

Interactive comment on “An improved HIRS upper tropospheric water vapor dataset and its correlations with major climate indices” by L. Shi et al.

Anonymous Referee #2

Received and published: 22 February 2013

General:

The authors introduce a UTWV data record based on HIRS observations which covers more than 30 years. The new UTWV data record has been improved relative to its previous version by an updated cloud screening approach. This data record is compared to the previous version and to two month of AMSU-B water vapour observations. Finally, the paper focuses on the correlation of the HIRS UTWV data record with major climate indices. The correlation analysis between the HIRS UTWV data record and the climate indices is a valuable study. However, at its present stage a publication of this paper is not recommended. Instead, major revisions need to be addressed:

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Specific comments:

- 1) I am missing a clear definition of the term UTWV. It should be made clear that UTWV is not an upper tropospheric humidity product with units of relative humidity but is the brightness temperature observed by an infrared water vapour channel.
- 2) The paper is lacking a description and discussion of important product specifications:
 - a) As far as I know the UTWV product is affected by the surface under dry conditions as they e.g. occur at high latitudes. A specification/discussion of this aspect is needed. Then a discussion on how this affects the climate index analysis north of a certain latitude is needed. It might be adequate to restrict the figures to a certain latitude band and change figures and analysis accordingly.
 - b) To me it makes more sense to carry out radiative transfer simulations to characterise the sensitivity of the water vapour channel to clouds. This way, a product (here: UTWV) specific brightness temperature threshold which might be a function of latitude can be identified and applied. The discussion at the beginning of section 2.1 is dealing with the identification of deep convective clouds/MCS/squall lines and not with the sensitivity of the UTWV to clouds and can be shortened. I wonder if the change in T threshold affects the climate index analysis.
- 3) An improved UTWV product is introduced. It is clear that the cloud handling is in general an advantage. However, the quality of the new product has not been evaluated. An evaluation should be included in the paper. To me the comparisons to the previous product and to the AMSU-B product are not adequate in this context because the new cloud screening can introduce uncertainties which can not be identified in the above comparisons.
- 4) The UTWV product is not an all-sky product. Please remove all such statements from the paper, in particular in the abstract and in the conclusions.
- 5) The introduction would benefit from an overview of all available, satellite-based

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UTH/FTH/UTWV data records and studies related to climate index analysis and maybe also climate model evaluation. One aspect of using climate indices is to identify predictive skill on seasonal scales and beyond in climate model forecasts/hindcasts. This can also be recalled in the introduction.

6) 33416, 28 and subsequent discussion: My understanding is that the clear sky bias (e.g., Soden and Lanzante, 1996, as stated in this paper) is the bias between cloudy and clear sky conditions, that is, there is more water vapour within clouds than outside clouds, at least when global averages are considered. But is this also true relative to the above cloud case? I doubt it because in Fig. 2 minima are observed off the coast of South America and Africa. In these areas stratus clouds are present (O'Dell et al., 2008). Maybe an "above cloud bias" can be observed in certain areas/situations? Do you have a reference?

Technical comments:

Section 2: A short description of the previous product can be added.

Section 2.2: This section would benefit from reformulations and can be shortened.

33416, 10: Change to "to better retain".

33412, 23: Add "operated by EUMETSAT"

33412, 24: Add wavelength.

Section 3.2: I am missing a clear motivation for this comparison. It is maybe out of scope but it might be more appropriate to consider homogeneity and stability in this inter-comparison.

33427, 7: "the processing of..."->"water vapour measurements in the upper troposphere using HIRS:"?

33427, 9: Change to "to better retain".

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334247, 20-21: This should be stated in section 4 first, together with a few comments on the differences.

33428, 7-9: Please remove because it was not discussed in this paper.

Fig. 1: Use same scale/range in both plots.

Fig. 4: Either use same scale/range in both plots or explicitly mention a 10 K difference in the figure caption.

Figures are hard to read.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 33411, 2012.

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