P28. MAPPING TIDAL CURRENTS AND RESIDUAL CURRENTS BY USE OF COASTAL ACOUSTIC TOMOGRAPHY

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A coastal acoustic tomography (CAT) experiment for mapping the tidal currents in the Zhitouyang Bay was successfully carried out with seven acoustic stations during July 12 to 13, 2009. The horizontal distributions of tidal current in the tomography domain are calculated by the inverse analysis in which the travel time differences for sound traveling reciprocally are used as data. Spatial mean amplitude ratios M_2 : M_4 : M_6 are 1.00 : 0.15 : 0.11. The shallow-water equationsare used to analyze the generation mechanisms of M_4 and M_6. In the deep area, velocity amplitudes of M_4 measured by CAT agree well with those of M_4 predicted by the advection terms in the shallow water equations, indicating that M_4 in the deep area where water depths are larger than 60 m is predominantly generated by the advection terms. M_6 measured by CAT and M_6 predicted by the nonlinear quadratic bottom friction terms agree well in the area where water depths are less than 20 m, indicating that friction mechanisms are predominant for generating M_6 in the shallow area. Dynamic analysis of the residual currents using the tidally averaged momentum equationshows that spatial mean values of the horizontal pressure gradient due to residual sea level and of the advection of residual currents together contribute about 75% of the spatial mean values of the advection by the tidal currents, indicating that residual currents in this bay are induced mainly by the nonlinear effects of tidal currents.