



Establishment of bridge closure and its flood warning stage

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In the face of extreme flood events or the possible impact of climate change, non-engineering disaster prevention and early warning work is particularly important. Taiwan is an island topography with more than 3,900 meters of high mountains. The length of the river is less than 100 kilometers. Most of the watershed catchment time is less than 24 hours, which belongs to the river with steep slope and rapid flood. Every year in summer and autumn, several typhoon events invade Taiwan. Typhoons often result in rainfall events in excess of 100 mm/1hr or 250 mm/3hr. In the face of Taiwan's terrain and extreme hydrological rainfall events, flooding is difficult to avoid. The safety of bridge piers depends on the stability of the bridge structure and the impact of river erosion. The numerical model can be used to simulate the bridge pier scouring in different situations so that the stability and local scour of pier can be well evaluated and predicted. By simulating different flood conditions with hydraulic and sediment models, the water level, the flow velocity and the scouring and silting results in each case can be obtained, and showing the scouring and silting characteristics of the riverbed between each of the structures and bridge piers. Based on the simulation results can analysis the allowable erosion depth of the bridge, the relation between erosion depth and water level of the bridge pier. Finally, the water level of the bridge closure is establishment according to the above two results.

The bridge flood warning stage is equal to the flood control elevation minus the flood rise rate \times the flood early warning time. The control elevation can be the top of the embankment or the water level of the bridge closure. The flood rise rate is the factors such as hydrological stochastic and uncertain rainfall and the effect of flood discharge operation on the flood in the watershed catchment area. The maximum value of the water level difference between the two hours before the peak value of the analysis result is decided by this rate. The flood early warning time is 2 hours that including the implementation of traffic guidance, information dissemination of news media, disaster response center preparation time at the same time. Finally, the bridge flood warning stage is practical application of the three bridges on the highway in Taiwan.