

A Numerical Study of Currents in the Taiwan Strait During Winter

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ABSTRACT

Hydrographic data acquired in the Taiwan Strait during the past decade suggest that, in winter, a zonal oceanic front develops over the Chang-yuen Ridge implying that the northward moving Kuroshio branch current cannot persistently hug the west coast of Taiwan as it flows toward the East China Sea as previous suggested. A three dimensional numerical model is used to study the dynamic process leading to the hydrographic pattern observed in the Taiwan Strait in winter. Model results show that the warm Kuroshio branch water in the Peng-hu Channel is blocked and then is forced to deflect westward as it impinges on the southern flank of the ridge. On the other hand, the monsoon-driven southward flowing cold China coastal water spreads southeastward into the northern Taiwan Strait when it passes around the Hai-tan Island. The cold water bulge occupies the upper layer of the area north of the ridge in time as winter progresses. The overall flow behavior in the strait in winter favors the formation of the oceanic front over the ridge between the two water masses.

(Key words: Taiwan Strait, Oceanic front, Numerical model)

1. INTRODUCTION

Taiwan Strait (TS) is a shallow water channel connecting the East China Sea (ECS) and the South China Sea (SCS). Figure 1 shows isobaths of the seas in and surrounding the TS. A distinct topographic feature in the TS is a ridge, Chang-yuen Ridge (CYR), extending westward from the middle of the west coast of Taiwan, to separate the strait into two basins. Early hydrographic investigation results suggested that there is a persistent northward current in the eastern TS carrying warm and saline water to the ECS (Chu, 1961; Wu, 1984; Chuang, 1985; etc.). Direct current measurements also indicate that, in winter, the mean current is northward in the Peng-hu Channel (PHC) and at the location marked CBK in Figure 1 (Chuang, 1985; Wang *et al.*, 1988). According to results of hydrographic observations in the northern SCS and the ECS, Guan (1986) further speculated that this northward current in the TS connects the so called "South China Sea Warm Current" in the SCS and the "Taiwan Warm Current" in the

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