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Interactive Comment

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

**K. Gierens et al.**

klaus.gierens@dlr.de

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*Page 2, line 2:*
The central achievement of our paper, that is, the regression beween HIRS/4 and HIRS/2 channel 6 brightness temperatures is independent of the special choice of humidity. Equation 3 is valid for both $UTH_w$ and $UTH_i$. That we are especially interested in supersaturation is due to historical reasons; the first author works on this topic since the late 90s. However, we make it clear in the paper that the regression is valid for both kinds of humidity measure, see text directly before eq. 3 in the original paper.

*Page 2, line 4:*
The central wavenumbers ($cm^{-1}$) for the two channels are as follows:



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Channel 6: The designed central wavenumber is 733 for both HIRS/2 and HIRS/4. However, there can be small difference from two different instruments due to slight shifts after launch and other onboard factors.
Channel 12: The designed central wavenumber is approximately 1480 for HIRS/2 and 1530 for HIRS/4.
We add this information in the paper.

*Page 3, line 8:*
We will mention the change of IGFOV from 20 km to 10 km in the revised version. Of course, the effect of such a change had to be corrected for with the intercalibration and this was done.

*Page 3, line 21:*
We agree that it might be convenient for the general reader to explain shortly the main ideas behind the retrieval formula. We will do this in the revised version, see text after equation 1.
In short: It is evident that we need a signal from a water vapour channel, i.e. channel 12. It is less obvious why we need a signal from the CO2 channel, channel 6. In fact, ch. 6 is not used to diagnose CO2, but rather to determine a temperature in a thick layer in the atmosphere. A water vapour and a temperature measurement are the usual ingredients for the determination of a relative humidity. Comparing channel 6 with other temperature channels that can potentially be used, Jackson and Bates (2001) found that channel 6 had better correlation and smaller RMS error than other channels.

*Page 6, line 20:*
Cloud clearance means that only clear measurements are selected.

*Page 6, line 22:*
The $T_{12}$ difference between a nadir measurement and a measurement at 30° for channel 12 is approximately $1.2$ K in average. However, all the measurements used in this



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study are limb-corrected (Jackson and Bates, 2000).

*Page 8, line 24:*
It is improbable that the increasing $T_{12}$ variances in the 2000s have anything to do with the halving of the IGFOV in HIRS/4. If this would indeed be the case we should expect a similar increase in channel 6, i.e. increasing $T_6$ variances. However this is hardly the case, see Figure 8, middle panel.

In order to see whether the HIRS data are consistent with other data sets we checked temperature data of ERA-interim and NCEP re-analyses. Both re-analyses show consistently that the temperature variances are increasing on all pressure levels from 300 to 700 hPa in those areas where we find a statistically significant increase of UTH. The temperatures themselves increase mostly, consistent with expectations from global warming. These results corroborate our statement in the paper that the significant increase in UTH originates mainly from the increase in temperature variances. We have added a paragraph on this in the paper.

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