ABSTRACTS AND REVIEWS

ELLIS, WILLIAM, F. R. S. *On the Relation between the Diurnal Range of Magnetic Declination and Horizontal Force and the Period of Sun-spot Frequency.* Proc. Roy. Soc., London. Vol. 63.

In a paper printed in the Philosophical Transactions of the Royal Society for 1880, the author compared the diurnal range of the magnetic declination and horizontal force, as observed at the Royal Observatory, Greenwich, during the years 1841 to 1877, with the corresponding numbers of the sun-spot frequency as determined by the late Dr. Rudolf Wölf, of Zürich. The present communication supplements the former one by incorporating into the discussion the Greenwich magnetic and the Zürich sun-spot observations that have accumulated between 1877 and 1896, and tabulating a strictly comparable series of numerical results for the 56 years from 1841 to 1896.

Throughout this period the results show an entire synchronism between the irregularities in the length of the sun-spot period and the magnetic period. The accord between the two phenomena, both in period and activity, is so complete as to indicate either a direct relationship between them or the existence of some common cause producing both.

Among the uncertain results is a suspicion that the period of these phenomena, which is commonly called the eleven-year period, but which varies in length to the extent of several years, decreases in length for several periods, then increases for several periods, and so on.

The conclusion formerly reached that the magnetic effect follows the sun-spot effect, so that a "lagging" of the magnetic effect exists, is not borne out by the present extended comparison; and it seems doubtful, without a yet more extended series of observations, whether any definite lagging can be said to exist.

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NIPPOLDT, A. *Neue allgemeine Erscheinungen in der täglichen Variation der erdmagnetischen Elemente.* Annalen d. Hydrographie u. Maritimen Meteorologie. 1898. No. III.

The declinations of the needle observed in Pavlovsk, in the year 1882-83, are discussed as follows: All of the observations for the daily variation in the declination during one month are united and expressed by a formula involving sines and cosines of the variable x up to the fourth multiple. The coefficients of these developments were then plotted as a curve, the abscissæ being the time, and the ordinates the value of the coefficient for the twelve different months. Observations made at Tiflis, Wilhelmshafen, Southern Georgia, Fort Rač, and Greenwich were treated in the same way. The following conclusions are reached:

1. The law of the annual change of the coefficients in the formula for the diurnal variation of the declination grows more complicated, the higher the order of the coefficient.
2. In all of the stations investigated, the variation of the lower coefficients can be represented as a combination of a wave of period twelve months with one of period four months.
3. The law of annual variation for the lower coefficients, and therefore the influence of these changes upon the daily variation, is the same for the whole earth.
4. The wave w_1 containing only the simple multiple of x is due to geometrical causes such as follow from the position of the earth in space.
5. The wave w_2 containing the double angle, *i. e.* $2x$, is principally due to causes which are to be found in the atmosphere or the earth's interior, and which are secondary effects of the earth's position in space.

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