ACOUSTICS2008/2932
Stick-slip dynamics of a granular medium

Alberto Petri[a], Andrea Baldassarri[b], Fergal Dalton[a], Giorgio Pontuale[a] and Stefano Zapperi[c]

[a]Institute of Complex Systems - CNR, via del Fosso del Cavaliere 100, 00133 Rome, Italy

[b]Dipartimento di Fisica -Università di Roma La Sapienza, P.le Aldo Moro 5, 00186 Rome, Italy

[c]CNR-INFM, S3, Dipartimento di Fisica - Universita' di Modena e Reggio Emilia, via Campi 213/A, 41100 Modena, Italy

Under certain limits, granular materials share many features with fluids and solids. Most of the time, however, they exhibit peculiar features which originate in the non-equilibrium and dissipative character of the grain dynamics.

We have investigated the dynamics of a granular medium in a channel, when subject to continuous shear stress from a plate connected to a motor by an elastic spring.

We have shown [1] that the statistical features of granular stick-slip dynamics are not simply Gaussian and that [2] can be described in a quantitative way by a simple stochastic equation. Extant work, such as the statistical properties of friction in solid-on-solid systems, further suggests that a large class of driven instabilities can be described in terms of similar general mechanisms.

The intensity of the acoustic signals emitted by the granular medium during the slip events displays a non trivial correlation with the plate velocity.

[1] F. Dalton et al., Phys. Rev. Lett. 95, 138001 (2005) [2] A. Baldassarri et al., Phys. Rev. Lett. 96, 118002 (2006)