

# **Improvement of a single bulk microphysics in NICAM for super-cooled water clouds using J-simulator and CALIPSO**

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The satellite simulator is one of good tools to evaluate and improve cloud and precipitation systems simulated by non-hydrostatic models such as NICAM (Satoh et al. 2014) using observation data. Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) has the information about thermodynamics phases. It is used for evaluation of mixed phases clouds for GCMs. However, there are few studies about evaluations and improvements of thermodynamics phases of clouds for a global nonhydrostatic model.

This study is an evaluation and improvement of mixed-phase clouds in NICAM using a CALIPSO and a satellite simulator. We evaluated thermodynamics phase of mixed-phases clouds over the Southern Ocean in a regional version of NICAM between 45°S to 65°S and 170°E to 170°W following Yoshida et al. (2010) method. We found underestimation of super cooled water clouds in our single moment scheme. We improved the single moment microphysics scheme using a double moment microphysics and a single column model. We expand to global simulations to check the improvement.