An event in periglacial Mont Blanc area: the Arp Vieille Dessot avalanche in Val Veny Courmayeur – AO (ITALY)

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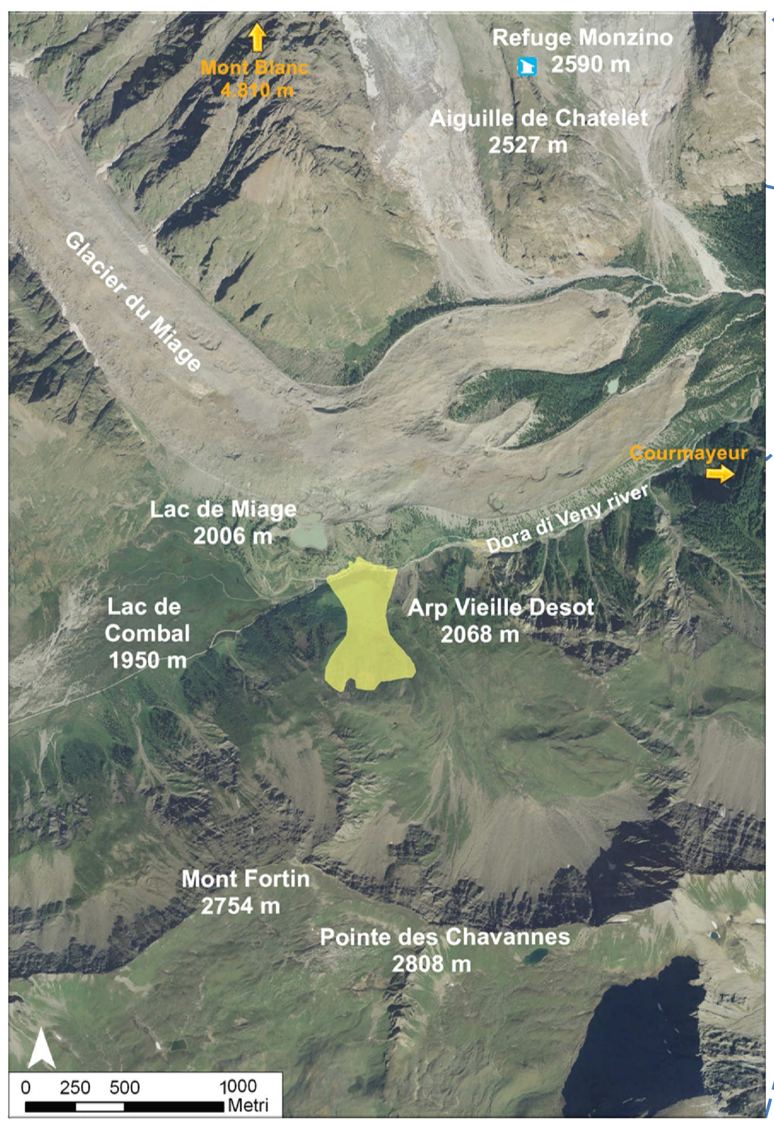
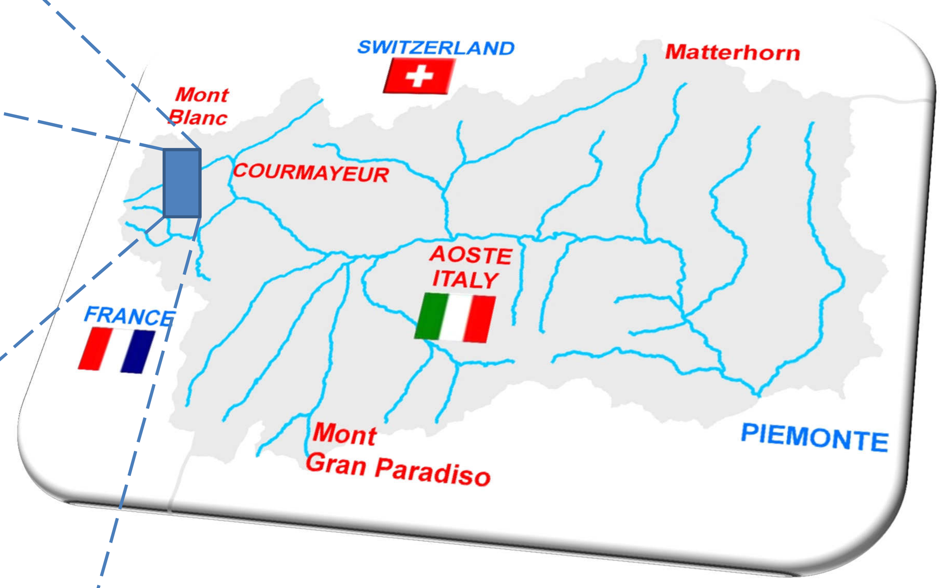
INTRODUCTION

In the last decades, various catastrophic avalanches occurred in the valley of the Mont Blanc from summits with an altitude greater than 4000 m a.s.l.

