水位流量率定曲線產製改善之研究

Modifications to head discharge rating curve establishment

國立臺灣大學水工試驗所　國立臺灣大學氣候天氣災　國立臺灣大學氣候天氣災

博士後研究員　害研究中心　害研究中心

欉順忠　副研究員　研究助理

SHUN-CHUNG TSUNG　張向寬　石欣軒

HSIANG-KUAN CHANG　HSIN-HSUAN SHIH

摘 要

流量為河川治理及水資源管理等重要背景資料。臺灣常用現場觀測流量產製水位流量率定曲線並推估流量。然受限於流量觀測能力與時機，使得颱洪期間中高流量觀測資料少，導致水位流量率定曲線的適用範圍小且外延使用的可信度低；此外常態作業上未引進自動流量觀測與推估系統而限制觀測作業以外的流量掌握。前人研究顯示採用聲波都卜勒流速剖面儀與定點長時作業方式調整「河川局全洪程觀測標準作業程序」可提升流量觀測效率與快速累積觀測資料；此外利用雷達波表面流速儀觀測表面流速，並搭配含平均與表面流速關係及表面流速資料品管作業的「指標表面流速法」已經可合理推估颱洪期間完整流量歷線，如此可彌補無法進行觀測時的流量而達到全洪程觀測效果。為進一步提升水位流量率定曲線的適用範圍與可信度，本研究以新竹香山八股排水為例，於延壽宮旁橋梁進行颱洪期間現場流量觀測，應用調整後的颱洪期間流量觀測作業程序及指標表面流速

法獲得颱洪期間完整流量資料。研究中資料範圍為 2019/7-2021/5；流量觀測場次為 2019/8/9 利奇馬颱風及 2021/5/21 梅雨；進行流量歷線推估事件共 17 場。整合觀測與推估流量後產製水位流量率定曲線，與僅以觀測流量產製結果比較，顯示整合觀測與推估資料可產製高密合度的水位流量率定曲線，並將水位流量率定曲線的適用水位範圍擴大為原有的 1.5 倍。

關鍵詞：水位流量率定曲線、指標表面流速法、流量觀測、八股排水

ABSTRACT

Discharge is an essential data for river training and water resource managements. In Taiwan, head discharge rating curve built based on measured discharges is commonly used to estimate discharge. However, high measured discharge data is few that leads head discharge rating curve with low reliability. The two main reasons are limitations of current discharge measurement operations during flood and shorts of discharge estimations beyond measurements. Previous studies have shown that the modified discharge measurement operations during flood considering acoustic Doppler current profiler and long period measurement at a constant site could enhance the efficiency of discharge measurements. The Index Surface Velocity Method considering the relationship between mean and surface velocity and quality treatments of measured surface velocity data could reasonably estimate discharge history during flood. To expand applicability and improve reliability of head discharge rating curve, in this study, the bridge near the Yen-Shou Temple in the Ba-gu watershed, located in Hsin-Chu City, was selected as demonstration site. The period of discharge measurements and estimations is from 2019/7 to 2021/5. Two measurements were carried out on 2019/8/9 (typhoon Lekima) and 2021/5/21 (plum rain). Seventeen flood events were selected and discharge histories were then estimated. The established head discharge rating curve based on measured and estimated discharges was more reasonable and its applicability of water level expanded 1.5 times comparing to the rating curve based on measured discharge data only.

Keywords: Head discharge rating curve, Index surface velocity method, Discharge measurement, Bagu Watershed