THE GREAT LANDSLIDES OF THE DOLOMITES: SOME EXAMPLES

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The mountainous slopes of the Dolomites (Southern Alps, NE Italy) bear evidence of numerous deep-seated catastrophic rock-slope failures. Many of these evolved into long-runout rock avalanches with volumes of several 100 Mm^3.
Some of the most spectacular rock avalanches are concentrated in the Brenta Dolomites area like the Marocche di Dro (Marocca Principale 1000 Mm^3; Kas 300 Mm^3) located in the middle reach of the lower Sarca valley, and Molveno (500 Mm^3) and Tovel (300 Mm^3) in the core of the Brenta massif. Other rock avalanches are present in the surrounding valleys: the Lavini di Marco (200 Mm^3) in the middle reach of the Adige valley and the Nago-Torbole (260 Mm^3) near Lake Garda (Fig. 1).

Other huge landslides are present in the Venetian Dolomites such as: the Vajont (270 Mm^3) on the northern slope of Mt. Toc, the Mt. Peron (170 Mm^3), Alleghe (20 Mm^3) and Antelao (5 Mm^3) in the Cordevole valley (Rossato et al., 2018), the Fadalto deposit in the Lapisina valley (~135 Mm^3) and the Sasso Lungo (Città dei Sassi) landslide (Montandon, 1933) (Fig. 2).
Many of the colossal landslide events, once thought to have occurred between 17,000 and 12,000 years ago, are now shown by ^{36}Cl dating to have failed much more recently, within historical times (Martin et al. 2014, Ivy-Ochs et al. 2017a; 2017b). To date the events, we use cosmogenic ^{36}Cl dating of limestone and dolomite boulders in the deposits.

