APPROACHING EARTHQUAKES THROUGH A GRANULAR EXPERIMENT

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In order to analyze different questions related to earthquakes (and scale-invariant phenomena in general) we will present an original experimental setup that mimics the dynamics of a tectonic fault by studying a two-dimensional granular layer that is sheared continuously while submitted to a controlled confining pressure. As the ?(tectonic) plates? move in relation to each other at a controlled and very low speed, shear stresses build up on the packed grains, and eventually they are liberated through sudden avalanches (reorganization of the pack). Acoustic measurements will be the main source of information. However, both the position of all the grains and the force networks in the structure will be monitored. I will present the first preliminary results obtained in this experiment, which show a very good resemblance with real earthquakes: The size of the events are distributed following a power law, similar to the Gutenberg-Richter (G-R) law. The distribution of waiting time between avalanches also follows the same law as real earthquakes, showing a gamma distribution for all the events, and a poissonian process when only large events are considered [1].
The increase of the force between the plates results in larger avalanche sizes, however, the G-R distribution is robust. Currently the analysis focuses on the acoustic [2], with the main goals of understanding the relations between the different measurement (dynamics of force networks, structural disorder, global force and acoustics) and finding precursors of large events.

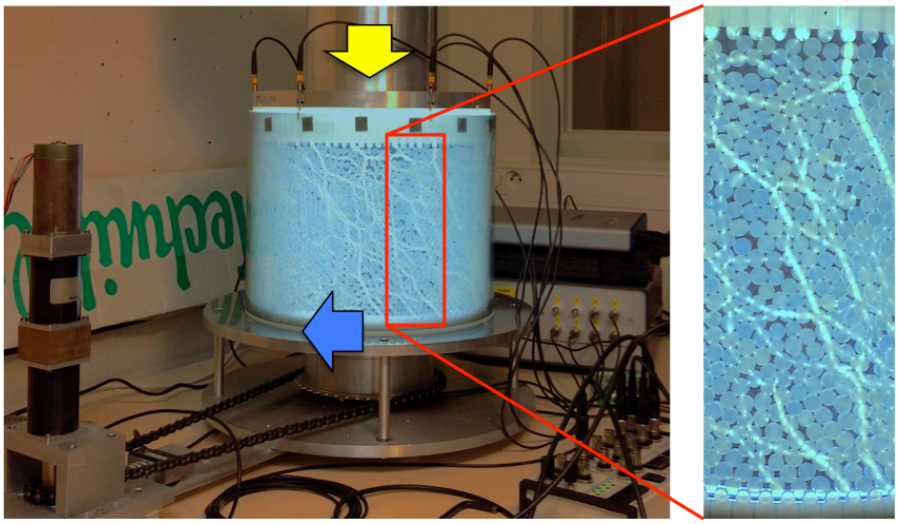

Figure 1. experimental setup.

References

[1] Planet, R., Lherminier, S., Simon, G., Måløy, K. J., Vanel, L., and Ramos, O., *Proceedings CFM 2015, Lyon, France* (August 2015).
[2] Lherminier, S., Planet, R., Simon, G., Vanel, L., and Ramos, O., *Phys. Rev. Lett.*, **113** 098001 (2014).