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Cloud Microphysical Properties in Mesoscale Convective Systems: An Intercomparison of Three Tropical Locations

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Mesoscale Convective Systems are complex cloud systems which are primarily the result of specific synoptic conditions associated with mesoscale instabilities leading to the development of cumulonimbus type clouds (Houze, 2004). These systems can last several hours and can affect human societies in various ways. In general, weather and climate models use simplistic schemes to describe ice hydrometeors' properties. However, MCS are complex cloud systems where the dynamic, radiative and precipitation processes depend on spatiotemporal location in the MCS (Houze, 2004). As a consequence, hydrometeor growth processes in MCS vary in space and time, thereby impacting shape and concentration of ice crystals and finally CWC. As a consequence, differences in the representation of ice properties in models (Li et al., 2007, 2005) lead to significant disagreements in the quantification of ice cloud effects on climate evolution (Intergovernmental Panel on Climate Change Fourth Assessment Report). An accurate estimation of the spatiotemporal CWC distribution is therefore a key parameter for evaluating and improving numerical weather prediction (Stephens et al., 2002).

The main purpose of this study is to show ice microphysical properties of MCS observed in three different locations in the tropical atmosphere: West-African continent, Indian Ocean, and Northern Australia. An intercomparison study is performed in order to quantify how similar or different are the ice hydrometeors' properties in these three regions related to radar reflectivity factors and temperatures observed in respective MCS.