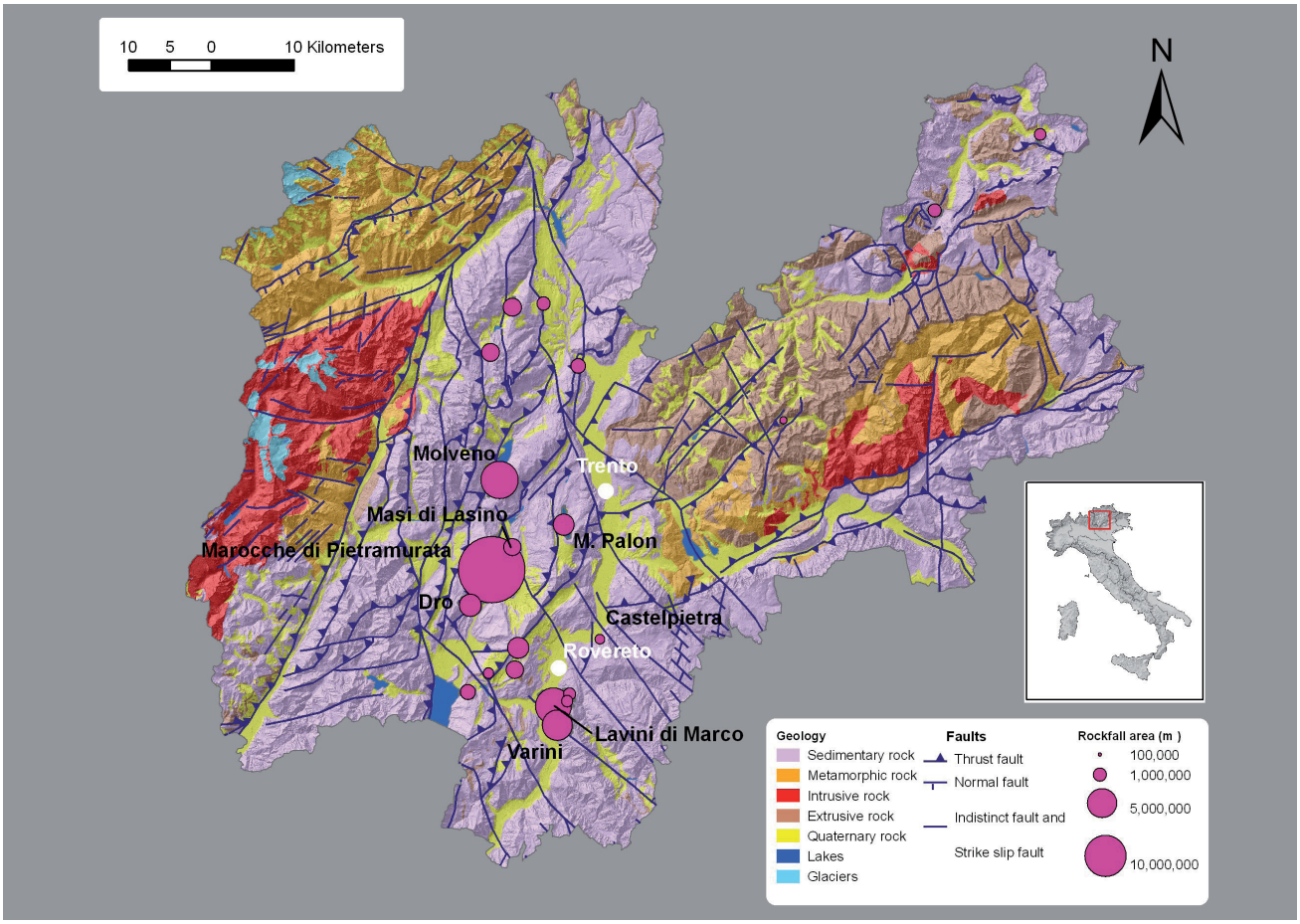

FIG. 1: Landslides of the Trentino Dolomites (modified from Ivy-Ochs et al., 2017b).

A summary of all dated and large landslides in the Alps has shown three periods of enhanced slope activity during the Holocene: 10-9 ka, 5-3 ka and 2-1 ka, the latter especially in the Southern Alps. Usually we have observed a repetition of the rock-slope failure in the same mountainous site with events during the pre-historic time and some others during the historic one, mostly concentrated within the latter two periods.

The results of this study based on ^{36}Cl dating are interpreted in the framework of geomorphological and structural field mapping, remote sensing analysis and runout modelling, focusing on the type of event, timing and impact on human life and activities, and discussing their predisposing and triggering factors.

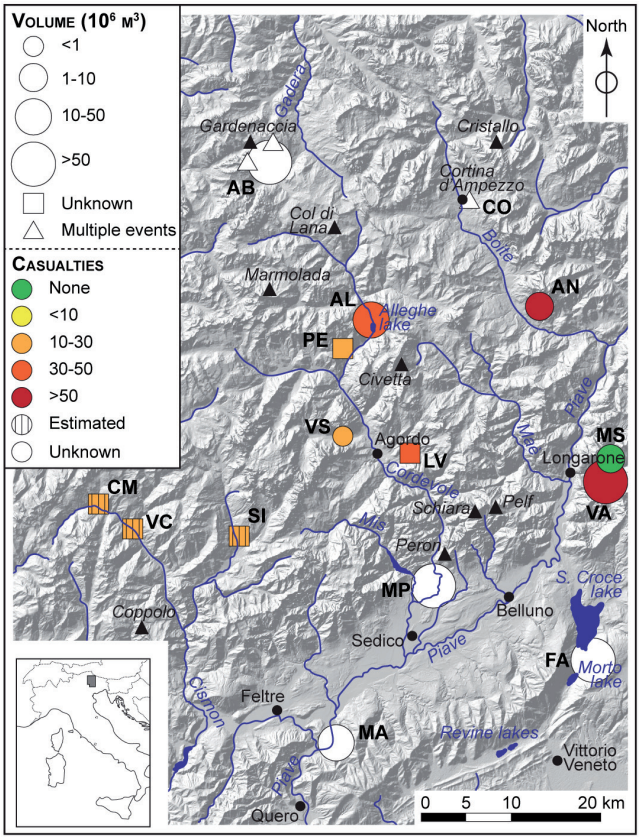

FIG. 2: Landslides of the Venetian Dolomites (modified from Rossato et al., 2018). The size of the symbols corresponds to the volume; casualties are shown with color coding. **AB** Alta Badia, **AL** Alleghe, **AN** Antelao, **CM** Col Mandro, **CO** Cortina d'Ampezzo, **FA** Fadalto, **LV** La Valle. **MA** Marziai, **MS** Mt. Salta, **PE**: Pecol, **MP** Mt. Peron, **SI** Siror, **VA** Vajont, **VC**: Val Cia, **VS** Valle San Lucano.

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: Geo.Alp

Jahr/Year: 2019

Band/Volume: 0016

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