

Review of “The Impact of Cloud Microphysics and Ice Nucleation on Southern Ocean Clouds Assessed with Single Column Modeling and Instrument Simulators”

Using an ECMWF SCM, the paper compares two different cloud microphysical schemes, MG (double moment) and IFS (one moment), to ground and satellite based observations over a 2.5 month period (January 1 - March 17, 2017) during MICRE. Large differences of water mass and reflectivity between the schemes are found. Many sensitivity experiments on the cloud microphysics schemes found that Surface radiative fluxes and total water path are highly sensitive to the formation and fall speed of precipitation. Although MG produces well the observed reflectivity and radiative fluxes, higher liquid water contents is seriously overestimated. The sensitivities of the results to liquid Cloud Condensation Nuclei (CCN) and Ice Nuclei are also investigated.

The paper is well written and the results are interesting and important for model improvement.

Recommendations

Minor revisions

Minor points

- 1) The overestimation of the LWP by MG is too large. EXP Ac3Au1.5 produces less LWP, but still about two times of IFS. Since the single moment can be treated as a special case of double-moment, could an experiment be designed to produce the similar LWP of IFS microphysics?
- 2) EXP “No Graupel ” produces large precipitation, total Ice, and even the liquid is not small, where are the sources of those hydrometers?