

Discovery Bay may be considered to lie in a region within which all observers hitherto report their inability to discover connexion between disturbances and appearances of auroras. It possesses further the interest of being situated in the most remote northern latitude at which a prolonged series of observations has been accomplished.

The method adopted for computing the elements of Tables VI., VII., VIII., in which the difference is taken between the scale reading at each hour and the monthly mean at the same hour, the square root of the mean of the squares of these differences being called the mean disturbance at that hour, is one well known; the formula for a whole month or longer period being $\sqrt{\frac{\sum (\psi_h - \bar{\psi}_h)^2}{N}}$. In this ψ_h represents the hourly scale readings, $\bar{\psi}_h$ the monthly mean at the same hour, N the total number of the observations, $\sum$ the sum of all the squares.

Turning first to the mean disturbance without regard to sign in Table VI., it is found that the disturbing force never ceases. It will be observed that in the declinometer abstracts there are solitary scale readings here and there which do not differ from the monthly mean at the same hour, but they are rare. It is evident from the monthly values in the tables that as the winter solstice is approached the disturbing force decreases, and increases again rapidly towards the equinox. Thus December gives the lowest values closely followed by January, but in March a sensible increase is apparent. This points to an accordance with the investigations by Mr. Broun, F.R.S., of the disturbances of declination in high northern latitudes, "that there are maxima at the equinoxes and "minima at the solstices."*

In the hourly values the maximum mean disturbance occurs between the hours of 9 a.m. and 3 p.m., and again from 9 p.m. to 2 a.m.; the minimum from 6 to 9 p.m. and 3 to 8 a.m. Comparing the results for the whole period at Van Rensselaer Harbour and Discovery Bay, a marked difference is apparent. Mr. Schott,† in his discussion of the observations at the latter place, says, "the disturbing force is least during the day (if "such an expression is admissible in this case) from 10 a.m. to 7 p.m., and greater and "equally regular during the hours of the night (?) from 8 p.m. to 8 or 9 a.m." Now at Discovery Bay the disturbing force during the day, that is, from 8 a.m. to 8 p.m., is considerably greater than that of the night between 8 p.m. and 8 a.m.

Whilst, however, pointing to differences in results, there are those in which marked agreement occurs. Again, quoting from Mr. Schott's discussion, he says, "At Van "Rensselaer Harbour we find the maximum disturbance at this very hour (noon) preceded "and followed by quite small values; this circumstance certainly deserves our particular "attention." Captain (now General Sir J. H.) Lefroy, in his *Magnetical and Meteorological Observations at Lake Athabasca, &c.*, also remarks, "There are indications in "each of the three curves (of declination for Lake Athabasca, Toronto, and Sitka) of a "small increase in the mean disturbance about noon."‡ These remarks are confirmed by the results in Discovery Bay as regards the hour of noon, and they may be supplemented by another as to the more marked disturbance at 11 p.m. when compared with the moderate disturbances of the whole night.

In the monthly curves of the mean diurnal variation of the declination, the effects of disturbance about noon are remarkably shown, more especially in the months of November, January, and March, by the decided break in an easterly direction of the prevailing curve of westerly deflection between 10 a.m. and noon.

Having considered the mean disturbances without regard to sign, it yet remains to be seen what was the *direction* of the disturbance during the hours of the day.

For this purpose Tables VII. and VIII. have been formed, in which the mean disturbance in the easterly and westerly directions are shown separately, the hourly values having been computed by the formula previously given. Taking the difference between the results in these tables, we obtain the elements of Table IX., or the excess of easterly over westerly deflections, and *vice versa*.

From these it is evident that the easterly disturbances prevail over the westerly during the night from about 7 p.m. to 7 a.m., and during the remaining hours of the day the westerly disturbances predominate.

At the bottom of each column are the means of the aggregate values, which show the easterly disturbances to be both moderate in amount and monthly change when compared with the westerly. Thus the ratio of the excess of westerly disturbances in December

* See Trans. Roy. Soc. Edinburgh, Vol. XXVII., Part IV., page 586.

† See Smithsonian Contributions, Vol. X., 1858, Art. III., page 18.

‡ Page 76.