

Interactive comment on “Empirical analysis and modeling of errors of atmospheric profiles from GPS radio occultation” by B. Scherllin-Pirscher et al.

Anonymous Referee #2

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The authors derive an empirical parameterization of GPS RO observational errors based on the comparison of CHAMP, GRACE and COSMIC RO data with ECMWF analyses. This is an interesting paper and I recommend publication with minor revisions.

General remark:

Table 1 (giving the values of the error model parameters) distinguishes between the two RO processing systems, WEGC and UCAR. This distinction is sensible, since RO processing algorithms introduce additional parameters (e.g. order/degree of the Doppler filter, cut-off altitudes, background models, etc.) whose values may affect standard

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deviations (and possibly biases) of the derived profiles. I would think, however, that a similar distinction should be made between CHAMP/GRACE and COSMIC data, since the occultation antenna's gain function constitutes a significant part of the instrumental effects. CHAMP and GRACE were/are equipped with (to the best of my knowledge) identical helix-type antennas to record the occultation signals; COSMIC, on the other hand, uses more advanced multi-element patch antennas. As a consequence, COSMIC's signal-to-noise ratios at large occultation azimuth angles are significantly higher than those from CHAMP and GRACE and I would expect that an error analysis, performed separately for CHAMP/GRACE and COSMIC, yields statistically significant differences. I suggest to add a comment in section 3 justifying the approach selected by the authors, i.e. the combination of CHAMP/GRACE and COSMIC observations within the same (WEGC) data set ignoring the instrumental differences.

Minor comments:

Page 2600, abstract, page 2601, introduction and page 2617, summary:

The abbreviation 'RO' is defined twice in the abstract (page 2600, line 2 and 4), the introduction (page 2601, line 2) and the summary (page 2617, line 18/19).

Page 2613, line 4 and page 2614, line 16:

Typo: “Figure 4 shows UCAR (top two rows) and WEGC (bottom two rows) refractivity error estimates [...]”

In my copy of the paper figure 4 consists of just a single plot. I assume the sentence quoted refers to figure 5 instead. Likewise, “Fig. 4” in line 16, page 2614 should read “Fig. 5”.

Page 2618, line 6ff:

Since WEGC uses ECMWF forecasts for bending angle initialization, I'd expect to see reduced biases and standard deviations in the bending angle data at higher altitudes. Therefore, I suggest to extend the altitude range of the bending angle error analyses beyond 35 km to, e.g., 50 or 60 km (figure 1; figure 2, 3 and 7, top panels).

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Page 2628, figure 3:

The fractional refractivity errors (between about 15 and 35 km) shown in figure 3 differ significantly from the ones shown in Schreiner et al., 2010 (DOI 10.1007/s10291-009-0132-5), figure 5. Please comment.

Figs. 3, 5 and 7 are quite hard to read (at least for eyes my age). I suggest to increase their size.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 2599, 2011.