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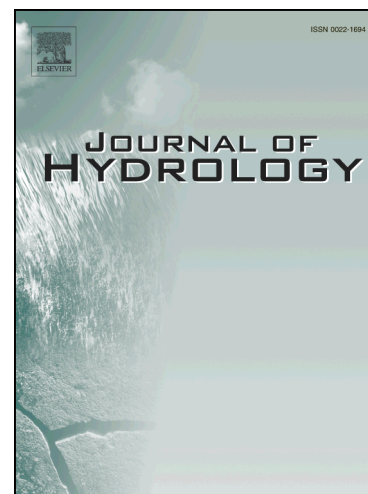
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# Stage-discharge prediction in natural rivers using an innovative approach

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## Abstract

Determination of stage-discharge relationships in natural rivers is extremely important in flood control projects. Observational data at various stages cannot be collected simultaneously. It may take a considerable amount of time and a great deal of difficulty to collect the data required for establishing the rating curves. The main purpose of the current paper is to estimate the discharge using the concept of isovel contours with the corresponding hydro-geometric parameters of the cross sections which was first introduced by Maghrebi (2006). Although the accuracy of the contours is not very high, it is believed that when the sum of the whole cross sectional contour values is used as a single parameter in the proposed relationship the accuracy of discharge estimation is surprisingly high. A relationship based on dimensional analysis is used to interrelate the discharges at two different stages by simply using the geometrical parameters such the cross-sectional area, wetted perimeter, the width of the free surface and a quantity which is related to the summations of isovel contours. Then, the most accurate relationship that is obtained by minimization of the differences between the calculated and analytical discharges at two different stages is introduced. For verification, the results of the proposed method are compared with the observed stage-discharge data taken from the Main and Severn rivers in UK, the Tomebamba River in Ecuador and the Yangtze River in China. The results indicate the high accuracy of the proposed method such that the mean values of *MAPE* and *NRMSE* of all selected rivers do not exceed 8.7% and 0.09, respectively.

**Keywords:** Stage-discharge curve, natural rivers, dimensional analysis, *MAPE*.

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