that the general ringcurrent field contains at least three components of different nature: One caused by actual ringcurrents set up by the storms, one by the interference of the solar plasma flow with the earth's magnetic field in a larger scale and a semi-annual wave of the last one by the varying angle of attack of this flow against the earth's dipole axis. On behalf of the isotropy of cosmic rays this wave is only seen in magnetic on the earth and not in cosmic rays. Its mean amplitude of -40γ indicates that the pure earth magnetic field is at Huancayo close to the value of 29000γ extrapolated above and that the assumptions for this extrapolation are widely correct. This value itself may underly final corrections not yet known at the moment as we used preliminary magnetic data just to show the method, that must be extended to much longer periods regarding secular variations.

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II-4-11. Phases Changes in the 27 Day Type of Intensity Variation of Primary Cosmic Rays from January 1955 to January 1961

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It is well known that 27 day recurrent variation of cosmic-ray presents long periods of stability in correlation with long life high activity regions of the sun, these variations mainly providing from modulation effects of solar plasmas on the cosmic-ray galactic flux.

In previous works[1)2)3)] these variations have been studied during the last solar activity maximum, from the October 1956 to December 1958 data of two neutron monitors located at Pic-du-Midi, France and Port-aux-Francais, Kerguélen Island. During the whole period of observations a constant period of 27.40±0.06 day was found for the cosmic-ray variation and a corresponding constancy for the integral distribution of ≥ 2+ solar flares (Carrington coordinates) was put into evidence[4)].

In the present paper, we give the results concerning the study of these recurrent variations for the January 1955 to January 1961 period.

Experimental material

For the 1959-1960 period, the used data are the daily mean values, pressure corrected from the Pic-du-Midi neutron monitor. For the former period, we take the 1955 daily mean values from the Itabashi Nishina type ionization chamber, 10 cm Pb shielded corrected for the barometer and the decay effects, and the 1956-1957 daily mean data from the Mawson vertical telescope, 10 cm Pb shielded, uncorrected.

Computation method

The used method has been formerly described[1]: Daily mean values are ordinated in a 27 day Barteles' pattern. Sequences of successive periods are added and the phasis of the first harmonic component is calculated. The day one has been selected in order to coincide with the starting day of the I.G.Y. *i.e.* July 1 1957.

Results

Figs. 1 and 2 give the phasis of the first harmonic minimum against the time. For each value the vertical line is the statistical error, the two opposite arrows indicate the ends of the period of calculation. The successive crossings of the solar disk center

