

水流流經草地之水理分析

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摘要 存在於地表上之草本植物會增加水流之阻力，造成流速減緩、能量損失等影響。本研究以Biot孔彈性介質理論為基礎，以解析方式進行研究。流場依不同孔隙介質分為三層，分別為均質水層、草層、以及土層，分別求得三層之流速分佈和剪應力分佈，進而繪出分佈圖來探討草地水流之物理現象。研究發現：當水層深度與草層高度相等時，會得到一無因次參數 δ_2 約等於9.5，此時水、草交界面和地表之剪應力相等，且等於垂直分佈中之最大剪應力。

關鍵詞：孔隙流體、流速分佈、剪應力分佈。

Hydraulic Analysis of Flow Passing over Grassed Ground

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ABSTRACT The existence of grasses increases the resistance of the ground, and thus decreases the flow velocity and produces energy loss. In this study, the governing equations of flow were nondimensionalized, based on the Biot's poro-elasticity theory. These equations were solved analytically. The flow region was divided into three layers--homogenous water, vegetation and permeable soil. The velocity distribution and the shear stress distribution were analytically derived and were discussed for understanding of the flow mechanism. The shear stress distribution showed that when the dimensionless coefficient δ_2 approximately equals 9.5 with equivalent depths of water layer and vegetation layer, the shear stresses at the interface between the water layer and vegetation layer and at the ground surface are equal and reach a maximum.

Key Words : Pore fluid, flow velocity distribution, shear stress distribution.