

Interactive  
Comment

## ***Interactive comment on “Simulating the effects of mid- to upper-tropospheric clouds on microwave emissions in EC-Earth using COSP” by M. S. Johnston et al.***

**M. S. Johnston et al.**

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The reviewer’s comment is mainly concerned with the intricate details of the RTTOV\_SCATT algorithm used in our study. It is true that RTTOV\_SCATT is a critical part of our study but this comment would be better responded to by the authors of Geer and Baordo (2014) who are more knowledgeable about the scattering assumptions underpinning RTTOV\_SCATT. Since authors of RTTOV\_SCATT have published and implemented algorithm in RTTOV, a code that is now widely disseminated throughout the global modelling community, studies such as our own should be able to also use RTTOV\_SCATT without the need to go to discuss again such rudimentary details. Nev-

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ertheless, according the author of RTTOV\_SCATT, other experiments have been done with this algorithm with different particle shapes. Despite the large variability that is obtained when traversing the range of Liu shapes, most experiments converge around the Geer and Baordo (2014) scattering assumptions as these assumptions provide reasonable good fit with observations. Furthermore, the scattering assumptions have been tuned to the ECMWF operational model so that using RTTOV\_SCATT to assimilate MW information provides the best fit to the observations. Therefore the scattering assumptions have been driven by a fit to observations concept, not by working from physical first principles.

In the paper being reviewed the authors cited the Yurkin et al 2007 as a source to explain the DDA approximation principle, not the source of the single scattering properties. The Draine and Flatau (2000) was used for RTTOV\_SCATT the single-scattering properties. The paper will be revised to reflect this fact.

"Ice crystal models that follow observed mass-D and density-size relationships are required, if the simulations discussed by the authors are to be further improved in the tropics." This may certainly be true, but as a first step in improving the evaluation of the model atmosphere and hence improving the model's representation, models must first provide the microphysics of the ice they are simulating to set this discussion in its proper framework and not rely on forward models assumptions.

We hope this satisfies this comment. The author of RTTOV\_SCATT can be contacted for further details if necessary.

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