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Large scale reconstruction of fragmentation in a rock avalanche deposit

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Rock avalanches are characterized by enormous volumes (larger than 0.5 and 1 Mm3) and energy, high velocity (roughly between 20 m s-1 and 100 ms-1), long runout and flow –like features. Rock avalanches are frequently composed of dry material, or with a limited water content. The initial stage of motion as fall or slide is followed by a flowing stage of dynamically disintegrating rock mass. The mechanisms involved in the rock avalanche motion and the dynamic disintegration of rock masses are poorly understood (Crosta et al., 2007; Davies and McSaveney, 2009) and, excepted in a few cases (Dunning, 2006; Crosta et al., 2007), described at limited exposures or at the deposit surface. We present a new dataset collected from the deposit of the 1987 Val Pola rock avalanche (Central Italian Alps) following the excavation of about 4 million of cubic meters of material, and the destruction drilling for a total of about 36 km. Blocks larger than a threshold size (3m3) have been collected, described and a record of their dimensions kept. A large and continuous exposure has been created cutting through the deposit for a total length of about 500 m, exposing blocks and their relative relationships. This new dataset allowed us to produce linear, areal and volumetric estimates of the block distribution, partially applying the approaches proposed for blocks-in-matrix rocks. This is an important characteristic which extremely few dataset have. We describe for this data the fragment size distributions, their fractal dimension, spatial distribution. This description is useful to characterize the deposit, to understand the degree of disturbance of the material because of the transport, to study the role of fragmentation in the energy budget and the excessive runout of rock avalanches, and finally to give a reasonable estimate of the problems that can be found during excavation of these deposits. The results are compared with those obtained in a previous research (Crosta et al., 2007) by analyzing debris exposures and grain size distributions from small and large samples, and from debris exposures generated by erosion in the upper sectors.

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