

CORRESPONDENCE

To the Editors of 'The Observatory'

Distribution of Sunspots in Heliographic Longitude

GENTLEMEN,—

In a recent letter to the Editors of *The Observatory*, M. Lopez Arroyo¹ has indicated the results of his study on the distribution of sunspots in heliographic longitude. We have carried through a similar study,² covering six solar cycles for the period 1889–1954. We consider that the differential rotation with latitude has to be eliminated in any such study in order to link the position in longitude of a sunspot group in one latitude zone with the position

in longitude of another sunspot group in a different latitude zone. We have reduced our longitudes to the system pertaining to rotation No. 780 (Greenwich Photoheliographic results) commencing on 1912 January 13.42. The sunspot groups in each hemisphere were divided into four groups in the latitude belts 0° - 10° , 10° - 20° , 20° - 30° and 30° - 90° . We believe that the final corrected longitudes obtained in this way represent the longitudes on a rigid sun with the system of longitudes defined by the commencement of rotation No. 780 of the Greenwich system. An examination of the longitude distribution of sunspot activity after the rectification as explained above indicates the following:—

- (1) The sunspot activity integrated over a cycle shows meridional structure.
- (2) The curves suggest an occasional migration of the centres of activity with time which, however, is neither uniform nor always in the same direction.

Our study did not take into account each latitude zone separately, though the diagrams indicate that the distribution of sunspot activity for the latitude belt 0° - 20° closely resembles that in the entire region north or south of the equator.

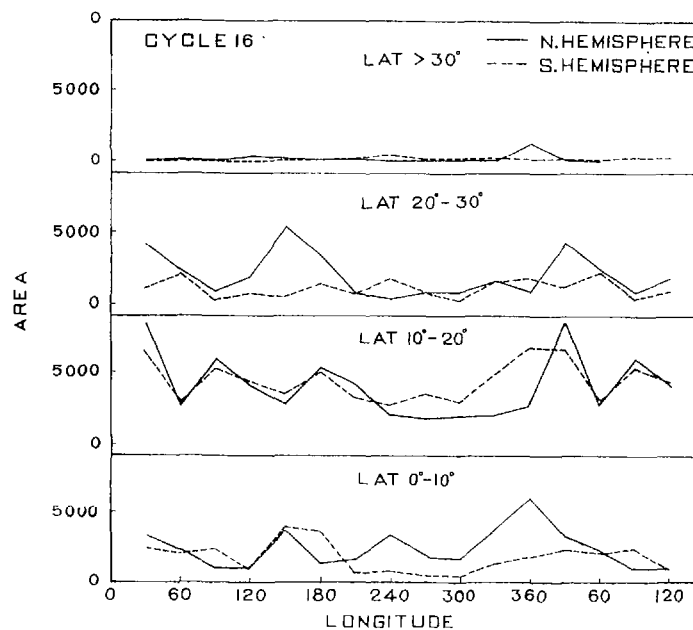


FIG. 1
Longitude distribution of sunspot activity
for Solar Cycle 16.

In order to compare our results with those obtained by Arroyo, I have examined the data on sunspot activity in the four latitude zones separately in the northern and southern hemisphere for cycles 16 and 17. The recurrent groups were considered only once. Figs. 1 and 2 give the curves for the two cycles which I have studied, showing the distribution of spot activity in longitude for the different latitude zones. Arroyo's study employs large intervals of longitude to determine the most active zone. The curves of Figs. 1 and 2, together with the figures in Kodaikanal Observatory Bulletin

No. 160, indicate that distinct and relatively narrower zones of activity are discernible in narrow belts of longitude. Hence one can easily examine whether a drift in longitude of the active zones is indicated as we proceed from one latitude zone to the other. Arroyo finds a drift of as much as 200° in longitude for solar cycle 16 on passing from 7° latitude to 23° latitude north. We find from our study of the sunspot data for the same cycle, rectified for differential rotation, that the zones of activity are aligned within 30° when we pass from equatorial latitudes to higher latitudes. Such an

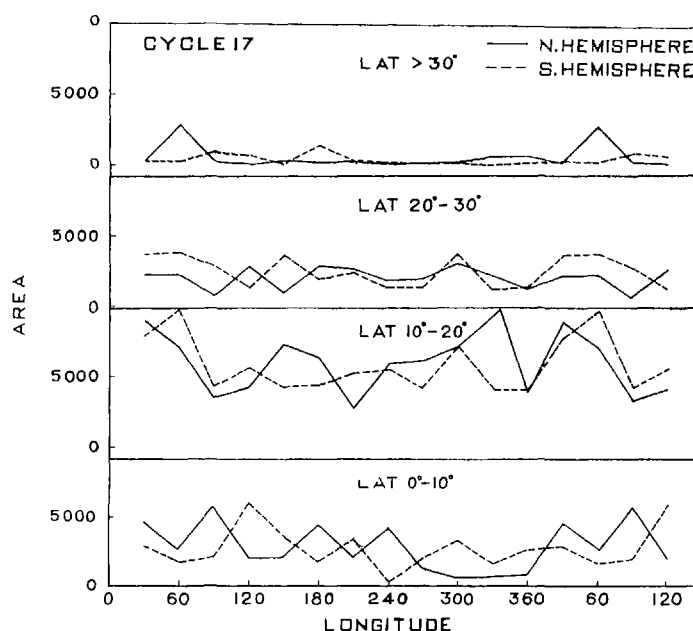


FIG. 2
Longitude distribution of sunspot activity
for Solar Cycle 17.

alignment is also seen in the southern hemisphere. Our curves for cycle 17 show very little drift as we pass from equatorial to higher latitudes whereas Arroyo finds a shift of at least 200° in the northern hemisphere and much more in the southern hemisphere. Contrary to Arroyo's findings, we note that the curves indicating spot activity for different latitude belts show that there is a good deal of similarity between the different curves for the different latitude zones, suggesting a meridional structure. We, therefore, believe that the drift in longitude found by Arroyo may tend to vanish if the longitudes employed are corrected for the differential rotation of the Sun.

I am, Gentlemen,

Yours faithfully,

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1962 August 31.

References

- (1) M. Lopez Arroyo, *The Observatory*, **81**, 205, 1961.
- (2) A. S. Ramanathan and R. Jayanthan, Kodaikanal Observatory, *Bulletin* No. 160, 1962.