Pulsating aurora in the noon to dusk side during Summer Solstice Storm 2015 based on Syowa and Van Allen Probes observations

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Pulsating aurora (PsA) is known as a quasiperiodic variation of auroral emission with a typical period that ranges from 2-3 s to 30 s [Oguti et al ., 1981; Yamamoto , 1988]. In the recovery phase of a substorm, PsA is commonly observed in the low-latitudinal region of the auroral oval. It is also well-known that PsA is widely distributed between the midnight and dawn sectors [Royrvik and Davis , 1977; Jones et al ., 2011]. Recently, ground-based optical observations in the south pole, which is located close to the high latitude edge of the aurora oval, revealed that PsA often appeared even in the dawn to noon side [Nishimura et al ., 2013]. However, a global distribution of PsA including noon to dusk side and its relation to generation mechanism are still poorly investigated due to difficulty in ground-based optical monitoring during sunlit time.

In this presentation, we report an event study on PsA, which was continuously observed in the magnetic noon to dusk side at Syowa station (69.0°S, 39.6°E), during Summer Solstice Storm 2015. PsA with patchy structures and westward propagations were identified by a panchromatic imager with 1-Hz sampling from 1330 to 1930 MLT on 23 June, 2015. In addition, Van Allen Probes-A (VAP-A) was likely to observe at a inner-edge of the outer radiation belt (L = 5~6) during this period. A apogee of VAP-A was located in the dusk and the ionospheric footprint of VAP-A was moving close to Syowa. The VAP-A observations demonstrated the important plasma features as follows: Enhancement of energetic electrons from a few tens of keV to 1 MeV were observed. Cold plasma density was higher than usual (~20 /cc) despite outside the plasmasphere and fpe/fce ranged from 7 to 9. Whistler mode waves in a quite wide frequency range from 100 Hz to a few kHz including hiss emissions and lower-band chorus were also observed continuously around the apogee.

These observational evidences imply that PsA can be driven by anisotropy of energetic electrons and subsequent excitations of whistler mode waves even in the noon to dusk side, as well as PsA in the post-midnight to dawn side. Pitch angle diffusion coefficients considering spectrum of the observed whistler mode waves is consistent with electron precipitations in a energy range above 20 keV. One more important point is that this PsA event was associated with the major storm (Dst~-200 nT). The storm may lead injections of a large amount of energetic electrons and transportation of the electrons in noon to dusk side.

References

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