Long-lasting high correlation between pulsating aurora and chorus

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Pulsating Aurora (PsA), which consists of diffuse patches/arcs blinking with various periodicities ranging from a few to a few tens of second, is known to occur very frequently in a local time sector from the magnetic midnight to dawn. It has been suggested that the luminosity variation of PsA is controlled by the intensity modulation of chorus wave often appearing near the equatorial plane of the magnetosphere. Chorus waves typically occur in two distinct frequency ranges, lower-frequency and upper-frequency bands, respectively below and above half the gyro frequency. In particular, lower-band chorus (LBC) waves can resonate with PsA electrons whose energy typically ranges from a few to a few tens keV, which is one of the reasons why the modulation of LBC has been considered as an agent causing luminosity variation of PsA.

However, most of previous studies analyzed intervals whose duration is 5 min or less; thus, the direct association between PsA and chorus has not yet fully confirmed. In this study, we perform a continuous cross correlation analysis between the chorus intensity observed by the Arase satellite and the luminosity of PsA captured by an all-sky imager (ASI) in Apatity(Kola Peninsula, Russia) during 1.0 h interval of simultaneous observations from 0000 to 0100 UT on March 31, 2017. Then, we tracked the motion of the high correlation region within the field-of-view. The result showed that the high correlation region moved in tandem with the magnetic footprint of the satellite estimated by the empirical model which strongly confirmed the modulation of chorus dominated the temporal variation of PsA. However, During the interval, the motion of the high correlation region showed sudden jumps in both the latitudinal and longitudinal directions. We will discuss the reasons for such abrupt jumps in terms of motion of the satellite through discrete spatial structure of plasma in the region of wave particle interaction.