A DEFINITIVE METHOD FOR THE SELECTION OF SEDIMENT TRANSPORT RELATIONS

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EXTENDED ABSTRACT

The emphasis of this paper is a methodology for the selection of total bed material sediment transport relations and although only 4 transport functions are presented, it is applicable for analysis of any sediment transport function. Based upon analysis of over 8,000 measurements from flumes and rivers, the data are partitioned into dimensionless grain size intervals. The methodology then requires the development of a weighting function by taking the ratio of the measured versus the predicted sediment transport concentrations and determining the accuracy and precision of the ratio within the dimensionless grain size interval for each sediment transport function. Within each dimensionless grain size interval, four dimensionless parameters, dimensionless grain size, relative depth, grain Froude number, and dimensionless Stream Power, are computed based upon the data and dimensionless number that produces the best overall statistical results for the four transport functions is selected. The statistical results for each transport function, using the best dimensionless number within the dimensionless grain size interval, are used to select the best function.

The methodology determines not only the ranking of sediment transport methods for a given river situation, but also indicates if the methods have high to low applicability. This method can then be used to select an appropriate sediment transport method dynamically in a sediment transport model over time and space. However, to illustrate the methodology, four total bed material sand transport relations are used in this presentation. The transport relations are: Ackers and White (1973), Brownlie (1981a), Engelund and Hansen (1967), and Yang (1973).