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A COMPARATIVE STUDY OF AURORAL MODULATION AND GROUND Pi2 OSCILLATIONS (EXTENDED ABSTRACT)

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A comparative study was carried out to investigate the correlation between periodic drift of auroral patches and ground Pi2 oscillations during the substorm event that occurred at 2239 UT June 16, 1986. The substorm started with auroral break-up in the field-of-view

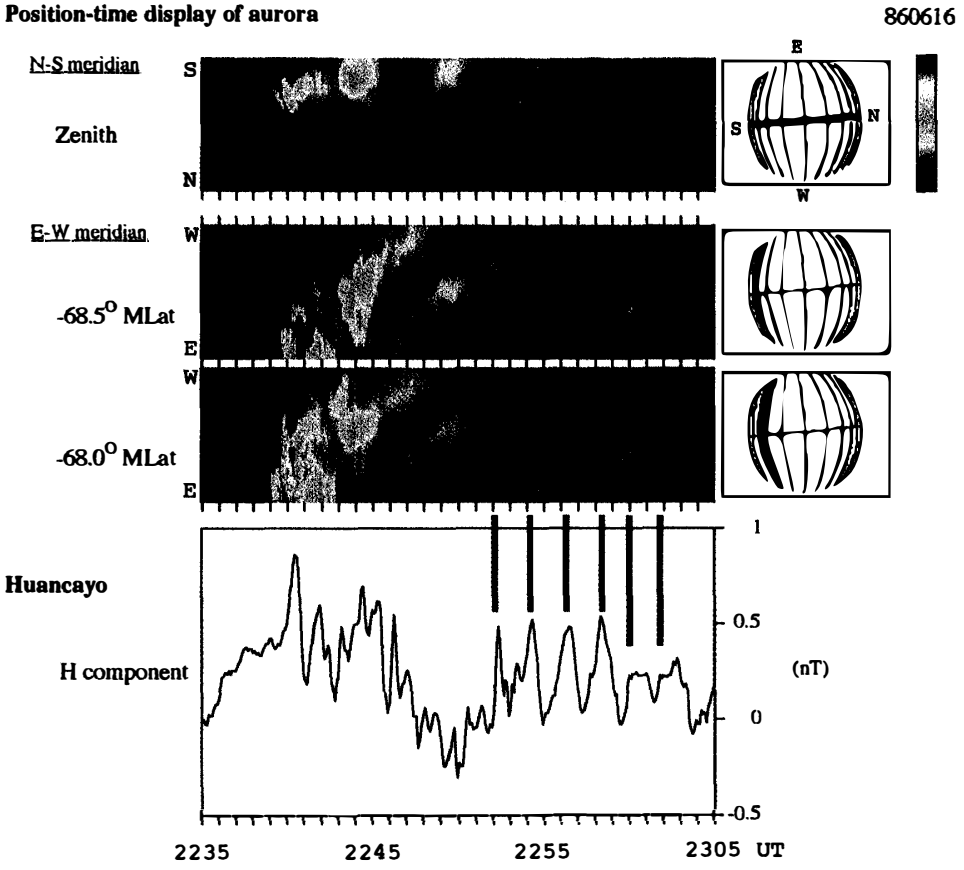

Fig. 1. Position-time display of meridian scan (top panel), of E-W scan (second and third panels) for the aurora event in Syowa field-of-view during the periods from 2235 to 2305 UT June 16, 1986. The line of the scan is indicated to the right of the each panel. Fluxgate magnetometer data for the Pi2 event at Huancayo, Peru are presented in the bottom panel.

of the Syowa Station in the pre-midnight sector in association with the ground Pi2 onset at Huancayo, Peru (1805 LT meridian). We found that magnetic oscillations of the ground Pi2 pulsations were correlated fairly well with a periodic westward drift of auroral patches that appeared during the diminishing phase of the Westward Traveling Surge (WTS).

The auroral image data used in this study were obtained by all-sky TV cameras at Syowa Station, Antarctica ($L=6.7$). Temporal variation of auroral luminosity was examined by scanning the image data along a fixed line of the geomagnetic meridian (N-S) or along the geomagnetic east-west (E-W). Hereafter, this technique is referred to as the position-time (*p-t*) display in this report.

