

Interactive comment on “Relationships among Brewer-Dobson circulation, double tropopauses, ozone and stratospheric water vapour” by J. M. Castanheira et al.

Anonymous Referee #1

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Review of "Relationships among Brewer-Dobson circulation, double tropopauses, ozone and stratospheric water vapour" by Castanheira et al

General:

This paper looks at the relationships between double tropopause frequency in midlatitudes, and ozone and stratospheric water vapor. It is generally well written and should be suitable for publication in ACP with minor revisions.

As noted below, some points need clarification. A further investigation of different lags between the tropical upwelling and other timeseries would be valuable, particularly for ERAI data. In addition, it would be nice to look at correlations with the extratropical

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downwelling as well. This could be done by hemisphere to provide a bit more fine-grained detail, and might sort out the downward motion v. quasi-isentropic motion better.

Further detailed comments are below.

(P)age and (L)ine number

P12394, L11: Reference for WMO criteria (plural).

P12395, L25 State that the r^2 value is 0.63. Can you say from the regression what the explained variance is for each of the 3 timeseries? How does that match with the correlations? What are the correlations between the timeseries (ENSO, QBO, solar).

P12395, L27: Over what time period?

P12395, L28: Briefly describe instruments and provide a reference.

P12396, L7: Is this a t-test?

P12396, L25: Are o_3 anomalies monthly? Annual cycle removed?

P12397, L7: length of satellite records?

P12397, L27: What about the sparse HIRDLS sampling? Co-location of the DT and HIRDLS data?

P12398, L8: What is the standard deviation of the area? Could the variability be affected by the length of the timeseries (this is only 3 years). Are you doing this daily and averaging only 3 values (2005-2007) for the seasonal cycle? Clarify

P12398, L17: Can you separate these processes (tropospheric intrusions up and from the sub-tropics? Also: not just northward (you use both hemispheres here).

P12399, L10: What happens if you use a lag? Timescale here is monthly? What happens if you lag the H_2O by 1-4 months? Do correlations increase?

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P12399, L17: Good explanation

P12399, L25: What does that mean do you think that the ERAI correlations are low. One would assume there is a process missing in ERAI? Since one term comes from ERAI, one would assume the correlation would be higher.

P12401, L11: What does this mean? What about looking at the downward motion in the extratropics as well?

P12401, L27: Can you show a plot of correlation as a function of lag?

P12402, L1: What about other lags? Maybe ERAI has something different with its transport? Interesting that there is nothing seen.

P12402, L17: Why? Again, what about downwelling? Other lags?

P12402: L25: It gets more uniformly positive in figure 11: does that mean that the upwelling is a negative correlation, and something else is a positive correlation between H₂O and double tropopause area? Note that if air is moving quasi-isentropically below the 400K surface, then more isentropic motion from the stratosphere would imply higher water vapor (since the extratropical air is from the 'overworld'). Looking at correlations with downwelling might help .

P12403, L2: How is figure 12 different than figure 6?

P12404, L15: Comment on other lags here in Conclusions?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 12391, 2012.