

observations. From the gradient of sea-level thus obtained, combined with the data of tidal observations on the coast, the tidal constants at each current station were obtained. Finally he prepared a co-tidal and co-range chart of tides M_2 and K_1 . The characteristic feature of the co-tidal chart of M_2 is the existence of an amphidromic point very near to the east of the Shantung Promontory, around which the tidal wave revolves counter-clockwise in 12 hours. The co-tidal chart of K_1 tide shows that an amphidromic point exists in the Pwok Hai very near to the Pechili Strait, around which the tidal wave revolves counter-clockwise in 24 hours.

ON THE CURRENT IN THE OKHOTSK SEA AND THE ORIGIN OF THE "OYASIO"

by

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(In Japanese. *Suivo Yōhō* (Hydrographic Bulletin) 12 (1933), pp. 325-8, 3 pl.).
Extract from the *Japanese Journal of Astronomy and Geophysics*, Vol. XI, No. 3,
National Research Council of Japan, Tokyo, 1934, page (42).

The author has prepared two dynamical charts of the Okhotsk Sea in the summer season, one from the results of hydrographical observations made in 1916 by the *Unyō Maru* belonging to the Imperial Fisheries Institute, and the other from observations made in 1917. These charts reveal a south-going current in the middle part of the sea. One part of this current returns northward off the west coast of Kamchatka, and the remaining part runs out to the Pacific through the middle part of the Kurile Islands. In the western part of the sea it is expected that several systems of vertical currents will be found to exist.

AN ANNUAL PERTURBATION IN THE RANGE OF TIDE.

by

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On several occasions seasonal changes in the semi-diurnal tides have been ascertained to exist. In 1902 and 1903, DARWIN noted their presence at Ross Island in the Antarctic; others have been noted in Chesapeake Bay and its tributaries, from monthly averages calculated. In 1925 the Tidal Institute noted their existence in the tides of Newchwang.

Tidal analysis in the past has been restricted to a search for constituents indicated by the tide generating potential and by the shallow water theory. In the Report of the British Association for 1923, Professor PROUDMAN has shown that additional frictional constituents are possible. However, none of the above suggests an annual variation in the range of tide. For the purpose of continuing the investigations, a direct method of analysis for such an annual perturbation was considered desirable.

Constituents which will produce an annual perturbation of M_2 may be considered as having either of the following arguments:

$$\left[(\text{Argument of } M_2) - h \right]$$

or

$$\left[(\text{Argument of } M_2) + h \right],$$