

バンダル水制周辺の河床変動解析に関する研究
Analysis of Bed variation around Bandal-like structures

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1. Introduction

Bandal-like structures or simply bandals are local structures commonly applied to improve and maintain the flow depths for navigation during low water periods in alluvial rivers of Indian Sub-Continent. They also can be used to close off secondary channels in the large rivers to ensure stable single course. Bandal-like structures are characterized by an upper blocked portion to obstruct flow near water surface and an opening below to allow it to pass near the bed. These are made of naturally available materials such as bamboo and wood that are regarded as inexpensive method over conventional structures as groins.

2. Methodology

Few experiments and field observations appear to have been conducted to investigate the bed configuration, including the scoured area and the deposition of the sediment around the bandals. A detailed experimental study was carried out to improve the knowledge about the mechanisms by which these structures affect the flow dynamics and river channel morphology. Two structures (bandals and groins) were positioned at one side of a straight flume. The velocity field in horizontal plane (water surface by PIV) and representative cross-sections in vertical plane (transversal and longitudinal directions), and the bed level at the dynamic equilibrium condition was measured during the experiments.

Numerical model simulations were also conducted to compare the characteristics of bandal-like structures with groins (impermeable and permeable ones). The turbulent flow field formed due to the disturbance

caused by groins and/or bandal-like structures was simulated using a 3D hydrodynamic model coupled with a sediment transport model, which solves the RANS (Reynolds-averaged Navier Stokes) equations for flow calculation with the k- ϵ model for turbulence closure. The bed variation was calculated considering the bed load and suspended load transport.

3. Results and Conclusions

The efficiency of the bandal-like structures was verified through the analysis of the experimental and numerical results (**Fig.1**). The reduced erosion around the bandals and the deposition at downstream of both structures can be emphasized as the main advantages of bandal-like structures in comparison with impermeable groins. Also, the bed degradation of the main channel shows promising results for improvement of stable navigational channel. Further detailed investigation of the influence of suspended sediment transport on deposition/erosion process around bandals is expected to verify the effectiveness of this structure in real conditions with suspended sediment concentration measurements.

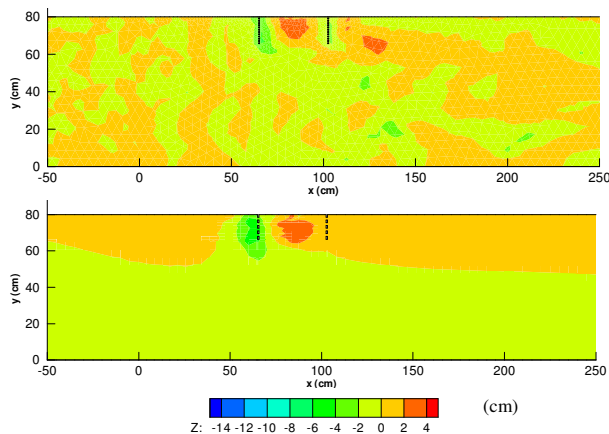


Fig.1 Bed variation under non-submerged condition for bandal-like structures at time $t = 1$ hour (experiment:top; simulation:bottom)