

Interactive comment on “Surveying pulsating auroras” by Eric Grono and Eric Donovan

Anonymous Referee #2

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This paper describes a large survey of the occurrence of 3 different types of pulsating aurora. The latitudes and local times of the pulsating events are mapped into the equatorial plane using a magnetic field model. This is a valuable addition to the scientific literature and will help to constrain theories for the formation of pulsating aurora and patchy aurora. In general the paper is well written, but there are some parts which are more difficult to follow than they could be.

I recommend that this paper is published in Annales Geophysicae, but have some questions and suggestions for improvements which I have listed below. The line numbers given here refer to the corrected manuscript, "angeo-2019-129-AC1-supplement".

Abstract

Line 4-5: This sentence seems to suggest that pulsating aurora is dominated by the amorphous type at all times (early morning and pre-midnight), without explicitly saying

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that. Perhaps more information on the other types could be added to make the meaning clearer and easier to interpret?

Could you add a comment on the relevance of the locations to which the different pulsating aurora types map? Does the location imply something about the source and/or generation mechanism? Maybe refer to the proton aurora here?

1. Introduction

Line 60: The sentence starting "Pulsating aurora is..." could be worded more clearly. How about something like "Pulsating aurora is a widespread type of aurora, but we do not yet understand its subcategories. These subcategories could provide valuable information about the state of the magnetosphere."

2. Data and methodology

Line 84: "would also have" should be "also had" or "also has", or change the "was not" earlier in the sentence.

You state that PPA and PA create pathlines in the keograms. Can you be sure that pathlines created by other features such as arcs could not be mistaken for patches?

Figure 2: What are the features appearing in the RANK keogram north of 72 degrees, that appear to be pulsating? Perhaps it would be helpful to also show a keogram with no pulsating aurora, to contrast with Figure 2?

3. Results

Line 135: "Panel 3a" - I think this should be Panel 4a.

Line 136: "nearly as farther" should be "nearly as far".

Line 137: "panel 3b" should be 4b.

Line 138: The local maximum in the APA MLT histogram seems like it could be a single isolated MLT bin with a larger number of events, but there is actually a slight dip for this

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bin in the PA and PPA histograms. Could it be that some PA and PPA was mis-labeled as APA at this time?

In general you don't consider the possibility, likelihood or effect of mis-identification when discussing your results. Is there any way you could quantitatively estimate uncertainties on your occurrence percentages?

4. Discussion and conclusions

Line 149: GSM is used here without the acronym being defined. Although this is a common acronym, it is worth defining for clarity. Similarly for GSE later.

Line 147: I realise explaining the method used is quite complicated, but this paragraph and the following one are difficult to follow. I think you are describing the exact process you use in your computer code, but probably the terminology could be reduced in the paper and the explanation simplified. Instead of using the terms "total bins" and "event bins", can you just say the 1 RE x 1 RE bins shown in Figure 5 count the number of events (i.e. rectangles on the keograms) that intersect that bin, when mapped using T89? Is this correct? You could include the detail that the events are mapped at a 1-minute resolution to determine intersection with the equatorial bins.

Line 158: I think one or two words are missing here around "passed". The sentence doesn't seem complete.

Line 183: "spacecraft" is plural, it doesn't need an s on the end.

Line 185: "This agrees with our observations." - Could you be more specific here? You are not measuring the proton aurora, right?

Line 194 and 195: Is "develop" the right word here? Perhaps "extends" on line 194 and "exist" or "is found" on line 195? To me "develop" implies a location of initial formation, which I don't think is what you mean.

Line 203: Do you mean Figure 4a rather than 3a?

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