Proc. NIPR Symp. Upper Atmos. Phys., **10**, 142–146, 1997

COMPARISON BETWEEN PRENOON AND POSTNOON AURORAS DURING QUIET AND DISTURBED CONDITIONS (EXTENDED ABSTRACT)

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The characteristic of dayside aurora was examined by using aurora TV data obtained at two stations, Godhavn (76.6°), Greenland and Ny-Ålesund (76.0°), Spitzbergen during the period from December 25, 1994 to January 4, 1995. The difference of magnetic local time between Godhavn and Ny-Ålesund is about 5 hours, so the prenoon and postnoon aurora were compared by using the simultaneous data at Godhavn and Ny-Ålesund. The typical dayside aurora event during quiet and disturbed conditions is described and also general characteristic pattern of dayside auroral phenomena is summarized in this paper.

(A) Dayside aurora events during quiet and disturbed periods

Figure 1 illustrates the quiet dayside aurora event on December 27 1994. The upper three panels show all-sky TV data during the period from 0939 to 1030 UT at Ny-Ålesund. The *Kp* index during this interval was 2- and there was no remarkable disturbance in the auroral region. Since the magnetic local time (MLT) at Ny-Ålesund is three hours earlier than universal time (UT), these three panels are the auroral data in the postnoon sector. Although no remarkable auroras are seen in the upper left and middle panels, a weak band aurora is recognized in the upper right panel on the poleward side of Ny-Ålesund. The lower three panels show auroral data at Godhavn during the period from 0940 to 1030 UT. The magnetic local time at Godhavn is two hours later than universal time (UT), so these three panels are auroral data in the prenoon sector. In these data, coronal auroras with ray structure were intermittently observed during this interval. It is noted that most coronal auroras appears at the zenith or the poleward side of Godhavn. This result suggests that the prenoon particle precipitation region (may be cleft regions) shifts to the poleward side during this quiet condition.

Figure 2 illustrates the disturbed dayside aurora event obtained on December 25, 1995. The upper three panels are auroral data obtained at Ny-Ålesund from 0930 to 1029 UT. The *Kp* index during this interval was 3- and a moderate disturbance was seen at Fort Churchill and other auroral stations. The corona type aurora was seen at 0930 in the left panel and bright band aurora appeared after 10 UT as shown in the middle and right panels. The lower three panels show auroral

