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COSMIC RAY INTENSITY VARIATIONS DURING FEBRUARY 1986

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In this report we present data of cosmic ray intensity variations during February, 1986 when the sun was highly active, and solar-flare events and the related solar-terrestrial phenomena were observed. Data are from a multi-directional meson telescope at Mt. Norikura (2770 m above sea level, Sekido et al., 1975), and from neutron monitors at two polar stations, Thule and McMurdo (Yasue et al., 1982).

Figures 1 and 2 show the pressure corrected hourly values of cosmic ray intensities observed by neutron monitors at Thule and McMurdo, and by the Norikura meson telescope respectively, during February, 1986. In Figure 1, observations are also shown of solar-flares, geomagnetic storm sudden commencement (ssc) and Kp-indices quoted from STE Data Book No. 1 (1988), to examine the relationship among the cosmic ray intensity variations and the interplanetary phenomena. Two Forbush decreases are clearly seen in the figures. One, starting to decrease gradually on around 6th, reached a maximum depression on 9th, of which the magnitude is about 10% for polar neutron monitors and about 2% for the Norikura meson telescope. The second Forbush decrease started decreasing also gradually on around 15th and reached a maximum depression on 17th. The magnitude to the level before disturbance is a little less than that of 9th. It should be noted in the figures that ssc's are reported in association with Forbush decrease on 9th, but that no ssc is reported for Forbush decrease on 17th.

Note, too, in the figures that pronounced anisotropic intensity variations are observed through this period. To investigate the anisotropy associated with the Forbush decreases, the deviations of the cosmic ray intensity from 24-hour running averages are computed from hourly value data of the Norikura meson telescope, to eliminate the contributions due to the world-wide intensity variations. Based on these filtered data, diurnal and semi-diurnal variations are derived on a daily basis by a harmonic analysis, and are shown in Figure 3 for the Norikura Vertical telescopes. The diurnal and semi-diurnal variations are also shown for three representative directional telescopes of Norikura, Vertical, 30° East and 30° West, by summation dial of daily harmonic vectors. Figures 3 and 4 illustrate clearly the existence of enhanced daily variations associated with Forbush decreases. It should be noted in Figure 3 and 4 that the enhanced semi-diurnal variation appears at the initial phase of

Forbush decrease, decaying quickly with the recovery of Forbush decrease. A preliminary analysis shows that the phase of these enhanced semi-diurnal variation in space is about 3 hr and 15 hr in local time, perpendicular to the average direction of interplanetary magnetic field, and this phase is similar to that obtained from the average semi-diurnal variation (Lietti and Quenby, 1968, Fujii et al., 1969). The enhancement of diurnal variation in association with Forbush decrease is not so remarkable as that of semi-diurnal variation. This may be due to the fact that the observed diurnal variations may be produced not only by a mechanism directly related to Forbush decrease but by a complexity of different physical mechanisms. Further analysis of daily variation associated with Forbush decrease may yield information on the physical process of Forbush decrease in interplanetary space.

In the present report we briefly presented data of cosmic ray intensity variations observed during February, 1986. We wish to thank Dr. M. Matsuoka, Director of WDC-C2, Itabashi, Tokyo for supplying the neutron data.

