Improvement of a representation of mixed-phase clouds, and its impact on a global cloud-system-resolving simulation

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Many GCMs have suffered from an underestimation of low-level mixed-phase clouds in mid-to-high latitudes, leading to an underestimation of solar albedo. Reducing this bias is thus important for improved projection of a future climate. Roh et al. (2020, JAS) and Seiki and Roh (2020, JAS) recently revealed major sources of the underestimated mixed-phase clouds in a one-moment bulk cloud microphysics scheme: overestimations of the Bergeron-Findeisen and riming processes and a growth rate from cloud water to rain. This presentation applies their scheme to a global atmospheric model, NICAM, to investigate its impacts on clouds over the global domain. A 14-km mesh NICAM experiment shows improved reflection of solar incident not only higher latitudes but lower latitudes due to a reduction of rain formation, showing that revised warm microphysics processes also play an important role to improve a global radiative energy budget. Impacts on cloud feedback processes will be also discussed.