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Polycyclic Aromatic Hydrocarbons Over A Tropical Urban And A High Altitude Himalayan Station In India: Temporal Variation And Source Apportionment

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Abstract

The temporal variations and major sources of polycyclic aromatic hydrocarbons (PAH) intrinsic to PM₁₀ were investigated over a tropical urban atmosphere on the Indo-Gangetic Plain (IGP) and for the first time over a high altitude urban atmosphere at eastern Himalaya in India. Samples were collected over Kolkata, a megacity and Darjeeling, a high altitude (2200 m asl) hill station in eastern India during the dry season (October 2015 – May 2016). Fourteen PAHs were detected and quantified over Kolkata and Darjeeling during three consecutive seasons, viz., post-monsoon, winter and pre-monsoon. The total-PAHs concentrations were in the order of winter (78.08 – 146.71 ngm⁻³) > post-monsoon (83.42 – 113.52 ngm⁻³) > pre-monsoon (37.65 – 109.27 ngm⁻³) at Kolkata, whereas post-monsoon (22.72 – 36.60 ngm⁻³) > winter (8.52 – 28.43 ngm⁻³) > pre-monsoon (5.45 – 13.34 ngm⁻³) at Darjeeling. The observed seasonality of PAHs at Kolkata *vis-a-vis* Darjeeling has been explored in the light of anthropogenic activities, boundary layer dynamics and meteorological parameters such as temperature, relative humidity, wind speed and solar radiation. Negative correlation was observed between total-PAHs and temperature, wind speed and solar radiation over Kolkata and Darjeeling. The positive matrix factorization (PMF) model calculations suggested that coal (26%), petrol (24%) and diesel (17%) combustion, commercial and household kitchens (18%) and municipal solid waste incineration (15%) are the possible contributors to the PM₁₀ associated PAHs over Kolkata whereas diesel (37%), commercial and household kitchens (23%), coal (21%) and petrol (20%) are the possible PM₁₀ associated PAH sources over Darjeeling.

Keywords: Polycyclic aromatic hydrocarbons, Urban air, PM₁₀, Seasonal variation, Source apportionment, PMF (Positive matrix factorization)

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