3. Some Features of the PWBC

3.1. The Kuroshio at its origin

The Kuroshio is defined differently by different oceanographers (Kishindo, 1931; Sverdrup et al., 1942; Wyrtki, 1961; Nitani, 1972). Nitani (1972) stated that the current from just north of the place where the North Equatorial Current is separated into two branches offshore east of the Philippines to the east of Japan where the current veers away from land can be called the Kuroshio in a broad sense. At least, the beginning of the Kuroshio is in the region off the east coast of Luzon.

In order to detect the Kuroshio three sections east of northern Luzon and Taiwan were designed (Fig. 1). However, the latitude of the section east of the north end of Luzon for 1986 is half degree different (more) than 1987 and 1988. A summary can be made about the Kuroshio as follows from the inversion-calculated results.

a) Volume transport of the Kuroshio in its origin area

October 1986. The strength of the Kuroshio can be examined by westward volume transport through the meridional section east of Luzon Strait (approximately 122°20'E) and northward through the zonal sections (18°30'N and 22°10'N). It is seen from Fig. 2 that the main flows are concentrated in the upper 600m layer. A very narrow northward flow between st. 7 and 9 is more than 19.10^6 $m^3.s^{-1}$ in transport (Fig.2a). There are two westward flows between st. 9 and 11 (east of Taiwan) with 11.10^6 $m^3.s^{-1}$ in transport and between st. 12 and 14 (north of Luzon) with 19.10^6 $m^3.s^{-1}$ (Fig. 2b). A narrow eastward flow of $3.10^6 m^3.s^{-1}$ in transport gets through the meridional section (Fig. 2b). So if we use the northwestward flow from st. 7 and 14 to indicate the Kuroshio, the transport is about 46.10^6 $m^3.s^{-1}$ without the leakage in between st. 14 and Luzon coast (they are about 46 km apart. The velocity near st. 14 is more than 30 $cm.s^{-1}$. Suppose the average velocity in the upper 600 m is 18 $cm.s^{-1}$ southeast of st. 14, then the transport leaked is about $6.10^6 m^3.s^{-1}$. Therefore, the volume transport of the Kuroshio east of Luzon and Taiwan is about 52.10^6 $m^3.s^{-1}$ which is about 1.5 times of the normal transport (Hu, 1989). This can be circumstantially verified by the σ_t = 26 topography (Fig. 5a).

October 1987. Through 122°40'E section (Fig. 3a) gets a westward flow between st. 18 and 21 with a volume transport of 18.10^6 $m^3.s^{-1}$, and eastward flow with $18.7.10^6 m^3.s^{-1}$ in transport including a narrow eastward flow between st. 17 and 18 with $1.5 \times 10^6 m^3.s^{-1}$. Through 18°N section (Fig. 3b) take place a northward flow between st. 17 and 14 (transport is about 15.10^6 $m^3.s^{-1}$), and two bands of southward flow offshore with transport of 19.10^6 $m^3.s^{-}$ between st. 14 and 13 and 5.10^6 $m^3.s^{-1}$ between st. 9 and 8 in the upper layer. In consideration of the fact that st. 17 is about 50 km away from land, northwestward leakage between st.17 and Luzon might be about 5.10^6 $m^3.s^{-1}$. And then the transport of the Kuroshio is only about 20.10^6 $m^3.s^{-1}$, which is only half of the normal (Hu, 1989). Obviously, the Kuroshio is weaker during this time. A great deal of water getting through the section of 132°E (Fig. 3d-st. 5 to 1) turns right to the north in the place east of st. 1. This also can be verified by the σ_t = 26 topography (Fig. 5b).

October 1988. An obvious westward flow through the 122°40'E section (Fig. 4a) is between st. 10 and 15 mainly in the upper 600 m layer with a volume transport of about $30.10^6 m^3.s^{-1}$ and a return (eastward) flow in the upper 300 m layer exists between st. 8 and 10 with 7.10^6 $m^3.s^{-1}$ in transport. The section along 18°N (Fig. 4b) shows a strong $28.10^6 m^3.s^{-1}$ in transport and wide (about 300 km in width) northward flow, in the upper 600 m layer between st. 15 and 18 and a return flow, which is 300 km wide and with volume transport of 10.10^6 $m^3.s^{-1}$ in the upper 500 m layer in between st. 18 and 21. This year the volume transport of the Kuroshio here is about 33.10^6 $m^3.s^{-1}$ with the same estimate as above since the distance between st. 15 and Luzon is about 33 km. This tendency can be verified from figure 5c.

