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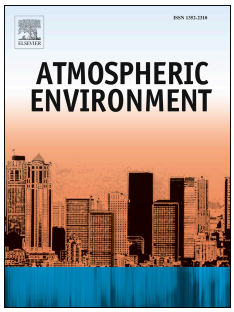

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Oxidative Potential of Ambient Particulate Matter in Beirut during Saharan and Arabian Dust Events

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Abstract

In this study, we examine the oxidative potential of airborne particulate matter (PM) in Beirut, Lebanon, as influenced by dust events originating in the Sahara and Arabian deserts. Segregated fine (< 2.5 µm) and coarse (2.5-10 µm) PM samples collected during dust events, as well as during non-dust periods, were analyzed for chemical composition, and an *in vitro* alveolar macrophage (AM) assay was performed to determine the oxidative potential of both types of samples. We performed Spearman rank-order correlation analysis between individual chemical components and the oxidative potential of PM to examine the impact of the changes in PM chemical composition due to the occurrence of dust events on overall PM oxidative potential. Our findings revealed that the oxidative potential of Beirut's urban PM during non-dust periods was much higher than during dust episodes for fine PM. Our findings also indicated that tracers of tailpipe emissions (i.e., elemental (EC) and organic carbon (OC)), non-tailpipe emissions (i.e., heavy metals including Cu, Zn, As, Cd, and Pb), and secondary organic aerosols (SOA) (i.e., water-soluble organic carbon, WSOC) are significantly associated with the oxidative potential of PM during dust days and non-dust periods. However, the contribution of desert dust aerosols to Beirut's indigenous PM composition did not exacerbate its oxidative potential, as indicated by the negative correlations between the oxidative potential of PM and the concentrations of crustal elements that were enriched during the dust days. This suggests that aerosols generated during Saharan and Arabian dust events pose no additional health risk to the population due to PM-triggered reactive oxygen species formation. These results significantly contribute to our understanding of the effects of desert dust aerosols on the composition and oxidative potential of PM in

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