

# Establishment of an early warning model for the mine waste dump failure induced by rainfall

Hongnan Qin<sup>1</sup>, Haitao Ma<sup>2</sup>, Zhengxing Yu<sup>3</sup> and Xiaolin Yang<sup>4</sup>

1.  
Engineer, China Academy of Safety Science & Technology, Beijing, P.R. China, 100083. Email: qinhn@chinasafety.ac.cn

2.  
Senior Engineer, China Academy of Safety Science & Technology, Beijing, P.R. China, 100083. Email: maht@chinasafety.ac.cn

3.  
Senior Engineer, China Academy of Safety Science & Technology, Beijing, P.R. China, 100083. Email: yuzx@chinasafety.ac.cn

4.  
Senior Engineer, China Academy of Safety Science & Technology, Beijing, P.R. China, 100083. Email: yangxl@chinasafety.ac.cn

## ABSTRACT

Rainfall is widely recognized as the trigger for the deformation and failure of most slopes, such as mine waste dump. Proper interpretation of the correlations between rainfall and dump failure is important for the disaster prediction and early warning. Traditional load-unload response ratio method is a potential way to simulation of the correlation. However, its calculation was based on a fixed interval, which is not consisted with the real case.

This paper investigates an early warning model for the failure of mine waste dump induced by rainfall based on load-unload response ratio method at unfixed intervals. Firstly, the period of each load and unload cycle was obtained from the monitored data of rainfall and slop deformation. Then, the response characteristics of dump slop with the external inducement was analysed. Thirdly, an early warning index was build up based on the response characteristics. Finally, the early warning model was established with continuous adjusted load and unload cycle. The early warning model for the failure of mine waste dump induced by rainfall was tested and verified through a case study at Zijinshan Gold and Copper Mine in China. The established early warning model is effective, accurate and adoptable for the use of predicting the failure behaviour of potential landslide in mine waste dump, which could assist with reducing or avoiding of casualties.