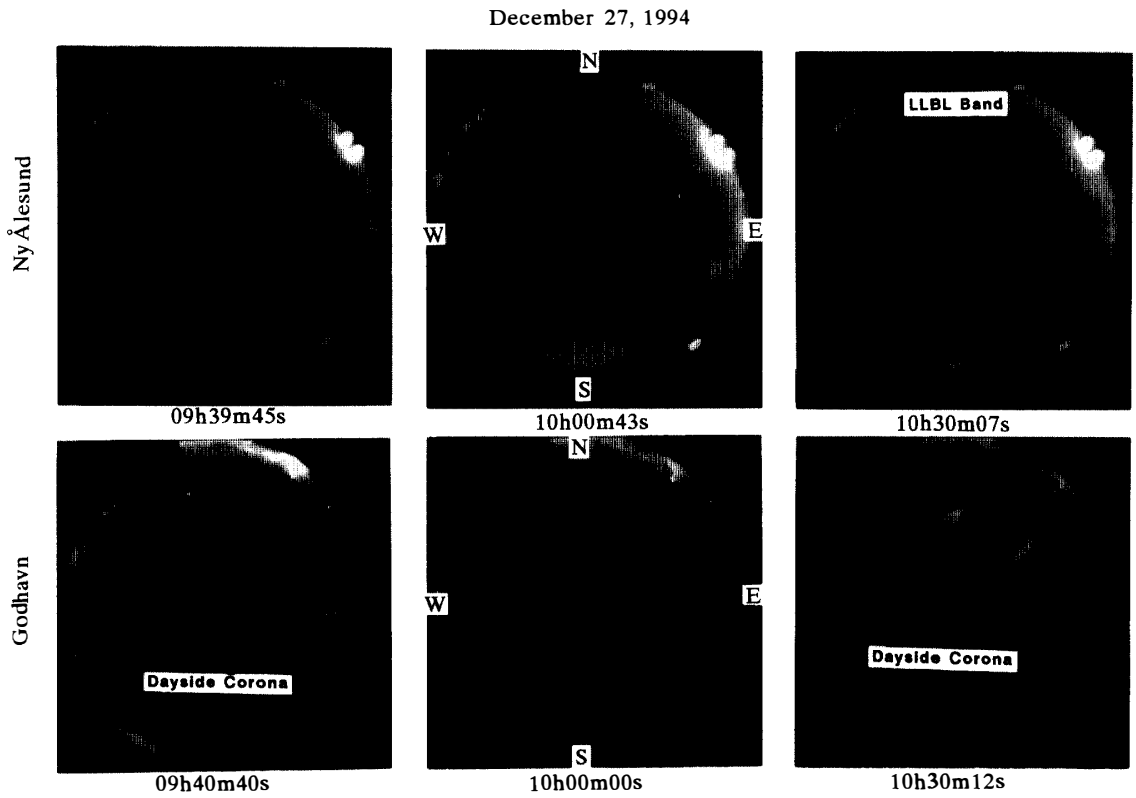

Fig. 1. Dayside aurora event during a quiet period. The upper three auroral data were observed in the postnoon sector at Ny-Ålesund, Spitzbergen. The lower three auroral data were observed in the prenoon sector at Godhavn, Greenland.

data at Godhavn from 0929 to 1030 UT. During this interval, corona auroras were continuously observed at Godhavn. It is noted that these auroras were seen near the zenith or the equatorward side of Godhavn. The precipitation region shifts to the lower latitude side during this disturbed period.

(B) General occurrence pattern of dayside aurora

On the basis of several other cases of dayside and also the dawn and dusk auroral phenomena during the period from December 1994 to January 1995, the appearance region for difference types of dayside auroras (including also night side aurora) are schematically illustrated in Fig. 3. The left panel shows the appearance of dayside auroras during the quiet period. Generally, multiple bright arcs are frequently seen in the dawn and dusk sectors near 72°–75° magnetic latitude (MLAT). These arcs are traditionally called as sun-aligned arcs and their occurrence frequency increases as the magnetic activity becomes low and/or IMF turns to the northward direction. These dawn-dusk arcs are gradually connected to the auroral oval in the dawn and dusk sector at about 70° MLAT (the dynamics of these dawn and dusk arc phenomena will be reported in a separate paper). We compared these arc auroras to the simultaneous particle precipitation data and found that the electron spectrum of arc aurora was similar to that of the low latitude boundary layer electrons as reported by NEWELL and MENG (1992). Therefore, we call this aurora as LLBL arc in Fig. 3. On the other hand, faint arcs are occasionally

