ABSTRACT

In this study, to examine the topographic change of natural beach in semi-closed water area, the field observation on the sediment transport in the vicinity of shoreline by boat waves, image analysis of aerial photographs to grasp mid- and long-term topographic change and numerical simulation on tidal current and ocean waves were carried out. Study site is Omaehama beach which is located in the closed-off section of Osaka bay, Nishinomiya city, Hyogo prefecture, Japan. In front of the water area of Omaehama beach, most boats round trip along the coast line, the deviation of the directions of sediment transport to one side or the other wasn’t observed and we couldn’t find distinguished shoreline change. On the other hand, in terms of mid- and long-term topographic change, Omaehama beach remains unchanged due to surrounding landfills which prevent the approach of offshore waves.

KEY WORDS: Omaehama beach, semi-closed water area, boat wave, topographic change

INTRODUCTION

In previous times, natural coasts with white sand and green pines had been spread in Osaka bay which is one of the most famous semi-closed water areas in Japan. However, natural coasts has been disappeared, segmented and isolated by the development of coastal regions. Under such social situation, Omaehama beach located in the north part of Osaka bay still remains precious natural environment. The name of “Omaehama” has a long history and dates back to the time of Heian Period (794 - 1185). The coastline of Omaehama beach at that time was above the current position and it was located in front of Hirota shrine. Omae means honorific title of “In front of God” and hama means beach. Hence, the place-name Omaehama means “natural beach in front of Hirota shrine”. This natural beach has been designated many laws and regulations such as the wildlife sanctuary by Hyogo prefecture. In former Omaehama beach, it was an old historical and cultural place, therefore, residents in previous times could enjoy sea bathing or live primarily by fishing. In these days, we can see people enjoying the personal watercraft and water-skiing. On the other hand, the development of coastal regions such as reclamation strongly promoted to enclose water area. It led to seawater environmental degradation, the blue tide generated by rising anoxic water is often reported in especially summer season when the thermal stratification was promoted.

Recently, the rehabilitation of continuity between beaches in semi-closed sea water area are tried to carry out as a part of urban redevelopment, however, we’ve not learned enough about it. In previous our study (Uno et al, 2010, 2011), the characteristic of sediment transport by boat generated waves in the vicinity of coast line was clarified by both field observation and numerical analysis. Moreover, we’ve been tried to exam how local wind and boat generated waves affect the current and ocean wave field. However, the direction of sediment transport by boat generated wave and the effect of topographic change on current and ocean wave field still remain to be examined.

In this study, we tried to clarify how the original external force in semi-closed water area such as boat waves and surrounding topographic change affect the direction of sediment transport and mid- and long-term topographic change in Omaehama beach, field observation, image analysis and numerical simulation were carried out.

METHODS

Field Observation

Figure 1 shows our study site, Omaehama beach in Nishinomiya City, Hyogo prefecture, Japan. This beach has been surrounded by artificial islands. To clarify the direction of sediment transport by boat generated waves, sediment trap separated crosswise by partitions (Figure 2) was installed on the surface of beach in the vicinity of shoreline. After the deposition by boat generated waves in the sediment trap was confirmed, it was immediately recovered from the surface of the beach and the amount of sediment in each block was weighed in the laboratory. The amount of sediment transport from east to west can be estimated by adding the amount of related sediment traps. For example, the amount of sediment transport from east to west can be estimated by adding the amount of deposition in No.2 and No.3 block.

In parallel above experiments, at St.1 in Figure 1, water velocity, wave height and tidal level change were measured by the self-recording equipments. The water depth of St.1 at the low tide is 2m. The wave height was eliminated the effect of tidal change and water level was adjusted by using the data of tidal change observed by Japan