

Mean Structure and Transport of Taiwan Current (Kuroshio)

Cho-Teng Liu¹, Shih-Pei Cheng¹, Wen-Ssn Chuang¹, Yih Yang¹,
Thomas N. Lee², William E. Johns² and Hsien-Wen Li³

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ABSTRACT

From October 1990 to May 1995, 12 hydrographic cruises were made along a submarine ridge northeast of Taiwan to measure the velocity structure and volume transport (VT) of the Kuroshio east of Taiwan, or the Taiwan Current (Wyrki, 1961). These are part of the Republic of China (ROC) contribution to World Ocean Circulation Experiment (WOCE), PCMI subprogram. From the few hydrographic surveys since 1965, geostrophic computation of the Taiwan Current volume transport (TVT) ranged from $18.7 \times 10^6 \text{ m}^3/\text{s}$ (Sv) to 44.2 Sv, compared to 0 to 46.8 Sv of Kuroshio VT (KVT) in the deeper water regime 600 km downstream near Okinawa. The 12-cruise mean of geostrophic TVT across the ridge was 13.5 Sv. Direct measurement of the velocity field is necessary to assess the contribution of the bottom velocity, v_b in the geostrophic computation of TVT. Ten sections of ship-board ADCP (Acoustic Doppler Current Profiler) velocity v_a were available to estimate Kuroshio's v_b over the shallow ridge. The sections of v_a , density and geostrophic velocity v_g were all interpolated onto the same grid along PCMI. The averaging of 10 velocity sections reduces uncertainties caused by tidal currents, ship-heading and amplitude errors in the ADCP data. The average of $v_a - v_g$ is much larger in shallow regions where v_b is significant than in deep regions where the reference velocity is low. The ADCP section between Taiwan and Yonaguni shows that flow axis of Taiwan Current (Kuroshio) was closer to Taiwan than in the geostrophic velocity section and the TVT was 19.7 Sv for the upper 350 m. Using geostrophy to extend the ADCP velocity profiles to the sea bottom, we estimate the TVT at 22.6 Sv, which is close to the 10-year mean of KVT near Okinawa of 25.5 Sv.

(Key words: Kuroshio, WOCE, PCMI, Transport, Taiwan)

¹ Institute of Oceanography, National Taiwan University, Taipei, Taiwan, ROC

² Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, Miami, Florida, USA

³ Dept. of Oceanography, National Taiwan Ocean University, Keelung, Taiwan, ROC