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# Preliminary Report of the Cosmic Ray Intensity Variations on August 1–10, 1972

by

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## Abstract

The cosmic ray intensity variations on August 1–10, 1972, recorded by large ionization chamber are presented, and the characteristics of the variations are briefly described.

During the passage of the solar active region McMath number 11976 on the solar disk, from July 28 to August 11, 1972, the region activated flares on August 2, 4, and 7. These flares caused disturbances in solar wind velocity, geomagnetic and ionospheric activities, and other geophysical phenomena (HAKURA, and Report of NOAA, 1972). The satellite observations (Explorer 41 and 43) have shown the largest solar cosmic ray events at the earth ever observed for energy regions of >10, >30 and >60 Mev (BOSTROM et al., 1972). The ground observations of cosmic rays show remarkable variations on neutron monitor measurements as well as on meson components. The observed records of these solar and geophysical phenomena in Japan will be published soon ( * , 1972).

The variations of cosmic ray intensity associated with some of these disturbances were observed by the large ionization chamber at this laboratory. Table 1 shows

Table 1. The location of the observation and the descriptions of the ionization chamber.

| | |
|---|---|
| Geographic coordinates | 139°39' E, 35°42' N |
| Height | 42 meter above sea level |
| Cut-off rigidity | 11.58 GV |
| Ionization chamber | |
| effective length | 501.6 cm |
| diameter | 22.0 cm |
| shield | 10 cm of lead |
| standard deviation | 0.12% for hourly value |

Table 2. Hourly values of cosmic ray intensity corrected for atmospheric pressure. IPT are daily values corrected for atmospheric pressure and temperature. 'a' and 'b' are extrapolated values.

August, 1972 (M. R. I. Koenji, Tokyo)

| Hour, U.T. \ Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0—1 | 0.0 | 0.1 | 0.0 | 1.1 | a −1.0 | −0.9 | −0.2 | 0.2 | 0.0 | −0.4 |
| 1—2 | −0.2 | 0.2 | −0.5 | 0.4 | b −4.0 | −0.8 | −0.1 | −0.5 | −0.1 | −0.4 |
| 2—3 | 0.4 | −0.2 | −0.3 | 0.3 | −1.5 | −0.4 | −0.5 | −0.6 | −0.7 | −0.8 |
| 3—4 | −0.5 | −0.2 | −0.5 | −0.1 | −1.1 | −1.1 | −0.5 | −0.9 | −0.4 | −0.6 |
| 4—5 | −0.2 | −0.1 | −0.3 | −0.4 | −1.3 | −1.2 | −0.5 | −0.7 | −0.9 | −0.6 |
| 5—6 | 0.1 | −0.1 | −0.2 | −0.3 | −1.6 | −1.2 | −0.7 | −0.8 | −0.8 | −0.7 |
| 6—7 | −0.3 | 0.0 | −0.2 | −0.5 | −1.7 | −1.2 | −0.7 | −0.8 | −0.8 | −0.5 |
| 7—8 | 0.0 | −0.3 | −0.3 | −0.8 | −1.8 | −1.3 | −0.6 | −1.0 | −0.7 | −0.4 |
| 8—9 | −0.1 | 0.0 | −0.5 | −1.0 | −2.1 | −1.3 | −0.8 | −0.9 | −0.8 | −0.7 |
| 9—10 | −0.1 | 0.0 | −0.3 | −1.1 | −2.1 | −1.1 | −0.8 | −0.7 | −0.7 | −0.6 |
| 10—11 | 0.1 | 0.0 | −0.3 | −0.9 | −1.9 | −1.3 | −0.9 | −0.7 | −0.7 | −0.6 |
| 11—12 | −0.1 | −0.1 | −0.2 | −1.1 | −2.1 | −1.3 | −0.9 | −0.9 | −0.6 | −0.5 |
| 12—13 | 0.0 | 0.1 | −0.2 | −0.9 | −2.1 | −1.3 | −1.1 | −0.8 | −0.9 | −0.4 |
| 13—14 | 0.1 | 0.2 | −0.3 | −1.3 | −1.9 | −1.2 | −1.0 | −1.3 | −0.8 | −0.5 |
| 14—15 | 0.0 | 0.3 | −0.2 | −1.0 | −1.5 | −0.9 | −0.8 | −0.8 | −0.8 | −0.4 |
| 15—16 | 0.1 | 0.1 | −0.4 | −0.7 | −1.2 | −0.7 | −0.6 | −0.7 | −0.5 | −0.1 |
| 16—17 | 0.4 | 0.3 | −0.1 | −0.9 | −1.4 | −0.8 | −0.3 | −0.5 | −0.5 | −0.3 |
| 17—18 | 0.1 | 0.3 | −0.5 | −1.0 | −1.5 | −0.6 | −0.2 | −0.6 | −0.2 | −0.2 |
| 18—19 | 0.1 | 0.2 | −0.3 | −1.0 | −0.7 | −0.8 | — | −0.2 | −0.2 | 0.0 |
| 19—20 | 0.1 | 0.0 | — | −0.6 | −0.8 | −0.6 | — | −0.4 | −0.3 | −0.1 |
| 20—21 | 0.3 | 0.1 | — | 0.0 | −0.7 | −1.0 | — | 0.1 | 0.1 | −0.2 |
| 21—22 | 0.1 | 0.2 | — | 0.2 | −0.7 | −0.6 | — | −0.2 | 0.0 | −0.2 |
| 22—23 | −0.1 | −0.3 | — | −0.1 | −0.8 | −0.7 | — | 0.2 | 0.0 | −0.2 |
| 23—24 | 0.1 | −0.2 | 0.4 | −0.4 | −0.9 | −0.4 | 0.0 | 0.4 | −0.1 | −0.4 |
| Mean | 0.0 | 0.0 | −0.3 | −0.5 | −1.5 | −0.9 | −0.6 | −0.5 | −0.5 | −0.4 |
| IPT | 0.0 | 0.0 | −0.3 | −0.4 | −1.3 | −0.6 | −0.3 | −0.4 | −0.3 | −0.2 |

