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The Impact of Dust Storm Events on the Chemical and Toxicological Characteristics of Ambient Particulate Matter in Riyadh, Saudi Arabia

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Abstract : In this study, we investigated the chemical and toxicological characteristics of PM10 in the metropolitan area of Riyadh, Saudi Arabia. PM10 samples were collected on quartz and teflon filters during cold (December 2019–April 2020) and warm (May 2020–August 2020) seasons, including dust and non-dust events. The PM10 constituents were chemically analyzed for their metal, inorganic ions, and elemental and organic carbon (EC/OC) contents. Additionally, the PM10 oxidative potential was measured by means of the dithiothreitol (DTT) assay. Our findings revealed that the oxidative potential of the collected ambient PM10 samples was significantly higher than those measured in many urban areas worldwide. The oxidative potential of the collected ambient PM^{10-} samples was also higher during dust episodes compared to non-dust events, mainly due to higher concentrations of metals during these events. We performed Pearson correlation analysis, principal component analysis (PCA), and multi-linear regression (MLR) to identify the most significant sources contributing to the toxicity of PM^{10-} The results of the MLR analyses indicated that the major pollution sources contributing to the oxidative potential of ambient PM10 were soil and resuspended dust emissions (identified by Al, K, Fe, and Li) (31%), followed by secondary organic aerosol (SOA) formation (traced by SO_4-$^{-2}$ and $NH+_4$) (20%), and industrial activities (identified by Se and La) (19%), and traffic emissions (characterized by EC, Zn, and Cu) (17%). Results from this study underscore the impact of transported dust emissions on the oxidative potential of ambient PM10 in Riyadh and can be helpful in adopting appropriate public health policies regarding detrimental outcomes of exposure to PM_{10}-

Keywords : ambient PM10, oxidative potential, source apportionment, Riyadh, dust episodes
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