

Wintertime circulation of the Taiwan Strait derived from surface drifter data

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Abstract

Eight satellite-tracked Iridium SVP surface drifters, drogued at 15-m depth and with data transmitted in 15-minute interval, were deployed in the northern Taiwan Strait (TS) by the Tai-Ma Ferry in February 2017 to measure near surface current and SST of the TS and East China Sea (ECS) in wintertime. Only four drifters survive after the deployment and the other four drifters were shortly picked up by the fishermen. The trajectories show a weak southward movement with a clear semi-diurnal tidal oscillation during a 10-day period of northeastern winter monsoon. As the winter monsoon weakened the drifters moved northward. The drifters also observed a marked SST decrease of 2°C in the central region of the TS before and after the arrival of a strong cold air mass, indicating the influence of the China Coastal Current in the TS. Two drifters exhibit tidal recursion with almost stagnant movement off northern Taiwan, indicating the existence of an amphidromic point in this region.

The trajectories of 220 historical SVP surface drifters from 1989 to 2016 and the NCEP/NCAR reanalysis wind field were also analyzed to elucidate wind-driven near surface circulation in the TS. Among all drifters in the study region, only 17 drifters entered the TS from the ECS or were deployed in the northern TS in wintertime. About half of them moved southward into the TS, and the other half moved northward into the ECS or eastward to the northern Taiwan and were later merged with the Kuroshio. Some of these winter drifters lingered around and eventually went aground in the northern, eastern part of the TS (the Taiwan side), only two drifters moved along the Chinese coast all the way to the South China Sea, indicating the existence of a cyclonic eddy in the northern TS which drives waters from the China coast towards the Taiwan coast.