



A method for assessment of slope unloading zone based on unloading strain

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Slope unloading is a process of energy release. During the evolution of slope, unloading deformation appears and unloading zone is formed in shallow slope with rock mass relaxation and extension. In this paper, a new method is proposed to quantify the extent and damage degree of unloading zone according to unloading strain energy which is released in the process of unloading. By using elastic theory and statistical mechanics of rock masses, we establish a relation between accumulative opening displacement of unloading cracks and unloading strain, which is the principle to assess the extent and damage degree of unloading zone. Based on the unloading strain, the degree of unloading zone can be divided into two sub-zones, i.e. strongly unloading zone and slightly unloading zone, and the extent of the two sub-zones can be determined from the accumulative opening displacement curves of cracks. This method is applied to assess the slope unloading zone at a hydropower station dam site in northwest China. Results show that the accumulative opening displacement curves of cracks along adits vary regularly, and the curves can be divided into three parts. The strongly and slightly unloading zones can be recognized from the slope of each part, and their extent is limited by the two inflexions of each curve.