

Local energy losses at positive and negative steps in subcritical open channel flows

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Abstract

Local energy losses occur when there is a transition in open channel flow. Even though local losses in subcritical open channel flow due to changes in channel width have been studied, to date no studies have been reported for losses due to changes in bed elevations. Steps are commonly used in engineering applications to stabilise the flow in open channels. Hence, it is important to estimate local losses for design purposes. The aim of this study was to formulate the local energy losses at positive and negative steps in subcritical open channel flows. Flow rates and water depths before and after the step were measured for varying step heights of abrupt and 45° inclined steps. Empirical equations relating the local losses to the Froude number on the step and the relative step height are proposed for positive and negative steps. In addition, practical values of local loss coefficients are determined.

Keywords: local (minor) loss, positive step, negative step, open-channel flow