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Positive climate forcing of aerosols at high albedo.

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Estimates of aerosol radiative forcing are important to understanding climate and climate changes due to their influences on the Earth's radiation energy balance. In this study, we empirically determine how natural and anthropogenic aerosols (i.e. mineral dust, biomass burning and urban aerosols) affect light extinction using ground-based observations from the Aerosol Robotic Network (AERONET). The critical surface albedo, aerosol radiative efficiency, and radiative forcing are calculated for the classified aerosols. The estimated radiative forcing is varying with the surface albedo. At the top of the atmosphere (TOA), the aerosol radiative forcing generally tends to the positive correlation with aerosol concentration, and its forcing efficiency is dependent on surface reflectance, which is controlled by multi scattering between aerosols and surface. We find that all types of aerosols can give a net positive radiative forcing at the TOA when the surface is enough bright such as deserts or snow and ice covered.

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