ABSTRACT

Xiangshan Bay characterized by typical bedrock and silt is a long and narrow coast waters. It is both a traditional shellfish and algae breeding base and a frequent human activity area, where the environmental pollution is increasingly severe. Simulating pollutant transport process and forecasting water quality changes could provide a strong support for comprehensive improvement of water quality. A FVCOM-based tidal current hydrodynamic model is built. It is validated that this model can successfully simulate the bay’s hydrodynamic conditions. Based on a pollutant transport model with the hydrodynamic conditions, the transport process of the pollutant from major land-based outlets in the bay is simulated and discussed, and the pollutant transport regularity is summarized.

KEY WORDS: a long-narrow waters; pollutant transport model; pollutant; outlets.

INTRODUCTION

Xiangshan Bay is located in the middle part of the coastal area of Zhejiang, China, with Hangzhou Bay in north, Sanmen Bay in south and Zhoushan Archipelago in east (Fig. 1). It is a narrow half-confined harbor along northeast-southwest direction with 3km ~ 8km in width, and extends 60 kilometers inland. The bay with 1445km² catchment area is an ideal deep safe harbor, and both a traditional shellfish and algae breeding base and a frequent human activity area. With the development of the social economy and the coastal harbor industry, sewage from land-based outlets discharged into the bay leads to accelerated eutrophication, and several red tide events have happened in recent years. The optimal arrangement of land-based outlets in the bay has become one of focuses.

Fig. 1 Geographic sketch map of Xiangshan Bay

The major tidal current restricted by topography and boundary condition in Xiangshan harbor is reversing current with little rotation, and the current velocity reduces gradually from the bay’s entrance to the inner and the average velocity in main channel is the greatest. Furthermore, direct water exchange is dominant in east of Xize, and residual current exchange occurs in west. The regional characteristic is obvious. Generally, the hydrodynamic condition is the most important lasting impetus for pollutant dilution and transport. So, analyzing hydrodynamic characteristic and discussing pollutant transport process regionally is of great importance for optimal arrangement of land-based outlets and pollution control in Xiangshan Bay.

There are already many researches on Xiangshan harbor’s hydrology. However, it presents a marked shortage for modeling sophisticated terrain features in this area with rectangular grid. A 3-D unstructured-grid, free-surface, primitive equation, Finite-Volume Coastal Ocean circulation Model (FVCOM) can simulate complex shoreline with