Importance of giant condensation nuclei in cloud and precipitation formation

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Abstract

The impact of giant and ultra giant cloud condensation nuclei (>5-micro-m radius) on precipitation formation is investigated within a modified mesoscale modeling framework. Thus to investigate the effects of various concentrations of giant cloud condensation nuclei (GCCN) on precipitation, the Regional Atmospheric Modeling System with CL-scheme (Chen & Liu 2004) for warm cloud was used. Several sensitivity experiments were performed to see how surface precipitation change with GCCN concentrations. Additional test were also performed to examine the relative role of auto-conversion comparing to the rain embryo effect from GCCN. GCCN are found to influence significantly on the activation of typical cloud condensation nuclei (CCN), rain condensation, accretion and finally accumulated surface precipitation. Rain was enhanced when GCCN concentration is below an optimum value, after which the collision coalescence processes is actually reduced due to competition among rain embryos. This result may suggest possible over seeding effect for warm-cloud modification. The effect of GCCN is less significant when ambient CCN concentration is low and the auto-conversion process becomes important. So, it is the worthy of further investigation to see the interaction between CCN, GCCN and ice nuclei on the microphysics and precipitation formation processes.

Keywords: GCCN; rain-embryo; Cloud microphysics and precipitation.

Reference:

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