



## **Application of different techniques to obtain spatial estimates of debris flows erosion and deposition depths**

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In Alpine regions, debris flows endanger settlements and human life. Danger mitigation strategies based on the preparation of hazard maps are necessary tools for the current land planning. To date, hazard maps are obtained by using one- or two-dimensional numerical models that are able to forecast the potential inundated areas, after careful calibration of those input parameters that directly affect the flow motion and its interaction with the ground surface (sediments entrainment or deposition). In principle, the reliability of these numerical models can be tested by flume experiments in laboratory using, for example, particles and water mixtures. However, for more realistic materials including coarse particles, the scaling effects are still difficult to account for. In some cases, where there are enough data (for example, point measures of flow depths and velocities or spatial estimation of erosion and deposition depths), these models can be tested against field observations. As it regards the spatial estimates of debris flows erosion and deposition depths, different approaches can be followed to obtain them, mainly depending on both the type and accuracy of the available initial data. In this work, we explain the methods that have been employed to obtain the maps of erosion and deposition depths for three occurred debris flows in the Dolomites area (North-Eastern Italian Alps). The three events are those occurred at Rio Lazer (Trento) on the 4th of November 1966, at Fiames (Belluno) on the 5th of July 2006 and at Rio Val Molinara (Trento) on the 15th of August 2010. For each case study, we present the available initial data and the related problems, the techniques that have been used to overcome them and finally the results obtained.