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A new experimental site for the study of snow avalanches in the Aosta Valley (NW-Italy)

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Within the Operational programme 'Italy - France (Alps - ALCOTRA)', Project "DynAval - Dynamique des avalanches: départ et interactions écoulement/obstacles", a new experimental site is proposed in the Aosta Valley (NW-Italy) to study small-medium size snow avalanches.
In the past the attention has been mainly posed over extreme events, which can destroy villages and infrastructures and modify the landscape; scientists tried to understand their dynamics and potential destructive effects. Only recently the scientific world has started to study more in details the dynamics of smaller avalanches, which might be characterized by different relevant processes than those typical of extreme events.
The paper describes the new experimental site that will be built to study the behavior of this kind of snow avalanches from several points of view.
The test site is located in Aosta Valley (North-western Italian Alps) within the MonterosaSki resort (410171, 5078440) on the Monte Rosa Massif. The slope, with an altitude difference of about 300 m (from 2300 to 2570 m a.s.l.), has a dip direction of 350° and a mean dip of about 38°. The rock mass is constituted of a surface debris layer about 10 m thick on a highly fractured bedrock. Two instability phenomena can occur in the slope: superficial sliding in the debris layer and rock falls.
The main objectives of the studies are:
1. the dynamics of small-medium size avalanches;
2. the interaction between avalanche flows and obstacles;
3. the mass balance of avalanches;
4. the characteristics of the snow in the deposition zone compared to those of the release zone;
5. the release process produced by explosives.
To achieve the objectives, from winter 2009-2010, it is planned to artificially release avalanches along the slope according to the snow and weather conditions. In that occasion, the research team records the event measuring different variables of the avalanche. It is planned to film the event from the opposite side of the slope, to measure the snow properties in the release zone, to perimeter the avalanche outline, to dig profiles of the avalanche deposit.

To detect the behavior of structures impacted by avalanches and their influence on the snow flow, the test site will be equipped with an instrumented obstacle.
The galvanized steel obstacle is composed of two masts whose height is about 4 m that support instrumented horizontal plates for measuring the impact forces. The plates can be separately positioned at different levels or grouped together to form a panel with area of 1m2.
The exact positioning of the obstacle is one of the goals of the first experiments for winter 2009/2010, as well as the calibration of the sensors and the study of the behavior of the obstacle under different loads in the laboratory. The obstacle will be built in summer 2010.
The data (impact forces, pressures, accelerations, etc…) will be continuously acquired and transmitted via optical fiber to a control room remotely located.
All the activities will be conducted according to an operational plan, which governs all the different steps of an

experiment: from the alert system, to the role of each operator during the experiment, to the security plan.