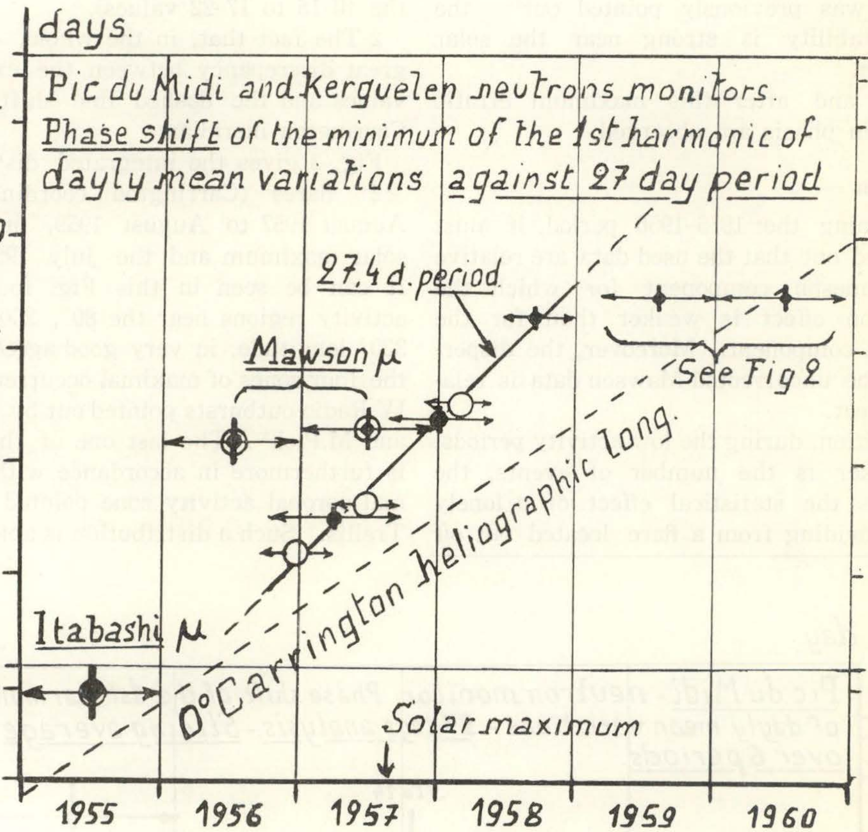

Fig. 1.

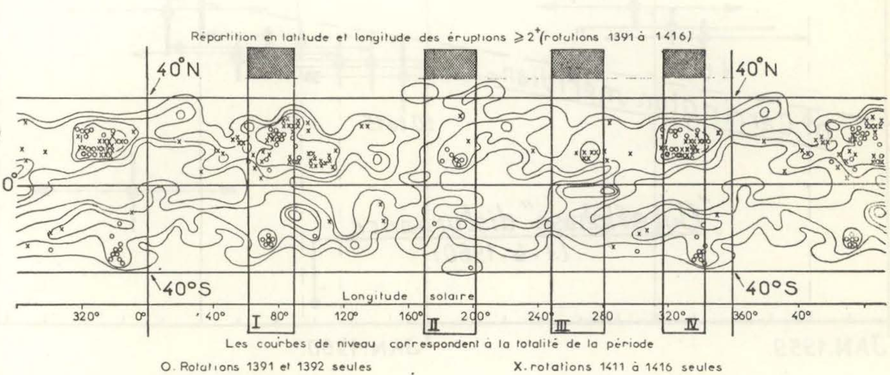

Fig. 2.

by the 0° Carrington meridian are indicated by the dashed lines.

The Fig. 1 is relating to the whole results. The Fig. 2 is a detailed analysis of 24 successive 27 day period obtained by means of the sliding average method, each value corresponding to 6 successive periods: 1 to 6, 2 to 7, and so on.

The main features are the following:

— As it was previously pointed out[1),3)] the phasis stability is strong near the solar maximum.

—Before and after this maximum erratic changes in phasis are observed.

Discussion

Concerning the 1955-1956 period, it must be pointed out that the used data are relative to the meson component for which the modulation effect is weaker than for the nucleonic component. Moreover, the dispersion of the uncorrected Mawson data is relatively great.

In addition, during the low activity periods, the weaker is the number of events, the greater is the statistical effect of a lonely event providing from a flare located out off the maximal activity area.

Such an effect can be observed Fig. 2: The discrepancy between the 9-14 and 10-15 values provides from an "out of phase" event, arising during the 15th period, (1/4/1960).

On the other hand, it must be pointed out:

1-The phasis stability tendency (See Fig. 2 the general slope of the 1-6 to 9-14 and of the 10-15 to 17-22 values).

2-The fact that, in the whole, there is no great discrepancy between the experimental values and the dashed line shift of the 0° Carrington meridian.

