A MAGNETIC SURVEY OF JAPAN REDUCED TO 1895.0
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(ABSTRACT.)

The Survey was carried out by 16 observers by order of the Earthquake Investigation Committee, during the four summers of 1890–6. Its full report is given in the Journal of the College of Science, Imperial University, Tōkyō, Volume XIV.

The mean isomagnetics are given by the empirical formula for the declination, dip and horizontal intensity:

\[ \delta = 5^\circ 3'.15 - 8'.274 \lambda + 17'.365 \varphi - 0'.649 \lambda^2 - 0'.236 \lambda \varphi - 0.075 \varphi^2 \pm 0.65 \pm 0.291 \pm 0.345 \pm 0.096 \pm 0.187 \pm 0.103 \]

\[ \theta = 50^\circ 50'.61 - 7'.578 \lambda + 68.253 \varphi + 0.296 \lambda^2 - 0.438 \lambda \varphi - 0.482 \varphi^2 \pm 0.58 \pm 0.247 \pm 0.292 \pm 0.081 \pm 0.158 \pm 0.078 \]

\[ H = 29401.4 - 74.97 \lambda + 362.45 \varphi + 3.497 \lambda^2 - 1.316 \lambda \varphi - 4.331 \varphi^2 \pm 8.1 \pm 3.45 \pm 4.10 \pm 1.41 \pm 2.216 \pm 1.222, \]

where \( \lambda = (\lambda - 138^\circ) \) and \( \varphi = (\varphi - 37^\circ) \) expressed in degrees. The total intensity and its rectangular components are calculated from those formulac and are given in tables and maps together with the observed values and their differences. Four of those maps are given here reduced both in scale and details.

The annual variations of those elements are found by taking simpler expressions as in the former survey of 1887 with which the present is compared assuming the variations to have been uniform. The results are:

\[ \frac{dJ_\lambda}{dt} = 1'.08 + 0'.288 \varphi - 0'.015 \lambda - 0.0013 \lambda^2 \text{ per annum.} \]

\[ \frac{dJ_\varphi}{dt} = -1'.00 - 0.624 \lambda + 0.612 \lambda \]

\[ \frac{dH}{dt} = 9.33 + 0.402 \varphi - 2.460 \lambda \]

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where $\Delta \varphi$ and $\Delta \lambda$ have the same meaning as above.

The vertical current is found in two ways; first by taking line integral round the country, and second by taking surface integral. The latter method gives line of no current running through the middle of the country from northeast to southwest, the direction of current being upward on the southeast and downward on the northwest. By comparing this with the same quantities in other surveys, it is inferred that such current is to be attributed more to the inadequacy of empirical formula than to their real existence.

By neglecting those currents and presence of free magnetism in the air, vertical variations of magnetic forces are calculated, and inferences are drawn to the probable effect exerted by the presence of continent.

Differences of observed and calculated values of rectangular components are treated as those of disturbing forces and their horizontal components are represented in magnitude and direction by lines on a map: from these, magnetic ridge and valley lines are indicated as in British survey. In two districts, Nankaidō and Huzi, attempt is made to trace lines of forces due to disturbing forces.
ISOGONIC LINES

\[
\delta = 5'3'15 - 8'274(\lambda - 138')' + 17'385(\varphi - 37')' - 0'546(\lambda - 138')'{}^2 - 0'236(\lambda - 138')(\varphi - 37')' - 0'075(\varphi - 37')'{}^2
\]
LINES OF EQUAL HORIZONTAL INTENSITY

\[ H = 29401.4 - 74.97(\lambda - 138') - 362.45(\psi - 37') + 3.497 \left( (\lambda - 138')^2 - 1.316(\lambda - 138')(\psi - 37') - 4.331 (\psi - 37')^2 \right) \]
MAGNETIC DISTURBING FORCES

\[ \frac{m}{m_0} = 0.002 \]

- RIDGE LINE
- VALLEY LINE