Numerical modeling of the Mount steller rock-ice avalanche flow history and it's associated seismic signal.

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Gravitational instabilities, such as landslides, avalanches or debris flows play a key role in erosion processes and represent one of the major natural hazards in mountainous, coastal or volcanic regions. Despite the great amount of field, experimental and numerical work devoted to this problem, the understanding of the physical processes at work in gravitational flow is still an open issue, in particular due to the lack of observations relevant to their dynamics.

In this context, the seismic signal generated by gravitational flows is a unique opportunity to get information on their dynamics. Indeed, as shown recently by *Favreau et al., (2010)* and *Moretti et al.(2012)*, simulation of the seismic signal generated by landslides makes it possible to discriminate different flow scenarios and estimate the rheological parameters during the flow. Because global and regional seismic networks continuously record gravitational instabilities, this new method will help gathering new data on landslide behavior.

The purpose of our research is to establish new relationships making it possible to extract landslide characteristics such as volume, mass, geometry and location, from seismic observations (amplitude,duration,energy...).

The Mount Steller rock-ice avalanche, that occurred the 14th Septmeber 2005 in the south of Alaska, and the associated seismic waves have been simulated. We shown that the stress field applied on the ground surface by the landslide is highly sensitive to the flow history, that is to say, sensitive to the rheological properties and the physical processes, as erosion, involved in the flow.

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