Impact of Meteorological Conditions on PM2.5 Concentration in Delhi

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Ishita Lai ; Sandip Maji ; Md. Meraj Alam ; Anirban Chattopadhyay **All Authors**

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Abstract:
Air pollution has been a widespread concern in recent years. It is an alarming issue due to the adverse effects of impurities, particularly on human health. The presence of the influence of the meteorological factors on the concentration of pollutants becomes the major subject of interest, as the determination of the correlation would help to explore the dynamics of the concentration of air pollutants. In this work, the existence of cross-correlation between pollutant PM2.5 and four meteorological factors, including temperature, humidity, pressure, and wind speed has been unraveled for Delhi using Multifractal cross-correlation detrended fluctuation analysis (MF-X-DFA) method. The daily data of the air pollutant PM2.5 and four meteorological factors have been obtained from the Central Pollution Control Board (CPCB) for the years 2015 to 2019. The exploration shows that the cross-correlation between PM2.5 and all the four factors are persistent and long-range correlated also confirming multifractality. Meanwhile, the strength of the multifractal spectrum of wind speed is found to be strongest thus the effect of wind speed on PM2.5 concentration is obvious to be most pronounced. Hence it becomes evident from Hurst exponent values and multifractal spectrum that not only wind speed rather temperature, humidity, and wind speed combined can bring a massive change in concentration of PM2.5.

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Ishita Lai
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Sandip Maji
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Md. Meraj Alam
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Anirban Chattopadhyay
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Contents

In recent years, Pollution has been a global issue, pertinent mostly where urbanization, industrialization, and population growth are rampant. Air pollution and its harmful effect on the environment and human health in the capital city of India, New Delhi, has drawn prominent attention for quite a while.

Authors

Ishita Lai
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Sandip Maji
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Md. Meraj Alam
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

Anirban Chattopadhyay
Department of ECE, Dr. B. C. Roy Engineering College, Durgapur, India

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