

Greenwich Mean Time		Range		
Beginning	Ending	Declination	Horizontal Intensity	Vertical Intensity
May 13, 13 ^h 09 ^m	May 17, 8 ^h ..	2° 41.2*	871*	1211*
First stage May 13, 19	May 14, 8 ..	1 07.8	596	1092*
Second stage May 14, 22	May 15, 9 ..	2 02.6*	810*	964*
Third stage May 15, 22	May 16, 12 ..	2 07.8*	586*	471*
May 19, 20	May 20, 6 48	0 45.2	189	343
May 20, 14 33	May 21, 5	0 25.5	147	81

* Recorded values; traces went off sheet; the storm of May 13 to 17 is the largest magnetic storm in recent years.

NOTE REGARDING THE "EARTH-EFFECT" ON SOLAR ACTIVITY AND RELATION WITH TERRESTRIAL MAGNETISM.¹

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In deriving conclusions *c* and *g* of my paper, "Measures of the Electric and Magnetic Activity of the Sun and Earth and Interrelations" (see *Terr. Mag.*, vol. xxvi, pp. 65 and 66), all sun-spot numbers throughout a sun-spot cycle were utilized for the whole period of available data. It is apparent, however, from a combined consideration of *c* and *g*, that the annual periodicity obtained in *c* contains other effects than simply those resulting from the revolution of the Earth around the Sun. The synodic period of Jupiter is 13.11 months, and that of Saturn 12.4 months; hence, periods differing not greatly from a year. In fact, Dr. T. Royds, of the Kodaikanal Observatory, India, found that prominences were apparently subject to a period of $13\frac{1}{3}$ months.² Assuming that the disturbing or superposed effects upon the annual period would be a minimum at times of sun-spot minima, the annual variation of sun-spot activity, or the "Earth effect," was deduced only from the three circum-minimum years, i. e., year before, year of sun-spot minimum, and year after. For the entire period of available sun-spot data (1749-1920), 15 of such circum-minimum means of sun-spot numbers could be formed for each month, which have been combined into Groups I to V, as given in Table 1. Each

¹ Communicated in a paper before the American Astronomical Society, Aug. 30, 1921.

² *Kodaikanal Observatory Bulletin*, No. XXXIII.

group contains the means for 9 circum-minimum years, and the mean group (VI), accordingly, the means for 45 circum-minimum years, the results from which are shown by curves 1 and 2 of Fig. 1. Curves 3, 4, and 5 are the same as Nos. 7, 8, and 9 of Fig. III, p. 50 of paper above cited; No. 6 is taken from W. Ellis's paper, "The Aurora and Magnetic Disturbance" (*Monthly Notices of R. A. S.*, Jan., 1904).

From Table 1 and Fig. 1 the following general conclusion is drawn:

Throughout the period of 172 years the annual variation of sun-spot activity near the years of minima is practically of the same character, and consists mainly of a double wave. On the average, the maximum Earth-effects occur at the times of the year, near the equinoctial months, when magnetic disturbances and polar lights are most frequent, and the minimum Earth-effects occur near the solstitial months, when magnetic disturbances and polar lights are least frequent; the average difference between minimum and maximum effect shown in Table 1, is 3.4 sun-spot numbers for the circum-minimum years of sun-spot activity.

It would appear from these preliminary studies that the Earth, and probably the other planets as well, is sending out into space or returning, by a sort of reflex action, a portion of the electrified particles continually coming from the Sun; as a result, the Earth exerts a small but observable effect on sun-spot activity, the action being apparently electrical in its nature.

