

Some considerations on the important problems regarding radiation scattering phenomena

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To date, we are enjoying various advanced remote technologies from surface and space for monitoring and scientific studies of the earth-atmosphere system. In-vitro measurements of scattering phase functions using polar nephelometers started in late 1970s and several knowledges on the complex refractive index and size distribution of aerosols were obtained. This technology has been extended to extensive sun and sky measurements by surface networks like AERONET, SKYNET, Pandora and so on, which give global distributions of aerosol and cloud radiative properties to be utilized for satellite remote sensing validation and climate study of radiative forcing of atmospheric particulate matters. In parallel, advanced satellite-borne imagers, like MODIS, MISR, POLDER, SGLI, GOSAT2/CAI2 etc, have been developed to fill the gap of the surface measurements. This passive imaging is now further being combined with active sensing of vertical stratification of particles by lidar and cloud radar from CALIPSO and CLOUDSAT satellites, and soon continued by the next generation missions of EarthExplorer6/EarthCARE and MetOp-SG/Sentinel-5 for realizing Doppler cloud radar, HRS Mie lidar, and 3MI multi-angle and polarization measurements.

Looking at these significant progress of remote sensing technologies of atmospheric particulate matters as a science team member in some of these projects, I like to discuss several important problems which still needs to cast careful attention and research efforts to improve our knowledge, such that how much degree of polarization is generated by a mixture of fine and dust particles and clouds; how the information contents depend on the structure of the earth-atmosphere system, and so on.

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