Usually, on the orographic left side of Val Veny, several catastrophic events present avalanche dynamics affected by glaciers and rock walls.

The considered avalanche basin is located on the orographic right side of Val Veny, at an altitude of around 2300 m a.s.l., characterized by a steep grassy slope and the absence of permanent glacial formations.





WEATHER CONDITIONS

During the second half of April 2013 in fact, several storms provided new snow on the whole Aosta Valley. The last of these storms, coming from the south and characterized by strong winds and snow/rain limit close to 2200-2500 m a.s.l., occurred from the last days of April to the early ones of May: the new fresh snow settled on the ground was quite wet up to 3000 m a.s.l..

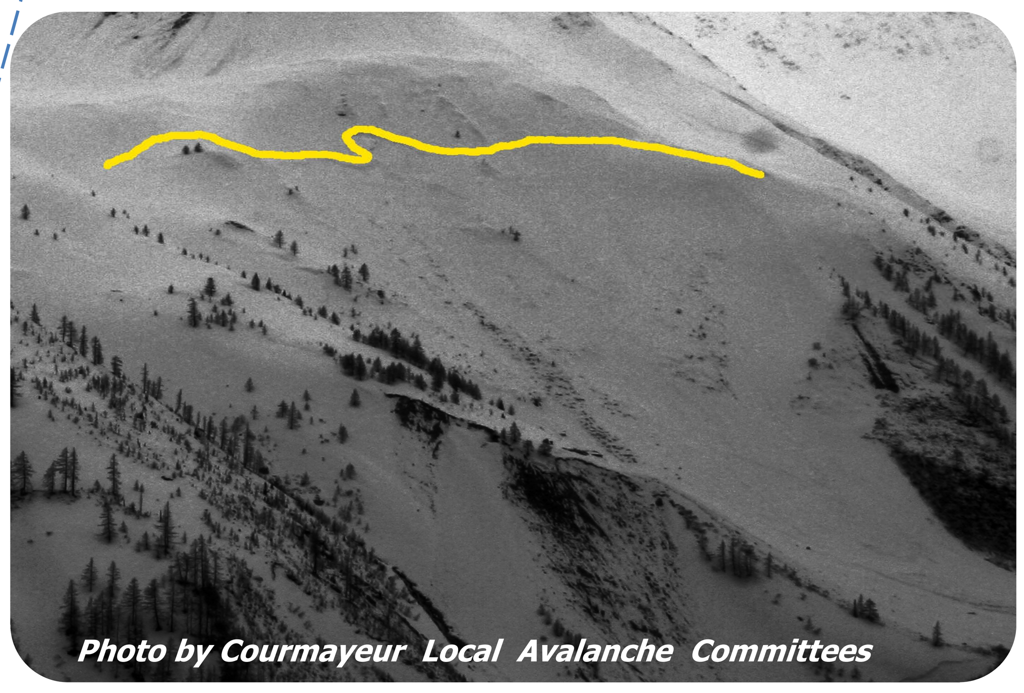


Photo by Courmayeur Local Avalanche Committees

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THE AVALANCHE DYNAMICS

The detachment of several slabs with a thickness greater than 1 m originated in the first days of May from the top of the avalanche basin, at about 2310 m a.s.l., with an extension of about 500 linear metres.

The avalanche fell towards the bottom of the valley with greater force and **removed, from the Dora di Veny river, a large amount of fine deposits (sand) and a massive boulder.** The deposit affected more than 360 m the river's bed and the close farm road, and went up the opposite slope for more than 30 vertical metres.

GEOMETRIC MODELING

The granite boulder was previously located at the centre of the river's bed, about 16 m from the farm road that runs along the stream. After the avalanche interaction, the boulder was found drowned inside the wet snow mass just above the farm road, shifted by about 18 m (AB) and 7 m (BC) in planimetric and altimetric distances, respectively.

