Study of hydrodynamic model in sluice controlled river networks

Yan Li (1) and Fantang zeng (2)

(1) South China Research Institute of Environmental Sciences (liyan@scies.org), (2) China South Research Institute of Environmental Sciences (zengfantang@scies.org)

Shiqi river network ,is situated in the Zhongshan city of Guangdong province in the P.R.China. The river network covers approximately 702.55km2 ,with a total river length of over 500km and extending over 34km from north to south and over 46km from east to west.

The river network overlaps with the most densely populated and economically developed region in the Pear River Delta Economic Zone. In 2008 the region had a population of 1 846.9 thousands And a GDP of more than 8 2500 million RMB.

All branches of the river network are encircled by the main rivers of Pear River Delta(PRD) network. With the economic and social development, all natural connections with the external rivers are controlled by the sluices, water body exchanges between the Shiqi river network and external rivers are significantly changed by human activities.

The overall objective the research is to develop a tool for the local Environmental Protection Bureau to Understand and quantify the impact of the artificial construction on the hydrological cycle.

The developed model can accurate representation of the water levels and flows in the study area, to allow accurate representation of the transport of pollutants.

The river network topography is derived directly from the available database. Only the "major" rivers were included in the model, because cross-section data for the "minor" rivers are currently not available.

In general, the 1D hydrodynamic model is provided with flow boundary conditions ("Q") at its upstream boundaries and with water level boundary conditions ("z") at its downstream boundaries. For all boundaries of Shiqi river network, there are no flow records available, all records are water level. To reflect the hydrodynamic process accurately, the author developed a new methods to set the hydrodynamic model's boundary. For each boundary, the boundary condition is "Z" when the sluice is open, and the boundary condition is "Q" while it is closed. The open or close condition is identified by the water level differences inside and outside the sluice.