Comment on amt-2021-241

Anonymous Referee #1

Referee comment on "An assessment of reprocessed GPS/MET observations spanning 1995–1997" by Anthony J. Mannucci et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-241-RC1, 2021

General comment:

The paper addresses an analysis of reprocessed GPS/MET data using a single frequency retrieval technique which is compared to the dual frequency processing product of CDAAC 2007 and the MERRA-2 analysis. With this new and partly not overlapping dataset they can extend the CDAAC 2007dataset and hence can provide more (RO) measurement data for climate trend analysis and climate model validation in a time where globally even distributed measurement data is sparse.

The paper is structured in a good way, the title clearly reflects the contents of the paper, and the scientific methods and assumptions are valid and clearly outlined. The results are sufficient to support the interpretations and conclusions. Some minor questions, comments and typos I will provide in the specific comments.

Specific comments:

- Section 2 page 4 line 121: I would change "... and underwent reprocessing in 2007." to "and underwent **a first** reprocessing in 2007." since there were more than this reprocessing in the last years.

- Section 2.1, page 5 line 143/144: I would add the cite to Liu et al. 2020 https://doi.org/10.3390/rs12213637 ("New Higher-Order Correction of GNSS RO

Bending Angles Accounting for Ionospheric Asymmetry: Evaluation of Performance and Added Value") on the bi-local higher-order RIE here and also in Section 4.1 page 15 line 466.

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Section 2.1 page 6 last paragraph: Which orbit/orbit processing software did you use? are there any updates to the CDAAC 2007 processing? Could you add a short sentence to specify this in your paper?

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Section 2.1 page 7 line 216ff: Could you please explain here a little bit more detailed what you mean by this sub-interval processing. What I think I understand from the following paragraphs and Figure 2 you're doing this on each "ray" for the 1 Hz pseudo-range data and then interpolating this to the 50 Hz CA measurements. But I'm not sure that I've understand that correctly.

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Section 2.1 page 8 line 233: How do you extrapolate below 15 km? constant, linear, ...?

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Section 2.1 page 8 line 254/255: The sentence "The altitude range for the fits in 15-60 km, or whatever the upper altitude of the occultation happens to be." is finishing without being finished ...

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Section 2.1 page 8/9 line 258 - 260: I think these two sentences can be removed since in the next paragraph you're telling the same only in more detail.

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Section 2.1 page 9 line 275: typo: "...AS **in** on." -> "... AS **is** on."

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Section 3 page 11 line 331f: "Other climate-related work that ...": please add a cite which work you mean.

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Section 3 page 12 360ff and Figure 6: To compare the CDAAC AS on AS off data with the new JPL data it would be good to separate the JPL data according to AS on and AS off too, although there is no difference in the processing in the JPL case.

- Section 3 page 12 line 371: typo: remove the "**.**" after 30 km.

- Section 4 page 13 discussion on Figure 7 lines 406ff: The bias of the 12 km level is larger at higher (shown) latitudes (JPL dataset but also both CDAAC datasets). This could be a problem of the MERRA-2 analysis there. The approximate height of the mid-latitude tropopause should be there. Could these biases at this height level be related to the mid-latitude tropopause? You only mention the tropopause with respect to the lower latitudes and the tropical tropopause. Please discuss this. The 17 km level shows an opposite effect than the 15 km level for the JPL data. This could indicate that there is a possible mislocation of the tropopause.

- Section 5 page 16 line 503 typo/auto-correction error: "...radio **location** ..." -> "radio **occultation**"

- Figure 4, Figure 5, and Figure 6: no x unit.

- Figure 7: caption: you could interchange AS-on and AS-off in the caption since then it corresponds to the panel order.