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Measurement of the mineral dust concentration using an optical-based approach in central Los Angeles

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As a primary component of PM_{10}, ambient mineral dust particles have been linked to increased morbidity and health risks in urban environments. Dust particles also alter the Earth's radiation balance because of their absorbance and scattering properties. We employed absorption photometers to investigate the real-time concentration and light absorption of dust particles in central Los Angeles for three different periods. We adopted a novel method by utilizing a coarse particle virtual impactor that increases the concentration of coarse particles by around 20 times to eliminate the effects of light absorption of black carbon, which has a considerably higher light absorption and dominates the $PM_{2.5}$ light absorption. The concentrated coarse particles were collected on Teflon filters, and their chemical components were measured by the Inductively Coupled Plasma Mass Spectroscopy method. The light absorption of dust particles was determined by subtracting the measured values by aethalometers on two different lines: 1) the virtual impactor line and 2) the $PM_{2.5}$ line. The light absorption coefficient of the dust particles in central Los Angeles was estimated to be 2.7 1/Mm at 370 nm, while the corresponding value at 880 nm was 0.41 1/Mm. The estimated mineral dust mass concentration showed a similar trend with the reported coarse PM by the California air resource board. Finally, we determine the absorption Angstrom exponent (AAE) of dust particles in the area to be around 2.18 for the entire study period. Our findings affirm that this method can be used to analyze the mineral dust concentration in distinctive urban environments effectively.