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Atmospheric Measurement Techniques Discussions

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.

Anonymous Referee #2

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These are comments on the manuscript "Application of GPS radio occultation to the assessment of temperature profile retrievals from microwave and infrared sounders" by Feltz et al, manuscript amt-2014-74, submitted to Atmospheric Measurement Techniques.

This study uses GPS radio occultation retrievals to validate temperature profiles from nadir sounding instruments. As noted in the study, information from GPS RO is a useful complement to information from radiosondes, especially the GPS RO unbiased sampling over land and ocean. The authors have compared the performance of multiple nadir sensing instruments using GPS as a transfer standard. These intercomparisons

are a necessary step in creating merged records from all instruments, something especially challenging with sounders in different orbits. Also, the comparisons in this study are broken into separate latitude zones. The authors note some often-overlooked issues with the sounder data, including compensating biases in different zones and errors unique to one of the algorithms used to process data in this study. Finally, the manuscript is well organized and clearly written. For all these reasons, the results are appropriate for publication.

As for weaknesses, my primary concern is the lack of information about the number of samples that go into the comparisons. While GPS RO may have thousands of profiles per day, how many are within the matching criteria used in this study? This issue needs to be discussed in the text, and appropriate information needs to be conveyed clearly, either by including the counts in each panel or by putting some sorts or error estimates (even crude ones) on the profiles plotted.

Also, echoing an earlier reviewer's comments, some attempt should be made to incorporate or approximate the averaging kernels in the comparisons. Doing so should reduce the vertical oscillations apparent in Figure 3. Given the much higher vertical resolution of the GPS RO, this does not need to be as involved as outlined in Rodgers and Connor. The sounder averaging kernels alone will suffice. However, I agree with the authors that the fundamental issue here is inter-sensor comparisons, especially biases, and that the instrument performance is usually defined for standard layers. One suggestion is to apply a smoothing filter of 2 km thickness, more consistent with the vertical resolution in Maddy and Barnet, 2008, TGARS. This may reduce some of the oscillation in the biases. The basic question to answer is: will some of the vertically oscillating bias be reduced by applying averaging kernels? The assumed 'no' answer may be wrong.

Finally, what about land-ocean differences? While the results in this study stand alone, conditioning by the underlying surface may reveal more biases (which probably cancel in the global mean). However, looking into land / sea differences is more a suggestion

than a necessity for making the paper ready for publication.

Here are a few other comments (few because of the quality of writing in the manuscript):

p. 5077, line 12. Here the 'select' can be expanded to note strictly cloud-free radiances, as compared to cloud-affected radiance used in the retrievals. Many in the community assume they are the same radiances.

p. 5079, line 11. Are the orbits all in the same inclination? In any case, different –or the sameâĂŤorbital inclinations should be noted.

p. 5085, last sentence. Suggest changing 'zonal' to 'regional'. Also, to be very clear about what is going on, suggest changing 'not just ... as is common practice' to 'because global comparisons will hide compensating local biases'.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5075, 2014.