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# ***Interactive comment on “Application of GPS radio occultation to the assessment of temperature profile retrievals from microwave and infrared sounders” by M. Feltz et al.***

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Editor comments on August 21, 2014 version of “Application of GPS Radio Occultation to the Assessment of Temperature Profile Retrievals from Microwave and Infrared Sounders” by M. Feltz et al. This version is significantly improved from the previous version and is close to being ready for final publication. However, there are two more points that should be addressed by the authors.

1. I apologize for not bringing up this issue earlier, but the authors should mention that the COSMIC dry temperatures  $T_{\text{dry}}$ , which are used for comparison with the tem-

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perature estimates from the other sounders, are biased significantly low compared to the actual temperature below about 300 hPa, and hence are not suitable for a comparison to actual temperature below this level. Thus all the other sounders show a very large warm bias compared to  $T_{dry}$  below about 300 hPa (see Figures 2, 3 and 5). This should be mentioned in the text because many of the readers may not be familiar with  $T_{dry}$  as a reference variable, and may think there are large problems with the other sounders, which is not necessarily the case. I suggest rewording lines 23-25 on page 3 as follows: “GPS RO dry temperatures suffer from uncertainty in the upper stratosphere due to errors in the ionospheric corrections and in the middle to lower troposphere where they are significantly lower than actual temperature due to the presence of water vapor (Kursinski et al., 1997; Ware et al., 1996; Hajj et al., 2002).” Then, in Section 4.1 on page 8 after the first paragraph insert “Biases of AIRS v5.2 and v6.0 compared to COSMIC dry temperatures are generally less than 1K between 10 and 300 hPa. Warm biases above 10 hPa of up to 2K exist. The apparent large warm biases below about 300 hPa are due to the COSMIC dry temperatures being significantly lower than the actual temperatures due to the neglect of water vapor.” Finally, in the captions of Figs. 2, 3, and 5 I suggest adding “The apparent large positive biases in the middle and lower troposphere are due to the comparison with the COSMIC dry temperatures, which are significantly lower than actual temperatures when significant amounts of water vapor are present.” An alternative to pointing this out in the figures is to not plot the differences below 300 hPa, since they are meaningless.

In the future, the authors could consider avoiding this problem by comparing the refractivity  $N$  computed from the other sounders’ temperature and water vapor with the observed RO values of  $N$ , at least in the middle and lower troposphere.

2. There appears to be a problem with the new Figure 6 in the paper. Fig. 6 indicates that the global average of (ALL GRAS minus ALL COSMIC) is lower than -2K between 10 and 1 hPa. Yet none of the profiles in the different latitude bands show negative values even close to this value, and in fact in some bands in the Southern Hemisphere

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the differences are positive. This is mathematically impossible (the global mean showing an extreme value greater than any of the subsets). Please check the calculations and this figure.

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