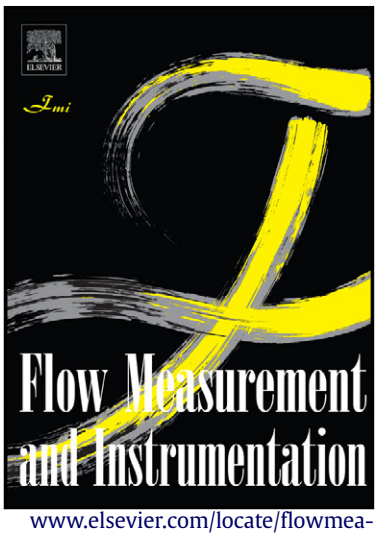

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www.elsevier.com/locate/flowmeasinst

PII: S0955-5986(15)00040-0
DOI: http://dx.doi.org/10.1016/j.flowmeasinst.2015.04.010
Reference: JFMI1061

To appear in: *Flow Measurement and Instrumentation*

Received date: 1 September 2014
Revised date: 14 April 2015
Accepted date: 19 April 2015

Cite this article as: J.N. Fernandes, J.B. Leal, A.H. Cardoso, Assessment of stage-discharge predictors for compound open-channels, *Flow Measurement and Instrumentation,* http://dx.doi.org/10.1016/j.flowmeasinst.2015.04.010

Assessment of stage-discharge predictors for compound open-channels

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ABSTRACT

The accurate prediction of flood levels and velocities is a prerequisite to any appropriate management of river valleys, where the mitigation of environmental, economic or human losses caused by flood events is of paramount importance. During these events, rivers frequently acquire a compound channel configuration.

Due to the 3D nature of compound channel flows, the stage-discharge curves are not as easily predicted as in single channels. Despite the availability of 2D and 3D flow models that may solve this question, 1D methods are often preferred due to the reduced data required and to the much shorter processing time. In the last five decades, important research efforts have been devoted to the improvement of 1D predictors of stage-discharge curves in compound channels. In this study, the accuracy of seven of those methods is assessed by comparing their predictions with a large experimental dataset, comprising symmetrical and asymmetrical compound channels with vertical and inclined main channel sidewalls, and smooth and rough floodplains. To the authors' best knowledge, this is the most comprehensive assessment of stage-discharge predictors for straight compound channels since it involves the highest number of predictors applied to the widest data set.

It was concluded that the methods that account for the momentum transfer between the main channel and the floodplains display considerably better results than the traditional methods. For relative depth (ratio between floodplain and main channel flow depths) higher than 0.25, predicted discharges for the methods that account for the turbulent momentum exchange are within 5% of observed values. Depending on