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Validation of DIC approaches to study surface displacements at deep-seated rockslides

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Digital Image Correlation techniques (DIC) are used to exploit multitemporal image stacks and track surface displacements. The increasing availability of high resolution imagery acquired from different sources (e.g., space borne, airborne, UAV) allows nowadays to apply DIC for pre-failure detection and/or monitoring of active slope instabilities.

Our work assesses the qualitative and quantitative performance of three different DIC algorithms based on airborne imagery acquired on the active Cuolm da Vi rockslide in the Swiss Alps. The deep-seated gravitational slope deformation with an unstable volume of around 150 million cubic meters topples along inherited tectonic structures and has been monitored systematically since 1942. For this study, GNSS data taken from 23 locations within the slope instability over a period of 16 years has been compared to the derived DIC results of the same area and time period. In addition, the influence of pre- and post-processing filtering was also examined, such as dynamic contrast enhancement as well as spatial filters constraining homogeneity of direction and amplitudes of DIC results. This study suggests that DIC is able to reach a high level of accuracy, and significantly improving the spatial coverage compared to GNSS measurements.