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Spatiotemporal development of pulsating auroral patch associated with discrete chorus elements: Arase and PWING observations

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A one-to-one correspondence between in-situ chorus elements near the equator and rapid luminosity variations of a pulsating auroral patch on the conjugate ground site (Gakona, Alaska) is identified from coordinated observations by the Arase satellite[1] and a ground observation network of PWING (study of dynamical variation of Particles and Waves in the INner magnetosphere using Ground-based network observations)[2]. The spatiotemporal development of the pulsating auroral patch was captured with a 100-Hz sampling imager. The temporal variations of a pulsating auroral patch are associated with not only a train of chorus elements near the equator, but also possibly subpacket structures of the chorus elements with tens of milliseconds. Here we found that the luminosity variations in the well-known few Hz range were observed only at the edge part of the auroral patch in this event, because they were caused by the spatial expansion and contraction of the auroral patch from the center location. The spatial size at the ionosphere (altitude of 110 km) of the auroral patch was approximately 15-km long at the short axis in the magnetic north-south direction and 70-km long at the long axis in the east-west direction of an ellipse. The spatial scale projecting the ionospheric auroral patch to the equatorial plane of the magnetosphere was roughly a circle of 900 km in diameter, which is comparable with a small spatial scale of relativistic electron microbursts. These observations suggest that the pulsating auroral patch associated with chorus elements reflects not only a temporal variation of wave–particle interaction in the magnetosphere, but also a transverse spatial profile (across the geomagnetic field line) of wave–particle interaction. In this presentation, we will present the spatiotemporal variation of the pulsating auroral patch associated with chorus elements in detail.

1. Y. Miyoshi et al., “Geospace exploration project ERG,” *Earth, Planets and Space*, 70: 101, 2018, https://doi.org/10.1186/s40623-018-0862-0.

2. K. Shiokawa et al., “Ground-based instruments of the PWING project to investigate dynamics of the inner magnetosphere at subauroral latitudes as a part of the ERG-ground coordinated observation network,” *Earth, Planets and Space*, 69: 160, 2017, https://doi.org/10.1186/s40623-017-0745-9.