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變量渾水異重流傳播特性之實驗研究

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摘　　要　颱風及豪大雨期間，水流會挾帶大量泥砂流入水庫，且所造成的入庫逕流皆爲洪峰形式的變量流。高濃度的入庫水流因與水庫水體有密度差異，易形成在庫底運移的異重流。異重流在向壩址移動的過程中會同時產生淤積或沖刷，此沖淤也同時造成異重流的運動行爲改變。本文研究渾水異重流受淤積之影響而造成的流況變化，且探討在定量入流與變量入流條件下之差異，並比較與鹽水異重流之異同。本實驗係利用長 42m 的 U 型渠槽，渠槽寬爲 10cm，其平均坡度爲 0.02，爲一可視化渠槽，使用比重 2.65 之未加分散劑高嶺土作爲懸浮泥砂。利用電腦控制產生變量流入流歷線。實驗過程中利用 DV 紀錄頭端、潛入點、異重流身體厚度變化等運動過程，並加以分析與討論。結果顯示，異重流頭端在經過長距離後會因爲淤積而造成頭速衰減，且渾水異重流在變量的特性上衰減較鹽水異重流快。因變量所造成的潛入點之移動會延長異重流的變量基期。定量渾水異重流濃度剖面在渠槽沿程中會由均勻的剖面轉變成不均勻的剖面，最後又因淤積而回歸至較均勻的剖面。

關鍵詞：異重流、密度流、水庫、變量流、渾水。

Experimental Study on the Propagation Characteristics of Unsteady Turbidity Currents

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ABSTRACT　River flow can carry large amount of sediment into reservoirs during typhoon periods and torrential rainfalls. Usually, the inflow into a reservoir is an unsteady flow with a flood peak. Because of the density difference between the inflow and ambient water, inflows of reservoirs with high concentration can become turbidity currents that plunge into the lower layers of the reservoirs and migrate on the beds of the reservoirs. Density currents can deposit or scour as they move downstream to the dam. The deposition and scouring also influences the movement of density current at the same time. This study intends to examine the variation in flow conditions of turbidity currents with the deposition effect; to discuss the difference between steady and unsteady inflow; to compare the turbidity current with saline density current. Experiments are run on a U-shaped flume, with a length of 42m, a width of 10cm, the average slope of 0.02; the flume is transparent to facilitate easy viewing. Kaolin with specific gravity of 2.64 without dispersing agents is used as

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suspended material. Unsteady inflow is controlled by computer software. Variation of head, plunge point, thickness of body, and other processes of density currents are recorded by seven DV recorders. The results show after the turbidity current moves a long distance, the head velocity decays as turbidity currents gradually deposit. The unsteady turbidity currents decay faster than the saline density currents. Migration of plunge points is caused by unsteady inflow and increases the period of unsteady time. Concentration profiles of the steady turbidity current change from initially uniform profiles to non-uniform profiles along the flume, and eventually become uniform profiles again but with much less concentration after deposition.

Key Words: turbidity current, density current, reservoir, unsteady flow, sediment-laden flow.