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The Impact of Traffic Emission on Air Quality in an Urban Environment

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ABSTRACT

Study of the impact of traffic emissions on air quality around the Haram Mosque in Makkah, Saudi Arabia, was conducted experimentally, numerically and statistically. Experimental study was performed to measure existing air quality. Numerical study was done to model the extent of air movement and pollutant dispersion within and around the Haram area. Statistical study was conducted to determine correlation coefficients, auto-correlation and time lags of each pollutant. Pollutant measurements were carried out using an air quality mobile laboratory at three sites. Numerical calculations were made using an ISC-AERMOD dispersion model. Concentrations of traffic emissions including nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), ozone (O₃) and airborne particulate material under 10 μm diameter (PM₁₀) are presented and analyzed. The calculated concentrations are validated by comparing with observed values at the three sites. The results indicate good agreement between calculated concentrations and observed values, which demonstrate satisfactory model performance. Results show that the Haram area is experiencing high concentrations of dust. High buildings around the Haram Mosque act as flow obstacles. Mean pollutant dispersion was toward the south and southeast during January and June. Highest mean concentrations were observed in January and June.

KEYWORDS

Air Quality; Pollutant Concentration; Field Experiment; Power Plant; Vehicle Traffic

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