(ID 268)

Preliminary Indications on an Atmospheric Particulate Matter and Rainwater Chemistry in Colombo, Sri Lanka: A Study During Southwestern Monsoon

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Abstract

The atmospheric cleansing nature of rainfall, specifically in the removal of particulate matter, is a determinant of rainwater quality. This study investigated the relationship between atmospheric particulate matter (PM_{10}) concentration and rainwater quality in Colombo during the southwest monsoon period in 2023. The rainwater samples were collected using a manually prepared high-density polyethylene collector and analysed for pH, electrical conductivity (EC), water-soluble cations (Na^+, K^+, Ca^{2+}, Mg^{2+}, and NH_4^+), and anions (Cl^-, NO_3^-, and SO_4^{2-}). The concentration of atmospheric PM_{10} was obtained from the ambient air quality monitoring station (AQMS) at Battaramulla. The measured data were analysed using multivariate statistical techniques, including principal component analysis and Pearson correlation analysis, to identify relationships between the concentration of atmospheric PM_{10} and rainwater quality. The atmospheric PM_{10} showed an insignificant positive correlation with southwest monsoon rainfall ($r=0.14$, $p>0.05$). The concentration of atmospheric PM_{10} increased the total concentration of water-soluble ions ($r=0.30$) and decreased the pH ($r=-0.42$) and electrical conductivity ($r=0.07$) of rainwater samples. The concentration of Na^+, K^+ and Ca^{2+} displayed moderate positive correlation, while Mg^{2+}, NH_4^+, Cl^-, NO_3^- and SO_4^{2-} showed a weak positive correlation of rainwater samples in the atmospheric PM_{10}. This study contributes valuable insights into the variations of PM_{10} in the atmosphere and its potential implications on rainwater quality in southwest monsoon, underscoring the importance of comprehensive analyses for a more nuanced understanding of the intricate relationships between atmospheric components and rainwater chemistry.

***Keywords**:* Atmospheric chemistry, Correlation analysis, Particulate matter, Rainwater quality, Southwest monsoon