Abstract

The present study evaluates the performance of NASA's Modern-Era Retrospective Analysis for Research and Applications Aerosol Reanalysis (MERRAero) over Indian cities by validating its $PM_{2.5}$ concentrations (reconstructed using individual species concentrations) against that of the real-time hourly observations. The study period of the present analysis is between 2013 and 2015. Several performance statistics (mean bias, mean absolute bias, mean fraction, correlation coefficient, FAC2) are derived for the assessment, which was carried out on various temporal scales. Grossly, MERRAero captured the temporal and spatial variations in $PM_{2.5}$ over India, but consistently underestimated the concentrations (except for significant instances of overestimations during summer and monsoon). The spatio-temporal gradients observed in MERRAero $PM_{2.5}$ are not as steep as that of observational $PM_{2.5}$. The bias in MERRAero $PM_{2.5}$ increased with increase in ambient $PM_{2.5}$, while the percentage underestimation has not followed any trend. During winters, the MERRAero derived $PM_{2.5}$ values are slightly less than half that of the observations. Based on the diurnal comparisons, it was found that the bias/underestimation by MERRAero is higher during rush hours. The possible explanations for the observed discrepancies are discussed and the limitations of the study are listed.

Keywords

Nitrate, Bias, FAC2