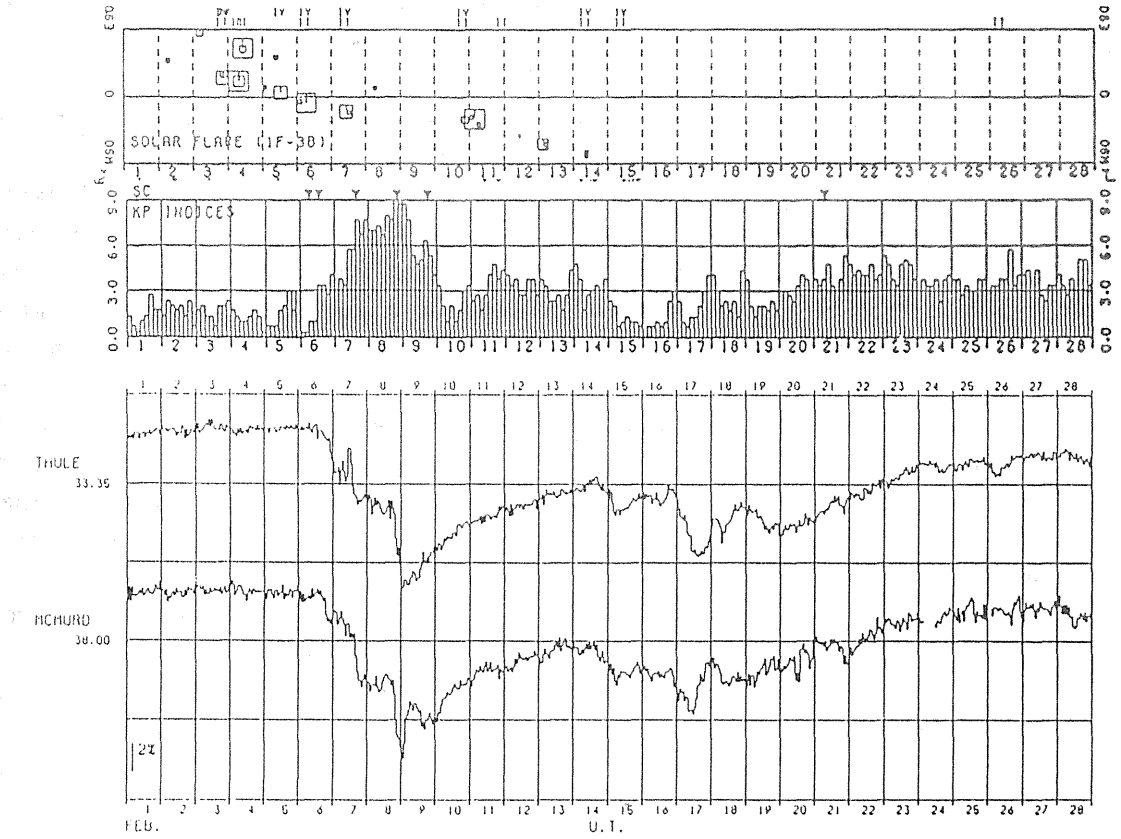

Fig. 1 Observations of solar-flares, geomagnetic storm sudden commencement and Kp-indices, and the pressure corrected hourly values of cosmic ray intensity observed by neutron monitors at Thule and McMurdo during February, 1986

