

increase of the horizontal magnetic force of about 254γ was recorded, with a simultaneous increase in the vertical component of the field of about 3γ , followed, however, immediately by a much larger decrease of 10γ . The oscillations in the value of the vertical component were very irregular, and for some part of the time of duration of the storm the recording light spot was carried off the recording-paper. The maximum value of the vertical component recorded during the storm was only 20γ above normal at 16 h. 55 m., and the storm ceased at about 21 h. 30 m., lasting about ten hours.

In the case of the horizontal force, a maximum value 414γ above normal was recorded at 12 h. 30 m. Greenwich time, the force then diminishing 652γ , or 0.00652 c.g.s. unit, in the course of an hour, the recording spot being then carried off the paper.

The total range of the changes in declination during the storm was slightly over $1^{\circ}5$, a marked maximum being recorded just after 13 h. and others occurring between 16 h. 40 m. and 18 h. 30 m.

During the disturbance the average value of the declination was greater than normal, of the horizontal component probably less than normal, and of the vertical component also less than normal, pointing to an average disturbing magnetic force (at Christchurch) directed (somewhat downward) to the west of south. The low value of the horizontal component persisted throughout the following day.

MILNE SEISMOGRAPH No. 16.

This instrument has been kept in satisfactory working throughout the year, and a number of the most important seismograms obtained are reproduced herewith.

Records were obtained of eighty-seven earthquakes during the year, about the average number recorded per annum.

The earthquake recorded here on the 12th June, 1909, commencing at 20 h. 25.5 m. Greenwich time, was also recorded at Sydney and Perth Observatories, and all three seismograms are given herein. It is evident from a comparison of the Sydney and Christchurch records that the origin of this quake was equidistant from these two places. The almost perfect agreement between the Sydney and Christchurch times of the various phases of the records is very striking. At Christchurch the beginning occurred at 20 h. 25.5 m., the commencement of larger waves at 20 h. 28.1 m., and the maximum motion at 20 h. 34.3 m. Greenwich time. At Sydney these occurred at 20 h. 25.8 m., 20 h. 28.2 m., and 20 h. 34.3 m. Greenwich time respectively. It is evident that in this case the times of occurrence of the different phases of motion were not influenced by any differing local geological peculiarities, the short, medium, and long waves reaching both places simultaneously, within the limits of observational error. The longer waves evidently travelled from the origin along a path almost entirely overlain by ocean. A comparison of the three records shows that the earthquake origin, about 23° distant from Sydney and Christchurch, was under the ocean a few hundred miles to the south of the Royal Company Islands.

The only records obtained of earthquakes felt in New Zealand were those of the 12th November, 1909, felt at Wellington, and that of the 29th March, two slight shocks being then felt at Christchurch.

For the Milne seismograph a new recording apparatus has been ordered from the makers. This will give a much more open time-scale, and yield records of a much more modern type. It has also been decided to instal gas at the Observatory, which will be conducive to even better working of the self-recorders.

A table of earthquakes recorded during the year is appended.

VECTOR DIAGRAMS OF MEAN HORIZONTAL DISTURBING FORCES AT CHRISTCHURCH.

There are appended to this report four Vector diagrams illustrating the changes that occur in the direction and magnitude of the mean diurnal horizontal disturbing forces, as deduced from the magnetograms for 1902, 1903, and 1904. The curves are drawn for the mean day from all days for the three years, the first curve being for the summer months of November, December, January, and February for the combined three years. The second diagram is the corresponding curve for the four equinoctial months of March, April, September, and October. The third is for the winter months—May, June, July, and August. The fourth is for the year.

The curves are affected with diurnal non-cyclic inequality, but as this is of small magnitude, the effect is slight. They are drawn from the hourly values for Greenwich civil hours, as obtained from the magnetograms for those years, and only one stormy day of very excessive disturbance—viz., the 31st October, 1903—has been omitted. Investigation showed that the exclusion of other disturbed days did not materially affect the diagrams. The period covered is practically that of the period of antarctic research of the "Discovery" and other expeditions, and the diagrams will prove of much interest in connection with the study of the published magnetic results of those expeditions.

The diagrams are all drawn to the same scale, the line W.-E. or N.-S. being taken as 20γ , or 0.00020 c.g.s. unit, and the origin is taken at the point of bisection of these mutually perpendicular lines. Greenwich civil hours are indicated by the spots in the curve, numbered 0 to 23 (hours), and the magnitude and direction of the horizontal disturbing force at any time in the day is given by the straight line drawn from the origin to that point of the curve corresponding to the given time.

It is evident from the curves that the maximum westerly horizontal disturbing force occurs here in summer at 21 h., and in winter at 23 h., Greenwich time, or at 8.30 a.m. New Zealand time and 10.30 a.m. New Zealand time respectively; while the maximum easterly occurs at 3 h. in summer and somewhat later in winter—that is, at 2.30 p.m. New Zealand time in summer, and 2.50 p.m. New Zealand time in winter. These maxima occur during the equinoctial months at the hours of 9.30 a.m. and 2.30 p.m. respectively.

It is noteworthy that the change of seasons practically only affects the time of the maximum westerly disturbing force, which occurs here in the mornings, and leaves the time of the afternoon maximum easterly practically unaltered.