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عنوان مقاله

Chemical characterization and source apportionment of atmospheric fine particulate:

matter (PM$_{2.5}$) at an urban site in Astana, Kazakhstan

چکیده : ۲۵۰ لغت

PM$_{2.5}$ is a significant air quality concern in urban areas globally. PM$_{2.5}$ in Astana exceeded the US EPA standard for annual mean PM$_{2.5}$ EPA with an average PM$_{2.5}$ mass concentration of 23.43 ±11.50 μg/m^3 and a maximum daily value of 63.8 μg/m^3 in January (heating season). The lowest 3.7 μg/m^3 was observed in September (non- heating season). However, source apportionment in Kazakhstan has not been done because of a lack of PM$_{2.5}$ composition measurements. This study presents the first analysis of chemical composition of PM$_{2.5}$ and source apportionments in Kazakhstan. It comprehensively examined Astana's PM$_{2.5}$ chemical characteristics and source apportionment over ~ two years (November 2019 to August 2021). Using elements, water-soluble inorganic ions, black carbon (BC), and estimated unmeasured mass (UMM), source apportionment was obtained using Positive Matrix Factorization (PMF) supported by conditional bivariate probability function (CBPF) analyses. Average PM$_{2.5}$ contributions of the eight sources were 'Spark Ignition' (30.3%), 'Coal Fly ash' (17.1%), 'Secondary Nitrate' (15.1%), 'Primary Sulfate-Fuel Combustion' (9.9%), 'Secondary Sulfate-Coal Combustion' (8.5%), 'Soil/Road Dust' (7.9%), 'Diesel' (7.1%), and 'Local Power Plant(s)' (4.2%). Local power plants burn high-ash coal and fuel oil year-round. The major contributions of heating/power plants, private residential heating systems, autonomous boilers, vehicles, asphalt pavement mixing facilities, and local construction activities. This study's source apportionment analysis provides critical insights for developing targeted air quality management strategies in Kazakhstan. Findings highlight the need for improved controls on vehicular emissions and heat/power generation sources and for the implementation of measures by local governments to effectively reduce PM$_{2.5}$.