



Powder avalanche and catching dam interaction : influence of upstream dam slope ?

Paolo Caccamo, Florence Naaim-Bouvet, and Thierry Faug
Irstea, UR ETGR, Saint-Martin-d'Hères, France (florence.naaim@irstea.fr)

The influence of an obstacle on the dynamics of a finite-volume density current modelling a powder-snow avalanche was investigated. A constant volume of a dyed salt solution reproduced the small-scale aerosol flowing down an inclined channel immersed in a water tank. Reference tests in the absence of the obstacle characterized the dynamics parameters of the flow and then the influence of two different types of obstacles on these parameters was studied. Both of the obstacles represent a catching dam one with a vertical uphill face (OBS1) and the second one with an inclined uphill face 32° (OBS2). A high resolution acoustic velocimeter allows measurements on the 3D Flow velocity.

For the reference avalanche, it was shown that the maximum velocity norm can be up to 18% greater than the maximum horizontal contribution (parallel to the slope) and that the ratio maximum velocity norm over front velocity varies between 1.75 and 2.2. This ratio varies between 1.7 and 2.8 for the obstacles situation. In terms of protection effectiveness, laboratory tests showed that a catching dam with the upstream vertical to the slope is more efficient than a dam with an inclined upstream face. In presence of OBS2 the flow does not hit the obstacle but it rather passes smoothly over it, without any visible detachment from the surface. The ramp effect is remarkable and the avalanche reaches faster (in terms of time) a given point downstream from the obstacle. On the contrary, in the OBS1 configuration, the incoming flow hits the vertical wall and bursts. The flow is subjected to a strong deflection with the formation of a vertical jet.