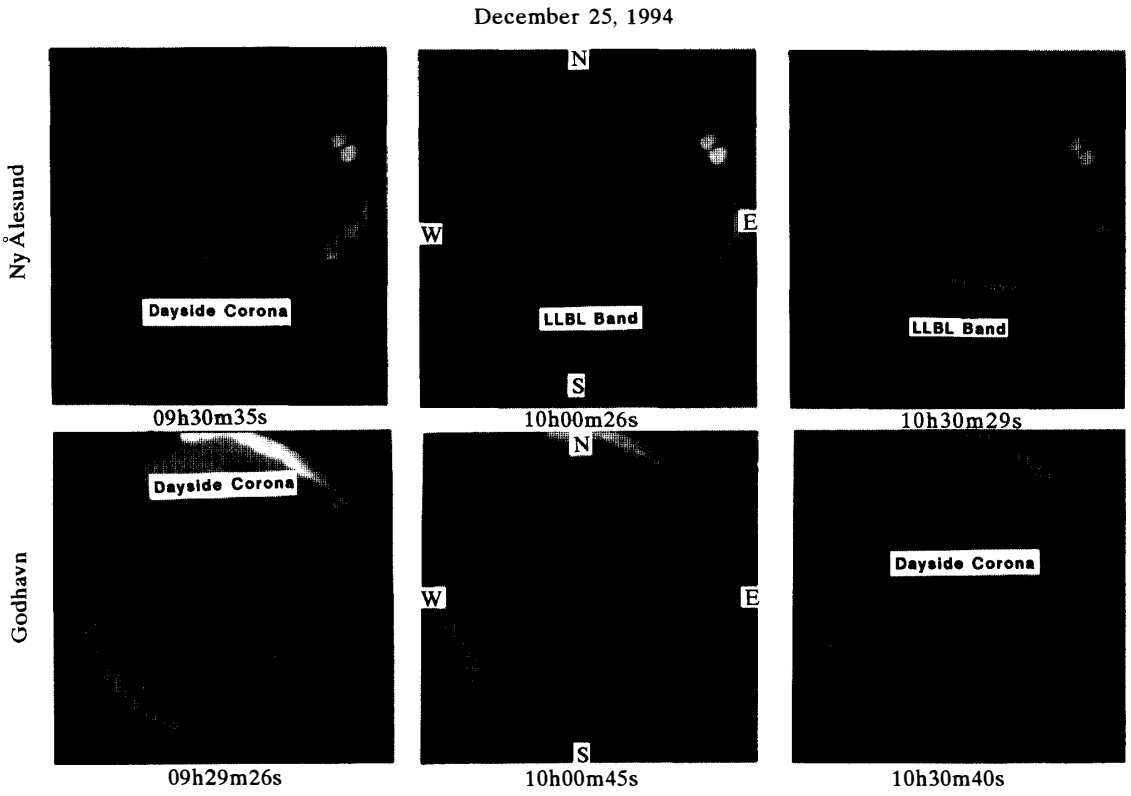

Fig. 2. Dayside aurora event during a disturbed period. The upper three auroral data were observed in the postnoon sector at Ny-Ålesund, Spitzbergen. The lower three auroral data were observed in the prenoon sector at Godhavn, Greenland.

observed on the higher latitude side of Godhavn near the prenoon sector. This arc is very weak and not so active. The electron precipitation spectrum related to this arc seems to be similar to that of plasma mantle electrons, so we named this faint arc as mantle arc.

Near the noon sector, active corona aurora with ray structures appeared instead of the LLBL arc in the dawn sector. The occurrence frequency of this corona aurora increases as the observation point reaches near the noon sector, and we call this arc as dayside corona. The dayside corona is frequently observed in the latitude between 75°–80° MLAT. The dayside corona seems to be confined to the prenoon sector during quiet period and the occurrence frequency increases and also its region expands both to the postnoon and morning sector as the magnetic activity increases. From the simultaneous particle precipitation data, the electron spectrum of dayside corona shows the intermediate characteristics between those of LLBL and plasmasheet electrons.

Bright band auroras are typically seen in the postnoon sector. This aurora seems to be different from the dawn and dusk LLBL arc. This postnoon band aurora is usually observed near 13–15 MLT and it does not extend to the dawn and dusk sectors. It is a noteworthy point of this postnoon aurora that a band aurora appears periodically from the equatorward side. From Ny-Ålesund observations, a band aurora gradually shifts to the zenith from lower latitude region and disappears

