



Probability forecast of the suspended sediment concentration using copula

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An approach for probability forecast of the suspended sediment loads is presented in our research. Probability forecast model is established based on the joint probability distribution of water discharge and suspended sediment concentration. The conditional distribution function of suspended sediment concentration given water discharge is evaluated provided the joint probability distribution between water discharge and suspended sediment concentration is constructed, and probability forecast of suspended sediment concentration is implemented in terms of conditional probability function. This approach is exemplified using annual data set of ten watersheds in the middle Yellow River which is characterized by heavy sediment. The three-parameter Gamma distribution is employed to fit the marginal distribution of annual water discharge and annual suspended sediment concentration, and the Gumbel copula can well describe the dependence structure between annual water discharge and annual suspended sediment concentration. Annual suspended sediment concentration estimated from the conditional distribution function with forecast probability of 50 percent agree better with the observed suspended sediment concentration values than the traditional sediment rating curve method given water discharge values. The overwhelming majority of observed suspended sediment concentration points lie between the forecast probability of 5 percent and 95 percent, which can be considered as the lower and upper 95th percent uncertainty bound of the predicted observation respectively. The results indicate that probability forecast on the basis of conditional distribution function is a potential alternative in suspended sediment and other hydrological variables estimation.