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Dynamic Response of High Steep Rock Slopes Based on Wenchuan Near-field Seismic Motion Characteristics

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Keywords: Wenchuan Earthquake; high steep rock slope; dynamic response features; seismic force

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Introduction

The Ms8.0 Wenchuan Earthquake of 12 May 2008 struck in a mountainous area, resulting in the collapse and sliding failure of many slopes. The region affected by earthquake damage has numerous high steep rock slopes, which resulted in extensive damage as the result of the burial of roads and damage to infrastructure caused by the earthquake. To prevent future disasters or, at least, minimize the losses, it is necessary to fully understand the earthquake mechanism and, in particular, the seismic dynamic response characteristics of high steep slopes. Most previous research on the dynamic response characteristics of slopes under seismic action has considered only the displacement and acceleration of a slope body under the action of a typical seismic wave [1-5]; no analyses of the dynamic response of slope bodies to the Wenchuan Earthquake have been reported. That said, some research has analyzed the mountain destruction characteristics of the Wenchuan Earthquake [6-10], discussing the problems from the perspective of engineering geology. However, they do not thoroughly analyze the dynamic response characteristics of the mountain slopes based on special records of Wenchuan Earthquake. This paper specifically addresses the issues surrounding the evaluation of the dynamic response characteristics of high steep rock slopes, a topic that earlier related research has not developed significantly.

Dynamic characteristics of the wenchuan earthquake

During the Wenchuan Earthquake, Wolong Station measured and recorded the seismic acceleration time history in the east-west, north-south and longitudinal directions, for which the peak acceleration of the east-west component was the maximum and is selected here as the model to explain dynamic characteristics. Figure 1 shows the record of acceleration time history during the first 180s (although the acceleration in the first 20s is almost zero and not displayed here). In Figure 1, Peak Ground Acceleration (PGA) in the east is 9.574m/s^2 = 0.976g at a record time of 33s. If ±0.05g is deemed as the boundary for judging the effective duration, the effective duration can be