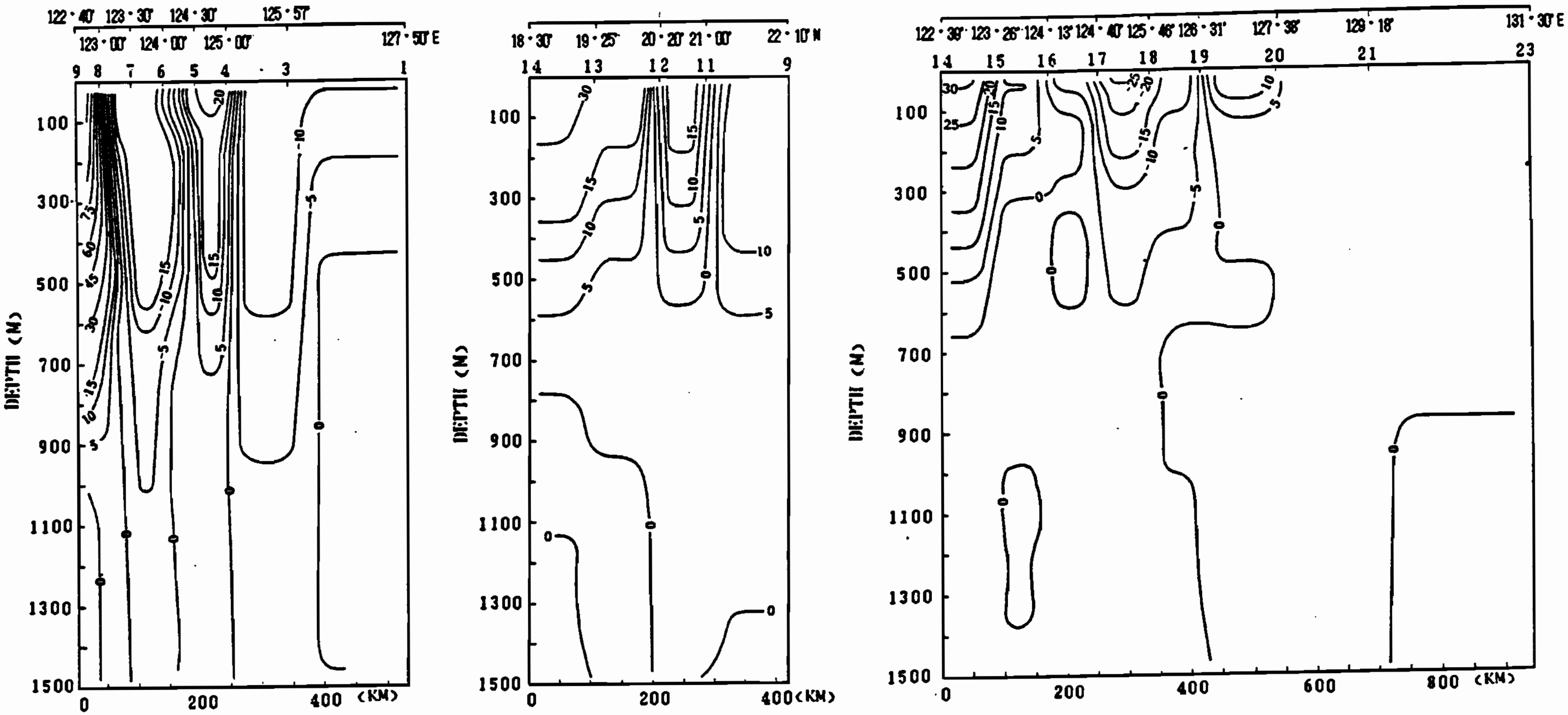

FIG.2. Velocity distribution in October 1986 along 22°10'N (left), 122°20'E (middle), and 18°30'N (right). Positive (negative) flow into (out of) the paper.

