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溪流階梯深潭型態分類及能耗率變化之渠槽實驗

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摘　　要　本研究採用混合泥砂粒徑(σ=2.57mm，D_{50}=4.44mm)，以渠槽實驗配合不同流量及渠槽坡度(2°-7°)方式進行清水流沖刷之動床實驗，藉此觀察床形演變之現象，並著重於階梯-深潭形成現象之定性描述。研究結果顯示，渠床呈現多樣化之階梯-深潭形式，與常見之肋骨狀橫向連續排列的階梯-深潭結構不同，且發現階梯的形成與關鍵顆粒之存在有關，本研究亦由顆粒排列方式將階梯分爲八種形式，並藉由因次分析與階梯-深潭發育權重 W_{sp} 之定義，分析階梯-深潭的發育與輸砂率變化之關係，進而建立一關係式，從中說明當河流趨於動態平衡時，透過幾何形態的調節將使能耗率趨小，而階梯-深潭的發育則爲水流縱向調整之結果。實驗顯示床面粗化將使渠床糙率增大，此外，階梯-深潭的發育增加了水流流路而減緩渠床坡降，兩者作用下皆使水流能耗率減小，進而降低水流輸砂的能力，達到穩定河床之作用。

關鍵詞：階梯-深潭、山區河流、穩定河床。

The Classification and Energy Dissipation of Step-Pools Streams on Flume Experiment

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ABSTRACT　The formation process of step-pools under the conditions of sediment mixtures(σ=2.57mm, D_{50}=4.44mm), different discharges and channel bed slopes(2°-7°) are studied experimentally in the laboratory. On this basis, the mechanisms of step-pools are further investigated. We find some results as follows, many varied step-pools forms are observed which develop in conditions where the largest floods are just capable of transporting the largest debris. Those will tend to form steps acting as keystones retaining smaller debris. Eight types of steps are classified according to arrangement of sediments in this research. Dimensional analysis and the index namely W_{sp} coefficient are proposed to evaluate the relation between the formation of step-pools and the variation in sediment discharge. The expression is established according to the experimental data which can illustrate the step-pools as vertically adjusting their profile, increasing channel-bed roughness and decreasing the channel slope to minimize the time rate of dissipation of potential energy. These have the effect of decreasing the sediment discharge of the stream flow and stabilizing of the channel-bed.

Key Words:　step-pool, mountain stream, channel stability.

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