Development of numerical models for wave deformation and sediment transport in wave-current coexisting field near river mouth

2004 Fiscal Year Final Research Report Summary

Development of numerical models for wave deformation and sediment transport in wave-current coexisting field near river mouth

Research Project

Project/Area Number

15560442

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

水工水理学

Research Institution

Kanazawa University

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Project Period (FY)

2003 – 2004

Keywords

river mouth / wave-current coexisting field / wave deformation / sediment transport / estuary / Boussinesq equation / wave action equation / empirical orthogonal eigenfunction analysis

Research Abstract

Physical understanding of wave characteristics and corresponding sediment transports around river mouths is essentially important in order to maintain physical environments and to prevent natural disasters in coastal areas. In this study, numerical and statistical models are developed for the wave transformation, viscous water flows, cohesive mudflows, and morphological seabed changes in the wave-current coexisting fields near river mouths. The main results obtained in this study are

summarized as follows.
A wave prediction model based on the wave action balance equation has been developed for analysis of wave deformation in large areas. This model includes the effects of wave breaking and diffraction in the wave-current coexisting fields. For detailed analysis of wave transformation in smaller areas, improved Boussinesq equations are derived and the corresponding numerical model has been constructed. In addition, the two-and three-dimensional viscous flow fields around coastal structures are numerically investigated on the basis of the Navier-Stokes equations in a generalized curvilinear coordinates. The characteristics of mudflows consisting of water and small mud particles are also examined.
Furthermore, long-term variations of the seabed profile near Tedori river mouth, Japan, are investigated using a set of field surveys. The effects of the sediment management along the river such as dam construction and sand dredging on the seabed morphology near the river mouth is examined. The mudflat profiles near the Shirakawa river mouth, Japan, have also been analyzed by using a quadratic profile approach.

Research Products (11 results)

All 2004 2003

All Journal Article

[Journal Article] 波・流れ共存場における砕波および回折効果を考慮した位相平均波浪変形予測モデルの構築 2004

[Journal Article] 手取川河口域周辺の海底地形変化に対する河川土砂供給の影響に関する研究 2004

[Journal Article] Slow spreading of fluid-mud over a conical surface 2004

[Journal Article] Numerical study of three-dimensional flow fields around the base of a vertical cylinder in oscillatory plus mean flow 2004

[Journal Article] Phase averaging wave prediction model with breaking and diffraction effects in wave-current coexisting field 2004

[Journal Article] Principal component analysis of morphological change 2004

[Journal Article] Slow spreading of fluid-mud over a conical surface 2004

[Journal Article] 複合防護施設周辺の複雑波浪場に対する高精度数値予測モデルの構築 2003

[Journal Article] 地形パラメータを用いた干潟断面の季節変動の要因分析 2003

[Journal Article] A Boussinesq-type numerical model for wave transformation over complex bottom topography 2003

[Journal Article] Parametrization of mud-flat profile changes caused by seasonal tide level variations 2003

URL: https://kaken.nii.ac.jp/report/KAKENHI-PROJECT-15560442/155604422004kenkyu_seika_hokoku_

Published: 2006-07-10