Radiative Forcing of Aerosols Over Oceanic Regions in Asia: Spatio-temporal Variations, Sensitivity and Climate Impact

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Aerosols found over the ocean surfaces are mainly sea salt particles produced by the evaporating water droplets sprayed into the atmosphere and wind blown dust transported from the surrounding land masses. In addition, anthropogenically produced sulfate and carbonaceous aerosols from the surrounding continents get transported across the oceanic regimes. Atmospheric aerosols from both natural and anthropogenic sources affect the Earth-atmosphere radiation budget directly by scattering and absorbing the incoming solar radiation, and indirectly by modifying the cloud radiative properties through altering the cloud microphysical properties. Because of the short residence times and diverse aerosol types, the direct and indirect effects of aerosols exhibit large spatial and temporal variations. The direct and indirect aerosol radiative forcings remain a significant uncertainty for climate studies. Aerosol forcing of climate can vary according to regional differences in aerosol columnar concentration as well as its chemical composition. Knowledge of aerosol chemical composition is important for quantitative determination of aerosol radiative forcing, and to estimate better the climate impact of aerosols on regional and global scales. Regional and seasonal variations in aerosol radiative forcing estimated over the oceanic regions will be presented. The sensitivity of aerosol radiative forcing to the vertical distribution of aerosols and curvature effects in aerosol optical depth spectra will be highlighted. The presentation will focus on the spatio-temporal heterogeneity in aerosol radiative forcing over the oceanic regions in Asia, and the resultant radiative and climate impact.