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Small-scale tests on granular avalanches against various types of flat obstacles

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Snow avalanche prone areas can be protected by passive defense structures aiming at dissipating, diverting and stopping the dense avalanche flow. Open questions remain concerning the design of retarding mounds and catching dams. New scientific knowledge is needed in order to optimize their location in the run-out zone, their size, their shape and their resistance to the avalanche forces.
This study tackles this issue on the basis of a small-scale laboratory device. Dense snow avalanches are simulated by free surface gravity driven granular flows down an inclined channel. The effect of two different types of flat obstacle on the avalanche flow is investigated. A first type of obstacle mimics a catching dam spanning the whole channel width. A second type, simulating a retarding mound, allows lateral overflows. Stagnant zones, with or without the presence of granular jumps, occur upstream the obstacles. Their features, depending on the obstacle shape, and the induced mean force are quantified. A discussion concludes about both the structural and functional design of mounds and dams.