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主 論 文 の 要 旨

論文題目 Wave-induced Topographic Change in Soil Structures Composed of Dredged Sand （浚渫土砂から成る土構造物の波による地形変化特性に関する研究）

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論 文 内 容 の 要 旨

Constructions of tidal flats and shallows with dredged sand near coastal regions have a variety of benefits in coastal environments and calmness, while dredged sand contains not inconsiderable cohesive sediments. One of the major required understandings is the cohesive effects on erosion in mixed sediments. However, few studies on the structural stability of mixed soil structures against waves have been conducted, thus there is little understanding about the behavior of mixed sediments, i.e., cohesive and non-cohesive sediments, in wave fields. Therefore, this is a foundational study to understand the characteristics of wave-induced topographic change in soil structures composed of dredged sand in free-clay and mixed soil conditions, numerically and experimentally.

The present study consists of mainly four subjects. First, the behavior of sediment transport for fine sand targeting dredged sand is investigated experimentally focusing on pore-water pressure effects on wave-induced topographic change in artificial shallows composed of fine sand (Chap. 2).

Second, as a methodology, a three-dimensional two-way coupled fluid-structure-sediment interaction model is applied to the experimental investigation to confirm the predictive capability of the model with the general characteristics of sediment transport calculations (Chap. 3).

Third, a sediment transport calculation considering cohesive force induced by clay surrounding sand particles is proposed and incorporated into the aforementioned model to examine the characteristics of the modified model (Chap. 4).

Last, laboratory experiments are implemented in terms of cohesive effects on sediment transport in an open channel and wave-induced topographic change in a tidal flat composed of both sand and sand-clay mixtures in a wave flume. The cohesive effects on topographic change are investigated and the applicability of proposed calculation to the assessment of topographic change is validated (Chap. 5).

Consequently, this study draws the following conclusions. From experimental results presenting the variation of pore-water pressure on the surface layer of the shallows, which is related to the incipient sediment motion, pore-water pressure should be considered in the evaluation of the stability of soil structures composed of fine sand. The modified sediment transport scheme considering cohesive effects shows an increase in the resistance as well as the different trend of bed load transport rate. In addition, it is found in the experiments that containing clay in the tidal flat leads to the less topographic change without ripple formation as well as different shoreline displacement. The proposed sediment calculation scheme presents the applicability to the estimation of sediment transport in the mixed soil condition, experimentally and numerically.