Evolution characteristics of reinforced landslide under long-term water-level fluctuations by physical model test

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Abstract

Anti-sliding piles are widely used for stabilizing the landslides within the Three Gorges Reservoir area. The reservoir landslide & piles system (RLPS, reservoir landslides reinforced by anti-sliding piles) is exposed to long-term water-level fluctuations (WLFs). In this paper, an experimental method of RLPS under long-term WLFs, which includes the design of physical model and multi-field monitoring system, is proposed. A physical model test, taking seventy-eight hours and involving twenty-nine WLFs, has been carried out. Through the observations during the test and multi-field monitoring results, RLPS responses to long-term WLFs are reproduced. And a failure mode of this system is proposed based on the evolution characteristics of this system. Test results show that RLPS has specific evolution characteristics at different areas under long-term WLFs, featured by uplift at trailing edge and erosion or progressive failure at leading edge and pile bending. The long-term WLFs causes the progressive failure and general instability of RLPS. Topography, strength and structural inheritance are the main intrinsic factors that affect their development. In addition, the anti-slide piles are playing a significant role in RLPS, and pile deformation is critical for controlling the evolution characteristics and stability of the whole system. Besides, this platform can be referenced to design the physical model test under WLFs and the monitoring can provide multi-field data to understand the deformation mechanism and long-term stability of reinforced reservoir landslides.

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