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Atmospheric Measurement Techniques Discussions

Interactive comment on "Meteorological information in GPS-RO reflected signals" *by* K. Boniface et al.

Anonymous Referee #2

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In this very interesting contribution the authors investigate the information content of reflected GPS signals with respect to tropospheric refractivity. My recommendation is "publish with revisions".

I have one general comment and several minor comments / remarks described below:

General comment:

Page 1202, section 1 "Introduction", lines 8ff:
"The main objective of the study is to assess the potential of [GPS radio occultation] signals that rebound off the ocean surface."
The authors base their assessment on the analysis of only one COSMIC reflection event. I suggest to extend the processed data set and perform a thorough statistical

analysis of the retrieval results.

Comments and questions:

Page 1200, "Abstract", line 14-15:
"The methodology is applied to one reflection case."
It appears that *two* observations are discussed: Fig. 2 shows COSMIC observation 'C001.2007.100.00.29.G05 2007.3200', Fig. 5, on the other hand, is based on 'C001.2006.227.00.46.G02 2006.3200'.

Page 1206, section 3 "Observables: [...]", lines 18ff:
How sensitive is $B_R(t)$ (Eqn. 6), in particular its phase (plotted Fig. 4), to the particular choice of the mask R (red parallelogram in Fig. 2)?

Page 1210, subsection 4.1 "Ray path determination" and subsection 4.2 "Optical path length variation [...]":
I think these two extended, rather theoretical sections could and should be shortened. The ray tracing equations (page 1213, line 4) and their derivation are discussed in the literature; I recommend to revise subsection 4.1 and 4.2 and add suitable references.

Page 1218, subsection 5.3 "Ray tracing examples [...]":
If I understand correctly this subsection serves as an illustration of the OAT ray tracer's performance, it does not provide results of the inversion procedure. I suggest to merge this subsection into section 4 "Ray tracing analysis".

Page 1220, subsection 5.3 "Ray tracing examples [...]":
"In the next two figures, we show the result of the two procedures [...]"
I assume this paragraph refers to Figs. 8 and 9 which are missing in my copy of the paper.

Page 1220, section 6 "Conclusions", lines 18-19:
"[...] indirect phase [...] indirect signals [...]."
I assume that 'indirect phase' and 'indirect signals' refer to 'reflected phase' and 're-

flected signals'.

Fig. 1, page 1225:
I suggest to plot the signal amplitudes in units of V/V instead of 0.1 V/V.

Fig. 2, page 1226:
It would be interesting to know the geographical location of the reflection event shown here and in Fig. 5.

Fig. 6, page 1230:
I assume that Fig. 6 shows the result for COSMIC event 'C001.2006.227.00.46.G02 2006.3200'. Why does the profile derived from the multidimensional solution search end at a height of about 1 km? For occultation event 'C001.2006.227.00.46.G02 2006.3200' the COSMIC data centre CDAAC provides a refractivity profile down zero height. Furthermore, I suggest to show the fractional refractivity error (N$^{RO} - N^{ECMWF})/N^{ECMWF}$ derived from the standard RO analysis as well.

Fig. 6, page 1230:
I assume that ΔN denotes the difference $N^{retrieved} - N^{ECMWF}$. Typo: in the caption "refraction index ($\Delta n/n$)" should read "refractivity ($\Delta N/N$)".

Fig. 7, page 1231:
For the vacuum propagation case (dotted lines) the plots show zero interferometric phase between 57 and 80 s implying identical paths of direct and reflected ray for a time period of 23 s. Most likely the corresponding event ends at 57 s (tangent point reaches the surface) and the vanishing phase for $>$57 s shown in the figure is an artefact of the plotting program. Please check.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 1199, 2011.