TABLE 1.—*Monthly means of circum-minimum sun-spot numbers, 1755-1913, and annual variation.*

Circum- Minimum Years	1912-14 1900-02 1888-90	1877-79 1866-68 1855-57	1842-44 1832-34 1822-24	1809-11 1797-99 1783-85	1774-76 1765-67 1754-56	Means for 45 Years	Annual Variation for 45 Cir.-Min. Years	
	Gr. I	Gr. II	Gr. III	Gr. IV	Gr. V	Gr. VI	No.	%
January	4.3	11.3	12.4	8.1	17.7	10.8	-0.7	- 6.1
February	4.2	10.4	15.6	9.4	18.4	11.6	+0.1	+ 0.9
March	6.0	11.4	14.6	9.5	21.3	12.6	+1.1	+ 9.6
April	5.5	11.5	13.4	7.8	18.6	11.4	-0.1	- 0.9
May	5.8	12.3	13.9	7.5	19.6	11.8	+0.3	+ 2.6
June	5.5	11.1	8.4	10.0	17.3	10.5	-1.0	- 8.7
July	4.9	9.3	9.0	9.7	11.4	8.9	-2.6	-22.6
August	5.3	10.5	9.4	6.6	15.0	9.4	-2.1	-18.3
September	8.0	15.1	9.0	7.9	14.2	10.8	-0.7	- 6.1
October	7.1	18.3	16.0	9.1	19.4	14.0	+2.5	+21.7
November	6.4	16.9	13.4	10.5	19.9	13.4	+1.9	+16.5
December	6.1	16.8	16.1	8.3	19.9	13.4	+1.9	+16.5
Mean	5.8	12.9	12.6	8.7	17.7	11.5

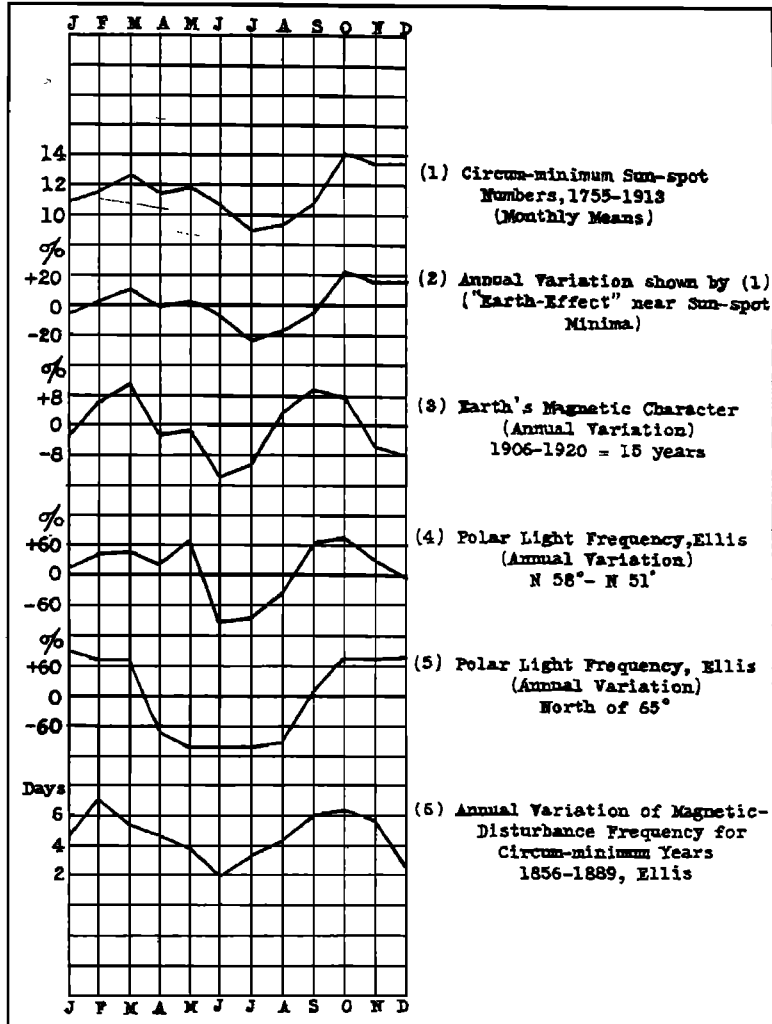


FIG. 1.—The "Earth-Effect" on Solar Activity and Relation with Terrestrial Magnetism. (See Page 113.)