

Replies to Reviewer 2

Authors thank the Reviewer for the constructive comments and suggestions. We believe that the revised paper is more clear and concise.

Please note that authors' replies are in blue.

The authors presented the validation for a new temperature product for the FORMOSAT-3/COSMIC satellite constellation, which measure with the well known radio occultation method. This product gives temperatures from the surface up to 0.2 hPa. This product is reliable only above the tropopause, because relative humidity is not included in the inversion.

They compare this new product with independent satellite based measurement (SABER/MLS), ground based measurements (radiosondes Taipei), and with three globally assimilated datasets (NCEP/NCAR, ECMWF ERA-interim, UKMO). The final conclusion is a high quality of the new dataset from the tropopause up to 1hPa, about 50 km.

This is a necessary paper for a new product, validation is essential for all kind of remote sensing data, especially from satellites. The paper is straightforward written and supports the overall conclusion.

Authors thank the Reviewer for highlighting the positive points.

My main concern is the additional conclusion, that this 'new dataset extends' the already available 'wetPrf' data product up to -50km. For this statement it is necessary, that the wetPrf and the atmPrf match in the overlapping region, i.e. from the tropopause up to 30km. I suggest to add this straightforward comparisons to the paper, in a way similar to the comparison with SABER and MLS. It is an important information, if this dataset can be really used as an extension of the 'wetPrf', not only in a statistical way, but even for individual profiles.

Authors thank the Reviewer for this suggestion. It has been incorporated in the revised version. The comparisons show that between 200 and 10 hPa, the differences between atmPrf and wetPrf profiles are near zero with standard deviations less than 1 K.

Detailed comments:

p 6188, l. 19-20:

'...there is a 20 km extension of reliable data in the middle atmosphere.' Extension of what? From later in the paper, it is clear your mean the extension of the temperatures of the 'wetPrf'. Please add here.

We mean 'extension of reliable data' as stated. As the wetPrf and atmPrf are different data products retrieved using different procedures, it would not be correct to write it as 20 km extension of wetPrf data. Hence, we have not modified the statement.

p. 6191, l. 15

'are interpolated from 10 to 60km at 0.1 km altitude spacing and 0.05 (in log scale) pressure spacing.' Please add the vertical resolution of the original profiles for information here. Also add the number of COSMIC measurement, that are available in the used time period.

The vertical resolution of the profiles is ~1 km and the total number of COSMIC measurements used in the study are more than 4,00,000.

Section 3: Here your conclusion for the altitudes above 1 hPa is not fully clear. The temperature bias of SABER in the 40-60 km region is reported as 1-3 K. The difference of COSMIC to SABER above 1 hPa is up to 10 K. This is in contrast to the last sentence about SABER: "Interestingly, these biases and the systematic pattern in the median differences of COSMIC and SABER temperatures observed in the present study are very similar." This has to be restricted to altitudes below 1hPa. For higher altitudes, I see clear indication from the SABER data, that the COSMIC product has a problem. Also the last sentence of this section has to be changed accordingly.

Authors agree with the Reviewer and the sentences (all occurrences) are modified as suggested.

p 6202, l. 12.

"This validation study shows that this dataset is of great quality, provides unprecedentedly large number of observations spread uniformly all over the globe and can be used for various investigations of the middle atmosphere." This is your final conclusion, so I suggested to move this sentence near the end.

Done

p 6203, l. 6

"The importance of these comparisons arises from the facts that SABER and MLS temperatures are from limb radiance measurements and the reanalysis outputs are semi-empirical." I simply do not understand, what you want to say with this sentence. The comparisons are important because a new product needs to be validated. Please clarify (or skip the sentence).

Authors want to emphasize the fact that the atmPrf data are from GPS RO measurements and other datasets are from completely different and independent methods. In spite of the difference in methods the comparisons show clear consistency. The sentence is clarified by adding the phrase 'while COSMIC data are from GPS RO measurements'.

When the mentioned points are addressed, I suggest to publish this paper in AMT.

Authors thank the Reviewer for the positive suggestion for publication.