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論文名稱：泥砂顆粒躍移動力特性之研究

英文論文名稱: DYNAMIC CHARACTERISTICS OF A SALTATING
PARTICLE IN FLOW

【中文摘要】

水流中泥砂顆粒躍移動力特性之研究對於推移載運動理論的發展具有重要的意義。本研究針對近床泥砂顆粒之受力情形以及運動顆粒與底床之交互作用，建立二維決定性之顆粒連續躍移理論模式，並透過數值實驗得到顆粒躍移軌跡隨系統參數變化呈現純躍移與間歇躍移交錯之複雜動力行為。

應用非線性動力學的分析方法得知，由純躍移與間歇躍移所構成分歧均經由週期倍增之路徑由有序趨於混沌。此外，顆粒起始位置差異與間歇躍移所導致之能量損耗亦為系統致亂之重要因素。

在輸砂力學的應用上，本研究根據泥砂起動機制建立類似希爾茲曲線之起動理論曲線；並利用純躍移週期一軌道所產生最大躍移長之特性對躍移質輸砂率進行推估並與各家輸砂公式進行比較，其結果與 Meyer-Peter & Muller 輸砂公式相符。

【英文摘要】

Understanding the dynamic characteristics of a saltating particle in flow is an important issue about the research of sediment transport. This study analyzes several forces influencing a saltating particle and constructs a deterministic 2-D continuous saltation model. Numerical experiment has been presented to simulate the ultimate trajectories of a saltating particle. The dynamical system of a saltating particle exhibits bifurcation diagrams, which includes complete saltation and intermittence saltation alternately with different shear velocities. We conclude that the bifurcation is through a periodic doubling route from order to chaos. Additionally, different initial sites and energy loss generated by intermittence saltation are essential to cause the system to be complexness.

Considering the application on mechanics of sediment transport, the study constructs the theoretical incipient motion curve like Shield's diagram and the bed-load formulas by the complete saltation of period 1. The results agree well with the Meyer-Peter & Muller's bed-load formula.