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Interaction avalanche-obstacle: a first attempt of comparison between a real case study and numerical simulations

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The purpose of this work, within the Project "DynAval - Dynamique des avalanches: départ et interactions écoulement/obstacles" - European Territorial Cooperation objective Italy - France (Alps), is to analyse the effects of the snow avalanche impact against structures by the comparison of a real case study with simulations. By a back analysis of the damages occurred on 15 December 2008 in Aosta Valley (North West of Italy), and more precisely in the village Les Thoules in Valsavaranche, the impact pressure is estimated. In this event 12 houses are destroyed or damaged, as well as electric poles, trees and an high voltage pylon. A first simplified attempt of simulation of the impact area is consequently proposed. The avalanche behaviour, considered as an incompressible fluid, is described by a twodimensional, in the avalanche slope, Navier-Stokes equations to which an advection equation is coupled to take into account the shape variation. A two dimensional and a three dimensional stationary models are implemented too. The models allow to describe the velocity and the pressure at every point. The role played by the natural dam localised in the site of protecting the down-wind structures is analysed. In addition, the pressure acting on the different parts of the houses is investigated, proposing different Cp coefficients, in order to evaluate which parts should have been more resistant. Finally, since the objects involved had different shapes and dimensions, an investigation into the Cd coefficient is made. Finally, the capabilities and the deficiencies of the models proposed are shown.