



## **Systematic acquisition of photogrammetric data from large unstable rock slopes: approach and quality assessment**

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The geological Survey of Norway (NGU) is mapping large unstable rock slopes in Norway using a systematic approach. In an early stage of the analysis, potential unstable rock slopes are flown over with a helicopter to assess to stability of the site and identify its main features. During this stage, pictures are taken in order to build photogrammetric models which will help in mapping the lineaments and will sometimes be used to perform a structural analysis. Such models are especially useful in the absence of high resolution DEM, and have been used in addition to assess the changes after an event. Considering the large number of sites visited, an automated approach is desirable. Thus, we present here a workflow that permits to (i) easily georeference the images by synchronizing the camera with a handheld GPS, (ii) automatically load and process the pictures in Agisoft Photoscan pro, and export the outputs, (iii) manually improve the model if necessary and (iv) reprocess automatically selected steps of the analysis.

In order to assess the reliability of the obtained models, a test site is required. For this purpose, Preikestolen, Rogaland county, has been selected. Preikestolen is a well-known touristic attraction, but happens to be an unstable rock slope as well. Photogrammetric point clouds obtained from the helicopter and from a UAV are compared to LiDAR scans of the area. The photogrammetric data show a good coherence with the LiDAR data when the photogrammetric point clouds are aligned and scaled directly on the LiDAR point cloud. On the other hand, the registration approach using a handheld GPS performs less well and depends mostly on the quality of the synchronization, as the helicopter moves fast. Nevertheless this method of georeferencing is sufficient for our general use and the registration can be improved in a later stage if required, for example to compare points clouds before and after an event. Finally, those point clouds offer a good communication support as they can be embedded in a web page, using for example the library potree. Thus, it is planned to provide relevant point clouds along the database of unstable rock slopes, that is already accessible as a web map service and presents the current state of the ongoing systematic mapping project.