Reply to referee 2

The author would like to thank referee 2 for the useful comments which have helped to improve the original manuscript.

Comment 2

"No analysis is included of simulated water vapor compared to the observations. This is conspicuous and critical, and has also been pointed out by the other referee. It should definitely be included, both in terms of the seasonal cycle (like Fig. 3), as well as the geographical distribution (like Figs 4 or 5-6). Because this is a particularly difficult parameter for satellites (seen nicely in the differences between the blue lines in Fig. 2), I would suggest adding water vapor data from radiosondes to the analysis to make this part more solid. (There is a statement in the text about water vapor and OLR not being easily available from CTMs; I definitely understand this for OLR, but not for water vapor, since it is an integral part of all CTMs I am aware of - it is needed not only for clouds, but also e.g. for OH formation)."

Reply. We have now added an extra section for comparison of observed water vapour with modelled water vapour. Since a suitable radiosonde dataset for the year 2005 is not readily available, we have decided to include water vapour from ERA-interim which include radiosonde data, as well as from satellites, in the data-assimilation process.

Water vapour fields in CTMs are prescribed using ECMWF analysis and are not calculated online. Since we want to see how water vapour in the models is affected by convection, we cannot use this water vapour fields from CTMs since it is not modified by the model. However, in order to extend analysis of water vapour and compare observations to all our models, we have decided to use an "idealised water vapour tracer" for CTMs. This tracer is initialised to a climatological water vapour distribution and constrained to the same climatology below 7km for the duration of the simulation. The tracer is subject to transport (including convective transport) and is removed if its concentration reaches the saturation mixing ratio with respect to ice (liquid droplets formation is assumed to be negligible above 7km).

Comment 3

"the flow of the paper would benefit from additional figures giving the reader a broader overall impression, combined with somewhat less description of the details (letting the reader ponder over the figures more to see the specific differences), but keeping the nice overall conclusions in the analysis of most of the figures that are present."

Reply. We have reduced text in the discussion and added additional figures, including on water vapour comparison.

Comment 4-7

Reply. We have made the specific changes suggested by the referee.