R006-42
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16:30-16:45

Spatial distribution of pulsating aurora with/without internal modulation

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Pulsating aurora (PsA) is a kind of diffuse aurora which almost always appears in the morning side during the recovery phase of auroral substorm. PsA typically has two distinct temporal variations. One is so-called main pulsation whose period ranges from a few to a few tens of seconds. The other is a few Hz modulation (internal modulation), which is occasionally seen during the ON phase of the main pulsation. Previous studies have suggested that the temporal variation of PsA is characterized by wave-particle interaction between whistler-mode chorus waves and energetic electrons in the magnetosphere. Especially, it has been indicated that there is a one-to-one correspondence between the amplitude variation of chorus waves and the luminosity modulation of PsA. However, there have been no studies which analyzed the spatial distribution of PsA with/without internal modulation, especially the percentage of PsA having internal modulation and its dependence on latitude are still unknown.
To reveal the spatial distribution of PsA with internal modulation, we have performed frequency analyses of multi-scale temporal variations of PsA by using data from high speed optical cameras capable of providing a wide spatial coverage and categorized PsA into ones with/without internal modulation. In this study, we make use of highly sensitive EMCCD cameras, which have been in operation in Sodankyla and Kevo, Finland, Tromsoe, Norway, and Tjautjas, Sweden. All-sky aurora images are taken with a temporal resolution of 0.01 sec. The temporal resolution of these cameras is sufficient to identify the multi-scale temporal variation of PsA. Note that in this study, to make the analysis easily, the images have been down-sampled to 25 Hz.
In the frequency analysis, we have examined all-sky images taken on March 14, 15, and 23, 2018. We detected PsA with/without internal modulation automatically and computed the average frequency of internal modulation from each pixel of the EMCCD cameras. Regardless of latitude, the luminosity of pulsating patches was fluctuating with a periodicity of ~3 Hz. We also computed a percentage of existence of internal modulation and found that the percentage of PsA with internal modulation increases at higher latitudes. These results indicate that the frequency of internal modulation is concentrated around 3 Hz and PsA with internal modulation has the dependence on latitude. In the presentation, we will discuss what factor controls the existence/absence of internal modulation using a TOF simulation in Miyoshi et al. [2010].