The differences in the potential energy anomaly for analyzing mixing and stratification between 2D and 3D model

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Abstract

As Simpson et al. (1990) emphasized the importance of the straining process in the stratification and mixing in the estuarine circulation process, various researches have investigated on the relative contribution of each process to the overall potential energy anomaly dynamics. However, many numerical works have done only for two dimensional modeling along channel or the short distance cross sectional three dimensional simulations as Burchard et al. (2008) and the estuarine channel was not simulated so far. But, in the study on the physics of shallow coastal seas, spatial dimension in the three dimensional way affects significantly on results of a particular numerical model. Therefore, the comparison of two and three dimensional models is important to understand the real physics of mixing and stratification in an estuary. Also, as Geyer and MacCready (2013) pointed out that the lateral process seems to be important in determining the periodic stratifications, to study such process the three dimensional modeling must be required. The present study uses a numerical model to show the signification roles of each term of the time-dependent dynamic equation for the potential energy anomaly (PEA) in controlling along and lateral channel flows and different stratification structures. Moreover, we present the relationships between the Φ-advection, the depth mean straining, vertical mixing and vertical advection can explain well how water level, salinity distribution and across velocity 2D model are slightly different from 3D.

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Key words: PEA, three dimensional models, stratification, mixing.

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