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Integrated approach for the classification of quaternary deposits in the alpine environment. The case study of Palafavera, Italian Dolomites

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In the last decades Italian territory has been affected several times by serious hydrogeological catastrophes that have caused enormous consequences in terms of economic damages, lost of human lives and injured persons. This situation has given a new strength to the research and application of effective prevention and mitigation measures by the Italian Government. Within this context, this work aims to illustrate a multi disciplinary approach to identify some quaternary deposits due to massive landslides that in past have been mapped with a different meaning.

Is very important, in fact, for hazard prevention to exactly know where and when landslides were occurred on a specific territory, for that reason on the last years within the CARG Project in Italy, the quaternary deposits were studied both from a geomorphological and from a sedimentological and stratigraphical point of view. The case study here reported is located on the Zoldo Valley, Italian Dolomites. In the village of Palafavera, a quaternary deposit that dammed the Rio Canedo torrent, was in past mapped from different scientists both as frontal moraine and as a rock avalanches landslide detached from the Mount Pelmo. Such a big difference in the classification subtend a non homogeneous study on the characteristics of the deposits both on the sedimentological and the morphological approach. In our vision the two approaches are deeply linked in terms that different deposits should have different morphology, for that reason some morainic and rock avalanches deposits were studied with both approaches, making detailed morphometrical analysis with an accurate study on the standard deviation values of the topographic surface. For an appropriate morphometrical study a detailed Digital Elevation Model is indicate, in order to delete the possible

errors due to a not accurate interpolation. For this reason a LIDAR laser scan restitution is the most indicate thing, but unfortunately the high costs of this technology do not allow a wide and spread around study of the territory. The numerical maps of the case study area was at the scale of 1:5.000, that means a DEM of 5X5 m cell; in order to affine the DEM on 1X1 m cell a granulometric map of the study area was carried out. The idea was to intersect the granulometric map with the DEM (5X5 m cell) and, with a Random Function Analysis, to affine the DEM transforming it in 1X1 m cell, taking in to account the deposit clast dimensions. The result was a more accurate topographic map in which was possible to make statistical analysis that clearly shown the morphological difference between the rock avalanche and the morainic deposits and definitely classify the deposit of the case study as a rock avalanche.

This result has been validated by a radio carbon analysis made on a sample of wood piece collected on a borehole exactly behind the deposit that dammed the Rio Canedo Torrent. The analysis date back the sample at 8.800 B.P. years, when the glaciers of the area have already been totally retreated, giving no hypothesis for any morainic deposits. This conclusion gives us a new strength to analyse all the deposits that in past have been mapped as frontal moraine on the dolomites, and gives also an important indication for the hazard analyses of the Zoldo Valley, that in case of sharp change of climatic events was in past interested by catastrophic landslide events and may suggest an accurate analysis of the stability of the steep slopes that nowadays crown the valley.