Figure 1 shows the *p-t* display during the periods from 2235 to 2305 UT, in which the top panel is along the geomagnetic meridian (N-S) crossing zenith (see the right-hand side of the figure indicating this meridian line), while for the second and third panels *p-t* profiles along the East-West lines of 68.5°S and 68.0°S latitudes are shown (see the right-hand side

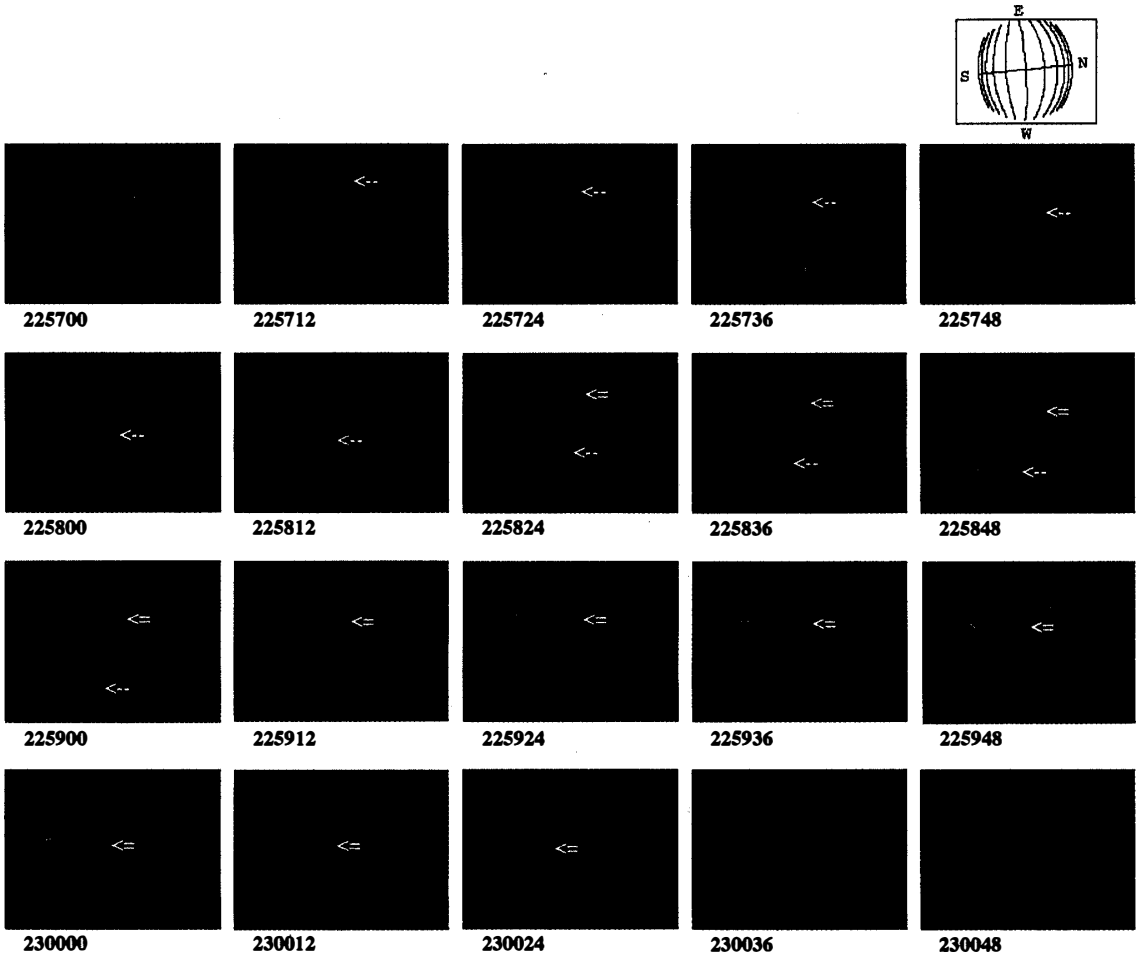

Fig. 2. All sky images obtained for the interval of 2257:00-2300:48 UT sampled at every 12 s. The auroral patches correlated to the amplitude peaks of the Pi2 oscillations at 2258:00 and 2300:00 UT are indicated by arrows (<---) and <=), respectively.

