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The 1963 Vajont landslide (Italy) simulated through a numerical 2D code

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On October 9th, 1963, a huge mass of about 260 million m3 collapsed along Mt. Toc flank into the artificial lake called Vajont and generated a gigantic wave that invested the town of Longarone (North-East Italy, about 100 km north of Venice), provoking about 2000 casualties. The event started a public debate on the responsibilities for the disaster, and also raised crucial issues for the scientific and engineering community, regarding reservoir flank instability and safety of the hydroelectric plant.
The peculiar features of the event were immediately evident. The clay layers remained uncovered in the upper part of the detachment niche, supporting the hypothesis of a well-defined pre-existing sliding surface, that could explain the high falling velocity (around 20 m/s as a maximum) and the compactness of the deposit layers that were found to sit almost unperturbed on the bottom of the valley.
The numerical study presented here contributes to the understanding of dynamics of the Vajont landslide. It is found that the accurate knowledge of the pre- and post-slide morphology provides tight constraints on the parameters of the numerical model, that are tuned to fit the observed deposit.
Numerical simulations are carried out by means of the in-house built code UBO-BLOCK2. The initial sliding body is divided into a mesh of interacting volume-conserving blocks, whose motion is computed numerically. The friction coefficient at the base of the landslide is determined through a best fit search by maximizing the degree of overlapping between the calculated and observed deposits. Our best solution is also able to account for the observed slight easterly rotation of the mass, the different behaviors of the eastern and western part of the sliding surface and the retrogressive motion of the slide that after climbing up the opposite flank of the valley reverted velocity to settle down on the bottom of the valley.