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Small scale modelling of dynamic impact of debris flows

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Fast landslides, such as debris flows, involve high speed downslope motion of rocks, soil and water. Engineering attempts to reduce the risk posed by these natural hazards often involve the placement of barriers or obstacles to inhibit movement. The impact pressures exert by debris flows are difficult to estimate because they not only depend on the geometry and size of the flow and the obstacle but also on the characteristics of the flow mixture. The presence of a solid phase can increase local impact pressure due to hard contact often caused by single boulder. This can lead to higher impact forces compared to the estimates of the peak pressure value obtained from hydraulic based models commonly adopted in such analyses. The proposed study aims at bringing new insight to the impact loading of structures generated by segregating granular debris flow.

A small-scale flume, designed to enable plane laser induced fluorescence (PLIF) and digital image correlation (DIC) to be applied internally will be used for 2D analyses. The flow will incorporate glass particles suitable for refractive index matching (RIM) with a matched fluid to gain optical access to the internal behaviour of the flow, via a laser sheet applied away from sidewall boundaries. For these tests, the focus will be on assessing 2D particle interactions in unsteady flow. The paper will present in details the methodology and the set-up of the experiments together with some preliminary results