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ON THE DEFLECTION OF A ROTATIONAL, BAROCLINIC JET BY AN ANGULAR COAST WITH APPLICATION TO THE BRANCHING OF CURRENTS SOUTHWEST OF TAIWAN

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ABSTRACT

The impact of a baroclinic jet upon an angular landmass is studied in terms of a steady, rotational and inviscid two-layer model. Integrations of the momentum equation over a control volume give dynamical constraints on the flow field, which specify the dependence of internal parameters, e. g. the partition ratio of deflected momentum or volume fluxes along either direction of the coast, upon given external parameters, such as the incidence angle of the jet and the shape of the landmass, etc.. These results are utilized to interpret some aspects of the impingement of the southwest-monsoon driven current onto Taiwan. The monsoon current is a dominant northeast ward flow in the summer; due to the blockade from the landmass, it splits into two branches when approaches to Taiwan. Supposing the inflow current possesses approximately constant potential vorticity, then its right-handed, southeastward branch would bring out about 77% of the total incoming volume transport from the study region; while the left-handed, northward branch delivers the remainder 23% through the Peng-Hu Channel to the downstream northern Taiwan Strait. Based on this partition rule and from an estimated volume transport of the latter branch, preliminary values for the summertime budget of volume flux of the upper layer in the northeastern South China Sea could be obtained; i. e. 2.6 Sv is brought in by the inflow monsoon current from the upstream southwest of Formosa Banks, while 2.0 Sv goes with the southeastward branch and the remainder 0.6 Sv drains out from the Peng-Hu Channel.

INTRODUCTION

The flushing of surface waters from the northeastern South China Sea (SCS), into either the Taiwan Strait (TS) or the Bashi Channel then passing respectively to the East China Sea and the Philippine Sea, is of importance to the summertime hydrography of these areas; because the process is associated with the horizontal movement of waters, which is physically the most efficient process delivering materials from the semi-enclosed SCS to adjoining water bodies. Current charts showing the summertime circulation pattern of the surface layer in the northeastern SCS had been given by Wyrtki (1961), among others. The dominant current in the SCS is induced by the prevailing southwest monsoon and flows northeastward during summertime (Wyrtki 1961; Chu 1971, 1972). Detailed regional features of this current in the vicinity of southern Taiwan were also reported by later investigators (e. g. Fan and Yu 1981; Chern 1982); they found that the monsoon current splits into two branches when approaches to Taiwan; one passes through the Peng-Hu Channel (PHC), and the other deflects to the southeast and flows along the coast of southern Taiwan then destines for the Pacific. Recently, more and more current data from instruments moored in the southern TS are

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