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博士論文

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石門水庫集水區輸砂與水文河相特性關係之研究

A Study on the Relationship between Sedimentation and Hydrogeomorphological Characteristics in Shihmen Watershed

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摘要

在不同之集水區中，地文、水理等內在及外在條件，往往使得輸砂行為具有特殊之地域特性。國內長期以來，由專家學者所進行之輸砂模式研究，由於台灣地區之地文、水理環境特殊，更需利用野外現場實驗方式予以驗證，然因現場實驗不易，故仍有賴於河相學等多方面之知識進行嘗試性之研究；加以下游集水區，近年來公共工程對於砂石之需求大增，如何尋求一致之治理目標，使得河川輸砂趨於平衡，對於泥砂生產及運移行為之瞭解應為當務之急。

本文由石門水庫集水區之河相參數進行分析，並以石門水庫管理局歷年實測之懸移質輸砂量與流量資料，作為分析與驗證之主要資料，進行輸砂特性與其水文及河相之研究。

經由石門水庫上游集水區內所設之六處水文站，共計 33 年之水文觀測資料進行分析結果，分別得到以霞雲水文站之懸移質輸砂量、流量及有效流量，使用各站之集水區面積推估其懸移質輸砂量、流量及有效流量迴歸公式。此外，亦求得各站與霞雲站懸移質輸砂率之比值與河道沿程之關係式。在以宏觀之分析方法中，確立子集水區與總集水區間之泥砂量推估，可藉由集水區面積與河流長度之河相關係進行分析與推估。由分析結果得知，推估水庫淤積量，約高估 17%。根據水庫集水區內各主支流河道至民國 79 年為止所興建之防砂壩，其所攔蓄之泥砂量約為石門水庫同期間淤積量之 5%。

本研究引伸泥砂遞移率之定義，以長期輸砂量解釋之，則於平衡河道中，其遞移率(D)值應等於 100 %。於本研究中，證實在石門水庫集水區內，由高義以下至水庫壩址處，於本研究採用之資料紀錄範圍內，可使用平衡之關係予以推導。

關鍵詞：石門水庫、輸砂模式、河相、懸移質、遞移率。

Abstract

River characteristics are governed by river morphological factors at various degrees among different watersheds. Some parameters such as discharge, flow velocity, sediment diameters used in sediment transport models are very difficult to measure in situ. For watershed management purposes, sediment yield and transport must be known before making a proper sediment budget evaluation. In this study, the geometric characteristics of Shihmen reservoir watershed and the suspended load and discharge records at 6 hydrometric stations in 33 years are used in evaluating the relationships between sedimentation and hydrogeomorphological characteristics.

The relationships among suspended load discharge, discharge, and effective discharge were derived. Regression equations obtained in this study are useful for estimating suspended load, discharge, and effective discharge by watershed areas. The estimated sediment deposit was 17% higher than the measured value. On the other hand, the sediment deposits in all sabo-dams in the watershed were determined to be about 5% of the total sediment deposited in the Shihmen reservoir.

The delivery ratio was used to modify the sediment transport balance in channel bed and explain the total sediment load along the channel in Tahan-chi reasonably.

Keywords: Shihmen Reservoir, Sediment Transport Model, hydrogeomorphological characteristics, Suspended Load, Delivery Ratio.