多方式特性法模式於明渠合分流之研究

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摘　要

本研究應用定床多方式特性法，將水流之連續方程式及動量方程式，轉換成全微分型式之特性方程式，同時求解流速及水深，並將之擴充至含主支流渠道之合分流模擬;在上下游邊界處理上，根據流況給予流量和水深，內部邊界條件則採用水位相等之概念來處理。為驗證數值模式之適用性與準確性，利用淡江大學不同之匯、分流角度、渠寬比與流量比之模型試驗資料，發現在合或分流角度小、流量比越大和渠寬比越小時，模擬結果較好，且其誤差也在可接受範圍內。

在合、分流之定量流模擬案例，合流部分之結果與 CCHE2D 模式比較，分流部分與有限解析法模式作比較，其結果頗令人滿意。本研究進一步假設變量流經過合、分流渠道之案例，於矩形和非矩形渠道中進行模擬，探討洪水波於主支流間的互相影響及傳遞過程，以供未來模式應用於天然河川之參考。

Study of Multimode Characteristics Model on Open-Channel Junction and Division Flows

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Abstract

This study applies fixed-bed method of characteristics. The continuity and momentum equations of the flow are transformed into characteristic equations with the ordinary differential forms, and flow depth and velocity are solved simultaneously. The numerical model is extended to the simulations of open-channel junction and division flows. At the upstream and downstream boundaries, discharge and flow depth are specified respectively according to flow regime. Equal stage serves as the internal boundary condition for junction or division flow simulation. To verity the applicability and accuracy of the proposed model, Tamkang University's experimental data for different junction or division angles, channel width ratios, and discharge ratios are adopted. Better simulated results can be obtained under the cases of small junction or division angles, large discharge ratios, and small channel width ratios.

For the cases of steady junction and division flows, the simulated results of the former case are compared with those obtained from the CCHE2D model, and the simulated results of the latter case are compared with those obtained by the finite analytic model. Both cases show satisfactory results. This study also considers unsteady flows passing junction or division channels with rectangular and non-rectangular cross-section. The interaction and propagation processes of the flood wave in the main channel and the tributary channel are investigated. The results can provide some information for extending the model to the simulations of natural river flows in future