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Which dynamic properties can be recovered from the seismic signal of steady and uniform granular flows ?

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The seismic signal generated by rockfalls, landslides or avalanches is a unique tool to detect, characterize and monitor gravitational flow activity. A major challenge in this domain is to retrieve the dynamic properties of the flow from the emitted seismic signal. In this study, we propose laboratory experiments where the dynamic properties of the flow (velocity, granular temperature, density, etc.) are measured together with the generated seismic signal. We investigate near steady and uniform flows made of glass beads of 2 mm diameter, flowing throughout a thin rectangular channel of 10 cm width, with tunable tilt angle and height flow. The flow is monitored from the spine with a fast camera (5000 fps), and the emitted waves are recorded by accelerometers (10Hz - 54 kHz), stuck on the back side of the bottom of the channel. We show that the power radiated by the flow, the mean frequency of the signal, and the modulation of its amplitude are related to the mean kinetic energy and the velocity fluctuations of the flow. As a result, measurements of the high frequency seismic waves generated by granular flows can help recovering the mean properties of the flow (velocity, inertial number, etc.) and its fluctuations (granular temperature, etc.).