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Topographical Change of the Sandbar and Estimation of Suspended Solid Flux in the Nakdong River Estuary, Korea - Focused on Jinudo -

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ABSTRACT

In this study, to establish a countermeasure from marine casualties as a basic study for long-term prediction of topographical change around Jinudo in the Nakdong river estuary, Korea, spatio-temporal topographical change monitoring and Suspended Solid (SS) net flux estimation were carried out. From the result of monitoring, the annual mean ground level and deposition rate were estimated about 158.8 mm and 0.431 mm/day, respectively. Moreover, the depth averaged values of the latitudinal and longitudinal SS net fluxes during spring tide were approximately 6.0 times higher than those during neap tide.

KEY WORDS: monitoring; deposition rate; SS net-flux; Jinudo; Nakdong river estuary; Korea.

INTRODUCTION

It is difficult to predict for environmental change in river estuary because this zones undergo constant changes due to the interaction between marine and fluvial systems. The zones in coastal area such as the tidal flat and salt marsh, is gradually decreased and changed due to large scale of coastal development projects, land reclamation, dike construction, and large amounts of soil dredging and so on (Tonis *et al.*, 2002; van der Wal *et al.*, 2002).

The Nakdong river estuary, Korea, is located in the south-eastern part of Korea, is very famous for the largest Asian habitat for migratory birds. However, this estuary is suffering from the changes in the water circulation and topographical changes caused by the generation and migration of sandbars.

The Suspended Solid (denoted as SS) originates from the materials such as clays, nutrients, polluted organic matters, and heavy metals. The transport of SS in shelf seas attracts more and more attention of scientists from different disciplines, as it plays an important role for many processes in the marine environment, not only for marine geology but also for the marine ecosystem (Jiang *et al*., 2004).

As a result, many experiments have been undertaken to analyze topographical change (Ban *et al.*, 1995; van der Wal *et al*., 2002; Blott *et al.*, 2006; Lee *et al.*, 2007; Yi *et al.*, 2007, Yoo *et al.*, 2007; Yoon *et al.*, 2007) and SS transport (Yanagi *et al.*, 1994; Lee *et al.*, 2006; Lim *et al.*, 2007) in estuaries. However, these studies have not provided detailed spatio-temporal change patterns of active deposition in the southern region of Jinudo.

In this paper, to establish a countermeasure from marine casualties as a basic study for long-term prediction of topographical change around Jinudo in the Nakdong river estuary, spatio-temporal topographical change monitoring was carried out. Besides, in order to know relative between the SS flux and topographical changes at a station located in about 3 km from Jinudo, SS concentration, current velocity and bed load were measured using the Van Dorn water sampler, RCM-9 and sediment trap during a spring and neap tides.

MATERIALS AND METHODS

Study Area

The Nakdong River is one of the largest rivers in southeast Korea (Fig.1). Area of the watershed is 23,817 km^2 while the waterway length is approximately 521.5 km. The Nakdong River is a major freshwater source for Busan City, with a yearly discharge of 1.5×10^{10} m^3/yr (Eun *et al*., 1998). The average depth is approximately 5 m, and range of tidal is approximately 2 m. The average annual precipitation is 1,160 mm, while two-thirds of that falls from July to September (Lee, 1993).

Monitoring of Topographical Change

Monitoring of Topographical Change

The monitoring of topographical change was carried out by installing the monitoring piles of topographical change around Jinudo which is located in western part of Nakdong River estuary (Fig.1). To install monitoring pile, the section leveling was conducted between St.7 and St.8 on Apr. 21, 30, May 8. As a result, 0 m of ground level where topographical change was most active was selected as standard level for the monitoring of topographical change. The three piles were installed in each region of Jinudo. The one and three additional piles were installed in the northern and southern parts, respectively, because these parts were longer than other parts. The steel pipe piles with 2 m length were installed in a ground 1 m in height. The monitoring of topographical change was conducted 14 times from July 8, 2005 to July 30, 2006.