

Comparison of pulsating aurora with and without internal modulation: simultaneous observations with ARASE

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Pulsating aurora (PsA) is one of the major types of aurora often seen in the lower latitude part of the auroral region in the morning side. PsA is known to have two distinct periodicities. One is the main pulsation whose period ranges from a few to a few tens of seconds. The other is so-called internal modulation which is ~ 3 Hz luminosity modulation during the ON phase of main pulsation. Previous studies indicated that $\sim 50\%$ of PsA are accompanied by the internal modulation (i.e., internal modulation is often seen, but not always observed during PsA). Recent coordinated ground/satellite observations of PsA suggested that these two periodicities are closely associated with the intensity modulation of whistler mode chorus waves in the morning side magnetosphere. In particular, the association between the main pulsation and bursts of chorus was confirmed by many examples. However, it is still under debate which characteristics of chorus waves control the existence/absence of internal modulation.

During the first coordinated campaign observations of PsA with the ARASE/ERG satellite in March 2017, we obtained two good case examples of simultaneous observations of PsA and chorus by the all-sky imagers (ASIs) and ARASE. During one of the cases in Scandinavia on March 29 (Case A), the correspondence between the periodicities of chorus burst and main pulsation was extremely good. However, it was difficult to identify signatures of discrete chorus elements and internal modulation. During the other case in Alaska on March 30 (Case B), on the other hand, good correlation was seen between chorus elements and internal modulations. These results imply a relationship between the existence of discrete chorus elements and appearance of internal modulation. In the presentation, we discuss what kind of background conditions control the appearance of chorus elements and internal modulation by comparing the two case examples.

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