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Study on Regularity of Typical Landslide Stability Variation and Influencing Factors related to Drawdown of Reservoir Water Level

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Abstract: It has been consistently found that the stability of landslide has a weakening trend during drawdown of reservoir water level. In fact, with the reservoir water level changing, besides changes the hydrodynamic pressure, landslides are affected by the buoyancy of groundwater. External forces impacting the stability of landslide are closely related to internal and external geo-environmental factors. In this paper, the limit equilibrium theory is applied to derive the formula expressing the change of residual slide force, in adjacent moment, of the landslide, which is influenced by the external force arising from the groundwater. According to this formula, this paper analyzes the main internal and external factors affecting landslide stability. This paper generalizes a typical landslide geological model by statistical analyses of 142 landslides in the Three Gorges Reservoir. We calculate stability coefficients of these landslides and analyze the regularity of stability variation for different moments. The results show that when the reservoir water level falls, the change of landslide stability is influenced by reservoir water influencing coefficient (the proportion of permeability coefficient of landslide and the falling rate of reservoir water), dip angle of slip plane in the changing area of groundwater infiltration line, and thickness of slip mass. There are four types of regularity of stability variation, including gradual decline, gradual ascent, U-shaped, stair-step ascent. The reservoir water influencing coefficient and dip angle of slip plane control the figure and changing shape of stability coefficients. Thickness of slip mass and intensity parameters of sliding zone only affect the stability coefficient value. The inclination of the sliding zone is the most sensitive factor affecting the variety of changing shape of the landslide stability, followed by reservoir water influencing coefficient. For the gradual decline type, when other factors are constant, reduction rate of stability coefficient and the negative logarithms of reservoir water influence the coefficient of the power function relationship.