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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Microphysical properties and high ice water content in continental and oceanic Mescoscale Convective Systems and potential implications for commercial aircraft at flight altitude" *by* J.-F. Gayet et al.

Anonymous Referee #2

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This is an interesting and important paper comparing satellite remote sensing of a deep continental cloud measured in 2007 and measurements in an MCS over the tropical ocean. This results in an interesting set of data from the oceanic MCS which I believe to be novel. The results are certainly of significant for understanding the microphysics of these clouds and are highly relevant to the aviation industry. The paper is generally well written with clear and appropriate diagrams I recommend publication of the paper after revision. I do have a number of issues that need to be addressed:

1. I am somewhat concerned about the use of the data from the 2007 continental convection study, much of this has already been published by these authors and I would reduce this to a summary. I do see the value in using this for comparison with the MCS 2. The differences between the MCS and continental cloud are quite significant and for this reason I am not convinced about the validity of comparing the in situ microphysics observed from the aircraft study in the continental convection with the MCS satellite retrievals. This section either needs to be removed or the justification for comparing the microphysics from in situ measurements with remote sensing data from a completely different cloud needs to be made much clearer. There are a number of issues here: a. The input aerosols are likely to be very different for the continental and marine cases and hence the numbers and sizes of water droplets and ice crystals are likely to be very different. b. The generation of chain aggregates in the highly charged continental cloud is a process likely to be much reduced in the marine cloud c. The trajectories of particles within the MCS are likely to be very different to the continental cloud and hence the size distribution of particles arriving at cloud top is also likely to be very different. d. The possible under sizing of particles due to inlet fracturing is raised. Despite the lack of anti shattering tips this can be investigated using arrival time analysis, however, these problems are especially acute using an FSSP.

3. On P2552 the liquid water and ice water contents retrieved are compared to adiabatic liquid water contents from cloud base. A factor of 2 reductions in Ice water content compared to adiabatic is possibly attributed to dry air entrainment. Another factor not mentioned is that precipitation will remove water. Is it possible to make an estimate of this ? Recommendation Publish after revision

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