Atmos. Chem. Phys. Discuss., 14, C1338–C1341, 2014
www.atmos-chem-phys-discuss.net/14/C1338/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: 30 years of HIRS data of upper tropospheric humidity" *by* K. Gierens et al.

Anonymous Referee #2

Received and published: 11 April 2014

This technical note presents a record of 30 years of upper tropospheric humidity derived from the series of various HIRS instruments observations onto various NOAA platforms. The author investigate the decadal change in UTHi.It is then proposed to interpret these results based on the brightness measurements statistics.

While the authors have to be commended for embarking in such an investigation, I have strong concerns about the paper and the results presented that I consider should be adressed before granting publication of this study. I also note that while the English writing is good, the overall writing style of the paper is not very satistactory and the paper desserves a real editing effort.

The study is dedicated to the investigation of super-saturation conditions. Nonewith-

standing the loose definition of such conditions over a deep layer of the atmosphere, my major concerns has to do with the cloud filtering of the data.

From the description of the dataset to the interpretation of the statistics I could not find any discussion related to the possibility that in the vicinity of clouds, the HIRS record might just be contaminated by a poor cloud clearing effect. What about the cloud clearing process done here ? How can you show that it is done homogeneously for the various HIRS instrument ? The various change of instruments do have an impact on the quality of the clear sky identification that should be acknwoledged and it should be demonstrated that the cloud contamination, especially with the thin cirrus cases, is not corrupting the interpretation of the decadal changes.See paper by John, V. O., G. Holl, R. P. Allan, S. A. Buehler, D. E. Parker, and B. J. Soden (2011),Clear-sky biases in satellite infra-red estimates of upper tropospheric humidity and its trends,J. Geophys. Res., 116, D14108, doi:10.1029/2010JD015355.

Second the authors take for granted that UTH can be retrieved from Soden and Bretherton's results in the mid-latitude conditions. The original paper is clearly restricted to the tropics (see for instance the paper of Ramond et al., 1981 for a detailed inspection of the interpretation of the upwelling radiance in the HIRS-12 like band in midlatitudes environment). Furthermore, the Jackon and Bates., 2001 results clearly show that the quality of the retrieval is diminished from tropical to mid latitude conditions. This should be adressed.

Furthermore, the interpretation of the radiance in the water vapor channel has been shown more recently to be better related, at least in the tropics, to the Jacobian of the BT to relative humidity (Brogniez et al., J Clim, 2009) and/or specific humidity (Buehler et al., JGR, 2008) than any weighting function based vertical averaging (Jackson and Bates JGR, 2001). How does this impact the present interpretation of the signal ? Eventually I would like to see discussed how well UTH can be retrieved in a mid latitude environment for the various spectral responses of each of the HIRS instruments used here.

Currently no validation (self consistency is not validation) what so ever is done for UTHi for the different HIRS instruments all through the record. With both the emphasis on homogeneity all through the years and with the individual HIRS with/without statistical correction. A good way to do this would be to follow the guidelines and the good practices proposed by the Gewex Water Vapor Assessment working group.

There is no argument in favor of presenting here the decadal trends in the "mean" UTHi. It has been shown clearly that the mean UTH should be used with caution given the strong departure from the Normal distribution (ohn, V. O., S. A. Buehler, and N. Courcoux (2006),A cautionary note on the use of Gaussian statistics in satellite based UTH climatologies, IEEE Geosci. Remote Sens. Let., 3(1), 130–134, doi:10.1109/LGRS.2005.859350. Simple alternatives have been proposed or could be designed and could be useful to to the present investigation (see for instance Schröder, M., Roca, R., Picon, L., Kniffka, A., and Brogniez, H.: Climatology of free tropospheric humidity: extension into the SEVIRI era, evaluation and exemplary analysis, Atmos. Chem. Phys. Discuss., 14, 9603-9646, doi:10.5194/acpd-14-9603-2014, 2014.). Please do explain why "mean" is chosen here and consider the possibility to redo your analysis with alternative parameters to accound for this distribution problem.

Other questions/ writing issues:

page 5873 line 1: "only one source of data". What about METEOSAT ? See Schroder et al mentioned above line 25: "as a kind of " please remove as a kind and be more specific. See comment #2 above.

page 5874 line 8 "As the latter alternative is simpler we follow it" remove this sentence this is not a report of activity but a scientific paper. Please stick to the standard (avoir "we") and avoid "telling". line 9. Fortunately. Please remove all through the paper see coment just above.

page 5875 line 9: what is would be the T6/4 uncertainty like ? How does it compare with the RMS line 18: what is the effect of discarding these measurements on to the

decadal signal you present here. What is the difference is frequency of occurence of these pixels with UTHw > 100% between the two decades? line 22: what is the impact of using nadir based regressions of the central 33° pixels in terms of long time trends in the UTH distribution and by consequence interdecal "mean" difference ?

page 5878 line 8: surprising. Please avoid using surprising in a scientific paper

page 5879 line 6: "fortunately this is rather improbable." Please avoid this kind of sentence and rephrase to a more scientific standard. Line 13: "Two observations times in a day". This is not correct because of cloud occurence. There is a strong diurnal cycle of convection and deep clouds that can easily prevent one of the observations from being used systematically in your daily average or even zero data can be present. It is a key problem. You are using cloud free data here. Please discuss and clarify the impact of the cloud filtering together with the drift and the diurnal cycle.

line 18: "conspiracy of orbit drifts and diurnal temperature variations". Please avoid this kind of sentence and rephrase to a more scientific standard.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 5871, 2014.