Comprehensive Simulation Model on Current in Region from River to Coastal Zone

1. Current Simulation from Oceanic Region to Coastal Zone

In the case of estimating the flow field of the southern coast of Japan facing the Pacific Ocean, the effects of the oceanic current (Kuroshio Current) must be included in the numerical model. On the other hand, the tidal current, the wind drift current and the density current associated with rivers needs to be reproduced in the detail. The method of dealing with these different scale flow fields is executed by the following procedures: (1) to extract the fundamental data of flows in the southern coast area from JCOPE (Japan Coastal Predictability Experiment) in which the flow of global scale is reproduced with high precision and high resolution, (2) to set it as boundary conditions and (3) to perform the simultaneous computation of multi coastal area. The method using both of σ-coordinate system and z-coordinate system is adopted in the region of sudden depth change and complicated sea bottom.

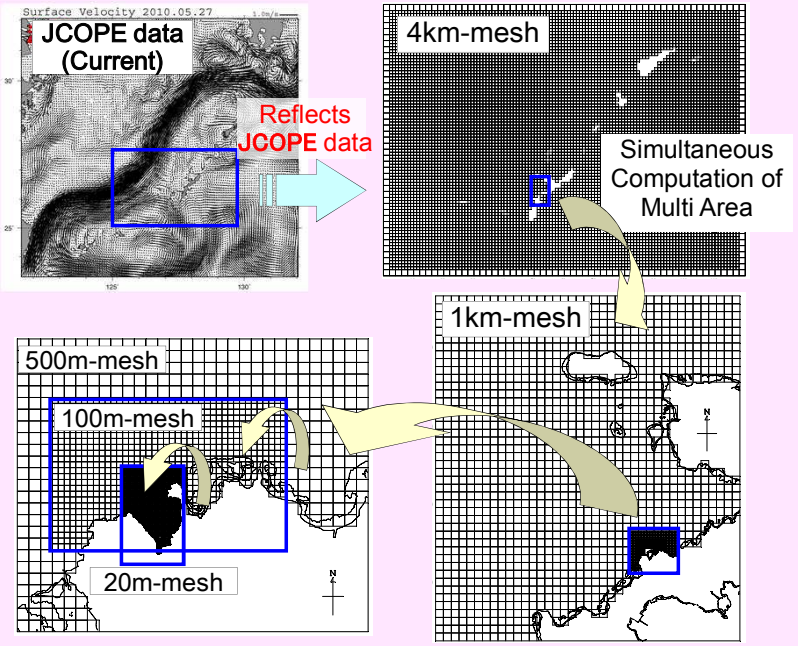

Figure 1 : Schematic Model of Combining Flow Fields of Wide Area and Coastal Zone

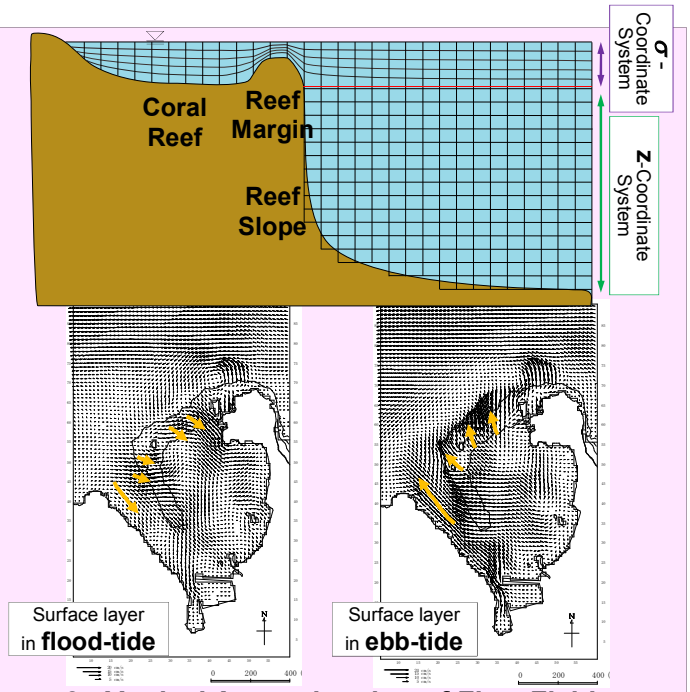

Figure 2 : Vertical Approximation of Flow Field on Coastal Zone and Simulation Examples

