

EXPERIMENTAL STUDY ON AGGRADATION

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ABSTRACT

The purpose of this study is to investigate the effect of overloading on bedforms, resistance to flow, sediment transport rate and average bed profile of aggrading by overload. A series of aggradation experiments were carried out by overfeeding sediment load to a movable bed channel previously maintained in equilibrium. The bed and water surface profiles were recorded and the sediment transport rate was measured. These data were used to i) study the time evolution of bedforms and resistance to flow during the transient situation generated by overloading; to ii) check the applicability of the sediment transport model suggested by Yen et al. to the non-equilibrium sediment transport data; and iii) to test the version of the linear parabolic model suggested by Jain for describing aggrading bed profiles. The dimensions of bedforms decrease due to overloading while their celerity increase; Manning's coefficient n was also observed to increase. In the sequence of the analysis of the sediment transport data, a slightly different version of the model of Yen et al. is suggested and a new relation for the calculation of the velocity of the deposition front is proposed. The linear parabolic model was seen to properly describe the bed trend of aggrading profiles for overloading ratios equal or greater than 4.

Key Words: *Non-equilibrium flows, Aggradation, Mobile-boundary, Bedforms, Sediment discharge, Analytical models*

1 INTRODUCTION

Human activities may induce significant changes in sediment transport capacity of alluvial river-channels and cause changes in the sediment load entering the river. These changes potentially destroy previously existing equilibrium states, leading to river bed aggradation or degradation.

The case of non-equilibrium flows, where the sediment transport capacity is different from the equilibrium value is rather more complex than the case of equilibrium flows. For the equilibrium case, semi-empirical relations are available for the prediction of bedforms, resistance to flow and sediment transport rate. Some of these relations produce reliable predictions. However, their reliability decreases for non-equilibrium (unbalanced) situations induced, for example, by changes in the sediment transport rate or flow discharge.

Despite this situation, a comparatively small number of experiments and related studies on aggradation or degradation are known at present. Pioneering experimental work was only carried out in the seventies and eighties, namely by SONI (1975) and MEHTA (1980).

Thus, experiments on aggradation induced by overloading were carried out in this study. The results of the experiments are presented and discussed in this paper regarding the impact of sediment overloading on the dimensions and celerity of bedforms as well as on the time evolution of re-

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