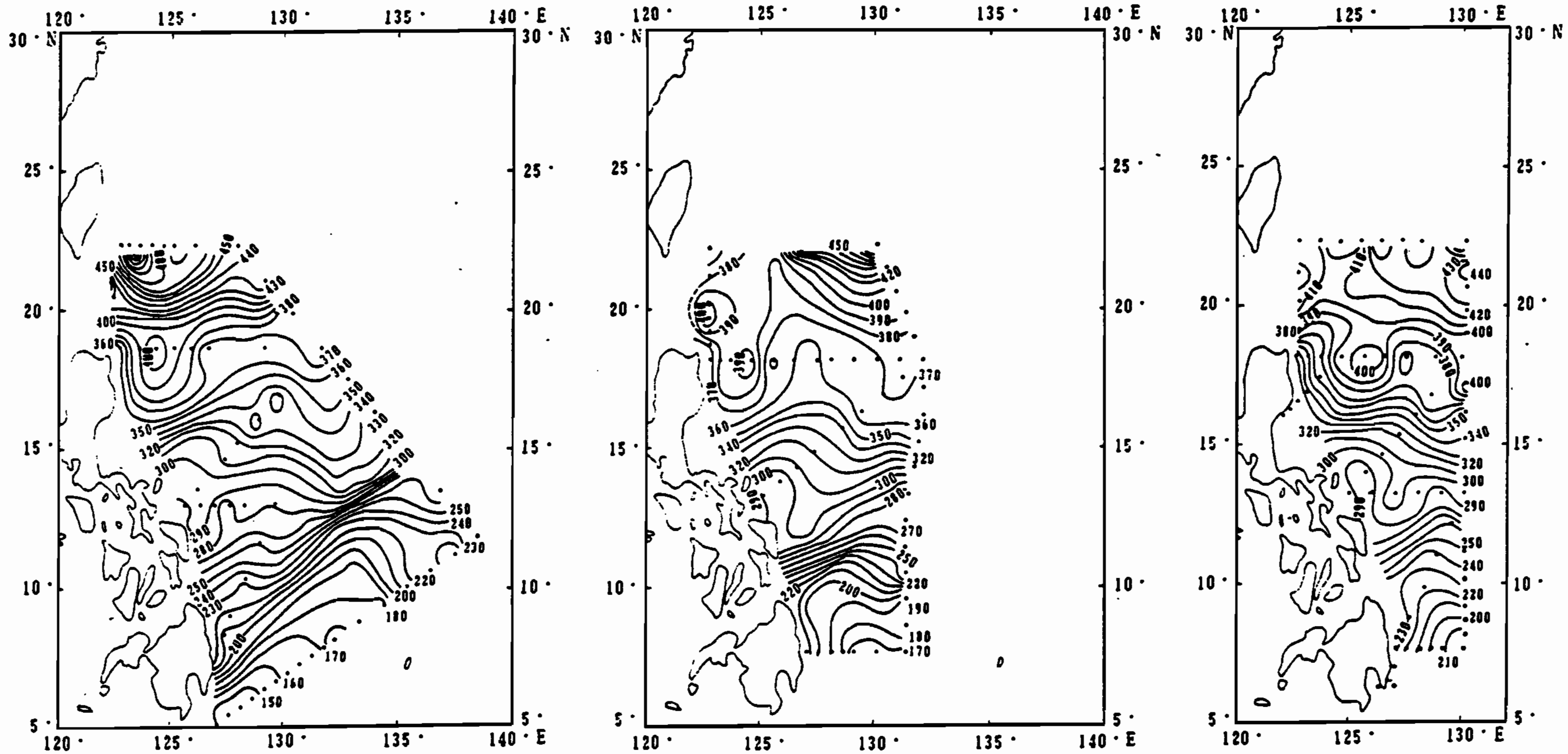

FIG.5. Sigma-t topography in October 1986 (left), October 1987 (middle), and October 1988 (right).

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PROCEEDINGS

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