

Review of “Comparison study of COSMIC RO dry air climatologies based on average profile inversion”

This study applied the API method to retrieve refractivity and dry temperature climatology for COSMIC data from January to March 2011. The method is not new, but a thorough comparison against multiple data could be very interesting. However, the paper is not well organized, and the presentation cannot be followed smoothly. The structure of the paper needs to be refined. Furthermore, some results lack of insightful explanation, or have no interpretation at all. The writing is another major issue. There are many grammar mistakes and typos. To make this work publishable, the authors should consider a thorough revision.

P: page, L: line

Here are some of my major concerns,

- The abstract could be rewritten with major points of conclusion from this study.
 - check grammar and language
 - re-structure and consider the way of presenting. For instance, the method of API may be presented immediately after the first sentence.
 - L17. The authors use different terms, e.g., upper initialization, upper boundary value, and top. They need to be clear, precise and consistent.
- P2L4, is that only in UTLS? Why?
- P2L30, “up to high altitudes”, how high is it? “introduced an alternative approach”, I guess it is not an alternative approach, but a different application? Please clarify.
- What is the major benefit of the API method? While it is comparable to IPI below 35 km, I see it is not very helpful in extending the accuracy of retrieval above 35km. Is it computational efficient? If so, can the authors provide the computational cost of the API and IPI?
- “The averaging of a large number of profiles suppresses noise in the data, enabling observed bending angle data to be used up to 80 km without the need of a priori information.” I do not understand. Can the authors explain more on this? which figures or results support this point and how? I did not see the connection of the current results to benefit of using bending angle data between 35 and 80 km.
- Definitions of M and N in Equation 3 do not seem correct.
- Many figures and results lack of complete explanation. I just list some of them as below,

- Figure 1, “only negligible implications are found”. Why are the dry temperatures retrieved using different R_c identical? What does “implications” mean? What is the reason for the large differences between 2–8 km?
- Figure 2, please explicitly provide what the dashed straight lines are. I think impact height is more accurate than impact altitude?
- Figure 3, what is the reason for the greater than 0.8 % difference around tropopause in refractivity? What is the reason for the large differences in the lower atmosphere (near surface)? What does altitude mean in the y axis? Is it impact height? How is the percentage calculated? Is the difference normalized by something?
- Figure 4, there is no description at all. What is the purpose of putting this figure?
- Figure 5, what does “data show again a slight increase” mean? What increases? Again, what is the explanation for the near surface differences?
- Figure 9, the authors could provide more explanation for the large differences in the northern high latitudes.
- Figure 10, “increasing” to about $\pm K$ is not accurate. It seems the patterns among the choices are different for the bins in the northern/southern hemisphere. Are the results showing here season dependent?
- Summary and discussion: Instead of repeating the major steps of what was already presented, the authors need to highlight the major points, and discuss the limitation and generalization of this study.

Some Minor comments (there are many more),

- P1L3, remove already
- P1L3, propagating \rightarrow propagate
- P1L17, what does already mean?
- P1L14, expansion \rightarrow extension, check all usages throughout the paper
- P1L19, between \rightarrow among
- P1L20, P13L9, average profile inversion \rightarrow API
- P2L2, remove meanwhile
- P2L5, global analyses and forecasts?

- P2L6, simulations might be simulation?
- P2L8-L9, “NWP centers **will** always assimilate data that are as close as possible to the original measurement; in case of RO these are atmospheric bending angles, which can be assimilated without any bias correction.” What do the authors mean by will? and what does “these” mean?
- P2L16-L17, please check grammar, “which is still small at bending angle level, but increase through the retrieval chain.”
- P2L24, change “Ao et al. (2012); Gleisner and Healy (2013)” to Ao et al. (2012); and Gleisner and Healy (2013). Also see P18L31.
- P3L1, “at WEGC and DMI,” → “at WEGC and DMI.”
- P3L2, please rewrite “section 3”
- P3L8, “Abel transformation” or “Abel transform”?
- P3L30, please correct the format of the citation.
- P4L3, change “(2017a)” to 2017a
- P4L9, change “(2017b)” to 2017b; also check P10L5
- P4L11, “up to”, I think “below” is easier to understand. Also check other usages.
- P4L23 and Figure 1, I recommend using left/right or putting (a)/(b) in the figure instead of using l.h.s./r.h.s; what are the two dashed blue curves? It seems they are not mentioned in the paper.
- P4L24, what do the authors mean by 5°-zonal? Please be clear and precise.
- CDAAC and UCAR should be used (formatted) consistently throughout the paper, e.g., P6L11, P5L11, etc.
- P6L12, Level L2a processing?
- P6L15, IPI was already introduced on P3.
- P6L24, please pay attention to and check the use of hence.
- P6L29, use full term at the first time and use abbreviation for the rest consistently. Please also check other usages.
- P6L30, again, what is “5° latitudinal bins”?
- P6L30, in → at
- P7L1-L2, remove content in brackets since they were already given in P3.
- P8L5, L10, please be consistent on rOPS-ex and rops-ex

- P8L21, what does the “RO core region of 35 km” mean?
- P10L14, alternative
- P19L4, CDACC→ CDAAC