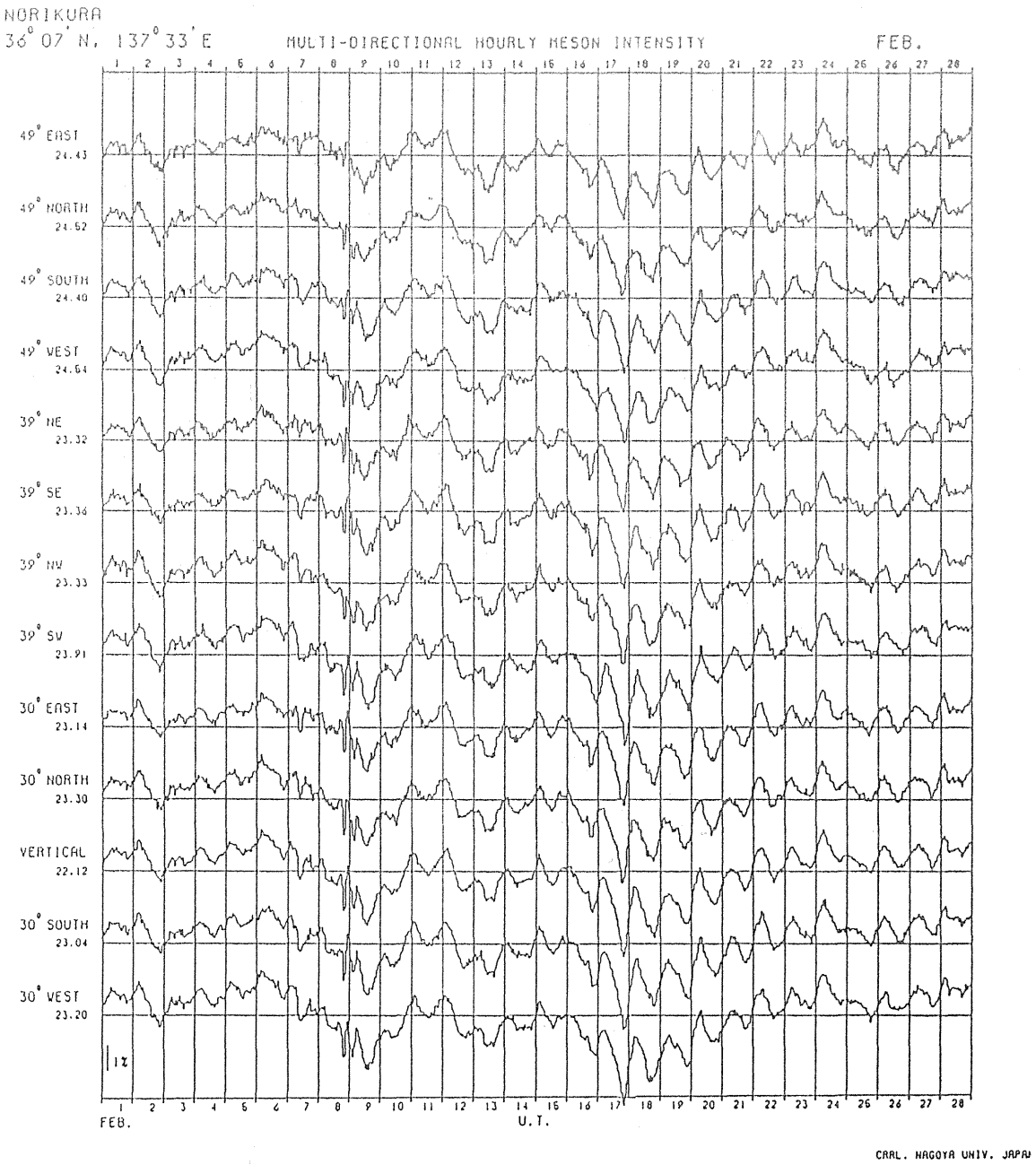

Fig. 2 The pressure corrected hourly values of cosmic ray intensity observed by the Norikura multi-directional meson telescope during February, 1986.

