

## VALIDATION OF A NUMERICAL MODEL FOR GRADED SEDIMENT TRANSPORT IN OPEN CHANNELS

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The FAST2D computer code using a finite volume method with boundary-fitted grids to calculate flow and sediment transport in alluvial channels was developed initially at the Institute for Hydromechanics, University of Karlsruhe, Germany. The model system consists of an unsteady hydrodynamic module, a sediment transport module and a bed-deformation module. The hydrodynamic module is based on the two-dimensional shallow water equations. The secondary flow transport effects are taken into account by adjusting the dimensionless diffusivity coefficient in the depth-averaged version of the  $k-\epsilon$  turbulence model. A quasi-3D flow approach is used to simulate the effect of secondary flows due to channel curvature on bed-load transport. The former model assumed uniform bed material. In order to take into account the influence of grain size distribution of the bed-surface on the evolution of the bed topography and consequently also on the flow field, a sediment transport module has been presently developed at the Institute of Hydraulic Engineering, University of Innsbruck, Austria, for fractional sediment transport using a multiple layer model.

This paper presents the numerical results for graded sediment transport compared to measurements in laboratory channels. The first comparison concerns simulation of bed erosion and armouring in a flume under steady flow condition according to Günter (1971). Further, the model was applied to calculate the sediment sorting and the bed deformation in curved alluvial channels under unsteady flow condition according to Yen (1995). The predictions have been compared with data from

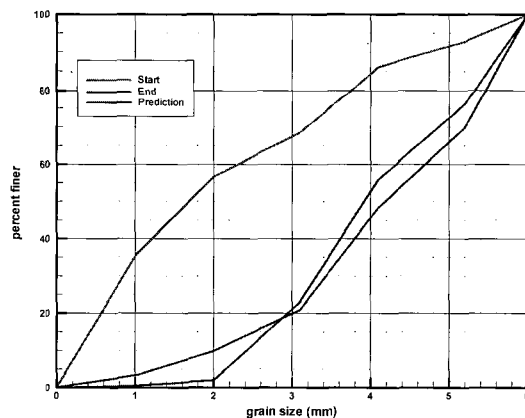


Fig. 4 Grain-size gradation curves, Günter (1971)

the laboratory measurements. In general the agreement was found to be satisfactory.

*Keywords:* numerical model; graded sediment; curved channel; morphodynamical simulation

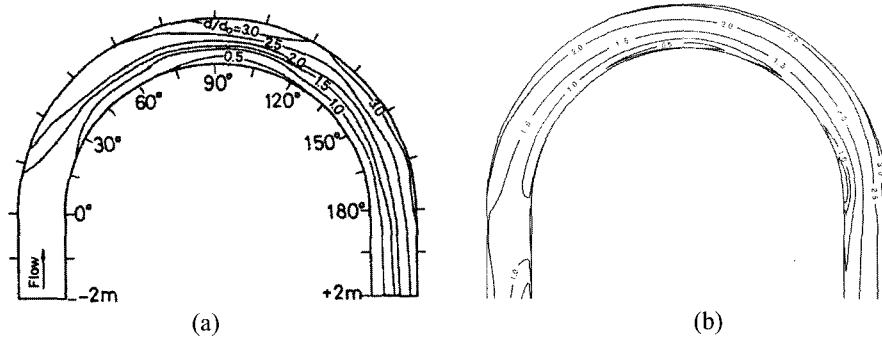


Fig.6 Measured (a) and calculated (b) contours of grain sorting, Yen (1995)

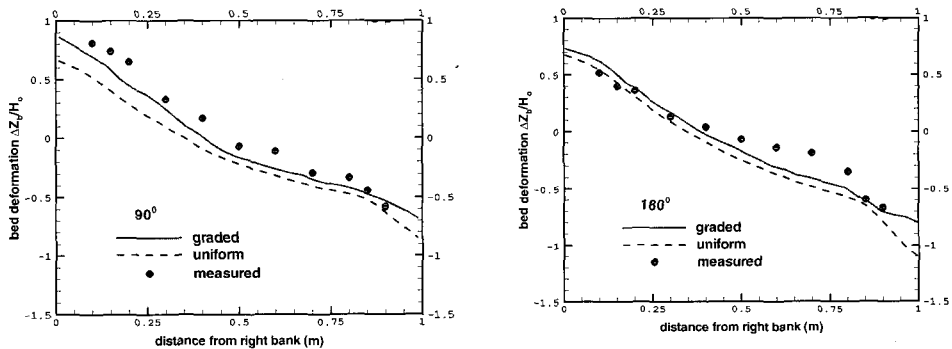


Fig.7 Bed deformation at sections  $90^{\circ}$  and  $180^{\circ}$ , Yen (1995)

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