# 1D AND 2D COUPLING ALGORITHM FOR PREDICTING FLOW AND SEDIMENT TRANSPORT IN RIVERS AND ESTUARIES

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The one-dimensional shallow water model is often used for the long reaches of rivers, because it provides a very accurate description of the river cross-sections and enables very efficient solution. Though the two-dimensional models are able to provide a more general description of the flow, they need more detail information of the domain and more CPU time to complete. Especially the two-dimensional models do not always allow for an accurate and efficient modeling of narrow rivers. Many one-dimensional models (MIKE11; Sheng J., Yanfen G., Zhili W., 2004; Li YS, Yong P., 2001) are successful used to the rivers.

The advantage of the two-dimensional models is that they describe the spatial distribution of the flow and provide a more general description of flow such as the detailed velocity, water level and sediment that may be used full locally. Because of the domains are often not regular, to accurate simulation the boundary of domains, many numerical models employ orthogonal rectilinear or curvilinear coordinates in order to fit the estuary boundary. Boundary fit grid method is successfully used to multi-dimensional simulation, but using those methods, the control equations become more complicated and for the complex boundary the grids are also not easy to generate. Compared with the boundary fit method, the unstructured grid methods are more flexible. So in this article the unstructured grid is used in the two-dimensional model.

Combined the one-dimensional and the two-dimensional models in which the one-dimensional models are used to the long reaches of river networks and two-dimensional models are used to the areas which we want to know more detailed flow information can exert all advantages of them. The dynamic functions of rivers and sea interact with each other in an estuary. The conditions of the water and sediment are unsteady and non-uniform. Previous works (Zhang SQ, Li YT, 1999; Wu WM, Li YT, 1992; Runge M., Olesen K. W., 2003) on the one- and two- dimensional combined models usually use simple matching conditions. Zhang (2004) present an implicated algorithm for the juncture, which based on the finite element method, but it is not efficient for the two-dimension estuary.

In this article, a 1D and 2D coupling numerical algorithm is developed for simulation the flow and sediment transport in rivers and estuaries, which based on the CC type finite volume frame and Roe type approximate Riemann solver. The 1D model is used to the long reaches of rivers and the 2D model based on the unstructured grid is used for the estuaries and sea. The flow and sediment transport of the Pearl Rivers and the delta estuary (Fig.1) is implemented as an example to test the present algorithm. The numerical results (Fig.2) comparison with measured data show that the model is correct, reliable and efficient.

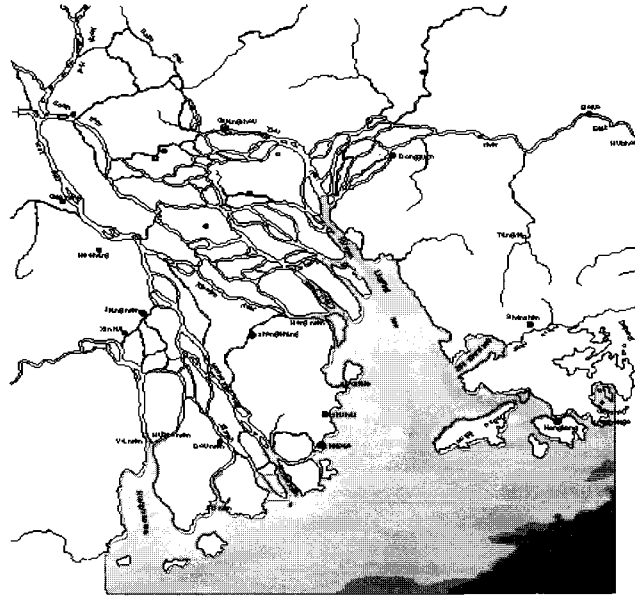

Fig.1 The sketch of the Pearl River Delta and estuary model

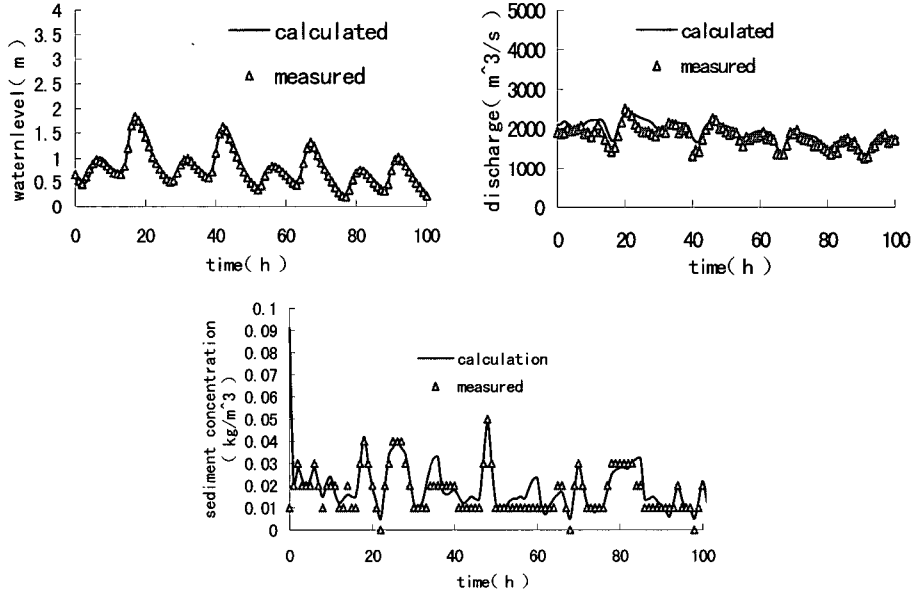


Fig.2 Comparison of numerical solutions with measured data for water lever, discharge, sediment concentration at the river section

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