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Interactive comment on "Fragmented Aurora-like Emissions (FAEs) as a new type of aurora-like phenomenon" *by* Joshua Dreyer et al.

Anonymous Referee #1

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General Comments

The paper is well-written and organized. It presents interesting observations of short living small scale aurora-like structures of high scientific interest. The presented first summary for characteristic features of the discussed Fragmented Aurora-like Emissions is important for future follow-up studies. Instrumentation, observations and methods are well explained. The paper presents images and spectral data for FAEs strongly supporting the author's hypothesis for a low energy generation mechanism with an upper energy limit between ∼8-11 eV which excludes a formation caused by precipitating electrons. The authors clearly state that the exact generation mechanism remains unclear. Their finding that FAEs are associated with elevated electron temperatures points to Farley-Buneman instabilities as a potential energy source and sets an impor-

tant base for follow-up studies. I have only a few minor comments for the authors to consider a few minor additions prior publication.

Specific comments

Major comments: No major comments.

Minor comments:

- It would be helpful to add a video showing an example for a category 2 FAE. - L.29–30: I recommend to add references for the following papers all presenting strong arguments against the hypothesis that precipitating electrons are responsible for picket fence structures below the purple arc of STEVE (Nishimura et al., 2019). Paper 1: Gillies D. M. et al. (2019). First Observations From the TREx Spectrograph: The Optical Spectrum of STEVE and the Picket Fence Phenomena, Geophysical Research Letters, 46 (13), 7207–7213. Paper 2: Mende S. B. & Turner C. (2019). Color Ratios of Subauroral (STEVE) Arcs, Journal of Geophysical Research: Space Physics, 124 (7), 5945–5955. Paper 3: Mende S. B., et al. (2019). Subauroral Green STEVE Arcs: Evidence for Low-Energy Excitation, Geophysical Research Letters, 46 (24), 14256–14262. - L.47–48: The authors mention that similar structures (FAEs) have been sighted on Svalbard at other days. I recommend to mention on how many days FAEs have been identified. - L. 53–56: [. . .The images were taken using an exposure time of 4 s and an ISO of 16000 at a cadence of 11 to 12 s, with a mean interval length of 11.8 s. This variance is due to variations of the read-out time to the attached computer, with the camera exposure time set to 10 s...] Contradicting exposure times. What is correct, 4 s or 10 s? Please clarify. - Figure 4: This figure shows a mark for the zenith. Is this the local magnetic zenith? Please clarify. - Figure 6 and 7: [. . .Data points with errors > 50% of the values were removed...] What are the errors for the shown data points? Are they close to 50% or significantly less? Please clarify.

Technical corrections:

None

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