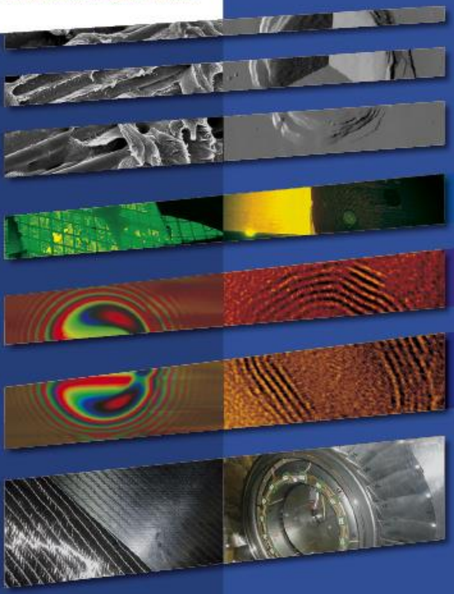

Café Scientifique

ECL, Bat H10, salle B11

Jeudi 20 mars 2014 - 13h-14h

Transition from static to kinetic friction : insights from numerical experiments

Julien Scheibert

Equipe TPCDI

The contact between macroscopic rough solids is made of many micrometric asperities in contact. Under increasing shear force, each microcontact deforms, reaches its breaking threshold, and triggers a local micro-slip event. In some conditions, such an event can destabilize neighbouring microcontacts and a collective micro-slip front propagates across the interface at speeds close to that of sound in the material. Gross sliding of the solids only begins when the front has spanned the whole interface. This scenario has emerged recently from a series of pioneering experiments [1], many aspects of which are still unexplained. Here, I will present recent numerical efforts towards a better understanding of the transition from stuck to sliding interfaces.

I will first show that 2D models incorporating all boundary conditions used in experiments are required to successfully predict the triggering force and propagation length of precursors to sliding motion (Fig.). Surprisingly, this good agreement is obtained even with the minimalistic Amontons-Coulomb friction law [2,3]. In contrast, I will then show that realistic propagation speeds of micro-slip fronts are spontaneously reproduced only using more complex friction laws involving an intrinsic time scale. I will use this model to identify the sufficient physical mechanism at the origin of so-called slow fronts, discovered recently [1].

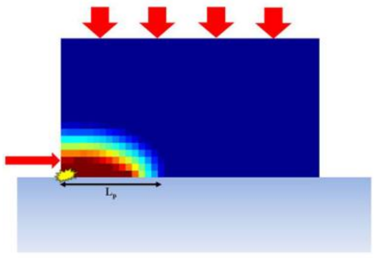

Fig. : Sketch of the system.
An elastic block is pressed (top arrows) on a plane. When the shear force (left arrow) is sufficient, a precursor to sliding nucleates (star) and propagates a length L_p along the interface.

[1] S.M. Rubinstein et al., Nature (2004) ; O. Ben-David et al., Science (2010)
[2] D.S. Amundsen et al., Tribol. Lett. 45, 357-369 (2012)
[3] J. Trømborg et al., Phys. Rev. Lett. 107, 074301 (2011)

GT Séminaires
36, avenue Guy de Collongue
F - 69134 Écully cedex
Tél. +33 (0)4 72 18 62 84
Fax +33 (0)4 78 43 33 83

Comportement vibratoire du steelpan : effet des procédés de fabrication et dynamique non linéaire.

M. Monteil

Equipe DFD

Les steelpans sont des percussions mélodiques nées sur l'île de Trinidad et Tobago. Ils sont fabriqués à partir de bidons métalliques qui subissent un ensemble de déformations irréversibles afin d'obtenir une cuve principale à l'intérieur de laquelle sont façonnées les différentes notes de l'instrument.

Le travail présenté s'intéresse d'une part au processus de fabrication, afin de mieux comprendre le travail du facteur et de proposer une modélisation adaptée, et d'autre part à la caractérisation de la dynamique complexe responsable du timbre de l'instrument. En effet, des non-linéarités géométriques entraînent l'existence de couplages modaux par résonances internes qui marquent l'originalité des sonorités produites par l'instrument.

Laboratoire de Tribologie et Dynamique des Systèmes

LTDS UMR 5513