Modeling Cohesive Sediment Transport in Tidal Bays with Current Velocity Assimilation

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Abstract: In coastal and estuarine waters, cohesive sediment transport often induced by tidal waters periodically enters and exits such regions. Clearly tidal currents must thus play an important role in sediment dynamic change. The aim of this study is to investigate the effect of current velocity assimilation (CVA) on such sediment transport predictions. A three dimensional hydrodynamic and sediment transport model in Deep Bay, Hong Kong has been built based on the well calibrated 3-D primitive equation Finite Volume Coastal Ocean Model (FVCOM). A model simulation with a time series assimilation of current velocity measurements from six vertical levels is then conducted. The optimal interpolation assimilation method is used in the CVA. Measurements from two sites not involved in the assimilation were used as the validation of the assimilation results and a fairly good velocity improvement was achieved. More importantly, simulated sediment concentration at measurement sites is enhanced in the model with CVA. Comparison of both vertical and spatial distributions of sediment concentration also showed a positive CVA effect. It was found that the bottom shear stress changed significantly after the addition of CVA, the latter correcting the velocity in the model. The model results suggest that the inclusion of CVA in the model is a feature enabling sediment transport modeling to be improved since current velocity dominant the sediment dynamic in the tidal bay.

Keywords: *sediment modeling, current velocity assimilation, optimal interpolation, FVCOM, Deep Bay*