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Interactive comment on "Evaluation of Water Vapour Assimilation in the Tropical Upper Troposphere and Lower Stratosphere by a Chemical Transport Model" *by* S. Payra et al.

Anonymous Referee #2

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This paper explores the possibility of assimilating MLS H2O into analyses and generally shows improvements that can be gained by doing so. I am mostly satisfied with the analysis but one thing I did not understand was the difference between the background runs and those that assimilated MLS. It seems like the background was also assimilating MLS data in some way also. It was not clear exactly what the background run is. If this can be clarified, then the paper is publishable in my opinion.

Minor points page 2 line 40 change assess to assessment of page 3 line 41 change Southern to South page 4 line 48 change earth's to Earth's page 4 line 50 change in form of to as page 4 line 53 change gas to gases page 4 line 58 earth to Earth page 4 lines 63-65. Specialized models seem to capture TTL water vapor well (e.g. La-

grangian trajectory type models). The challenge is why GCMs and Analyses seem to do so poorly when I would presume they have the same physics. page 5 line 76 change such as to such as those. Also IPCC International Panel on Climate Change. page 5 line 80 change Heggling to Hegglin page 6 line 112 change 60 hybrid to 60 vertical hybrid page 6 line 114 change beyond to above page 8 line 155 change order that to order to that page 11 line 226 change upper stratosphere to mesosphere page 12 line 250 The tropopause generally varies between 100 and 83 hPa. Could consider interpolating the values between the two levels to the TP. page 12 line 265 change on the rejection to the rejection page 13 line 275 change MIPAS run to MIPAS operates. page 14 line 302 change the South of to South (2 places) page 17 line 385 It is curious that using the MLS AK made things worse. page 18 line 406 do you mean assimilation run rather than free run? page 20 line 461 Why should ARPEGE represent the true H_2O? page 20 line 464 change constraint to constrain page 20 line 469 change continents to continent page 21 line 474 change constraint to constrains page 21 line 483 change cannot cope with to allows unrestricted page 22 line 500 change constraint to constrain page 24 line 560 change to assess the to an assessment of the page 25 lines 582–589 Instead of comparing Jan to Feb where the latter had some missing days as a data sampling, you could repeat the January with 4 days of data removed. page 26 line 600 change Southern to South page 26 line 619 change the Southern American to South America page 28 line 660 change prevent to assess the to prevent the assessment of the

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