Ann. Geophys. Discuss.,
https://doi.org/10.5194/angeo-2020-43-AC2, 2020

Annales Geophysicae Discussions

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

Fasil Tesema et al.

fasil.tesema@unis.no

Received and published: 16 September 2020

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

Major comments:

1.The FoV of EISCAT is pretty small compared to ASCs. And PPA and APA are sometimes hard to be distinguished from keogram and ewograms. For example, the first shading area in the ewogram of Figure 2 seems like a mixture of PPA and APA. How reliable is your categorization process? It would be helpful if a few movies of ASC images with FoVs of EISCAT are provided.

All the classification is based on EISCAT-FOV location in ASC images, and yes it is quite small but the pointing direction is well known and patchy features are typically large. The better approach often was flipping through all ASC images and selecting the dominant one over EISCAT. Movies for Figure 2 is provided as an example (supplement). As the sub-classification has been done twice (once at the beginning of the project and once when finalizing the analysis), we are confident on achieving a sufficient accuracy.

2.The red shading area in the keogram of Figure 2, the auroral structure in the EISCAT FoV seems to be more like auroral rays or streamers to me. Though there are pulsating aurora at lower latitudes. Is it possible some of your events are discrete auroras other than pulsating auroras?

We shaded the whole area on Figure 2,3 and 4, to show the different types of PsA over the entire ASC FOV and we mainly use the EISCAT data when a dominant PsA type is observed over EISCAT and stayed for few minutes (>10 minutes) and based on dominating over other type of aurora.

3.PPA, APA and PA may be alternately presented in the EISCAT FoV in a short time period. How fine are you classifying them?

We use visual inspection as the main way to classify them and exclude durations when we are not sure of the types. We include the dominant PsA types which persists a relatively longer period (> 10 minutes) (text added on line 136)

4.What is the beam size of KAIRA around the FoV of EISCAT? It's better to present FoVs of KAIRA beams in Figure 1 as well. Is it possible there are different types of pulsating aurora in the beam?

The KAIRA data used here is based on the riometric imaging where the images do not consist of individual beams any longer. Yes, the KAIRA spatial resolution 24km at 90 km altitude (added on line 149) is relatively large and might also include different

types of PsA. However, we used CNA values over EISCAT FOV corresponding to the dominant PsA types to discuss the absorption differences displayed on Figure 7.

Minor comments:

1.Lines 81-83: The definition of PA and PPA seems the same to me here and is inconsistent with lines 132-133.

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.Line 128: ewogram – from which latitude is the ewogram constructed? Please clarify.

Corrected (line 129): "Types of PsA are identified using keograms and ewograms generated at the location of the ASC, as described by . . . "

3.Figure 4: It's better to change the vertical axis into Glat, so it's easy for readers to compare the riogram with keograms

Vertical axis lable corrected.

Interactive comment on Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2020-43, 2020.