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Relevant issues of the aerosol and cloud studies using active and passive sensing

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A new trend toward simultaneous use of active and passive remote sensing techniques has opened a new era for understanding the role of aerosol and cloud in the earth's climate system. I like to study some of important issues of this new trend, especially related with development of the new Earth Explorers/EarthCARE satellite mission.

The Contoured Frequency by Optical-Depth Diagram (CFODD) seems to be useful in classifying the low-level cloud particle growth stage if we combine CPR and imager data (TY. Nakajima et al., JAS 2010), as also proved by recent high resolution simulations of clouds interacting with aerosols using high resolution non-hydrostatic models (Feingold et al., Nature 2010; Suzuki et al., JAS 2010; Sato et al., 2012 submitted). The CFODD pattern depicted the systematic difference in cloud particle growth mechanism between land and ocean, which is a key to understanding a wide variety of the effective cloud particle radius (RE) vs cloud optical thickness (COT) correlation pattern, including a positive correlation so called Anti-Twomey phenomenon, derived from passive remote sensing (Nakajima and King, 1990; Sekiguchi et al., 2003; Quaas et al., JGR 2008; Li et al. Nature 2011).

These studies are useful for building an analysis scheme of the EarthCARE satellite data when combined with a recent new method of constructing 3D cloud systems from CPR and imager data for radiative transfer calculation using a Monte-Carlo radiative transfer code (Barker and Donovan, private communication; Okata et al., IRS2012 presentation).