

Interactive comment on “Tropical convection regimes in climate models: evaluation with satellite observations” by Andrea K. Steiner et al.

Anonymous Referee #2

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1 General Comments

This article demonstrates the use of radio occultation (RO) satellite data for the verification of climate models. In particular, radio occultation from a combination of satellites is used to evaluate tropical temperature and humidity profiles for five atmosphere-only climate simulations.

The research described in this article is original and technically sound, making it suitable for publication in Atmospheric Chemistry and Physics. The quality of the writing is adequate and I think can be improved upon. I did find some sentences difficult to understand, some of which I've highlighted below. However, the article is well organised.

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2 Specific Comments

1. I don't understand why it is necessary to collocate the RO observations and the climate models. Are there gaps in the spatial/temporal coverage of the RO observations that make this necessary? As co-location requires daily model output, this will make using RO observations a challenge simply in terms of data volumes. How different would the results be without co-location?
2. Given that ERA-Interim is quite widely used to evaluate temperature and humidity in climate mode, it would be interesting (and presumably fairly straightforward) to compare the ERA-Interim temperature and humidity profiles to the OR observations.
3. You mention that a different reanalysis “might give a slightly different distribution of observed RO profiles”. Could you try actually redoing this analysis using a different reanalysis?

3 Technical Corrections

P1 L18: “and only partly represent high updraft or downdraft velocities”. I only understood what you meant by this once I'd read the paper once. Consider rewriting.

P2 L14: “Its proper representation. . .” It's not clear what it is here.

P2 L18: “Bony et al. (2015). . .” This sentence doesn't make sense.

P3 L2: Change “has shown” to “have shown”.

P4, L1: You say (paraphrasing) that the quality of RO measurements is best in the upper troposphere and lower stratosphere, but that the uncertainty of individual profiles

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is about 0.7 K in the tropopause region and decreases towards the low troposphere. This seems contradictory to me.

P5, L4: I think you mean “Extensive” rather than “Excessive” here.

Table 1: I think there are some inconsistencies between the resolution and the number of latitude/longitude points. E.g. BCC-CSM1 with a longitudinal resolution of 1.875 degrees has 192 longitude points, not 128.

P17, L32: I would change “Model profiles are clustered narrower from...” to “Model profiles are clustered over a narrower pressure range from...”.

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