Title of the thesis: An experimental approach of tsunamis generated by pyroclastic flows

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Summary: Pyroclastic flows are likely to generate tsunamis, but their dynamics of emplacement in water and the parameters controlling the generation of waves are still poorly understood. In the current state of knowledge, the numerical modeling approach makes it difficult to infer the different physical processes linked to the interactions between pyroclastic flow, air and water. This thesis offers an experimental approach to this issue. The pyroclastic flow is simulated at the laboratory scale using a fluidized granular flow. This gas-particle mixture is stored in a tank, then released into a 7 m long water channel. High-speed cameras (250 to 1000 fps) are used to monitor the formation and propagation of the wave. The experiments consist in characterizing the influence of different parameters such as the speed, the height, the density and the temperature of the flow, the size of the particles, the slope of the ramp of propagation of the flow, and the water height in the channel. The results will be compared with known historical cases, such as the Montserrat (1997, 2003), Stromboli (2019) and Krakatau (1883) eruptions, as well as with older cases of pyroclastic flow deposits emplaced in subaquatic environment. The experiments will be carried out in the tsunami flume of the Laboratoire Magmas & Volcans. The candidate from Earth Sciences or Physical Sciences must have skills in fluid dynamics.