LOGARITHMS AND NAVIGATION TABLES

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Service hydrographique de la Marine, CASABLANCA, 1944.
(1 vol. 26 × 18 cm., 67 pages)

These tables have been prepared following the advice of Chief Professor of Hydrography Hugon, lecturer at the French Naval Academy, they are intended to replace the Tables by Friocourt and Bertin the stock of which has become deficient. These are used for the calculation of position at sea by Marcq de Saint-Hilaire method.

— The estimated altitude is calculated by a fomula derived from the standard formula : $\sin h = \sin L \sin D + \cos L \cos D \cos P$. By putting

$$X = \cos^2 \frac{P}{2}, \qquad Y = \sin^2 \frac{P}{2}$$

the following is obtained : $X + Y = 1$ and $X - Y = \cos P$

thence : $\sin h = (X + Y) \sin L \sin D + (X - Y) \cos L \cos D$

or : $\sin h = X. \cos (D - L) - Y. \cos (D + L)$ (1)

This formula offers the advantage of requiring one logarithm less than the standard formula : its solution is quicker and more accurate.

ARRANGEMENT OF TABLES.

The calculation of altitude by means of formula (1) requires 4 tables to 5 places of decimals :—

— A table giving the logarithm of cosine for every minute, for all the angles between 0° and 180° (10 pages).

— A table giving logarithms of X and of Y, for every 10 seconds, for all hours between 0 hour and 12 hours (12 pages).

— A table giving the logarithms of numbers from 1.000 to 10.000 (18 pages).

— A table giving the value of natural sine for every minute for all angles between 0° and 90° (9 pages).

For calculating the azimuth formula

$$\cos h \cos Z = \cos L \sin D - \sin L \cos D \cos P$$

is written : $\cos h \cos Z = X. \sin (D - L) + Y. \sin (D + L)$ (2)

By putting $\cos h \cos Z = \frac{Z}{1000}$

$$X \sin (D - L) = \frac{m}{1000}, \quad Y \sin (D + L) = \frac{n}{1000}$$

is obtained $Z = m + n$.

The solution of formula (2) is made by means of a diagram giving 1000 K sin S or 1000 K cos Z, K being the abscissae and S or Z the ordinate.

A first entry in terms of $K = X$ and $S = D - L$ gives m.

A second entry in terms of $K = Y$ and $S = D + L$ gives n.

From $Z = m + n$, Z is deducted with the condition that entry with $K = \cos h$ and Z gives z. This provides the azimuth within 1/2 degree.

A special table furnishes azimuth lower than 10°, the accuracy of the diagram in such case being insufficient.

Four tables provide, in terms of polar angle and of declination of the heavenly body, simple correction data permitting calculation of circummeridians altitudes.

H. B.