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Cosmic Ray Intensity Increase on May 4, 1960

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Cosmic Ray Intensity Increase on May 4, 1960.

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On May 4, 1960, the Ellsworth neutron monitor (*) detected a sudden, big increase of about 110% in quarter hourly

counting rate, in the interval (1030 ÷ 1045) UT. After this initial peak, intensity dropped to the previous level

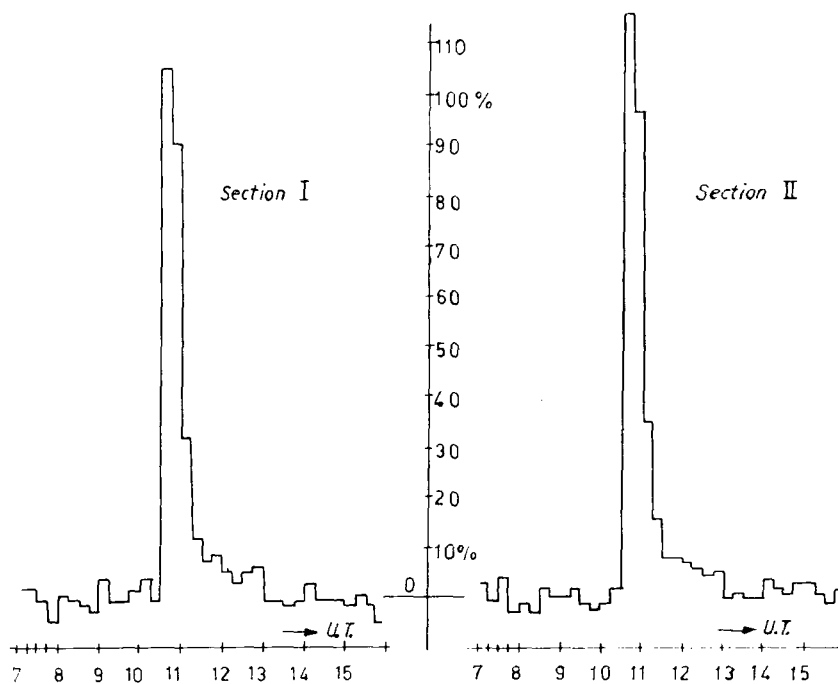


Fig. 1. - Percentage intensity variation referred to preflare level, for sections I and II of the Ellsworth neutron monitor. 15 min interval data.

(*) Geomagnetic coordinates: Lat. 67° S, Long. 14.7° E. Operated in collaboration with the Instituto Antártico Argentino and the University of California.

after about two hours. Ellsworth was located in the 09 impact zone for a solar event occurring at 1030 (1).

(1) J. W. FIROR: *Phys. Rev.*, **94**, 1017 (1954).

Fig. 1 gives the 15 min counting rate percentage intensity variation of neutron monitor sections I and II, referred to the preflare level. Unfortunately, only 15 min readings are available. Section II shows a relative increase systematically higher than section I:

$$\delta I_{II}/\delta I_I = 1.10 \pm 0.02.$$

additional flux. Indeed, for other time variations, like the July 1959 Forbush decreases, which have a flatter spectrum (*), percentage variations of sections II and I of the Ellsworth neutron monitor show a ratio 1.03 ± 0.02 .

In order to determine the approximate time of the beginning of the increase, we plotted the integrated additional

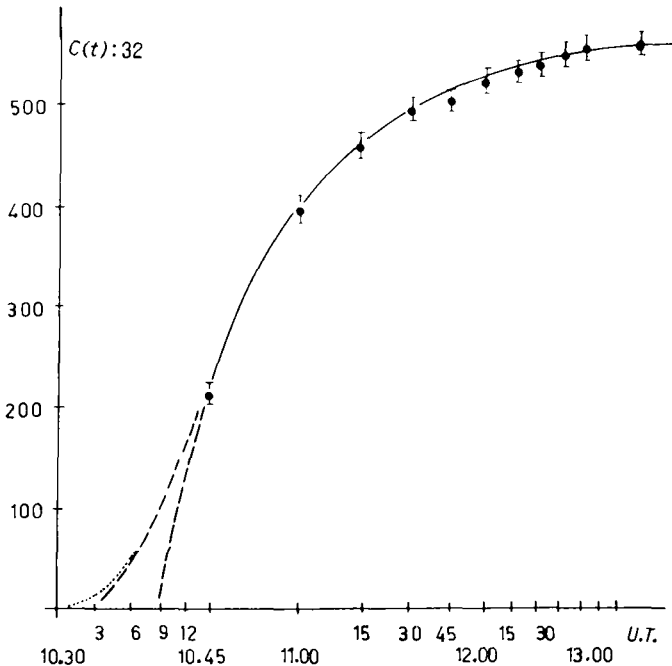


Fig. 2. - Integrated additional counting rate (sum of both sections) for 15 min readings. The extrapolation of the curve to zero counting rate gives an idea of the time of the beginning of the increase.

According to the geometry of this neutron monitor (section II lying above section I, Berkeley type), the coupling function for section I should be slightly displaced towards higher energies than that of section II, due to the increased absorbing material above section I with respect to section II. The fact that both sections do show an appreciable difference during this increase is an indication for a steep energy spectrum, or, what is the same for a small absorption length of the

counting rate

$$C(t) = \int_{t_0}^t (I - I_0) dt', \quad (I + II),$$

where I is the 15 min counting rate and I_0 the mean counting rate before

(*) J. G. ROEDERER, O. R. SANTOCHI, J. C. ANDERSON, J. M. CARDOSO and J. R. MANZANO: *Preliminary report on cosmic ray intensity during magnetic storms in July 1959*, preprint C.N.E.A., 1959.

the increase. Fig. 2 shows the result.

If we assume tentatively a very fast increase, the time of rise lasting not more than a couple of minutes, one may extrapolate the curve to 0 counting rate in order to get some information about the probable starting time. We obtain the values 1033 and 1039 UT as estimated lower and upper time limits for a sudden intensity rise. Taking this into account, the lower and upper limits of maximum intensity increase would have been of 138% and 277%, respectively, averaged over the time interval between start and 1045 UT. These considerations, of course, do not exclude the possibility of a slower rise starting at any time between 1030 and 1033.

Finally, neutron monitors of Mina Aguilar (geom. Lat. 11.6° S, Long. 3.1° E) and Buenos Aires (geom. Lat. 23.3° S, Long. 9.4° E) did not show any abnormal behaviour on the 4th of May. As it now seems to be usual for all interesting cosmic ray events, Ushuaia had a power supply failure starting exactly at 1030 UT. Ushuaia was located in the 04 impact zone.

* * *

This report was possible only due to the extremely efficient work of our technician, Mr. R. RASTELLI, who keeps operating the Ellsworth neutron monitor in spite of innumerable difficulties.

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