



Avalanche impact pressure and structure

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Impact pressures of snow avalanches measured at the Swiss avalanche test site in Vallée de la Sionne are reported. High frequency pressure transducers (sampling at 7.5 kHz) with circular diameters of 0.05, 0.10 and 0.25 m were mounted on a 20 m high tubular pylon at different levels between 0.5-19 m and on a 5m high steel wedge between 2.3-3.8 m. To interpret the influence of sensor dimension on impact pressure measurements, the total pressure exerted on the steel wedge was recorded using two bi-axial sensors and compared to the pressure recorded by the single pressure cells. At six locations along the tubular pylon (between 1-6 m above ground) optoelectronic sensors recorded the avalanche flow velocity. Flow depths were measured by mechanical sensors and were recorded with a sampling frequency of 1 kHz.

Statistical analysis of impulse and frequency of single particle impacts in combination with velocity measurements allowed us to reconstruct the flow structure of five avalanches. Avalanche typologies varied between dense and powder.

For all avalanches, the results indicated complex internal flow structures with extremely variable pressure values for similar speeds determined by different fluidized snow-particle concentrations and densities in all avalanches.

Measured pressures are compared with the Swiss Guideline pressure equation $P = c\rho v^2$. It is shown that this equation is not able to properly reproduce the measured pressure values.