

Interactive
Comment

Interactive comment on “Variability of subtropical upper tropospheric humidity” by J.-M. Ryoo et al.

W. Read (Referee)

bill@mls.jpl.nasa.gov

Received and published: 11 February 2008

This paper discusses distributions and variability of upper tropospheric humidity (UTH) measurements from Aqua AIRS focusing on the Boreal northern hemisphere winters. This paper is a nice extension of an earlier paper by D. Waugh (Geophys. Res. 110, D11305, doi:10.1029/2004JD005664, 2005) using UARS MLS data but benefits from using the AIRS H₂O which has much better horizontal coverage and deeper vertical penetration. In addition to providing statistics on the distributions of UTH variability, they provide a clear explanation for their cause—anticyclonic transport of tropical air moistened by convection into the subtropics. The transport follows "high" PV intrusions into the subtropics and the Madden Julian Oscillation. A nice finding of this paper is that the water vapor distributions are vertically coherent following the PV contours. I recommend publishing this paper with some clarifications and better presentation of figures described below.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



First question is why is $PV = 1.5$ PVU chosen for the tropopause? Two publications (Schoeberl, 2004 and Highwood and Berrisford, 2000) define the tropopause as 3.5 PVU. Also I would suggest referring to this quantity as the PV tropopause (PVT) rather than just tropopause to avoid confusion with the more familiar thermal definitions of the term. It should be realized that AIRS cannot accurately measure humidity in the stratosphere but given that the main focus of the paper is distinguishing regions of high humidity from dry stratospheric air, the analysis is good as presented and there is no need for auxiliary humidity data sets that more accurately measure stratospheric H₂O.

Second question is what is special about the $PV=1.5$ PVU at 250 hPa for identifying the subtropical intrusions of dry air from mid latitudes and moist tropical air to the subtropics. I mention this because humidity distributions are vertically coherent whereas PV is not.

The last question is what causes the drop in relative humidity as air follows the east side of the PV intrusion towards higher latitudes. Is it mixing with dry air on the high latitude side of the PV intrusion or does temperature increase?

Some minor points

Page 1043 line 13: Change "winter winters" to "hemisphere winters".

Page 1044 PP beginning with line 7: Which version of AIRS used (e.g. v4) and how was it quality screened (e.g. `QUAL_TEMP_PROFILE_MID = 0`)? Where there additional quality checks such as don't use $H_2O < 20$ ppmv; probably not desirable for this study but should be mentioned.

Page 1046 line 7: I would prefer a descriptor like PV or dynamical in front of tropopause to avoid confusion with thermal definitions of the term.

Page 1046 pp beginning with line 26: This paragraph is hard to reconcile with figure 2 because the longitude regions described in the text are different (not necessarily overlapping) those in the figures. Also figure 2c has a PDF peak at 30% not 60% as

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

described in the text. I would produce figures for the longitude ranges described in the text or vice versa. Also please be consistent with usage of east and west longitude (e.g. 340E–360E in text is 0–20W as shown in figure 2f).

Page 1047 line 26: I would change "130E and 60W" to 0, 120E, and 60W".

Page 1049 line 1: why the quasi in quasi horizontal transport?

Page 1050 line 7: "10 longitude or within 6 days" be "10 longitude and within 6 days?"

Page 1050 line 13: delete "and if 2.5 PVU is used only a few events would occur".

Page 1050 line 20: I prefer using east/west of the PV intrusion instead of ahead/behind of the PV intrusion.

Page 1051 line 14: Lack of correlation with PV may be caused by measurement noise being the dominant source of variability since UTH is so small and dry.

Page 1052 line 14: subtropical (what? missing a noun here) in 4d.

Page 1052, line 22: delete Madden Julian Oscillation acronym MJO already defined earlier.

Page 1052, line 28 change "using AIRS and other water vapor" to "using AIRS and UARS MLS water vapor". This is because 3 out of 4 references use UARS MLS UTH.

Page 1053, line 21: change "when increased" with "associated with increased"

Figures

Page 1061 figure 2. Make the longitude bins match those discussed in the text (or vice versa).

Page 1062 figure 3. I would only show 1 (much larger) of the four years and say the other years are similar. This will make it easier to discern 1-2 day features described in the text. Also there was no specific discussion I recall concerning interannual changes therefore showing all four years separately does not add anything.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Page 1063 figure 4. It is really hard to see the wind vectors on these plots. I would use a faded HSV color scheme for the shading.

Page 1067 figure 8: I think positive/negative OLR anomalies should be negative/positive OLR anomalies?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1041, 2008.

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

