Characteristics of periodicity of the dayside pulsating aurora and its response to solar wind obtained by multi-wavelength all-sky cameras at South Pole Station

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We report the event analysis on the characteristics of dayside pulsating aurora obtained with ground-based imagers, and its solar wind response. Pulsating aurora is a diffuse aurora that shows time variation with a period from a few to several tens s. It I usually seen from the midnight to the morning sectors (0-6MLT).Recent studies showed that pulsating aurora is caused cyclotron resonance between chorus waves and electrons near the magnetospheric equator [e.g., Kasahara et al., 2018]. Electrostatic electron cyclotron harmonics (ECH) play additional role to cause the pulsating aurora. Considering the dayside pulsating aurora, changes of solar wind dynamic pressure would affect the resonance conditions in the dayside magnetosphere [Engebretson et al., 1994, Vorobjev et al., 1999, Motoba et al., 2017]. However, it is difficult to observe dayside pulsating aurora because of sunlit conditions, and detailed characteristics, and generation mechanisms of pulsating aurora are not understood well.
It is important to examine the similarity and discrepancy between dayside pulsating aurora and morning side pulsating aurora, and its solar wind response to understand these issues,We examined the multi-spectral all-sky image data taken at the South Pole Station (geomagnetic latitude 74.4 °) to clarify the characteristics of the dayside pulsating aurora. The South Pole Station is a suitable for dayside auroral observations which provide continuous auroral images for 24 hours from May to August. From the data obtained with a panchromatic Watec all-sky camera (time resolution 0.5 s) and ASI-1 (time resolution 64 s, wavelength 557.7 nm and 630 nm) , we found dayside pulsating auroral events in the two nights of June 24 and 25, 2014. The main pulsation period was in the range of 10-50 s on the both cases on June 24 and 25, which is consistent with previous studies of dayside pulsating aurora, and similar to that seen in the morning-side pulsating aurora. We also found that the pulsating aurora on June 25 moved toward the higher magnetic latitudes greater than 74.5 deg. Compared the pulsating aurora with geomagnetic activity, solar wind dynamic pressure, and auroral intensity ration of 630nm and 557.7 nm emission, we see that the magnetic activities were quiet (AE˜50-100, IMPBz˜0-+6[nT]) on the both cases of June 24 and 25, 557.7 nm aurora was more intense than 630 nm aurora which indicates that the source region is the magnetospheric plasma sheet. Interestingly, the solar wind dynamic pressure increased from P = 1.0 [nPa] (8MLT) to P = 5.5 [nPa] (11MLT) only for the case on June 25. These results suggest that the source region of pulsating aurora in the dayside magnetosphere expanded toward higher latitudes caused by significant enhancement of solar wind dynamic pressure. The expansion of the source region of pulsating aurora is probably related with the minimum B pockets [Tsurutani and Edward, 1977] which is a weak magnetic field region at high-latitudes distorted by strong solar wind dynamic pressure. The increase of chorus wave growth rate may contribute to electron pitch angle scattering in this region.

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