Proposal of numerical wave tank for disaster mitigation and prevention of coastal zones

Masami KIKU

Associate Professor, Dr. Eng.

Email : kiku@gifu-nct.ac.jp

Research Fields Coastal Engineering

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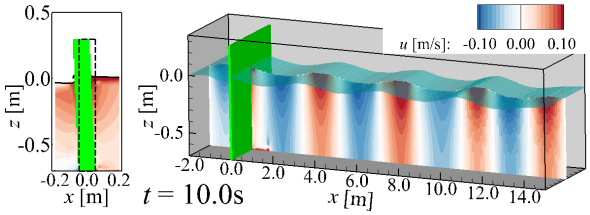
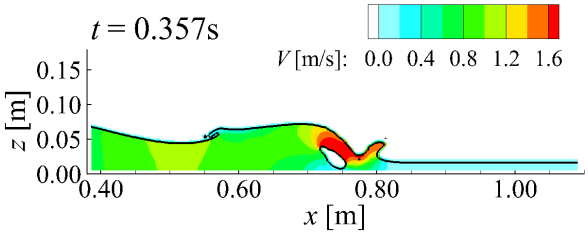
Research Outline

INTRODUCTION OF IMMERSED BOUNDARY MODEL TO 3-DIMENSIONAL NUMERICAL WAVE TANK 'CADMAS-SURF/3D'

A three-dimensional numerical wave tank 'CADMAS-SURF/3D' was improved so as to deal with the interaction between waves and movable objects using a volume-force type of immersed boundary method. The improved 'CADMAS-SURF/3D' was applied to enforced moving object tests in order to verify the validity and utility of the model. In a wavemaker test, regular waves were generated with a vertical plate in piston-type and flap-type motions. As a result, a reasonable agreement between numerical and theoretical results based on the small amplitude wave theory was found in terms of water surface fluctuation and flow velocity. From the dam-break test, it was demonstrated that the improved 'CADMAS-SURF/3D' was able to predict water motion accurately by considering the rapid upward movement of a gate.



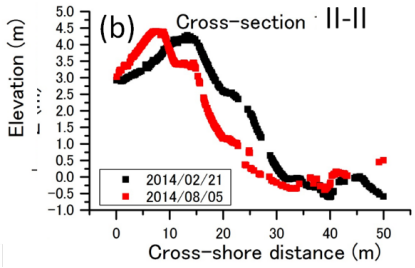
Wavemaker test



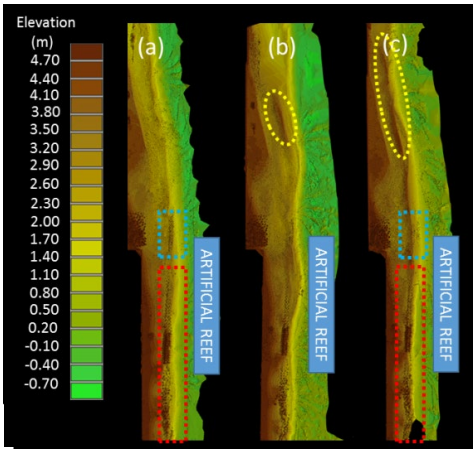
Dambreak test

FIELD OBSERVATION OF SHORELINE AND BEACH PROFILE CHANGE IN SHICHIRIMIHAMA BEACH, JAPAN

Coastal erosion is a serious problem in Shichirimihama Ida beach, located in the southern part of Mie Prefecture, Japan. Although various countermeasures were implemented in this area, coastal erosion is still in progress. To suggest effective countermeasures, this study aims to investigate characteristics of topographic change at Shichirimihama Beach by field observation using a three-dimensional (3D) laser imaging scanner. From results, the strong long-shore current occurs on high wave energy season and it causes a significant loss of sediment amount, and then it reduces the width of entire beach profile especially on the area without artificial reef. Hence results indicate the important role of artificial reefs on reducing the shoreline erosion.



Beach slope change



Topographic change in Shichirimiahma beach