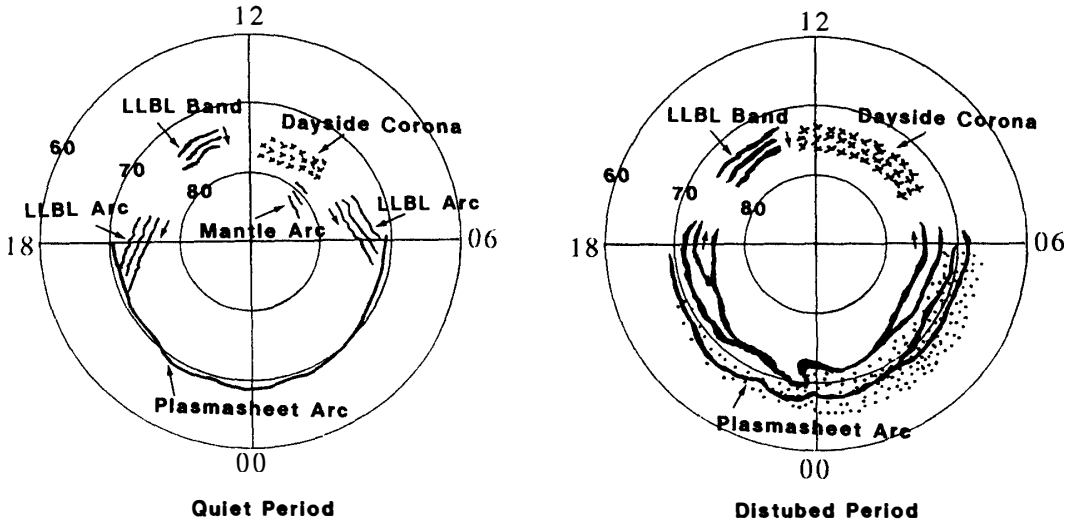

Fig. 3. The general characteristic pattern of dayside aurora during quiet and disturbed period. LLBL arc and mantle arc frequently seen during the quiet period. Dayside corona and LLBL band appeared during the disturbed period.

near the zenith, and after then another new band aurora appears at a lower latitude and shifts to the zenith again. The periodic interval of band auroral appearance is between 50 s and 130 s in our analysis. The periodic interval time obtained here is smaller than the average lifetime of poleward-moving dayside aurora as reported by FASEL *et al.* (1994). The difference of periodic time may be due to the different auroral data set. Namely, they examined the average life time by using auroral data obtained during the period from 1000 to 1345 MLT. On the other hand, we examined auroral data during the period from 1200 to 1500 MLT. We have not yet examined the simultaneous particle data for this postnoon band aurora. However, since the occurrence region is seen near 75° MLAT and its luminosity is high, its source seems to be located in the LLBL and so we call this band aurora as LLBL band.

The right panel in Fig. 3 illustrates the appearance pattern of the dayside auroras during the disturbed period. The occurrence frequency of dawn and dusk LLBL arc and also mantle arc is notably reduced under the disturbed condition. Since LLBL arcs are occasionally mixed with the plasmasheet arcs in the dawn and dusk sectors during the disturbed period, it is difficult to distinguish these two kind of arcs. On the contrary, the activity of dayside corona and LLBL band increases during the disturbed period. The appearance region of dayside corona expands to the dawn sector and also postnoon sector. The luminosity of LLBL band in the postnoon sector increases and the poleward movement becomes more clear in this period.

(C) Conclusions

From the Greenland and Spitzbergen auroral data during December 25, 1994–January 4, 1995, we examined the characteristics of dayside aurora. It is found that several different kind of auroras appear in the dayside region. In particular, there are a variety of different auroras in the prenoon and postnoon sectors. These dif-

ferent auroras must be occurred due to the asymmetry of magnetospheric structures (WEI and LEE, 1993). The source of these auroras were also examined by using simultaneous particle data (MAKITA *et al.*, 1995). From our auroral observations, the source of the dawn, dusk arc and mantle arc were almost identified to LLBL and plasma mantle from the comparison to the characteristic of particle precipitation examined by NEWELL and MENG (1992). However, the origin of the dayside corona remained unidentified from our data set. It is our next objective to compare the fluctuation of interplanetary magnetic field and the occurrence of dayside auroras in detail. From these studies, the relationships between solar wind variations and auroral dynamics in the nighside and dayside sectors will be understood more clearly.

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(Received April 15, 1996; Revised manuscript accepted July 15, 1996)