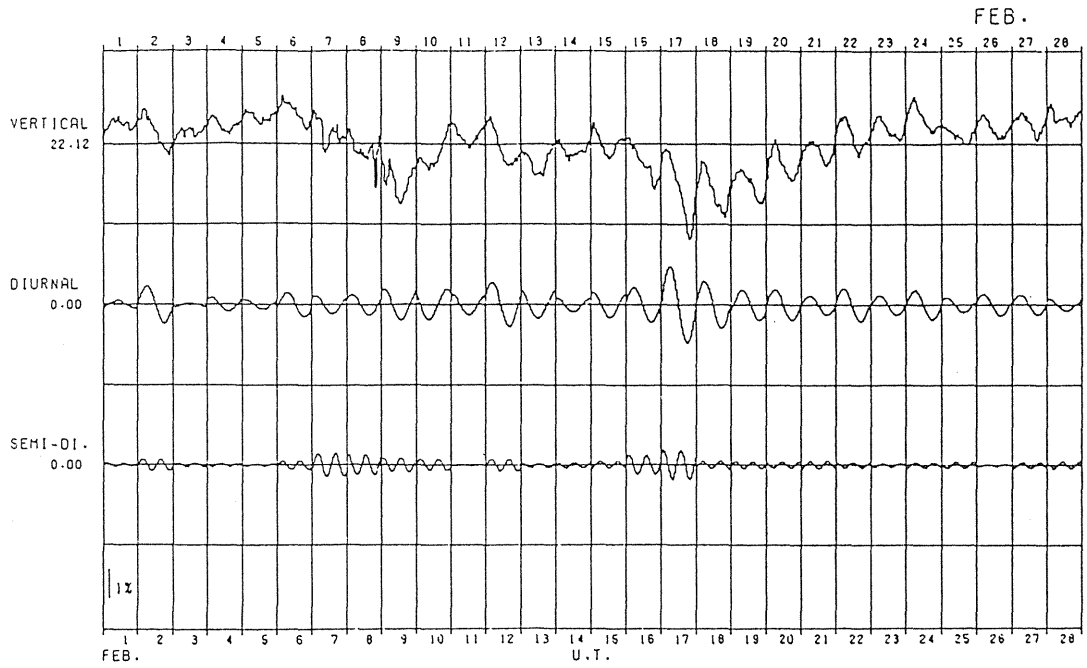

Fig. 3 Hourly values of the cosmic ray intensity, and the diurnal and the semi-diurnal variations derived on a daily basis for the Norikura Vertical telescope during February, 1986.

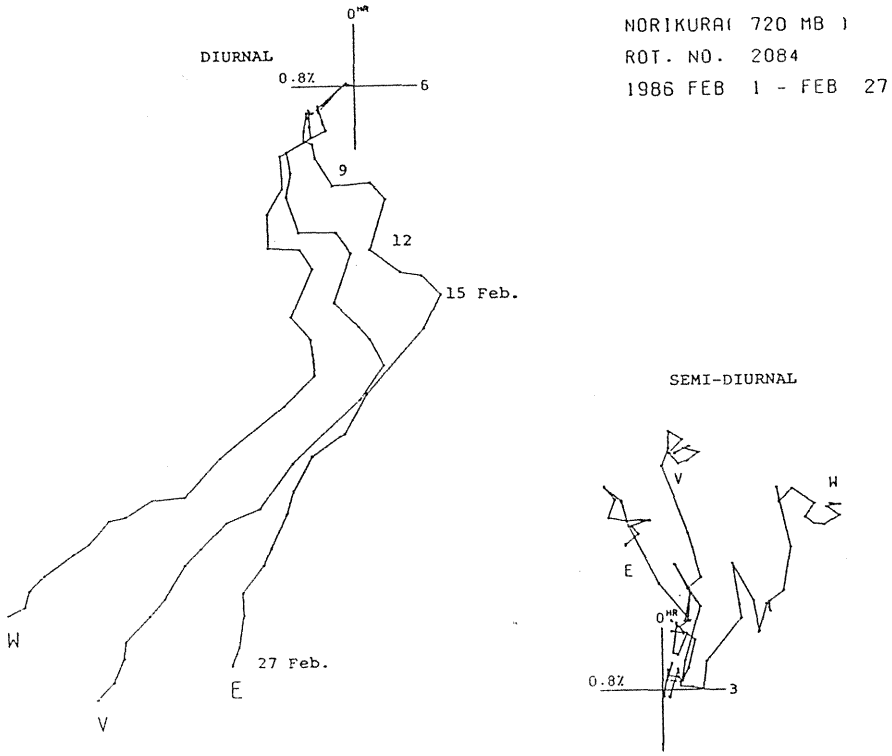

Fig. 4 Summation dial of the daily variation of the first and the second harmonic vectors observed by the Norikura directional telescope, Vertical, 30° East and 30° West from Feb. 1 to Feb. 27, 1986.

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