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WATER MASSES IN THE WESTERN PHILIPPINE SEA—PHYSICAL ASPECTS[1]

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ABSTRACT

To study the physical and chemical processes in the Philippine Sea, a joint effort was consummated in May 1985. It was named Cooperative Hydrographic Investigation of the Philippine Sea (CHIPS). This report concentrates on the physical data of the first cruise. From the temperature and salinity data, we found that in the upper 1200 m there is a band structure in both salinity and geostrophic velocity field. This band structure correlates with that north of the North Equatorial Current, and with the bottom topography. A flow field is suggested to explain the upper layer distribution of temperature and salinity in the study area. As the Kuroshio flows over the sill between Taiwan and Yonakuni, it experiences strong vertical mixing which removes Kuroshio's $S>34.9$ characteristic around 200 m depth, and mixes Kuroshio water at about 900 m depth before filling the lower layer of the Okinawa Trough. Strong mixing also exists south of the Ryukyu islands and the mixing effectively weakens the characteristics of the North Pacific Tropical Water ($S>34.9$) and the North Pacific Intermediate Water ($S<34.3$) in this region.

INTRODUCTION

In the North Pacific Ocean, the highest sea surface temperature (SST) is in the western Philippine Sea (WPS). The WPS is bound by the Philippine islands, Taiwan, and Ryukyu islands in the west, and in the east by the longitudinal line halfway between Taiwan and Guam (14°N, 143.2°E). In this region, the western boundary current, Kuroshio, acquires all its momentum and thermal energy. As it flows through the WPS towards the subpolar regime, Kuroshio gradually releases its heat to the overlying atmosphere, to the outer space, and to the cooler water on its coastal side. Since the spatial distribution and the temporal variation of this oceanic heat flux have severe impacts on the global climatic stability, the oceanic heat flux experiments are critical to the World Climate Research Programme (WCRP, 1983). Partly because of its distance from major oceanographic research institutions, and partly because of its desert-like oceanic climate, the WPS did not receive enough attention from the oceanographers in the past; henceforth, only a few high quality hydrographic data of deep stations (Worthington 1981; KER 1979-84) are available in this region.

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