Acoustic probing and triggering of shear instability in granular media

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Laboratory studies of granular friction have emerged as a powerful tool for investigating dynamics of seismic faults [1], including dynamic triggering of earthquakes at remote distance [2]. However, the physical origin of dynamic triggering still remains a challenging issue due to small strain of seismic waves [3,4]. To investigate this topic, a series of experiments have been conducted in granular solids. Firstly, I describe the shear banding in confined granular media (earthquake nucleation) with acoustic monitoring. Decrease of the shear wave velocity and development of the fabric anisotropy are observed prior to failure, and the correlation function of the multiply scattered coda waves is closely connected to the stick-slip like rearrangements [5]. Next, I discuss how the shear modulus softening of a granular solid is induced by the nonlinear acoustic pumping through the contact slipping, either without or with the grain rearrangement [6,7]. Finally, we investigate the triggering of granular avalanches (landslides) by small-amplitude ultrasound, showing that the acoustic fluidization can lubricate the contact between grains and reduce the particle friction coefficient [8] without causing dilatancy.

Références

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