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Aerosol indirect studies viewed by satellite and ground-based remote sensings

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Modification of cloud microphysics and cloud albedo by cloud-active aerosol is generally identified and accepted, but the nature and magnitude of aerosol-cloud interactions are vaguely understood and thought to include a myriad of processes that vary regionally and confound the application of simple physical models of cloud-aerosol sensitivity. Various aerosol and cloud microphysical properties have been compared and examined for several years using ground-based remote sensing data such as Atmospheric Radiation Measurement (ARM), which claimed that the clouds with strong above-cloud inversions are more immune to variations in the meteorological environment and the associated aerosol-cloud interactions are probably more dominant in nearly adiabatic clouds by comparing different environmental conditions. This kind of microphysical alteration of clouds by aerosol such as cloud albedo effect can be easily studied by ground-based remote sensing. Meanwhile, MODIS (Moderate-Resolution Imaging Spectroradiometer)/Terra level 3 and NCEP/NCAR (National Center for Environmental Prediction/National Center for Atmospheric Research) reanalysis data from 2001 to 2008 have been analysed to understand long-term aerosol cloud optical properties, and their relationships in East Asia. Interestingly, horizontal distributions of aerosol optical depth (AOD) showed the substantial horizontal gradient from China to Korea, especially with the strong difference over the Yellow Sea in the perspective of long-term average. Specifically only relationship between AOD and cloud fraction (CF) for the low-level liquid-phase clouds exhibited the overall positive correlation, being consistent with cloud lifetime effect. In addition, lower tropospheric static stability obtained from NCEP/NCAR reanalysis data showed no deterministic relationships with AOD as well as CF. The results imply that ground-based remote sensing is probably better for the study of aerosol-cloud microphysical interactions whereas satellite remote sensing is more appropriate for the study of aerosol and cloud macroscopic interactions.