

Interactive comment on “Analysis of upper-tropospheric humidity in tropical descent regions using observed and modelled radiances” by V. O. John et al.

Anonymous Referee #2

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I) General view of the paper

This article describes the use of modelled and observed radiances to study the upper tropospheric humidity (UTH) in tropical regions. The modelled radiances are generated from the satellite simulator COSP for the atmospheric component of HadGEM2, while the satellite observations are obtained from the HIRS and AMSU. The major objectives of the study is to check if modelled or observation radiances match and produce any significant relatively long-term trends in UTH. A significant UTH trend would have implications on the water vapour feedback and subsequently the global warming. The main conclusion is that there is no significant trend and the major mode of inter-annual

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variability of UTH in tropical descent regions is associated with El-Nino.

The subject treated in this research article is important for the scientific community for the following reason: matching modelled and observed variations of UTH provides a feasible path for better prediction of future climate and possible remedies to some global warming issues.

The paper seems grammatically well written but the content lacks substance and does very partially or insufficiently address the issues of mismatching between modelled and observed UTH as well as the relationship between the UTH variability and El-Nino (the paper embraces short and long-term analyses and does not treat either well enough). These are certainly the major flaws that may make most of the current manuscript's results meaningless.

It pains me to not recommend this paper for further review, at its current state. And, rather encourage the authors to work on improving the data quality and quantity, as well as the discussion of the results, for a possible future re-submission.

II) Some specific comments

1) In the introduction, page 10548 at lines 19-21, the authors suggest that the tropical descent or subsidence regions play a dominant role in the cooling of our planet... because of the absence of mid and high level clouds. The tropical regions (30S-30N) often has the highest frequency of cirrus clouds. These clouds are high level clouds. Could the authors verify and possibly correct the suggestions they made about the absence of high level clouds in these regions?

2) Still in the Introduction, page 10549, lines 6-9: the authors wrote "Compared to Atmospheric Infrared Sounder (AIRS) and reanalysis humidity profiles, on average, current climate models simulate a large moist bias in the free troposphere". Unfortunately the present study does not show better results than previous studies as there is still a strong moist bias present. Refer to Fig 1 and 2

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3) In section 2.1. Satellite data, page 10551, lines 1 to 12, based on the statements " However, for HIRS data cloud contamination is a severe problem. John et al. (2011) have clearly demonstrated using microwave UTH data that clear-sky HIRS UTH data suffer from a dry bias of up to 30%RH or more in convective regions. They have also shown that the clear-sky only sampling of HIRS can lead to biased estimates of inter-annual variability and trend." and, "Fortunately we largely avoid this problem because we focus on the descent regions where both IR and MW data are good and similarly sampled." It is unclear how to rely on the HIRS data of the years 1989-1998 were there is no AMSU sampled data. And these data are half of the amount of data used for the trend. How can we trust such a trend if half the years used for the HIRS observations are biased.

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