



Studies of snow avalanche evolution and energy from its seismic signals

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The main question of the given work is whether the energy transmitted into the ground by snow avalanches can be determined using seismic observations. The significance of having at least an order of magnitude estimate of the energy evolution of an avalanche is important; Moreover, it could be a useful input parameter for the avalanche model validation. It is obvious that a significant amount of the kinetic energy of a snow avalanche propagating down a slope is spent in overcoming the resistance of the flow at the fluid/solid interface. This energy is transformed into a combination of heat, vibration and sound waves. Vibrations produced by an avalanche, besides the impacts produced by intrinsic elements travelling inside the flow, are mainly attributed to the friction produced by the bottom of the avalanche in contact with the ground.

In the present work, an attempt to obtain reliable energy estimation from seismic signals recorded by a 3D seismometer installed in the main avalanche path is presented. The analysed data came from Ryggfonn (Norway) avalanche experimental site operated by the Norwegian Geotechnical Institute (NGI). We have used the data recorded by University of Barcelona during the artificially released avalanche of 2005/04/15; In addition, this data has been complemented with the speed evolution profile for the same event provided by the NGI. Seismic time series with the attenuation in amplitude corrected indicate the evolution of the seismic energy transmitted into the ground by the avalanche; this energy could be related to the basal friction evolution of the flow and could provide valuable information on the internal dynamics of the avalanche. Although we have successfully obtained the energy evolution of a single snow avalanche, due to the earlier stage of this work and the lack of distinct speed profiles for different events, the results presented here are still preliminary.