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Sediment Transport Rate in typical Coarse-Bed Rivers in the Northwest of Iran

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Abstract

The process of flow and sediment transport is different and more complex in coarse-bed rivers than in sand-bed rivers. The main aim of the present study was to evaluate different modes of sediment transport, from different methods. Three river reaches were selected as representatives of coarse-bed rivers in Northwest of Iran. A sediment transport model (STM) was developed to calculate the bed loads from 13 methods, the suspended loads from 4 methods and the total loads from 10 methods. The effects of bed material characteristics were also examined. This paper presents the order of uncertainties for the prediction of different modes of sediment transport in similar coarse-bed river reaches.

Keywords: Coarse-bed rivers, Sediment transport, Suspended load, Bed load, total load

Introduction

Coarse-bed Rivers are characterized by relatively high degrees of bed slope, stream power, sediment transport, particularly in the mode of bed load; and are relatively wide and shallow with potential of deposition of non-cohesive coarse sediment such as gravel and cobbles (Przedwojski, et al., 1995). The process of flow and sediment transport is different and more complex in coarse-bed rivers than in sand-bed rivers. The main characteristic of the flow in coarse-bed rivers is the development of an armor layer with coarse gravel, cobbles and boulders. While this surface layer establishes a stable and smooth boundary at low to mean flows, its mobility introduces a different mode of the flow resistance during high flows resulting in excessive bed load transport of finer sub-surface material, and channel instability (Hey, et al., 1982 ; Parker, et al., 1982).

Reliable prediction of the sediment transport capacity and determination of the different modes of transport (i.e. bed load, suspended load, and total load) in coarse-bed rivers are of major importance in river engineering.

Field data on suspended loads are more readily available, although lesser data are taken during high flows. Direct measurements of bed load are difficult to achieve in coarse-bed rivers, and less data is available. Therefore, the evaluation of total sediment load, and the contribution of bed load to the total load are very much uncertain.