Evaluations of clouds in NICAM using CALIPSO and Joint simulator

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The evaluation of cloud and precipitation is important in high-resolution models such as a Nonhydrostatic ICosahedral Atmospheric Model (NICAM, Satoh et al. 2014). These models are generally defined as nonhydrostatic models with horizontal grid spacing sufficiently fine to be able to explicitly simulate individual cloud systems. For clouds, NICAM more realistically represents microphysical processes, such as the consistent treatment of precipitating hydrometeors, compared with general circulation models (GCMs), and they calculate the time evolution, structure, and life cycle of cloud systems.
We evaluate thermodynamic phases of clouds in a NICAM using Joint simulator and a Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) lidar. For the evaluation, we developed the simulator of depolarization ratio in Joint simulator (J-simulator). We compare and analyze two simulations using two microphysics schemes such as NICAM Single-moment Water 6 (NSW6, Tomita 2008b) and the modified NSW6 (Roh and Satoh 2014).
Especially, we focus on the characteristics of ice clouds such as effects of backscatters distribution and temperature dependencies. We investigate the effects of ice clouds with 2D plate’ s shape (2D plates) on cloud optical properties such as radar reflectivities and backscattering coefficients using CALIPSO data. A merged dataset for CloudSat radar and CALIPSO lidar (Hagihara et al. 2010) and DARDAR (Delanoë, J., and R. J. Hogan, 2010) data are used. We introduce the parameterization of 2D plates using temperature and relative humidity with respect ice for J-simulator.

Keywords: Microphysics, CALIPSO, Satellite simulator

