

Interactive comment on “Retrieval of upper tropospheric water vapor and upper tropospheric humidity from AMSU radiances” by A. Houshangpour et al.

A. Houshangpour et al.

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Final author comments on "Retrieval of upper tropospheric water vapor and upper tropospheric humidity from AMSU radiances"

Authors: A. Houshangpour, V. O. John, and S. A. Buehler

We thank both referees for their valuable suggestions. Most of the raised is-

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sues are answered in the updated manuscript, we will only briefly outline the changes here. An updated manuscript can be found at: <http://www.sat.uni-bremen.de/members/viju/publication/amsu-regress/acpd-2004-si05013.pdf> and will also be submitted to ACP.

»> Anonymous Referee 2

»> Received and published: 1 April 2005

»> General Comments

»> The paper is well written and describes a sound and useful method
»> to retrieve UTH and UTWV from AMSU measurements. It has an
»> advantage of speed and ease of implementation over variational
»> retrievals. It does rely on certain approximations, and on
»> regressions versus model profiles, but these assumptions are all
»> explained in the paper. I have made some suggestions but I do not
»> believe any major changes are necessary.

»> Specific Comments

»> p. 1554, line 4. A limitation of the method is due to the
»> assumptions that must be made, such as water vapor density
»> decreasing exponentially with altitude. While this is a good
»> approximation, it may not represent all the variability in the
»> real data.

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See modification at the end of the introduction.

»> p. 1557, line 14: UTWV is defined earlier as the water vapor
»> between 500 and 200 hPa, but in Equation 8, it is from 500 hPa to
»> the top of the atmosphere. While the amount of water vapor above
»> 200 hPa is relatively small, you should be consistent in your
»> definitions.

The integral is taken to infinity for mathematical simplicity. The text has been modified to point out this approximation.

»> Section 4: If you already have UTWV, T_0 , and beta, can't you
»> compute UTH more directly from your known temperature and
»> moisture profiles?

For this purpose one would need an accurate moisture profile as UTWV represents merely an estimated averaged value. An introductory paragraph discussing this was added to section 4.

»> How does this method (using only one of the two channels) compare
»> to the method of Section 4, using both channels? In other words,
»> is the extra complexity warranted, particularly since UTWV is
»> the more meaningful and useful quantity anyway?

Using both channels turned out to provide better results on a "global scale". A paragraph discussing this was added to the end of section 4.

»> Section 6. The comparison against radiosondes provides a good
»> validation, although it is restricted to the range of atmospheric

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»> conditions present at Lindenberg.

See Referee 1: point /5.

»> Technical Corrections

»> p. 1560, line 6. Isn't partial pressure of water vapor usually

»> denoted e ?

»> p. 1563, line 19. Clarify that you are excluding beta greater

»> than or equal to -0.003 K/m. (I think that's what you mean.)

»> p. 1566, line 2. This is inconsistent with the previous lapse

»> rate criterion in Section 5.

Corrected.

»> Anonymous Referee 1

»> Received and published: 9 May 2005

»> General Comment:

»> This paper is of a technical nature and describes an empirical

»> method for deriving a simple average value of upper tropospheric

»> water vapor representative of the layer between 500 and 200 hPa,

»> rather than a Jacobian weighted quantity. The manuscript is

»> well-written and reads easily. With a few clarifications as to

»> the assumptions made by the method, the paper is suitable for

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»> publication.

»>Specific Comments:

S705 »> 1/ The method proposed for reporting a simple average rather than
»> a Jacobian weighted average should be useful and facilitate
»> direct comparison of AMSU retrievals with other UTLs measurements
»> and model results. Normally, such a comparison would require the
»> measurement sensitivity to be taken into account.

As for any regression method, it is difficult to quantify the influence of implicit a priori information and hence the measurement sensitivity. Instead, figure 13 explicitly shows the performance for different atmospheric conditions, confirming the high absolute accuracy, except for very dry atmospheres.

»> 2/ The Introduction should make clear that this is an empirical
»> method that relies on regression rather than a new retrieval
»> based in radiative transfer. As such it is an approximate
»> technique.

Text modified: last paragraph of the introduction.

»> 3/ The method should have the advantage of speed of computation
»> for comparisons of a large number of retrievals. However, for
»> specific detailed comparisons, a more detailed description that
»> takes into account the particular measurement sensitivity might
»> be more appropriate.

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See point 1/.

- »> 4/ In formulating the regression predictors from physically
- »> dependent quantities in sections 3 and 4, the authors should more
- »> clearly note where assumptions and approximations are being made,
- »> eg. eqns. 1, 3, 5, 9...

We have tried to point out and explain each assumption and approximation at the place where it occurs, a fact positively commented on by the other reviewer. If a particular assumption or approximation is unclear, please point out the problem more specifically.

- »> 5/ Validation by comparing with sondes representing a much wider
- »> range of atmospheric humidity conditions would more convincingly
- »> support the method. A comparison with measurements from a
- »> tropical station in addition to the mid-latitude German station
- »> would be useful.

A validation of UTH/UTWV with radiosonde data is difficult due to the limited reliability of the radiosonde data. We selected Lindenberg station data due to the fact that the data is corrected and well calibrated. A paragraph mentioning this was added to the end of section 6.

- »> 6/ The empirical nature of the method should be noted in the
- »> Conclusions.

Text modified.

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