Calculating the work needed to the granite boulder to move it from the undisturbed position at the riverbed (segment AB), then lifting itself from the bottom of the riverbed to the road (segment CB) and then dragging over to the side of the rugged road (segment CD), it was possible to estimate the push induced by the avalanche.

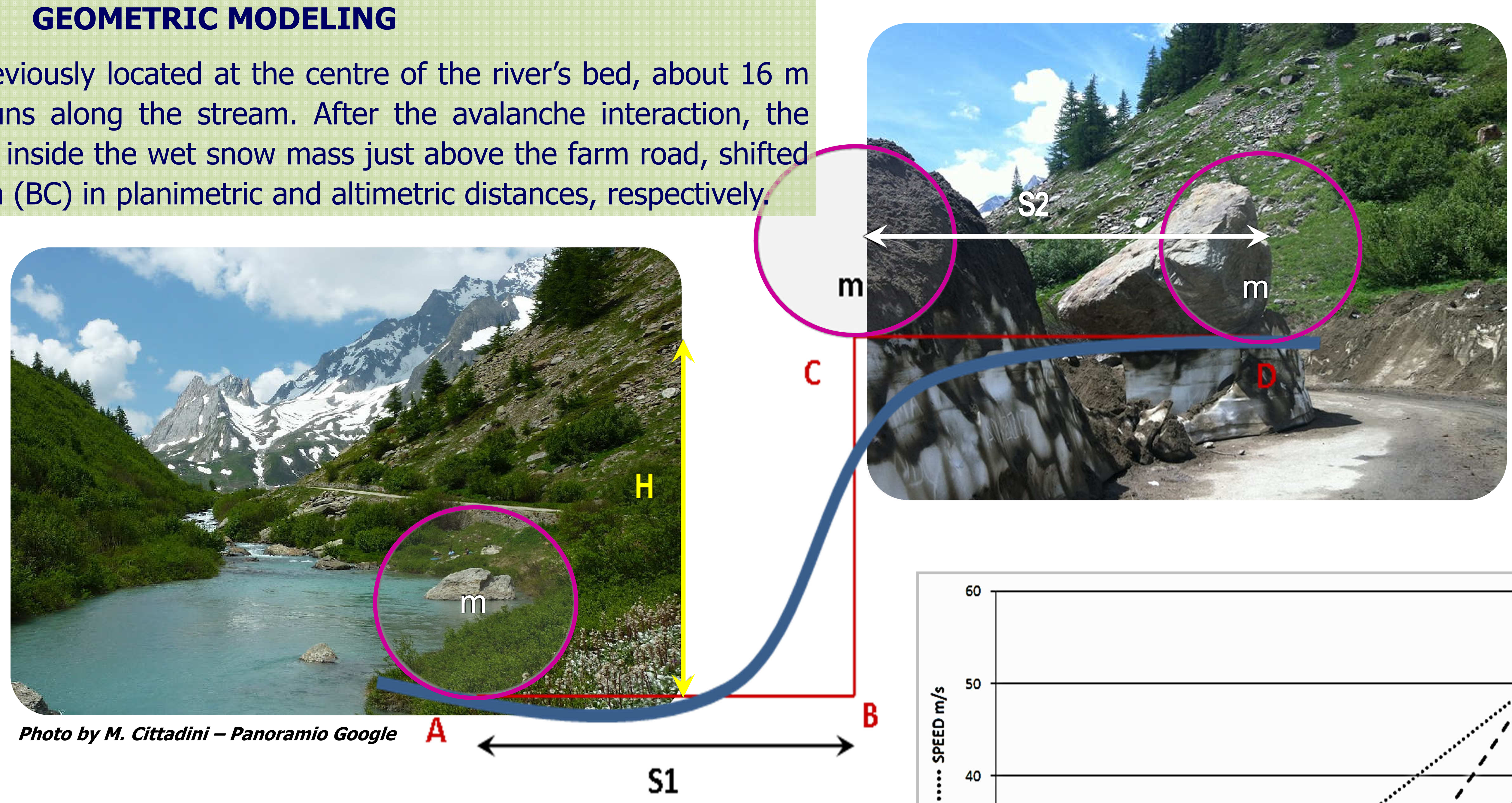
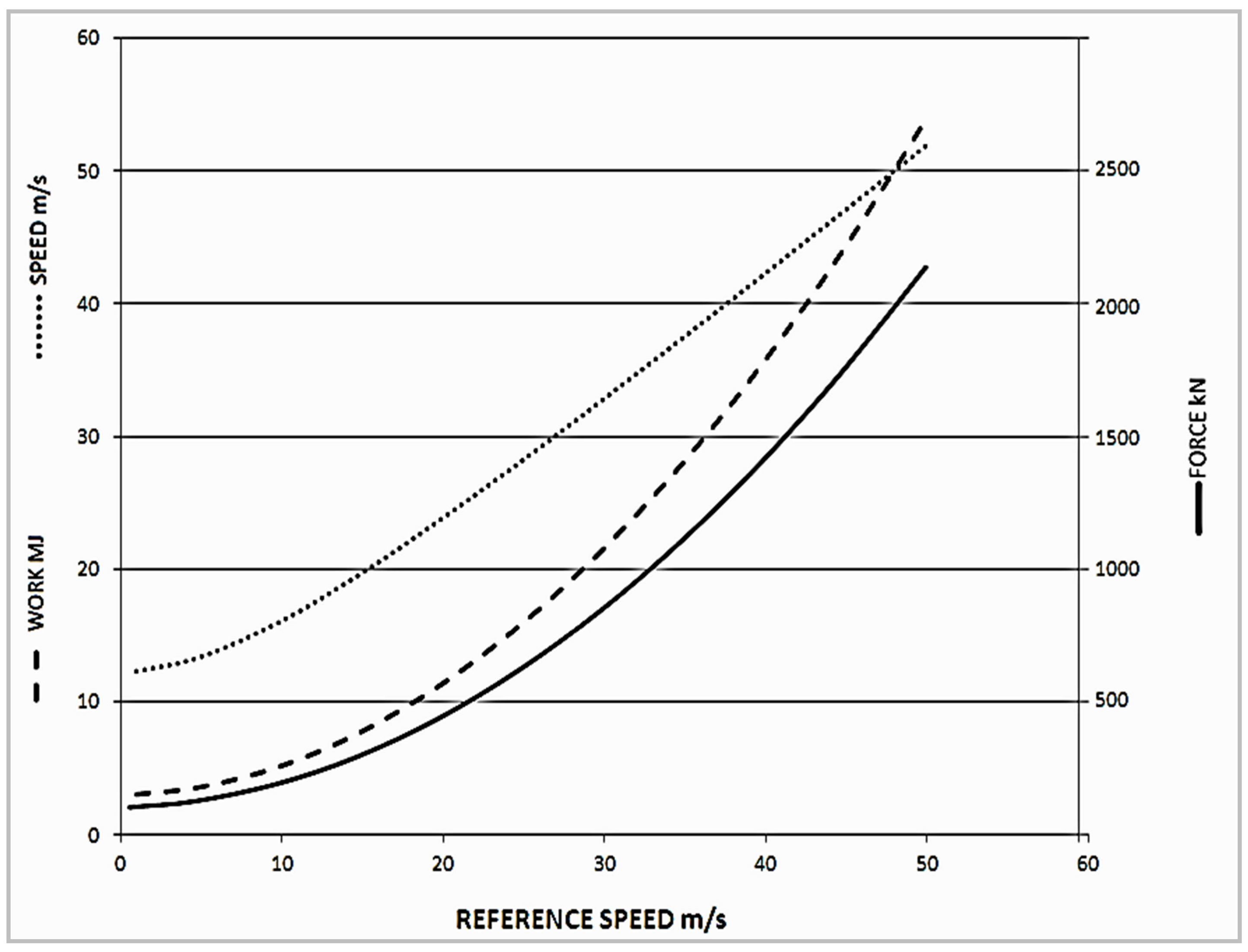


Photo by M. Cittadini – Panoramio Google

Only the kinetic energies of the boulder with respect to the distance S1 and S2 and the potential energy on the gradient of height, H were considered. Then, varying parametrically the speed at point C, the graph shown beside can be drawn. Note that if the reference speed (in point C) ranges between 1 and 5 m/s, the boulder presents an initial velocity induced by the avalanche (in point A) of about 13 m/s.

The boulder is a meta-granite of Mont Blanc and it has a volume of close to 15 m³ and a weight of about 40 tons with a maximum height and width of 3 m and 5 m, respectively and depth slightly higher than 3 m.



CONCLUSIONS

Future developments of the analysis will see the support of a numerical simulation of the event to improve the knowledge on the speed, energy and flow height of the avalanche at the location of sand and rock in the riverbed (point A) and those data will be compared (perhaps utopistically) to better understand the possible mechanisms of dislocation of the boulder.

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