ABSTRACT

Accurate time failure predictions and improved geotechnical certainty in an opencast mine will lead to tremendous safety and economic benefits. This study utilises interferometric synthetic aperture radar and ground-based radar data to conduct a back analysis on slope failures that have occurred in an opencast coal mine in South Africa. Time to failure predictions was done utilising the inverse velocity technique, while the effect of different data smoothing techniques on the accuracy of the failure predictions was evaluated. Additionally, ground-based radar data was used to calibrate a finite element numerical model to improve geotechnical certainty. Time to failure predictions based on satellite monitoring data was less accurate than predicted in the literature, but satisfactory results were obtained from ground-based radar data. This study confirms that displacement measurement from ground-based radars may be used to optimise the strength parameters of finite element numerical models. To improve the accuracy of time to failure predictions from satellite monitoring data, it was proposed that a satellite constellation with a shorter data acquisition time must be utilised. By having access to more frequent data acquisitions and by identifying the most active points within the failure zone of a slope, it is expected that the accuracy of the time to failure predictions can be improved.