Testing the accuracy of sediment transport equations using field data

ABSTRACT

In order to recommend the equations that can accurately predict sediment transport rate in channels, selected sediment transport equations (for estimating bed load and suspended load) are assessed using field data for 10 rivers around the world. The tested bed load equations are Einstein, Bagnold, Du Boys, Shield, Meyer-Peter, Kalinskie, Meyer-Peter Muller, Schoklitsch, Van Rijin, and Cheng. Assessment show that Einstein and Meyer-Peter Muller equations have the least error in their prediction compared with the other tested equations. Based on the field data, each of Einstein and Meyer-Peter Muller equations gave the most accurate bed load estimations for three rivers while Schoklitsch equation and Du boys equation gave the most accurate bed load estimations for two rivers and one river respectively. The lowest values of Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were obtained from the applying Einstein equation for estimating bed load for Oak Creek River and these values were found to be 0.02 and 0.04 respectively. On the other hand, the tested equations for predicting suspended load are Einstein, Bagnold, Lane and Kalinske, Brook, Chang, Simons and Richardson, and Van Rijin. Among the above tested equations, assessment show that Bagnold, Einstein and Van Rijin gave the most accurate estimation for the suspended load. The lowest values of Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were obtained from applying Bagnold equation and these values were found to be 0.012 and 0.015 respectively.

Keyword: Sediment transport equations; River; Application; Assessment; Testing