ASSESSMENT OF PARTICULATE MATTER 2.5 MICRONS AND PARTICLE BACK TRAJECTORIES ANALYSIS USING HYSPLIT MODEL AT DHAKA, BANGLADESH

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Abstract

The worldwide issue of air pollution, particularly the fine particulate matter (PM) problem, has drawn significant scientific and public interest due to global economic expansion and potential detrimental effects on human health. This study examines PM2.5 (diameter ≤ 2.5 microns) variability using hourly station data (2016-2023) collected from the U.S. Embassy in Dhaka and back trajectories analyzed with the HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory) model. The highest recorded daily PM2.5 value during the study period was 378 μg/m^3. The maximum monthly average concentration, 197(±21.12) μg/m^3, was observed in January, while the minimum, 31(±3.40) μg/m^3, occurred in July. The winter season exhibited the highest seasonal concentrations, 181(±14) μg/m^3. The yearly average concentration was 89 (±11.55) μg/m^3, with an increasing trend observed over the study duration. This study confirmed that the Air Quality Index (AQI) was deemed 'unhealthy (AQI>151)' on 39% of days, with only 1% classified as 'good (AQI<50)' during 2016-2023. Several meteorological factors have shown a strong influence on the dispersion of PM2.5. The 5-day back-trajectory analysis revealed that during the peak concentrations, PM2.5 primarily originated from the northwestern part of India, while during the lowest concentrations, it came from the Arabian Sea.