ABSTRACT

This study combines the field data analysis and the numerical simulation to analyze the channel evolution of Chengtong reach, which is located at the upper section of the Yangtze estuary. It is found that the main dynamic factor to shape the estuary channel is the ebb current. The recent changes of averaged ebb current velocity in the main channel show that the Chengtong reach is still in the process of development.

KEY WORDS: Chengtong reach; Yangtze estuary; channel evolution; field data analysis; numerical modelling.

INTRODUCTION

Yangtze River is the longest river in China and the third longest river in the world. The estuary of Yangtze River starts from the city of Jiangyin of Jiangsu Province and reaches the East China Sea by the city of Shanghai (Fig. 1). In recent years, the riverbed of Yangtze estuary has exhibited significant changes under the effects of natural evolution and human-kind activities such as upstream hydraulic engineering and local reinforcement, reclamation and waterway regulation projects at the estuary (Yang et al., 2006; Liu et al, 2007). Although a lot of research on the channel evolution of Yangtze estuary have been done in the past (e.g. Wang et al, 2008; Jiang et al, 2011), most of them only presented the qualitative trends of channel evolution based on the analysis of field measured bathymetry data. The dynamic reasons of those changes are still not well known. In this paper a new method by combination of field data analysis and numerical simulation is proposed to analyze the dynamic relationship between the channel evolution and the changes of hydrodynamic conditions at the upper section of Yangtze estuary.

The study area in this paper is the Chengtong reach of Yangtze estuary, starting at Ebizui and ending at Xulijing, with the total length of about 90km. The cities of Jingjiang, Rugao and Nantong locate on the left bank and the cities of Zhangjiagang and Changshu locate on the right bank (Fig.2). In recent years, with the continuous implementation of reinforcement engineering, the bank of Chengtong reach tends to be stabilized. However, the main channel of Chengtong reach, which is connected through Fuzhong waterway, Liuhaisha waterway and Tongzhousha east waterway, are not very stable because most of the shoals in this reach, such as Fujiangsha, Rugaoasha, Tongzhousha and Langshansha, move quite frequently. The continuous movement of the shoals causes considerable erosion-siltation changes at riverbed and leads to a frequent shift of deep trough. Those changes will affect the stability of channel of the Chengtong reach, which may raise a potential risk to harbour and waterway engineering in this area. In order to have a better understanding of the local riverbed change, it should carry out a comprehensive study to analyze the channel evolution, and predict the changes for the future.