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Stochastic modeling to Prediction of local scour depht on the basis river morphologhical changes in braided river

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Abstract:

In this paper, a new stochastic method for predicting scour hole depth in the future is presented in the braided river. The model procedure is as follows:
1- It is to apply regression equation with bed height as a dependent parameter and three independent parameters of maximum daily flow, and its corresponding sediment discharge and bed slope, these equations were derived at certain points along the river cross-sections over a specific time.2- By applying observed data, sediment rating curve equation as well as a relationship between slope, water and sediment discharge were derived.3- Simulation of maximum monthly flow by ARIMA stochastic modeling.4- By substituting values obtained from step 3 into 2 and 1, respectively, river bed height was predicted along the cross-sections. - The values of the deepest bed height is selected maximum scour hole depth. Yahagi river in Japan was selected as a case study due to comprehensive and accessible data base. A comparison of observed data and predicted values indicate a seasonable agreement between them.

Keywords: scour depth, braided river, stochastic modelling, ARIMA, non-linear regression

1. Introduction

Scour is one of the major causes of failure for stream and river projects. It is important to adequately assess and predict scour for any stream or river design. Prediction of bed height changes is a fundamental but problematic task. Braided rivers put an even more complex question, due to their multiple-thread pattern, intrinsic and unsteadiness spatial variability. (Ashmore, 1988 Hoey and Sutherland, 1991 Warburton and Davies, 1994). In the field of river morphology generally up to now the main focus was based on deterministic concepts, but since the river system is of a dynamic and stochastic nature, therefore these could not predict the exact shape of the river bed, especially e.g. for braided rivers (Habersack, 2000).
River morphology is changing continually through time. Prediction of river's responses toward created changes is a difficult Problem, because effective variants in this phenomenon are relative and respond to the changes in river system. Morphological river models are designed to provide physical insight toward the morphological responses and to assist river engineers and managers in the design, operation and maintenance of river systems.
Most numerical models that are currently used in the field of river Morphological changes are based on a deterministic modelling. In these models, morphological response is based on results, which all