.0 µm, 5.8-9.0 µm, 4.7-5.8 µm, 3.3-4.7 µm, 2.1-3.3 µm, 1.1-2.1 µm, 0.65-1.1 µm, 0.43-0.65 µm) and backup (<0.43 µm). The collected samples were analyzed for large suite of parameters including EC/OC by Thermal Optical method, metals from Li to U by ICPMS, and major ions by IC.

The size distribution of PM, OC and EC during the study period was depicted in Figure 1. It is clear from Figure 1 that all three parameters depicted bimodal distribution while the maximum concentration for PM and OC was observed at 0.5 µm. On the contrary, EC was found to be more enriched on particles less than 0.4 µm. The average OC/EC ratio in particles less than 1 µm was determined as 10 suggesting that secondary aerosol formation in Bolu atmosphere. The levels of these pollutants increased in winter time indication that emissions from domestic heating are important sources releasing these pollutants to the ambient air of the city.

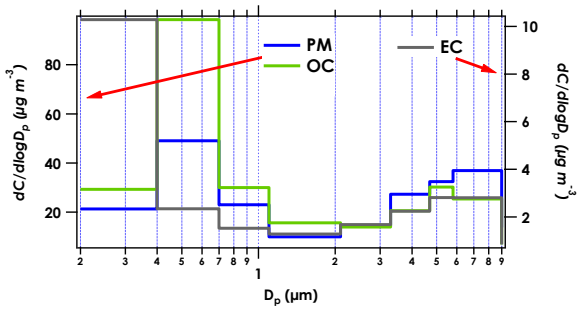

Figure 1. Size distribution of PM, OC and EC during the study period

Except for sulfate and nitrate, the rest of the major ions depicted bimodal distribution. Sulfate and nitrate, most important parameters determining the acidity of the particulate matter, were peaked on particles less than 1 µm implying the anthropogenic origin of these parameters.

The concentrations of sulfate, nitrate, potassium and anthropogenic originated metals (As, Sb, Ni, Cr, Cd, Pb, V etc.) were increased in the cold season due to elevated combustion and lower mixing height. On the other hand, the concentrations of soil originated metals decreased in the winter season due to damp soil conditions.

Harrison, R.N., and Yin, J., (2000). *Particulate matter in the atmosphere: which particle properties are important for its effects on health?*, *The Science of the Total Environment*, 249, 85-101.

This project was supported financially by Turkish Scientific and Technological Research Council (TÜBİTAK) with a project number 114Y429.