the charges of the two signs composing the neutral fluid. Having assumed that the electrical energy which results from such a separation is equal to the supplementary energy (6), we now obtain (1).

According to (5) and (1) the total charge resulting from the separation is $e = \sqrt{K} \int \rho \, dV$. The fact that the non-Euclidean volume of the fluid exceeds the Euclidean volume of the Newtonian physics gives rise to an additional charge which is given by:

$$\varepsilon = \sqrt{K} \int \rho \, (dV - dV_0)$$

$$= \sqrt{K} \rho \frac{4\pi}{3} a^3 \left(\frac{3}{5} \frac{Km}{c^2 a}\right) = \left(\frac{\sqrt{K} \rho \, Km}{5c^2}\right) 4\pi a^2. \qquad (9)$$

This can be regarded as a surface charge of density $\eta = \frac{K^{3/2} \rho m}{5c^2}$. For the earth, the computation gives $\eta = 1 \cdot 26 \times 10^{-4}$ e.s.u./cm.^{2}. The experimental facts indicate that the surface of the earth possesses a negative charge the average density of which is $-2 \cdot 7 \times 10^{-4}$.

J. Mariani

School of Mathematics,
Institute for Advanced Study,
Princeton, New Jersey.
July 28.

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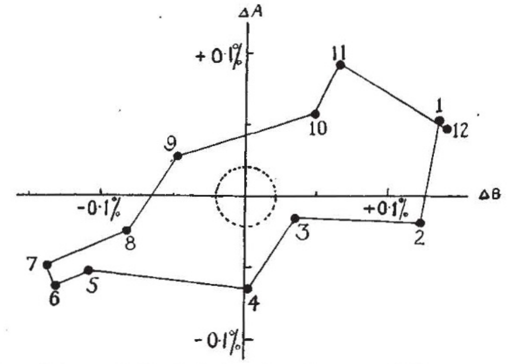
Sidereal Variations of Cosmic Rays

Duperier[1] has analysed the first harmonic of the apparent solar diurnal variation of cosmic rays at London, using a method due to Thompson[2]. He finds that the first harmonic for any month has three components, namely, (i) a mean solar vector M, (ii) a vector, A, altering the amplitude of M, and (iii) a vector, P, controlling the change of phase of M. The P vector may arise from either (*a*) a sidereal diurnal variation, (*b*) an annual solar variation, or (*c*) a combination of these effects. This communication discusses the interpretation to be placed on the P vector, by comparing Duperier's figures for London with the results obtained at Canberra.

The Canberra results were obtained with an ionization vessel and were corrected for bursts, pressure and temperature[3]. A harmonic analysis was made of the apparent solar diurnal variation averaged for each month of the year over a period of five years. From these analyses a harmonic dial was constructed showing the month-to-month change of the first diurnal harmonics. Smoothed points in this dial progressed clockwise in a closed figure, as found also by Duperier. An ellipse was fitted to the unsmoothed points by harmonic analysis of the deviations from the mean solar vector, and this gave the vectors A and P for comparison with Duperier's data. The accompanying table shows that the P vector, interpreted as a sidereal effect, exhibits a phase difference of about twelve hours between the northern and southern station. It seems preferable, therefore, to regard the P vector as representing, in the main, merely an annual change in the phase of the true solar diurnal variation, making the diurnal maximum occur earliest in the spring at both places.



Annual changes in the deviations from the mean of the cosine (A) and sine (B) components of the first harmonic of the apparent solar diurnal variation of cosmic rays at Canberra, arranged according to local mean time. 1 = Jan.; 2 = Feb., etc. The central circle indicates the probable error of the monthly points (± 0·02 per cent)

If the P vector is regarded as being of solar origin, it is appropriate to reduce the results according to local apparent time rather than local mean time. Local apparent time values for A and P are slightly smaller for the former than for the latter. It seems that any sidereal variation of cosmic rays with a 24-hour period would be extremely small, for the P vector (local apparent time) of 0·03 per cent (equivalent to a maximum change of phase of about 10 min.) would have to take account of not only the sidereal process, but also of any change in the lag between the cosmic rays and the sun's position. It seems likely that no 24-hour sidereal variation has been detected in these measurements, and that, in terms of the theory advanced by Compton and Getting[4], an interstellar rather than an intergalactic origin should be assigned to cosmic rays.

Analysis of the first harmonic of the apparent solar diurnal variation of cosmic rays

Vector	London (local mean time)		Canberra (local mean time)		Canberra (local apparent time)	
	Amplitude % ± p.e.	Time of maximum	Amplitude % ± p.e.	Time of maximum	Amplitude % ± p.e.	Time of maximum
M	0·41 ± 0·02	16·3h. (L.M.T.)	0·67 ± 0·02	15·0 ± 0·1h.	0·67 ± 0·02	15·0 ± 0·1h.
A	0·36 ± 0·02	June-	0·22 ± 0·02	Mar. 27 ± 12d.	0·20 ± 0·02	Apl. 7 ± 12d.
P(*a*) Sidereal ..	0·21 ± 0·02	21h. (L.S.T.)	0·05 ± 0·02	9·6 ± 0·7h. (L.S.T.)	—	—
(*b*) Solar	0·21 ± 0·02	March-	0·05 ± 0·02	Sep. 25 ± 12d.	0·03 ± 0·02	Nov. 12 ± 12d.

A. R. Hogg

Commonwealth Observatory,
Canberra, A.C.T. April 24.

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