the location of observation and descriptions of the chamber, and Fig. 1 and Table 2 are the hourly values corrected for atmospheric pressure on August 1–10, 1972. The data are deviations from the two-day average of August 1 and 2, and the data with 'a' and 'b' attached are extrapolated hourly values observed at 0000–0050 U.T., and 0125–0200 U.T. respectively. The bottom line of Table 2, $I_{PT}$, shows the daily values corrected for atmospheric pressure and temperature, referring to the average value of August 1 and 2. In the figure, arrows and triangles indicate the occurrence of solar flares and geomagnetic storms respectively.

Unfortunately the record was interrupted at 0050–0125 U.T. on August 5 for regular replacement of high voltage supply dry cells for ionization chamber. However, during this time the whole recording system, including the vibrating reed electrometer setting the input at ground potential and its D.C. amplifier, was operating. After

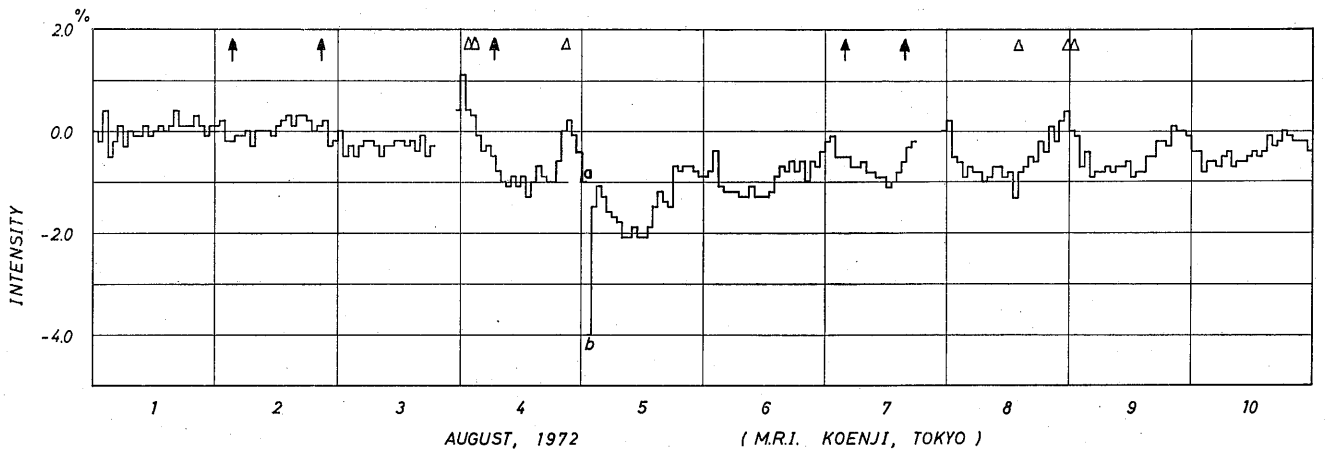


Fig. 1. Hourly values of cosmic ray intensity corrected for atmospheric pressure. 'a' and 'b' are extrapolated values. Arrows and triangles indicate the occurences of solar flares and magnetic storms respectively.

one minute charging-up time for the center collector wire of the ionization chamber to high potential, the record started again. Then we use the interrupted data as partially observed values, and these are represented as extrapolated hourly values for the purpose of normalization.

During this period the complex variations in cosmic ray intensity have been observed especially on August 4 and 5. The first decrease started at 1 U.T. on August 4, 1972 as observed at European stations and then reached to a minimum at 3–4 U.T. which was seen at Syowa station (*, 1972). A peak at 0–1 U.T. on August 4 in Fig. 1 has the corresponding peak in meson and neutron components at Mt. Norikura, though the amounts were small, and after a small bump at 5–6 U.T. the decrease event in Japan began at 8 U.T. Inspecting the data obtained by direct communication or through Data Center C, the peak at 16–17 U.T. was seen only at high latitude stations, Syowa (69.03°N), Tixie (71.55°N), Kiruna (67.8°N), Calgary (51.08°N), and Sulpher Mt. (51.20°N). At lower latitudes, even at Uppsala (59.08°N) and Kiel (54.3°N) in European zone, only a small bump was seen; no marked effect was seen at stations in Japan. The peak at 21–22 U.T. was observed at all stations in Japan except for underground measurments. The deep minimum at 0–2 U.T. on August 5 was a world-wide phenomenon and at Syowa station the depression from quiet level amounted to more than 30%, the largest decrease ever observed. On the recovery phase of this decrease the transient increase at 4–5 U.T. occurred on a world-wide sacle. The increase associated with the solar flare at 1505 U.T. on August 7 was seen at high latitude stations and could not be seen in Fig. 1.

The variations of cosmic ray intensity on August 4 and 5 may be due to multiple effects, i.e., Forbush decrease, solar cosmic ray event, prestorm effect, increase associated with magnetic storm, anomalous daily variation and so on (DORMAN, 1963), and should be clarified by detailed analysis.

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# 1972年8月1～10日の宇宙線強度変化の速報

須田友重，池上比呂志

1972年8月4日から5日にかけて，宇宙線強度が複雑な変化を示した。特に5日の0～2　U.T.には，かってない程の減少が世界的に観測された。これらの現象の前後を含め，8月1～10日の当所ではかった，大型電離函の資料の速報をする。同時に，これらの現象の概要を記す。