Global water cloud microphysics from active sensor synergy toward the EarthCARE mission

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Retrieval of global water cloud microphysics from space-borne lidar and cloud radar is on focus. Issues exists in how quantitatively multiple scattering effects from vertically inhomogeneous cloud layers are estimated for microphysical inversion, and in the reliability of low-level cloud detection in this connection. In our previous studies, A prototype of the microphysics retrieval algorithm combining the lidar attenuated backscattering coefficient, depolarization ratio and Cloud radar observables were developed for particle sizing and cloud particle-drizzle mass ratio estimates. There, the lidar returns from inhomogeneous clouds were simulated by combining look-up-tables of the parallel and perpendicular components for homogeneous profiles according to their contribution to the total path to reflect inhomogeneity effects. In this study, improvements were made in that area to replace the former approach by a numerically effective and flexible physical model that traces the exact Monte Carlo simulations, and to further meet the technical requirements for global retrieval. Preliminary results from CloudSat/CALIPSO data analysis showed the effectiveness of the synergy algorithm in tracking the vertical variation of cloud properties. Global analysis of water cloud microphysics will be further carried out together with a refined low-level cloud detection scheme.

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