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Proxy-dating the Tschirgant rockslide event with the U/Th method

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Age-dating of catastrophic rockslides is a prerequisite to understanding the potential controls over mass-wasting events. Rockslides are mostly dated with the radiocarbon method and/or surface exposure dating. In addition, in a pilot study on the carbonate-lithic rockslide of Fern Pass (Tyrol, Austria) it was demonstrated that U/Th dating of diagenetic cement formed newly within the rockslide deposit can provide a good proxy age of the mass-wasting event (Ostermann et al., 2007; Prager et al., 2009). Proxy-dating carbonate-lithic rockslides with the U/Th method is based on $CaCO^3$ precipitates (cements, stalactites) formed along the underside of rockslide boulders. Because the $CaCO^3$ precipitates form only after mass-wasting, their U/Th age represents a minimum proxy age of the event. In the present study, we applied U/Th dating to stalactites sampled from the prominent Tschirgant rockslide (Tyrol, Austria).
The Tschirgant rockslide detached from a mountain flank more than 1400 m in vertical height, from an intensely deformed succession of Triassic dolostones and cellular dolomites. The rockslide mass with an estimated volume of >200 x 106 m^3 is spread over an area of 9 km^2. The maximum runout of the rockslide is 6.2 km, and the fahrböschung is 12° (Prager et al., 2008). For the Tschirgant rockslide, five radiocarbon ages of organic remnants from five different locations suggest two distinct mass-wasting events (1: 3753 $\pm$ 191 cal. a BP; 2: 3151 $\pm$ 359 cal a BP) (Patzelt, 2004).
We sampled soda-straw stalactites from the underside of boulders at two different locations for U/Th dating. The U/Th ages of the stalactites are 3650 $\pm$ 350 a and 2800 $\pm$ 100 a. These ages are consistent with a hypothesis (Ostermann et al., 2007) that, in carbonate-lithic rockslide masses, precipitation of cement and stalactites starts closely or perhaps immediately after mass-wasting. Thus, the U/Th ages may confirm the existence of two separate mass-wasting events, as suggested by the radiocarbon data. Age-dated multi-phase rockslides are known from other locations nearby (e. g. Pletzachkogel, Tyrol), where the distinct events can also be identified by field mapping. For the Tschirgant rockslide, however, the apparent two events can not be unequivocally distinguished in either the field or in drill cores, or from surface shapes and laserscan topographic images; the possibility of successive mass-wasting events however is underscored by a large body of potentially unstable rock in the scarp area of the (former) rockslide(s). To further evaluate the possibility of successive rockslide events, we took samples for 36Cl surface exposure dating from five selected boulders scattered over the majority of the accumulation area; these samples are being processed at present.
The U/Th ages from the Tschirgant rockslide confirm the applicability of this method to deduce mimimum proxy ages for carbonate-lithic rockslides. In addition to the previous study on the Fern Pass event, the Tschirgant rockslide will represent the second location where radiocarbon dating, surface exposure dating and U/Th dating are applied and can be compared.

References:
Ostermann, M., Sanders, D., Prager, C., Kramers, J., 2007, Aragonite and calcite cementation in 'boulder-controlled' meteoric environments on the Fern Pass rockslide (Austria): implications for radiometric age-dating of catastrophic mass movements. Facies, 53, 189-208. DOI 10.1007/s10347-006-0098-5

Patzelt, G., 2004. Tschirgant-Haiming-Pletzachkogel. Datierte Bergsturzereignisse im Inntal und ihre talgeschichtlichen Folgen. Oral presentation, alpS Symposium Naturgefahren Management 13.10.2004, Galtür (Austria).

Prager, C., Zangerl, C., Patzelt, G., Brandner, R., 2008. Age distribution of fossil landslides in the Tyrol

(Austria) and its surrounding areas. Natural Hazards and Earth System Science 8, 377-407.

Prager, C. S., Ivy-Ochs, S., Ostermann, M., Synal, H.-A., Patzelt, G., 2009. Geology and radiometric 14C-, 36Cl- and Th-/U-dating of the Fernpass rockslide (Tyrol, Austria). Geomorphology 103, 93-103.