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Atmospheric Measurement Techniques Discussions

Interactive comment on "Assessment of COSMIC radio occultation retrieval product using global radiosonde data" *by* B.-R. Wang et al.

Anonymous Referee #2

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General remarks:

The aim of the paper is to compare the COSMIC temperature and humidity products to radiosonde data and discuss differences between different radiosondes. Compared to a similar study by Sun et al. (2010), cited in by the authors, the present study is constrained to a lower collocation tolerance in time (1 hour) and space (0.9 deg), and includes a longer time period of COSMIC data. It does not seem to be a major achievement, but it is a sound goal and it should be sufficient to justify a publication in AMT. The paper includes additional information of the shape of the relative error distribution.

The language is acceptable but not excellent. There are some wrong phrases in the

paper.

I have one main objection to the paper which I believe is absolutely necessary to address (by removing specific parts of the paper) in order to pass the review, and a few other critiques/questions which should be considered.

My main objection to the paper is the comparisons of humidity data at high altitudes. In my opinion neither the COSMIC data nor the radiosonde data can be expected to hold enough information about humidity above 200 hPa to justify any conclusions based on this part of the dataset. I agree with referee # 1 that the radiosonde data are unreliable above 200 hPa. Also, as far as I am concerned, stratospheric radiosonde humidity data are flagged out in the ECMWF data assimilation.

But more important: The GPS RO humidity retrieval holds no information above 200 hPa: In equation 2 the second term is probably 3-5 orders of magnitude lower than the first term above 200 hPa. Consequently N is quite insensitive to variations of V_p, as the authors also note. 1DVAR responds to that by falling back on the background humidity with added noise. This is why the authors conclude (p 8412 l8) that: "The wetPrf specific humidity bias and background bias were almost the same in the layers above 200 hPa". I think that the authors are confusing the subject because the comparisons of stratospheric humidities are applied in an unreflected way. Figures and discussion relating to water vapor above 200 hPa are quite irrelevant and should be removed from the paper.

Some further questions that should be addressed:

The method for dealing with the outliers, i.e. removing profiles outside a certain relative error (900 %, 9900 % etc.) of water vapor pressure may be seen either as an additional quality check or as a way to characterize the relative error distribution. I am not sure which. It looks as if data points are removed one by one rather that whole profiles profiles. Is that justified? If a single data point is flagged as invalid I would suspect that at least a larger part of the profile, if not the whole profile, would have to be flagged

out because the atmospheric variables at a single level depends on bending angle retrievals from several layers. I prefer to look at the reduced data sets as a tool to describe the relative error distribution. And that is probably better achieved by making histograms or scatter plots as in figures 4 and 5.

p 8415 l 15-21 I became a little uncertain about whether the 1DVAR algorithm refered to here is the same as the analysis as a whole is based on? I suppose that it is an alternative experimental 1DVAR. Maybe state that a little more clearly.

p 8417 l 5 (sec 3.4) This is an interesting discussion an the conclusion (that refractivity is a better benchmark than the 1D-Var products) sounds right whatever the reason for the discrepancy between the ECMWF model and the Chinese radiosondes is. The comparisons in refractivity space between observed and direct calculated refractivity from radiosonde measurement (fig 8 and 13) seems like a good tool because such comparisons would (as far as I understand) be completely independent of NWP models.

Small remarks: p 8406 l 4 : global radiosonde -> global radiosonde data

p 8404 l 13 could not detect some abnormal -> failed to detect some of the abnormal

p 8409 l 5 :"whicha" ?

p 8409 l 20 : There seems to be a small misunderstanding here. The Goff-Gratch equation is not exactly reported in Murphy et al., 2005. Rather they (Murphy et al.) suggest a more accurate parameterization.

p 8412 l 10 : smaller than radiosonde -> smaller than the radiosonde specific humidity
p 8412 l 17 : mean relative error had -> mean relative error has

p 8412 l 18 : function wich calculates the relative error. -> function used to calculate the relative error.

The negative relative error could -> The negative relative error can

p 8414 l 20 : not consistent -> inconsistent

p 8415 l 15 : had developed -> have developed

p 8426 show the data number -> show the number of data points (Possibly elsewhere also - consider writing "data points" rather than just "data" through out the paper)

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8405, 2012.