

## Visualization of precursory features of Typhoon-induced Shiaolin landslide by ALOS pan-sharpened stereoscopic imagery

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Precursory topographic features of gravitational slope deformation may provide a clue in predicting potential sites of catastrophic landslides. Visual photo-interpretation of high-resolution images such as optical satellite imagery and aerial photographs together with field survey remains the most used method to recognize the precursory topographic features and locate gravitational slope deformation. Here, we utilized ALOS pan-sharpened stereoscopic imagery of anaglyph to recognize the precursory topographic features before Typhoon Morakot-induced catastrophic Shiaolin landslide in southern Taiwan on 9 August 2009. Developed by the coauthors, Ryuzo Yokoyama and Michio Sirasawa, the ALOS pan-sharpened stereoscopic imagery is generated from the data of PRISM (a panchromatic stereo mapping sensor of 2.5 m resolution) and AVNIR-2 (a visible and near infrared sensor of 10 m resolution). We compared it with underlying geological structure that was exposed by the catastrophic landslide and was investigated after the event. The results indicate that the source area had the precursory topographic features: irregularly shaped bulges and depressions in many locations, suggesting the slope had been gravitational deformed beforehand. At least four of the locations were confirmed that the precursory topographic features were related to gravitationally deformed beds of alternating beds of sandstone and shale on a dip slope. The deformed beds were buckled and result in undulating beds or asymmetrical folds near the exposed ground surface. Consequently, the precursory topographic features might reflect the internal geological structures of the deformed slope. Besides, several slopes near the Shiaolin landslide site also appear as gravitational deformed slopes and can be characterized as potential sites of large and catastrophic landslides.

Keywords: ALOS pan-sharpened stereoscopic imagery, gravitational slope deformation, catastrophic landslide, precursory topographic feature