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Small and medium scale experiments to investigate avalanche-dam interaction

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The interaction between a dense snow avalanche and a catching dam has been studied in laboratory experiments where glass particles were used to simulate the snow as well as in experiments with snow on the 32 m long and 2.5 m wide meso-scale snow chute at Weissfluhjoch, Davos, Switzerland. The results of these experiments are compared to observations made at the real scale avalanche experimental site in Vallée de la Sionne. The analysis of the similarity criteria which small scale experiments have to respect in order to properly map the real scale behaviour has shown that the dimesionless avalanche volume plays an important role in the avalanche-dam interaction process. Small scale experiments have also shown that the avalanche-dam interaction process can be divided in three different phases: (i) first run-up (ii) hydraulic jump formation (iii) fully developed hydraulic jump. The occurence of the two last phases depends on the dimensionless volume of the avalanche and on its Froude number. Due to this constraint, experiments on the Weissfluhjoch chute as well as the observations made at Vallé de la Sionne provided no evidence for the evolution of the third phase at larger scales. Accordingly, it remains an open question if it is possible to generate a fully developed hydraulic jump during the interaction of a real avalanche with a catching dam. This question can only be answered by observation of real avalanches interacting with dams, which is a very demanding task.