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Comment on angeo-2022-25

Anonymous Referee #1

Referee comment on "A comparison of Jason-2 plasmasphere electron content measurements to ground-based measurements" by Andrew J. Mazzella Jr. and Endawoke Yizengaw, Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2022-25-RC1, 2022

The article "A comparison of Jason-2 plasmasphere electron content measurements to ground-based measurements" presents a study on techniques for isolating the plasmaspheric electron content by using space and ground GPS receivers, when suitable observing geometries are achieved. It takes advantage of several stations deployed over the African continent and compare this approach with earlier studies, by analysing a common day, 24 July 2011.

The text provides all details and references for clearly understand all assumptions and data processing steps. The figures illustrate the results and are useful to understand the method.

I found particularly pedagogical the discussion on the STEC data distribution, when considering measuring noise and also the discussions on geometries for data selections.

This article is worth for publication in Annales Geophysicae.

I suggest few minor corrections or manuscript improvements that the authors might consider, in order to improve the clarity of their work.

Page 3, line 22: could you provide a reference defining the "evil twin" problem?

Page 5, Figure 2: I suggest to explicitly state also in the caption that the depicted geometry represents the maximum latitude for the orbits of both Jason 2 (66°) and GPS

(55°). To improve figure readability I suggest to plot a dot at the position of each satellite. The geographic grid could also be plot more lightly, e.g. gray, to make the geometries between satellites more outstanding.

It is also worth stating in the caption of Figure 2, that the circles are plotted at every integer value of L.

Page 6, Figure 3; Page 9, Figure 5; Page 14, Figure 9: please add in the caption or on the figure axes that the units are TECU.

Figure 3: I suggest to explicitly indicate in the graph titles that the data shown are from the polar regions only.

Page 8, line 21, and page 17, line 26: note that the Heise et al. work cited from the Earth Observation with CHAMP has been published in 2005. Another article based on the same algorithm was indeed published in 2002: Heise, S., N. Jakowski, A. Wehrenpfennig, C. Reigber, and H. Lühr (2002), Sounding of the topside ionosphere/plasmasphere based on GPS measurements from CHAMP: Initial results, Geophys. Res. Lett., 29(14), 1699, doi:10.1029/2002GL014738.

Page 9, line 12 and Figure 5: I think that it could be useful to explicitly indicate if the formula used to compute LT is LT=UT+longitude/15, with 0 <= longitude <360. With the formula, it is more understandable that the LT varies between 0 an 48. I think it is important to make it clear for the reader that on the figure data at different UT can have the same LT, because Jason 2 satellite was making 12.8 complete orbits during 24 hours, with a very similar local time of the ascending node.

Page 10, figure 6: please indicate if the green dot isolines are magnetic latitudes, from which model they have been computed and for which altitude they are displayed.

Page 11, line 4: in this sentence the “magnetic local times” are indicated, while Figure 5 was showing “LT”. To avoid confusion, I suggest to make it explicit that the two different local times have been considered.

Figure 7: to improve clarity, I suggest to make a visual difference (e.g. a dashed line or a different colour) between PIM with boundary at 1000 km and PIM starting from 1346 km and indicate this visual difference in the legend on top of the figure.

How the error bars have been computed for this figure?

Page 13, line 20 and Figure 8: please add the PRN number of the common GPS satellite shown in this example.