

Interactive comment on “Generation of a Bending Angle Radio Occultation Climatology (BAROCLIM) and its use in radio occultation retrievals” by B. Scherllin-Pirscher et al.

Anonymous Referee #2

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This paper discusses the method used to construct a bending angle climatology (BAROCLIM) based mainly on the Formosat-3/COSMIC (F3C) RO data. It presents comparison with ECMWF and discusses sources of its uncertainty. The paper also describes how BAROCLIM can be used as background field for statistical optimization in retrieving refractivity profiles. Overall, I find that the paper is well written, contains new and interesting materials, and represents an excellent contribution to the AMT Special Issue. I recommend minor revision; my comments are mainly for added clarification.

(1) P8201,L3-7: BAROCLIM was compared with BA computed from ECMWF analysis. Since ECMWF has a top altitude of ~ 80 km, its refractivity would need to be extended

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higher in order to compute the corresponding BA. Please explain how this is done.

(2) Sec 3.1: While I understand the need to exclude profiles with strong variability in forming the climatology, the multiple steps used in the QC here seem unnecessarily complicated. I believe it is far simpler to use robust statistics such as the interquartile range to exclude outliers. Just a comment/suggestion. I do wonder how BAROCLIM varies depending on the strictness of QC (and latitudes). It would be useful to quantify.

(3) P8205,L13-15: Concerning the MSIS background error, the numbers seem very arbitrary. Can you provide some justification? I understand that the justification could possibly be found in the cited reference [Gobiet and Kirchengast 2004?], but it would be useful to summarize the rationale here as well.

(4) P8205,L28-P8206,L1-12: The use of measured BA for BAROCLIM in the lower troposphere was dismissed due to the fact that the lowest impact altitudes are different for individual profiles. As a result, the MSIS dry profiles were used instead. This seemed like a strange choice to me. Why not define an average lowest impact altitude based on the climatologically averaged BA profile? Even if there is uncertainty associated with that, it will surely be much better than using MSIS.

(5) P8206,L15: “cosine transition” should be defined or explained a bit more clearly.

(6) P8209,L10-17: Even though the error from the BAROCLIM spectral model is small, it is not negligible ~ 60 km or above. Can this be further reduced through an increase of Chebychev or zonal harmonic coefficients?

(7) P8211,L7-9: “Systematic errors from MSIS a priori information used at high altitudes (below 70 km) are assumed to be small...” I don’t see how you can be sure about that.

(8) P8213,L27-29 (Fig 6): Since the differences are zero below 30 km, I suggest limiting the y-axis to above 20 to 30 km to improve the clarity of the plots. There is no useful information below 30 km.

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(9) Fig 6: For the F3C results, the OPSv5.6 optimized BA is closest to raw BA. This surprises me given that OPSv5.6 used ECMWF for statistical optimization while BAROCLIM is directly based on F3C raw BA. Can you explain?

(10) Fig. 7: For BA, there is a clear negative bias in the lower troposphere from all the plots. However, the bias is absent in the refractivity. Why?

(11) P8216,L1-4: "Our current BAROCLIM spectral model does not include profiles of particular atmosphere conditions arising, e.g., during and after sudden stratospheric warmings (SSW)." Why weren't they part of BAROCLIM? Were those profiles excluded during QC? "Since several major and minor SSW events occurred since 2006 it is possible to include such profiles in BAROCLIM." How? Do you really want to do that for a climatology?

(12) Would you use the derived BAROCLIM for RO retrievals outside 2006-2012? Please discuss.

Minor comments:

(13) P8202,L4: "Bending angles, which are very noisy and/or contain unphysical values, can strongly affect the quality of a bending angle climatology." makes it sound like all bending angles are "very noisy". I suggest a change of wording here. Maybe "Some bending angles are very noisy and/or contain unphysical values; they could strongly affect the quality of the bending angle climatology if they were not properly excluded."

(14) P8202,L24: "damage" -> "degrade"

(15) P8202,L27: "non-negligible data noise at high altitudes" What does "non-negligible data noise" mean? Can you rephrase?

(16) I find that this paper has too many references that are not directly relevant. If length is an issue, I suggest removing some of the references.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 8193, 2014.

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