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Spatial and temporal variability of snow avalanche impact pressure and its importance for structural design

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Measurements of snow avalanche impact pressures are performed at the Vallée de la Sionne test site since winter 1999. In these years of operation, we recorded the impact pressure of around 60 avalanches characterized by different flow regimes and dimensions.

Pressure measurements were performed, simultaneously, on three different structures which are spatially distributed with a maximum distance of 30 m, in the run-out zone of the Vallée de la Sionne test site. The structure widths range from 0.25 to 1 m. On these structures pressure sensors ranging from small cells with 0.10 to 0.25 m in diameter to large pressure plates with area of 1 m² are mounted at different heights.

A systematic analysis of all 60 avalanche data sets shows that the pressure measured at the different obstacles varies considerably, even within the same avalanche, both in space and time. Part of these differences can be attributed to different drag coefficients and dependence on obstacle size, but a large part of these differences can only be explained by the spatial variability of the flow properties and the temporal variability of the physical processes governing the interaction of the avalanche and the structures.

In this contribution we show how spatial and temporal impact pressure variabilities correlate to avalanche dimension and flow regimes and we discuss the implication of such variations for structural design and hazard mapping.