THE LUNAR DIURNAL VARIATION AS OBTAINED AT THE
CHELTENHAM MAGNETIC OBSERVATORY FROM A SINGLE
COMPLETE LUNATION DURING FEBRUARY, 1903.¹

BY L. A. BAUER AND R. E. NYSWANDER.

(Abstract.)

The attempt was made to determine how well the lunar diurnal variation of the magnetic elements could be determined from simply one complete lunation, instead of using records extending over a period of a year or more.

For this purpose the comparatively "magnetically calm" month of February, 1903, was selected and the photographic records obtained at the Cheltenham Magnetic Observatory of the Coast and Geodetic Survey with an Eschenhagen Magnetograph were utilized. The scale values used were: 1 mm. ordinate, declination=1.014 minute,

1 mm. " horizontal intensity=0.00002 C. G. S. unit.

The recently arrived vertical intensity instrument was not yet in satisfactory adjustment and hence the records could not be successfully used.

First the declination ordinates were read off at the actual lunar hours as marked on the magnetograms, for the entire lunation beginning on February 1, 1903, and tabulated in the same manner as are the solar ordinates for a calendar month. On February 7th occurred a disturbance of sufficient amount to require elimination. In place of the actually observed ordinates, the means of the corresponding hours of the two days between which the disturbance occurred were substituted. The mean ordinates for each lunar hour for the entire lunation were next derived and the residuals on the mean of all the ordinates formed; these residuals being freed by this process from the effect of the solar diurnal variation, since the same solar hour fell successively on each lunar hour, were expected to exhibit the lunar diurnal variation in the declination. How well they do so, is seen by an inspection of the curve drawn in full, Fig. 1. The double oscillation in twenty-four hours, with the turning points about six hours apart, is well brought out. The average range between maximum and minimum is about 67'', two to four times larger than usually found by combining the results for several years.

Next, the declination ordinates as scaled for the solar hours were

¹The diagrams were on exhibition at the recent meeting of the International Meteorological Conference held at Southport, England.

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tabulated according to lunar hours, by merely taking the hourly solar ordinate nearest to the particular lunar hour, or in case the lunar hour fell nearly midway between two solar hours, the mean of the two solar ordinates was taken. This was done for the entire lunation and the residuals again formed as before, with the results as exhibited in the broken curve of Fig. 1. There is practically no difference between this curve and the previous one. Hence, if magnetograph observations

possess the desired degree of accuracy, and disturbances are eliminated, the lunar diurnal variation can be obtained expeditiously and with sufficient accuracy from the usually published solar ordinates for each lunation separately, and thus an annual inequality of this interesting variation can be successfully investigated.

The dotted curve Fig. 1 exhibits the mean lunar diurnal variation of the declination as obtained at the Los Angeles¹ Magnetic Observatory during the three years October, 1882–October, 1883; October, 1885–Octo-

¹Los Angeles, California. This observatory was operated by the U. S. Coast and Geodetic Survey, between 1882 and 1889, the magnetograph being of the old Adie pattern.

ber, 1886, and October, 1888-1889; the period includes a year of maximum sun spot activity and a year of minimum sun spot activity.

The lunar diurnal variation in the horizontal intensity, as shown by the full curve, Fig. 2, was obtained from the solar hourly ordinates for the complete lunation in same manner as the second declination curve. No corrections for temperature changes were required, as on account of the means employed at this observatory, the temperature was so uniform as to make the corrections negligible. The double oscillation is again most satisfactorily shown. The average range between maximum and minimum is about 6.6 gammas (0.000066 C. G. S. unit.)

The mean result of the same three years of observations at Los Angeles, as for the declination, obtained with less refined instruments, is shown by the dotted curve, Fig. 2.

The vector diagram combining the changes in declination and horizontal intensity for the single lunation was also drawn and found to consist of a curve of two loops of unequal area.

In view of the success achieved within a limited period, there ought to be no reason now for observatories not publishing lunar diurnal variation results as well as those of the solar diurnal variation.