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TIME LAG OF AURORAL BREAKUP IN CONJUGATE HEMISPHERES (EXTENDED ABSTRACT)

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The most useful method to examine how to connect the geomagnetic field lines, "mapping of geomagnetic field lines", between both hemispheres should be to use conjugate visible auroras. However, there are many problems in observing conjugate visible auroras simultaneously in high latitude on the ground. Because both conjugate observatories are rarely in darkness, with fine weather, and no moon interference at the same time. As a result, high quality visible conjugate auroral data are very limited. For example, we can obtain usable data for only one-two nights per month average over 10 years from the Syowa-Iceland conjugate auroral campaign during the equinox period every September

Using our limited data set of visible conjugate auroras, we found an excellent event observed by all-sky TV camera. The event occurred on September 12-13, 1988 under clear night and no moonlight interference at Syowa Station and Husafell. This event is one of the best example to examine conjugacy of small scale auroral arcs since 1984 when the Syowa-Iceland conjugate campaign started. Isolated auroral arcs were observed over the zenith from the two stations. Therefore, the spatial resolution of auroras is very high and it is easy to compare and identify one to one correspondence for the fine structure of conjugate auroras. Details of our observation and analysis method were reported by SATO and SAEMUNDSSON (1987) and ONO *et al.* (1987).

Figure 1 shows temporal variations of aurora images at conjugate stations in the time interval of 2225:45-2226:30 UT. In this figure, auroral images are shown on a linear scale which is converted from all-sky images. The coordinates of this figure are as follows: top, down, right, and left sides are geomagnetically poleward, equatorward, eastward, and westward, respectively. The centers of these figures at both stations correspond to the same geomagnetic latitude (66.0°) and longitude (68.9°) calculated by the IGRF 1985 model for September 12, 1988. The scale of this figure is 750 km × 750 km at 110 km altitude. It is found from conjugate auroral images at 2225:45 UT that the auroras have very similar shapes at both stations except for the small scale fine structure. Such good conjugate aurora continued for about one minutes from 2224:45 to 2225:45 (not shown in this figure). At 2226:00 UT, new active auroral arcs were enhanced on the west and poleward sides from Syowa, though previous good conjugate auroras still remain in the same position at both stations. After 2226:00 UT, auroras at Syowa began to activate, and many new auroral elements appeared and they moved very fast. The auroral image at 2226:30 UT at Syowa shows that auroral movement was very fast, forming vortex-like shape, and it is difficult to

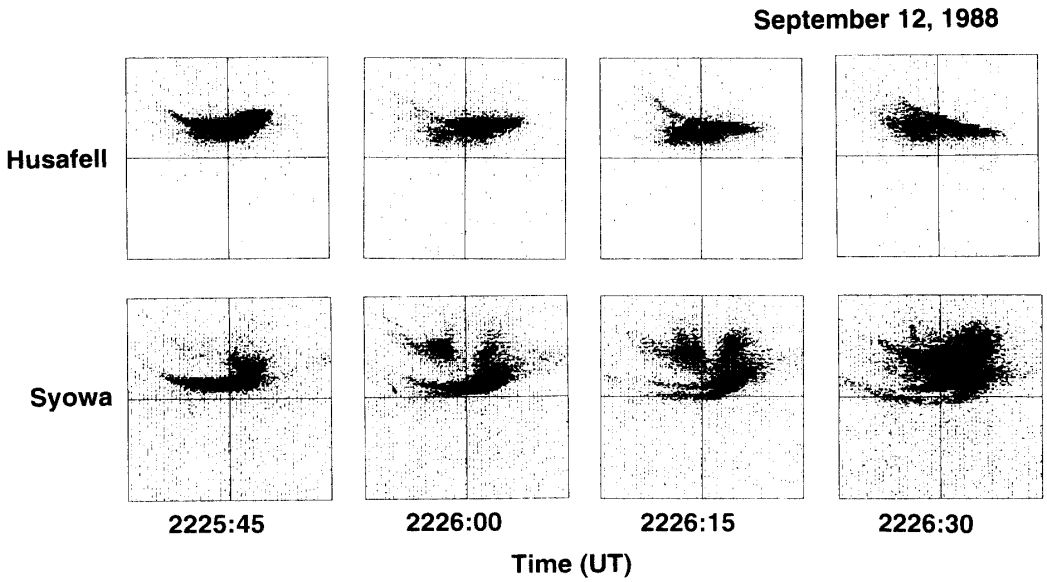

Fig. 1. Linear scale auroral images observed simultaneously at conjugate stations of Husafell in Iceland and Syowa Station in Antarctica. Each auroral picture is reproduced every second by averaging 30 frames of the TV camera.

identify the fine structure of the auroral shape from our one second average display. From these features and original data we can say that auroral breakup started around 2226:20 UT at Syowa. It is very important and interesting that such intense auroral enhancement, *i.e.*, auroral breakup, was not observed at Husafell during this time interval, though rather moderate auroral enhancements were seen. It is also worth noting that the transit time from good conjugate relation to non-conjugacy relation takes less than 30 s from 2225:45 UT to 2226:15 UT. During this transit time interval, the equatorward side aurora at Syowa coincidenced with the aurora at Husafell. Auroral breakup at Husafell occurred at ~2227:25 UT (not shown in this figure). The result suggests that the start time of auroral break-up was different between conjugate hemispheres, and the start time was ~60 s earlier at Syowa than at Husafell.

This event mentioned above is very interesting to examine how conjugate auroras develop and decay, and why the start time of auroral breakup is different between conjugate stations. The evidence for the time lag of auroral breakup in the conjugate hemispheres suggests that the triggering source of auroral breakup is not located near the equatorial plane in the magnetosphere, but it exists in the localized region between the magnetosphere and ionosphere in one hemisphere. In other words, the triggering of auroral breakup is caused by the localized acceleration mechanism of the ionosphere-magnetosphere interaction in either hemisphere.

This example is the best evidence to demonstrate the asymmetrical acceleration of auroral particles between conjugate hemispheres, in our knowlege.

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