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ASSESSING THE FRACTURE OCCURRENCE USING THE "WEIGHTED FRACTURING DENSITY": A STEP TOWARDS ESTIMATING ROCK INSTABILITY HAZARD

M. Jaboyedoff (1,2), F. Baillifard (1,3), F. Philippossian (4), J.-D. Rouiller (1)

(1) CREALP (Research Center on Alpine Environment), (2) Quanterra, Lausanne, (3) Institute of Geology and Paleontology, University of Lausanne, (4) Bureau d'études géologiques SA, Vétroz

Assuming that rock instabilities are generally created by discontinuities, a method is proposed to estimate the fracture density by means of a digital topographic model (DTM). This method can be easily used by means of a software program named MATTEROCKING, that can be freely downloaded from: http://www.crealp.ch/download/. Using the mean orientation, the mean spacing, the mean trace length of discontinuity sets potentially involved in slope instabilities, and a DTM, it is possible to calculate the mean number of discontinuities of a given set per cell of the DTM. This allows for an estimation of the probability of the presence of at least one discontinuity in a given area, or simply in a topographic cell of the DTM. This leads to a prioritization of sites that are potentially affected by rockslides within a region. Depending on the data available, the mean number can be calculated either by area or along a line parallel to the mean apparent spacing. The use of the probability of occurrence depends on the size of the discontinuities, as short and weakly spaced discontinuities will have a probability of occurrence of 100% in each favorable location.
This method was applied to a test area in which instabilities were identified by a detailed field survey. Results indicate that all the observed instabilities are located within the zones of potential slide along a joint set (220/45), including a recent rockslide of 2'000 m3 that occurred in 1994.
Instabilities are located within the zone of higher density of sliding planes intersecting the topography. This is verified with either spacing, surface or volume counting.

This method, when combined with other instability factors such as morphological, geological and hydrogeological settings, is a promising approach for rock instability hazard assessment.