Modified SBEACH Model for Predicting Cross-Shore Profile with Sea Dike in Run-up Region

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ABSTRACT
In this study, the applicability of SBEACH for predicting the local scouring depth in front of the sea dike on the run up region is examined through two-dimensional laboratory experiments. It is found that the local scouring depth at the foot of sea dike under the incidence of erosion type waves can be estimated by the slightly modified SBEACH by applying a proper boundary condition at the location of the sea dike.

KEY WORDS: erosion type beach deformation, local scouring, setting depth, sea dike, SBEACH

INTRODUCTION
Sea dikes are usually constructed on the place where significant wave overtopping does not take place under design wave and tide conditions assuming that the beach in front of the sea dike keeps on its initial design profile. The position where the sea dike is newly constructed is determined to be as high position as possible as depending on the surrounding circumstances. The crown height of the sea dike must be high enough to reduce wave overtopping rate within an allowable amount.

In the case where there is a wide sandy beach in front of sea dikes, the shape of cross-section of the beach usually changes according to the incident waves. If excess amount of sand deposit in front of the sea dike, the relative crown height of the dike decreases that brings about the increase in the rate of wave overtopping and in some times sand is also carried over the sea dike. In the former paper, the authors reported the possibility of sand overtopping from the sea dike on a sandy beach caused by the sand deposition in front of the dike under the incidence of extremely high waves of accretion type. (Deguchi, et al., 2010)

On the contrary, under the condition of erosion type wave incidence, the bed material in front of the sea dikes is usually transported offshore and relative crown height of the sea dikes increases and the setting depth decreases that will bring about the vulnerability of the sea dikes.

During 1960’s many sea dikes in Japan were visited by local scouring and some of them broke down. Since then, many studies have been carried out to investigate the mechanism of local scouring in front of the sea dikes. For example Sawaragi and Deguchi (1974) found that the down rush flow on the slope of the sea dike played very important role and derived the relation between the down rush velocity and the maximum scouring depth. Irie et al (1984) pointed out that the standing waves in front of the sea dike and classified the local scoring in front of the sea dike into two types. However, the objectives of these studies like a large part of other studies were the local scoring in front of the sea dike in the offshore of the swash zone. The objective of this study is the local scouring in front of the sea dike in the run up region landward of the still water level. There is not sufficient method for predicting the local scouring depth in front of the sea dike on the sandy beach in the run up region at the moment.

In this paper, the authors investigated the local scouring in front of sea dike on sandy beach with relation to the setting depth through hydraulic experiments and numerical simulation using a modified SBEACH model.

TWO-DIMENSIONAL EXPERIMENT ON THE TOPOGRAPHY CHANGE IN FRONT OF SEA DIKE
To examine the applicability of SBEACH to the beach deformation around the sea dike, two-dimensional experiments were carried out in a laboratory of Myongji University, Korea. A wave channel used in the