Fig. 3 gives the integrated distribution of $\geqq 2^+$ flares (Carrington coordinates) from August 1957 to August 1959, including the solar maximum and the July 1959 events[4)]. It can be seen in this Fig. four maximal activity regions near the 80°, 200°, 270° and 320° longitude, in very good agreement with the four zones of maximal occurrence of Type IV Radio-outbursts pointed out by Y. Avignon and M.Pick[5)]. The last one of these regions is furthermore in accordance with the maximal coronal activity zone pointed out by M. Trellis. Such a distribution is able to explain

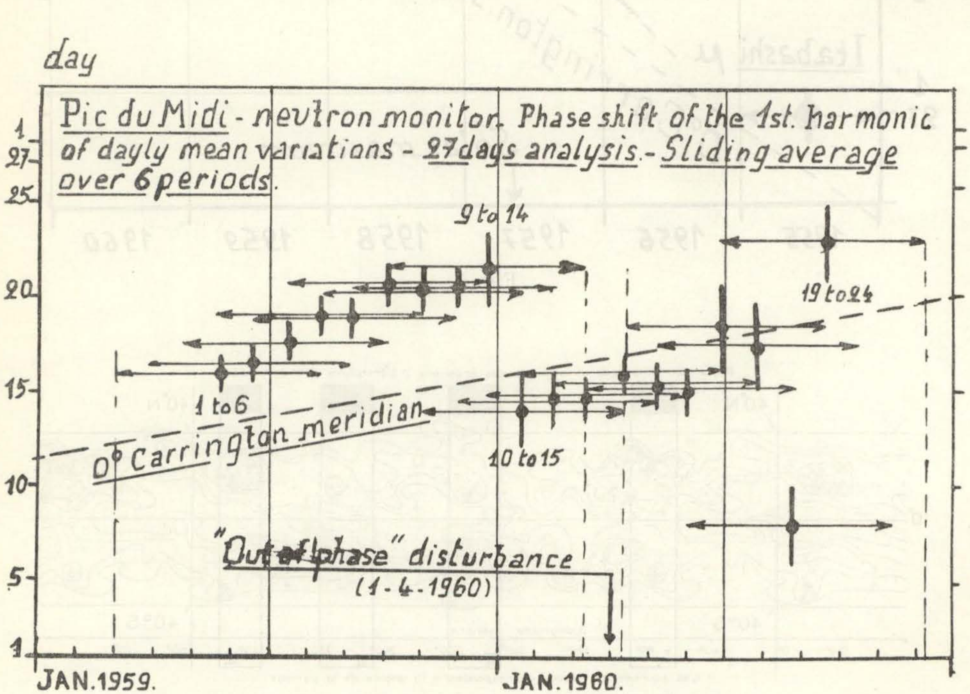

Fig. 3. Intergrated activity distribution on the photosphere from Angust 29, 1959 to August 8, 1959, and the four zones of maximal occurrence of Type IV Radio outburst.

the " structure fine " frequently observed in the Chree analysis (See, for example the R. M. Jacklyn' study on E—W asymmetry at Mawson).

Taking into account the fact that during the whole period of observation the phasis of the 27 day variation remains, on the mean, located about 6 days later in respect to the crossing of the 0° Carrington meridian at the solar disk center, one can assume that, from 1955 to 1960 the 27 day recurrent variation is mainly ruled by the solar activity located near the 0° Carrington meridian and, namely, by the 320° zone.

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Discussion

Kondo, I.: During the solar cycle the most likely latitude of the appearance of the sunpots moves from high latitude to low latitude. The period of the 27-day variation will change time to time.

Is there any indication in your work about this variation of period?

Fréon, A.: We have not such an indication, our neutrons monitors being operated only from October 1956. All we can say is that the constant period was found from the maximum activity to the July 1959 events: 27.40±0.06 d is corresponding to the differential rotation at 16°±1° latitude. This latitude is in close agreement with the most likely latitude of the solar events (both North and South) as sunspots, flares and corona intensity during the same time (see ref. No. 3. Moscow conf.).

Simpson, J.A.: We have found a systematic change in the period of the 27-day variation corresponding to the change in sunspot rotation 1951-1954. The change in period is about 2 days. However, we want to wait to repeat these results for the declining period of this next solar cycle before being convinced that we understand this correlation.

Fréon: I think there is a very interesting results. Unfortunately at the present time mean latitude of solar events is varing very slowly in respect to the time and it is necessary to wait the beginning of the further cycle to improve the statistics.