Suspended Sediment Environment Characteristics in Haizhou Bay Sea Area, China

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ABSTRACT

Suspended sediment concentration (SSC) environment is analyzed based on the observed data during the period from 1985 to 1995, Jan. 2006, Jun. 2009 and Aug. 2009 and the remote sensing data from 1987 to 2005. Results from the study suggest that: (1) SSC has obvious seasonal, temporal and spatial change, which is controlled by tidal range; (2) SSC during the strong wind is 3-5 times the general weather, and the SSC peak has certain hysteresis with wave height peak; (3) in most cases, waves are the main power of sediment movement in the nearshore shallow waters, sediment movement by wave and tidal current plays an important influence on the Haizhou Bay terrain evolution.

KEY WORDS: Haizhou Bay; suspended sediment concentration (SSC); remote sensing; wave and tidal current.

INTRODUCTION

SSC is an important indicator to reflect the sediment transport and resuspension processes, which are the important factors to study the condition of an estuary, its navigation environment and harbor construction (Zuo et al., 2012). SSC of the estuary or bay is controlled by multiple factors including freshwater and sediment discharges of the river, tides and waves (Li et al., 2010). Change of SSC can indicate the changes of sediment sources and transport processes or dynamic conditions.

Haizhou Bay is an open bay on the verge of Yellow Sea. Port development is still a blank in the bay at present. In order to develop the port resources of Haizhou Bay and the economic development of Jiangsu Province, Ganyu Harbor District of Lianyungang Port will be planned in northern sea area of Haizhou Bay, which is the adjacent area of Shandong Province and Jiangsu Province. In recent years, relative research achievements (i.e. geomorphic features, shoreline change, hydrodynamic and sediment) become abundant in response to the construction of Ganyu Harbor District (Fan et al., 1997; Sun et al., 2003; Zhao et al., 2008; Zhang et al., 2008). However, the characteristics of SSC distribution study of Haizhou Bay are rare.

Remote sensing is as a useful technique to study the SSC in estuarine and coastal waters (He et al., 1999; Zuo et al., 2010; Li et al., 2010; Zuo et al., 2014). The spatiotemporal distribution of SSC in a region can be obtained by analyzing the data of remote sensing, which is a very economical and efficient method. At present suspended sediment distribution is studied generally by using the measured data analysis and remote sensing data inversion method. In the paper, the SSC distribution characteristics are studied by the multi-method in order to further recognize the hydrologic and sediment features of Ganyu Harbor waters.

STUDY AREA AND METHODOLOGY

Study area and its natural conditions

Haizhou Bay north origin of Foshouzui (35°05’55”N, 119°21’53”E) of the Lanshan Town in Shandong Province, south to Gaogong Island (34°45’25”N, 119°29’45”E) of Lianyungang in Jiangsu Province, which is an open bay on the verge of Yellow Sea. Mouth width, coastline length, area of Haizhou Bay are 42 km, 87 km, and 876 km² respectively. Water depth of Haizhou Bay is shallow, and slope is slow with average gradient 1.0‰. There are bedrock coast, sandy coast, silt coast and muddy coast, and coastal types are complete in the bay (Fan et al., 1997).

The tides of the Haizhou Bay are predominantly regular semi-diurnal. The sea area is meso-tidal waters with mean tidal range 3.43 m. Tidal current actions are relatively weak, the averaged current velocity ranging from 0.20m/s to 0.40m/s and the maximum current velocity is 0.50m/s-0.70m/s.

In Haizhou Bay, the primary prevailing waves are wind waves. The prevailing wave directions are NE and E with the frequency of 26.41%, 18.40% respectively. The annual average H1/10 (H10 is the wave height of the average for fore 10% waves) of NE and E are 0.7m, 0.5m respectively. The strongest wave direction is NNE with the highest