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ANALYSIS OF THE CONTINUOUS MEASUREMENTS OF PM₁₀ AND PM_{2.5} CONCENTRATIONS IN BEIRUT, LEBANON

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Abstract

Atmospheric concentrations of PM_{2.5} and PM₁₀ were measured in Beirut, Lebanon, for a period of 12 months. The daily average concentrations of PM₁₀ and PM_{2.5} were found to be 51.3 ± 33.1 and $30.3 \pm 9.4 \mu\text{g}\cdot\text{m}^{-3}$, respectively, with corresponding maximum values of 359.7 and 208.6 $\mu\text{g}\cdot\text{m}^{-3}$. The annual average concentrations of PM₁₀ and PM_{2.5} exceeded the World Health Organization's standards by 150% and 200%, respectively. The mean concentration of coarse particles (PM_{10-2.5}) was found to be 41% of the average PM₁₀, suggesting that the site was also influenced by re-suspended surface dust and soil. The mean PM_{2.5}/PM₁₀ ratio for the entire study period was 0.61 ± 0.12 . This indicates that in Beirut, PM_{2.5} accounts for about 61% of PM₁₀. Such a large fraction of fine particles could have considerable effect on health; thus, it is necessary to quantify its impact. Daily concentrations of PM₁₀ and PM_{2.5} exceeded the upper threshold limit on 133 and 129 days, respectively, representing 39% and 38% of the entire sample, respectively. These findings indicate the important role dust events play within this area. Concentrations of PM_{2.5} were highly correlated with NO₂, whereas concentrations of PM₁₀ and PM_{10-2.5} were not associated with any gaseous pollutant. Regression analysis showed that 93% of PM_{2.5} and 43% of PM₁₀ particle mass concentrations were derived from road traffic exhaust in Beirut.

Key words: air quality, dust event, health effect, particulate matter, regression analysis

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