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Atmospheric Measurement Techniques Discussions

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 #1

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This paper introduces a new GPSRO bending angle climatology, BAROCLIM, which is based on FORMOSAT-3/COSMIC GPSRO profiles from 2006 to 2012. The paper does not report new scientific research results, but presumably it would be the standard reference for researchers using the climatology to conduct their research.

In deciding whether or not to accept the paper, the editor should consider two questions: Is this climatology of sufficient interest to the readers of AMT to warrant publication? And does the paper give a sufficient description of the new climatology that it can be used as a stand-alone reference for it?

Unfortunately I am not sure that the answer to either question is a confident yes. Regarding the first question, I can believe there is a community of researchers who might productively use the climatology, but I'm not quite sure who they are. Identifying the end-users is important because, as noted by the authors, the dataset has some limitations, and these limitations will be more or less consequential depending on the use to which the data is put.

One claim made by the authors is that the climatology "can be used to detect deficiencies in current state-of-the-art analysis and reanalysis products from numerical weather prediction centers." The bar is quite high for such use, and I don't think the paper makes a convincing case for it. There are some comparisions with ECMWF, but the ECMWF analyses use the F3C data as input so these are not entirely clean comparisons. The authors write that differences between BAROCLIM and ECMWF "rather show deficiencies in ECMWF than in BAROCLIM", but I do not see definitive evidence for this claim.

Another proposed use of the data is as a priori information for RO profile retrievals. I believe this would be a reasonable use of the data, and I think the authors should give more consideration to this application in describing the data. For one thing, I am not sure how one would access and use the data as prior information. I could not find a weblink to the data, either in the paper itself or online, or a description of data formats or other details that would enable community us of the data. Is BAROCLIM intended as a publicly available dataset? Otherwise I am not sure that readers of AMT would feel strongly motivated to read about it.

Another issue is that the dataset has some limitations, which may or may not be severe depending on the intended use. If the data is intended for use as prior information for retrievals, the limitations of the data can be evaluated against the tolerances required for that purpose.

While the authors assess various kinds of errors in the data, I do not believe they give

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sufficient consideration to the limitations imposed by the 6-year period of record. As one point of comparison, the standard period for "climate normals" is 30 years, the reason being that the climate system has a variety of natural modes and oscillations, many of which have substantial decadal and even multi-decadal variability. If the 6 years of the climatology coincide with the positive or negative phase of a low-frequency oscillation, they will skew the climatology towards that phase. Even modes which are not specifically low-frequency can have runs of multiple years with a bias towards one phase or the other, for example the run of positive years of the AO in the 1990s. At the end of the paper the authors mention the possibility of looking at conditions for sudden stratospheric warmings (SSWs) with their data, but they don't address the fact that the SSW events of the six years in their record will be aliased into their climatology. In a 6-year climatolgy only 6 months go into each monthly average, so even one or two SSWs could skew the climatology for a single climatological month.

What are the consequences of the short period of record? If the data is used as prior information for RO retrievals, what errors will come from the representativeness error in BAROCLIM, and will they matter? Possibly the prior information has most of its impact at upper levels which are relatively insensitive to the relevant climate modes. That would be fortunate, but on the other hand the upper levels are influenced by the auxiliary data from MSIS which is used to generate BAROCLIM. The paper doesn't give much information on MSIS, for instance the period of record (which ends in 2000 and thus does not overlap with the F3C period) or the distribution of data sources that go into it. Presumably much of the data comes from incoherent scatter radar stations, but I am not sure how these are distibuted over the globe. For the lower troposphere MSIS likely uses data from analysis or reanalysis products, and my impression is that the authors would prefer to have a climatology which is independent of analysis products generated from model-based assimilation systems.

In summary, I think this paper is potentially appropriate for publication in AMT, but only after the authors have addressed the two questions posed above. If the climatology

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is intended for public distribution to a community which overlaps substantially with the readership of AMT, and if the intended use is such that the limitations of the data are not too consequential, the paper should be published.

To map my concerns onto the 3-part AMT rating system, I have rated the Scientific Significance of the paper as Fair. If the climatology is not to be made publicly available, or if there is no clearly identifiable set of end-users for the data, the scientific significance of the paper would be quite low. Also, if the intended uses of the data are stymied by the short period of record, the significance would again be quite low. I have also given a Fair rating for the Presentation Quality, on the grounds that the paper should discuss the limitations imposed by the short period of record and the use of MSIS auxiliary data, as well as the potential uses of the data, as discussed above. If the paper is meant as a reference for users of BAROCLIM, these issues should be discussed. If these issues are satisfactorily addressed I believe the paper will be suitable for publication in AMT.

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