

極端降雨下堤防破壞機制探討 ~以舊寮一號堤防為例

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摘要

近年來世界各地極端氣候狀況(如超大降雨、地震等)接連發生，導致災害不斷發生，2009年8月8日，莫拉克颱風在台灣南部降下接近世界紀錄之雨量，造成嚴重的水患。究其原因，堤防的功能在極端降雨事件下，可能會因為各種致災原因而導致其功能完全喪失。在莫拉克颱風影響之下，荖濃溪與濁口溪匯流處的舊寮一號堤防發生嚴重損壞，導致鄰近區域土石遭大量沖刷而流失。本研究主要針對堤內外水位變化來探討堤防可能的破壞機制，機制一是關於堤內外相同水位下之邊坡穩定分析，其分析結果顯示，在此機制下堤防並不會產生破壞。機制二考慮堤內外不同水位，而導致穩態滲流狀況下之邊坡穩定分析，此機制分析結果指出，若堤內水位接近堤防頂部，則堤外水位一旦開始下降，堤防即可能會產生破壞。機制三與四考慮堤內外水位不同導致穩態滲流狀況下，堤防基礎發生滑動以及傾倒破壞之可能性，研究結果顯示此處堤防基礎發生滑動破壞之安全係數較發生傾倒破壞之安全係數為低。基於以上分析結果，舊寮一號堤防之破壞機制可能為位於河流凹岸之河床受到淘刷，當堤內的水位接近堤頂時，而堤外水位剛開始洩降時，此時堤防會因為穩態滲流下之堤防邊坡破壞和堤防基礎的滑動破壞而導致其產生全面潰堤。

關鍵字：堤防破壞、邊坡穩定、堤防基礎、颱風。

Levee Failure Mechanisms During the Extreme Rainfall Event- A Case Study of Chiuliao 1st Levee

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Abstract

Extreme weather has recently caused many disasters worldwide. In August 8, 2009, Southern Taiwan suffered from serious floods during Typhoon Morakot. In this extreme rainfall event, the Chiuliao 1st levee in the Laonong River basin experienced catastrophic failure. Therefore, this study focuses on the levee failure mechanisms based on variations in levee water levels. Specifically, this study investigates four mechanisms based on limit state equilibrium. The first mechanism involves the slope stability under hydrostatic conditions at various water levels. The results of this analysis show that the levee cannot fail under this mechanism. The second mechanism involves the levee slope stability with steady state seepage. Because the water levels are different on the protected and flood sides, the water recedes much faster on the flood side than the protected side. Based on this analysis, the levee slope might fail when the water level at the protected side is close to