2. 3D Simulation Model of River Flow (Applying DELFT3D)

The unstructured grid is applied to the 3D simulation of meandering flow path, because of its higher precision of duplicating a configuration of a river channel. In a river channel section, the approximation method of multi-layer can be carried out. The friction coefficient of river bottom is set by changing the roughness coefficient of Manning for each location. According to the simulation results, it is possible that the strong stream according to the depth of flow path and the secondary streams generated by the curvature of the river are observed. By the simultaneous computation of the distribution of temperature and salinity, the discharge of the fresh water at surface layer and the upwelling of the salty water mainly distributed at bottom layer can be reproduced.

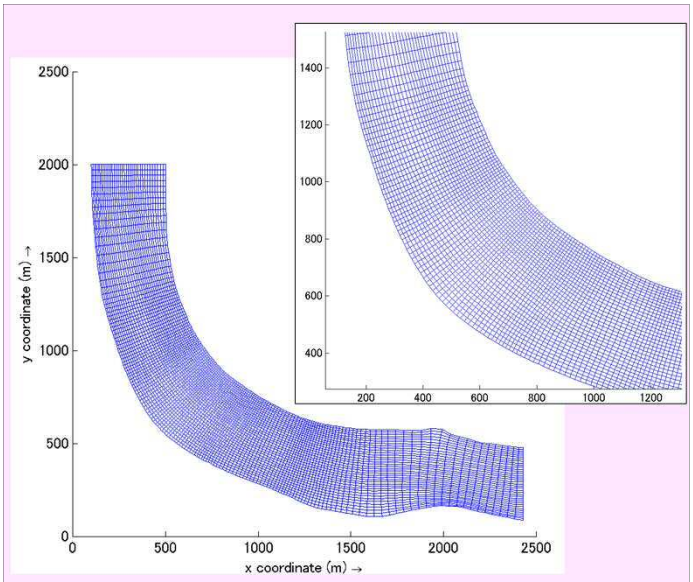

Figure 3: Example of Topographical Reproduction along River Channel

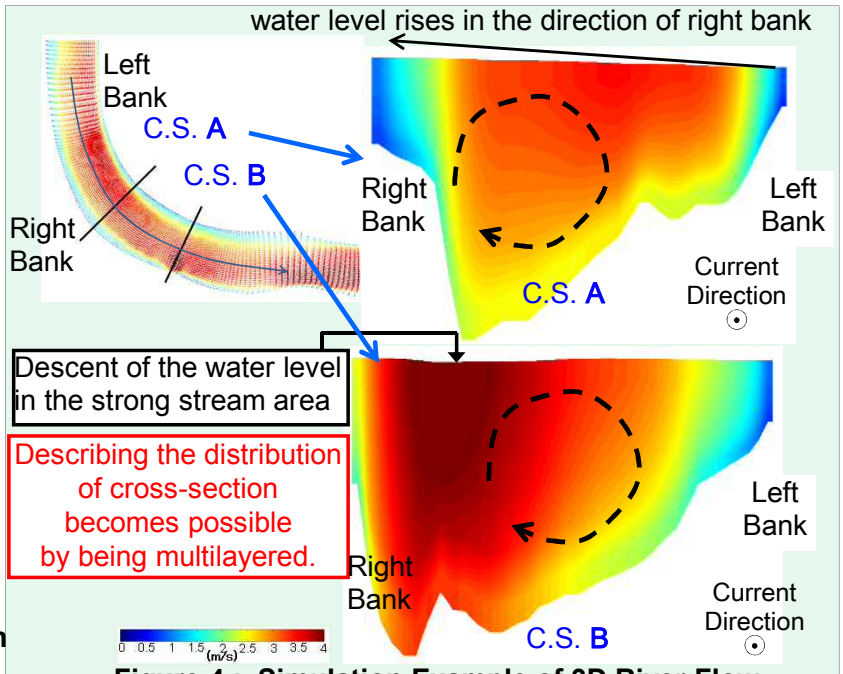

Figure 4 : Simulation Example of 3D River Flow