LabQuakes: Approaching earthquakes through a granular experiment

A simplified model of a tectonic fault is a layer of granular material that is compressed and sheared due to the continuous motion of two adjacent tectonic plates. We have built an original experimental setup using a monolayer of photoelastic disks with periodic boundary conditions. By providing all the details of the structure and dynamics of the system, and combining acoustics [1] and Statistical Physics, the experiments focus on:

1- Reproducing the real earthquake dynamics:
   Gutenberg-Richter (GR) law, waiting times between events, aftershocks, etc. [2]

2- Understanding the role of different key parameters:
   Force between the “tectonic” plates
   (it modifies the size of the events [1])
   Dissipation of the system
   (it may change the exponent value of the GR law)
   Disorder (it may control the generation of a GR dynamics)
   Driving (constant force or constant speed?)

3- Prediction of catastrophic events,
   Is it possible? How? Relation to unjamming transition?
   Control of the dynamics,
   Early triggering to avoid catastrophic events?

4- Relation between acoustics & structure


To appear in Fête des Lumières 2016, Lyon; Invited talk in ADVANCING EXPERIMENTAL GEOMECHANICS (Sydney, Australia, 30/10-02/11, 2016).

Main researchers: Osvanny Ramos (project leader), S. Lherminier (PhD student)