Insights into summertime haze pollution over Shanghai based on on-line water-soluble ionic composition of aerosols in 2009

Huanhuan Du, Lingdong Kong, Tiantao Cheng*, Jianmin Chen*, Xin Yang

Center for Atmospheric Chemistry Study, Department of Environmental Science & Engineering, Fudan University, Shanghai 200433, China

Abstract

A model ADI 2080 online analyzer for Monitoring of AeRosols and GAse with a PM10 sampler was employed to measure mass concentrations of major water-soluble (WS) inorganic ions in aerosols and trace gases in one hour resolution from May 27 to June 16 2009 in Shanghai. During the monitoring campaign, four haze pollutions were observed and the haze days were classified as biosmoke pollution, complicated pollution, and secondary pollution according to the differences in the levels of WS ions. Air parcel of biomass burning from northeast arouse biosmoke pollution. During biosmoke pollution, water potassium concentration was higher than its own averaged concentration and strong positive correlation was found between K+ and Cl-. The substantial conversion of SO2 and NO2 into SO42- and NO3- on the surface of pre-existing KCl particles has been found after biosmoke pollution at the sampling site. Therefore, the transport of biomass burning plume combined to local emissions could cause complicated pollution. During secondary pollution, large amounts of anthropogenic SO2 and NO2 sources were oxidized to sulfate and nitrate in aerosols because of high atmospheric oxidation ability in the atmosphere and steady atmospheric condition.

Keywords: haze, aerosol, water-soluble ion