

Ann. Geophys. Discuss., referee comment RC1  
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## Comment on angeo-2021-66

Anonymous Referee #1

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Referee comment on "Are drivers of northern lights in the ionosphere?" by Osuke Saka,  
Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2021-66-RC1>, 2022

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The manuscript by Osuke Saka on "Are drivers of northern lights in the ionosphere?" is about origin of auroral spirals. This question is still under the debate and, therefore, this topic is actual and interesting. The author presents a model for explanation of the auroral spirals of different spatial scales. An observation is also presented to support the model. I, however, find the manuscript quite unclear and requiring more work and explanation before it can be published in Annales Geophysicae. Please find below more detailed comments:

lines 15-16 and introduction, Could you please provide references that field-line mapping results in opposing spiral rotations of small and large scale auroras.

lines 18-19, If I understand correctly the model, the driver is still related to a dipolarization in the magnetosphere.

lines 20-21, 40-42, 65-67, 69-72, These sentences are unclear.

Introduction, could you please provide references on the classification of auroral spirals from 1 km to 100s of km size?

line 74, What are "the dynamical trajectories"? Which total energy do you mean?

lines 75-78, Why perpendicular velocities will be lost?

lines 102-104, Which formula is used to calculate electric fields and electrostatic potential?

line 110, Which formula is used to calculate plot in Figure 2?

line 120-123, please provide references for the numbers.

Figure 3, It is unclear how observations in Figure 3 are related to auroral spirals. More explanation is necessary.

line 135, it would be good to show the magnetic field observations from the geosynchronous orbit.

lines 137-138, I do not see motion of shear layers in this Figure.

lines 146-149, this statement contradict to the statement in lines 73-75.

lines 151-152, please provide a reference about the width of the flow channels.

line 158, the plot in Figure 3 is has also source, it should be mentioned here.