

Visualization of PM_{2.5} Time Series and Correlation Analysis of Cities in Bangladesh

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Abstract : In recent years of industrialization, the South Asian countries are being affected by air pollution due to a severe increase in fine particulate matter 2.5 (PM_{2.5}). Among them, Bangladesh is one of the most polluting countries. In this paper, statistical analyses were conducted on the time series of PM_{2.5} from various districts in Bangladesh, mostly around Dhaka city. Research has been conducted on the dynamic interactions and relationships between PM_{2.5} concentrations in different zones. The study is conducted toward understanding the characteristics of PM_{2.5}, such as spatial-temporal characterization, correlation of other contributors behind air pollution such as human activities, driving factors and environmental casualties. Clustering on the data gave an insight on the districts groups based on their AQI frequency as representative districts. Seasonality analysis on hourly and monthly frequency found higher concentration of fine particles in nighttime and winter season, respectively. Cross correlation analysis discovered a phenomenon of correlations among cities based on time-lagged series of air particle readings and visualization framework is developed for observing interaction in PM_{2.5} concentrations between cities. Significant time-lagged correlations were discovered between the PM_{2.5} time series in different city groups throughout the country by cross correlation analysis. Additionally, seasonal heatmaps depict that the pooled series correlations are less significant in warmer months, and among cities of greater geographic distance as well as time lag magnitude and direction of the best shifted correlated particulate matter time series among districts change seasonally. The geographic map visualization demonstrates spatial behaviour of air pollution among districts around Dhaka city and the significant effect of wind direction as the vital actor on correlated shifted time series. The visualization framework has multipurpose usage from gathering insight of general and seasonal air quality of Bangladesh to determining the pathway of regional transportation of air pollution.

Keywords : air quality, particles, cross correlation, seasonality

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