A NOTE ON THE DEEP CIRCULATION IN THE AREA EAST OF TAIWAN AND THE PHILIPPINES*

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Received Feb. 23, 1989

Abstract

The deep water (1000-3000 m) circulation in the area east of Taiwan and the Philippines has been little studied. Moriyasu (1972) and Reid (1981) discussed the 3000 db surface (3000/1200 db) and 2000 db surface (2000/3500 db) circulations of the Philippine Sea Basin, respectively. They both showed that there may be a northward current close to the western margin of the Sea Basin. Recent analyses of two sets of deep sea hydrographic data yielded quite different results, i.e., at deep waters in the area east of Taiwan and the Philippines, southward countercurrents flow under the upper northward currents.

The possible causative mechanism of these southward deep countercurrents is the blocking effects of the submarine ridge east of Suao and of the Ryukyu Islands Shelf on the northward flowing upper currents.

The above-mentioned preliminary deductions were wholly based on consideration of the relative geostrophic current and calculation, though the reference surface (3500 db) was very deep. It is suggested that direct measurements of the deep currents in the study area are needed to verify these results.

In this short report, the mid-depth circulation or current pattern in the area east of Taiwan and the Philippines is briefly discussed. According to the working definition suggested by Reid (1981), mid-depth waters are those found between about 1 and 3 km in middle and low latitudes. But the mid-depth waters are called deep waters for short in this paper.

Moriyasu (1972), in the study of "deep waters in the western North Pacific", discussed the 3000 db surface circulation of the Philippine Sea Basin and showed that there might be a northward current close to the western margin which might have been regarded by us as western boundary current as in the Stommel and Arons (1960) model (Fig. 1).

Reid (1981), in the study of "the mid-depth circulation of the world ocean", discussed the 2000 db surface circulation of the Philippine Sea Basin and presented the steric height topography at 2000 db relative to 3500 db as shown in Fig. 2. Evidently, the 0.7 dyn. m. contour also exhibits a northward current close to the western boundary.

Recent analyses of two sets of data from deep sea hydrographic observations yielded quite different results.

The station chart of the first set of data is shown in Fig. 3. There were 14

* Contribution No. 1750 from the Institute of Oceanology, Academia Sinica. This paper was presented at the PRC/USA Symposium on Western Pacific Air-Sea Interaction (Nov., 1988, Beijing). This project was supported by the National Natural Science Foundation of China.
Fig. 1  Geopotential topographic chart (referred to 1200 db) of the 3000 db surface
(After Moriyasu, 1972, in dyn. m)

Fig. 2 Steric height topography (2000/3500 db)
(After Reid, 1981, in dyn. m)