of each figure indicating those E-W lines). The bottom panel presents Pi2 oscillations (*H* component) observed at Huancayo by the fluxgate magnetometer, in which the Pi2 event commenced at 2239:30 UT. It was accompanied by the auroral break-up as can be inferred from the *p-t* displays in the upper panels. Right after the break-up, the aurora started a westward drift forming the WTS (see second and third panels). By about 2250 UT, the WTS had almost disappeared, and thereafter several auroral patches switching "on and off" sporadically appeared in the Syowa field-of-view. A prominent feature to be noted for this period is the good correlation between the ground Pi2 oscillations and the switching of the aurora. There occurred increases of the H component of the ground Pi2 oscillations at 2254, 2256, 2258, 2300 and 2302 UT, and they correspond to the "on" period of the diffuse aurora as indicated by vertical bars in the figure. In order to find a drift pattern of these "on" regions in the Syowa field-of-view, the all-sky aurora images obtained at every 12 s interval were examined during the period of 2257:00-2300:48 UT (see Fig. 2). The auroral patches correlated with the ground Pi2 oscillations during the above periods are marked by (<--) and (<=), respectively. It is found that these auroral patches executed westward drift (downward in the figure), and attained maximum luminosity when the *H* component became maximum at 2258:00 and 2300:00 UT.

Figure 3 shows energetic particle (95-600 keV proton) flux data monitored by the Charged Particle Analyzer (CPA) on board geosynchronous satellite S/C1982-019 in the pre-midnight sector (2100 LT). The initial flux enhancement of the protons was observed

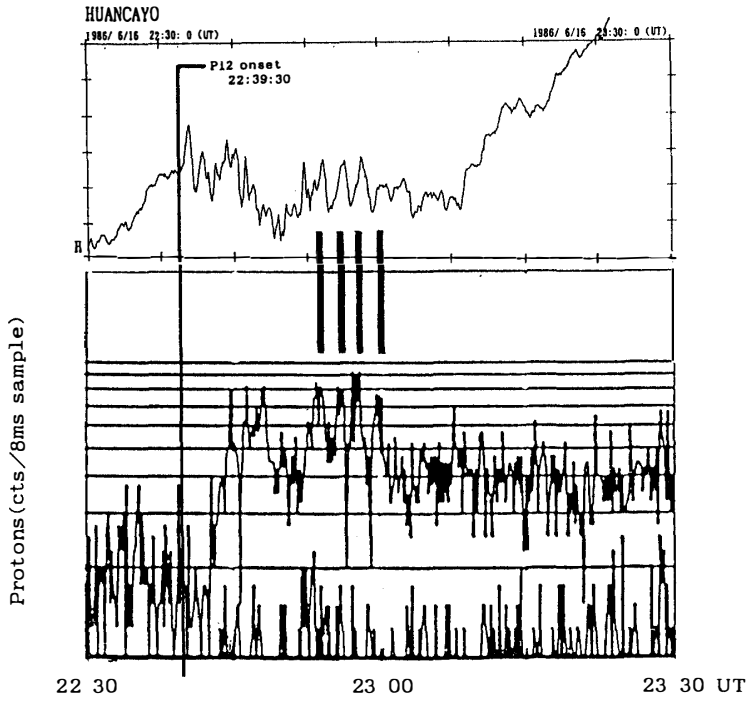

Fig. 3. Energetic particle (95-600 keV proton) flux data monitored by the Charged Particle Analyzer (CPA) on board geosynchronous satellite S/C 1982-019 in the pre midnight (2100 LT sector). The Pi2 oscillations are presented for the reference in the upper panel. The correspondence between Pi2 oscillation and the flux modulation discussed in the text is indicated by vertical bars.

3 min after the Pi2 onset, probably corresponding to the drift time from the midnight sector to the satellite position. During the interval of 2252–2303 UT, we could find the quasi-periodic flux variations correlated (with no significant time delay) with the ground Pi2 oscillations. We believe that these flux variations are not caused directly by the particles that were responsible for the auroral modulations in the Syowa field-of-view. Rather a modulation of the energetic particles would take place globally, and simultaneously in the midnight magnetosphere in association with the ground Pi2 oscillations. The auroral patches in the Syowa image in Fig. 2 would be attributable to plasma irregularities in the magnetosphere (*e.g.*, OGUTI, 1976), the brightness of which could be modulated in association with global oscillations of the energetic particle populations as can be inferred from the satellite flux oscillations. The velocity of the westward drift of those plasma irregularities (or auroral patches) is consistent with the plasma convection in the magnetosphere.

Acknowledgments

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Reference

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