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Interactive comment on "Observations of precipitation energies during different types of pulsating aurora" *by* Fasil Tesema et al.

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We thank the referee for evaluating the manuscript and forward constructive comments. We include corrections and suggestion made by the reviewer by adding texts, references and modifying figures. Point by point responses to the reviewer comments are listed below.

Specific comments

1. The difference between PPA and PA

- In lines 132-133, it is described that PPA has a pulsation nature and PA does not. It seems inconsistent with the description that both PA and PPA have steady emission structures with pulsations in lines 81-83.

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Discussion paper

The main difference between the two types is the spatial extent of the pulsation, PPA has stable structure and pulsating over a large area but PA has a limited area pulsation. The patch outlines/shapes are stable over several pulsations for PPA, unlike APA, for which the structures are too transient to be tracked. To describe this difference we added a text (line 134)

2. The division of PsAs into the three sub-categories

- PA, PPA and APA are often alternately observed in the EISCAT FOV during a short period. How fine are you classifying them? Is the categorization process quantitative to eliminate arbitrariness?

Classifying PsA is entirely based on visual inspection of keograms and whenever we find it difficult based on keograms we flip through the ASC images to make the classification more reliable. However, the time resolution of EISCAT measurement we use here is 1 minute, so any transient structures less than this time cannot be discussed. We include data for PsA types which is dominant for at least 10 minutes and based on dominating over other type of aurora.

- The auroras classified into PA in Figure 2 have an arc-like shape not patch shape. I checked 557.7-nm all-sky images installed in Tromsø. Especially, the aurora indicated by the blue arrow in Figure 2 has vorticities. Isn't there a possibility that they are discrete auroras or arc-type diffuse aurora not patchy auroras?

We probably included some transient structures in the data, however, EISCAT data time resolution we used is 1 minute, such transient structures cannot be captured. For further reference we add movies of PsA types of Figure 2. In addition, a patch can be an elongated one, so an arc like diffuse aurora does not change the precipitation as much as the discrete aurora does.

3. The definition of PsA thickness

- In line 197, the thickness of PsA is mentioned. What is the definition of thickness? Is

it the full width at half maximum or anything else?

Yes, it is full width at half maximum and text added to clarify it (line 199).

4. The meridional angle in the riogram

- I suggest that the vertical axis of the bottom panel in Figure 4 should be converted to the geographic latitude from the meridional angle to make it easier to compare with top two keograms.

Vertical axis labels changed.

5. The KAIRA cosmic noise absorption

- In lines 228-229, it is described that “The maximum CNA is observed in the late MLT period (after 5MLT)”, but the maximum CNA during APA is observed in before 2 MLT and that during PPA is observed before 4 MLT.

Corrected (line 230): “Most of the high CNA values are observed during the late MLT period (after 3 MLT)”

6. The MLT distribution of electron densities during different types of PsA - In lines265-266,it is described that“In the late MLT sector (after 5MLT),PPA tends to be most common with higher electron density at a lower altitude (see Figure 6).”, but it seems that PA is also common until 7 MLT in Figure 6.

Corrected (line 267): “In the late MLT sector (after 5 MLT), PPA and PA are more common with higher electron density at a lower altitude (see Figure 6)”

Technical corrections

1. line 2, “few” should be “a few”

2. line 23, “the” should be “a”

3. liens 27-28, the sentence starting with “In general ...” needs a reference.

4. line 29, the sentence starting with “The auroras are ...” is incomplete and needs to be revised.

5. lien 30: “PsA” should be “PsAs”

6. line 73: “region” should be “regions”

7. line 106: “ASC” should be “ASCs”

8. line 119: “region” should be “regions”

9. line 212: “Ne” should be “log10(Ne)”

10. lines 221, 233: The unit symbols should be in roman type

11. line 260: “D3” should be “D”?

12. Figure 4: The date should be specified.

All the above 12 points are corrected as suggested.

13. Figure 5: The color bar should be shown. It is shown below the x axes labels of the last two panels.

Please also note the supplement to this comment:
https://angeo.copernicus.org/preprints/angeo-2020-43/angeo-2020-43-AC1-supplement.zip

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