

PhD Position « Jumps in granular flows down inclines »

Project summary

The equations currently used for describing discontinuities in velocity and depth formed in granular flows, namely granular jumps, rely on the traditional shock theory for incompressible frictionless fluids. Recent laboratory tests have shown the existence of a wide range of granular jump patterns formed down chutes: transition from steep jumps with recirculation to frictional diffuse jumps, occurrence of compressible jumps if the incident flow is dilute enough, and formation of dead zones for some frictional diffuse jumps. Those patterns control the size and the shape of the jumps and clearly show the shortcomings of the classical hydraulic equations for granular jumps. It is therefore crucial to tackle all the regimes and to develop new equations for non-hydraulic granular jumps for which traditional water-like shock equations are not valid. The PhD thesis aims at studying the different granular jump patterns with the help of laboratory tests backed with discrete numerical simulations. Results will be compared to water and other yield stress non-Newtonian fluids. Beyond the expected results regarding the understanding of the rheology of granular media, the results should lead to updated design rules for avalanche protection dams (European handbook edited in 2009), which currently remain largely based on traditional shock theories for incompressible frictionless fluids.

Location and practical aspects

3 years PhD fellowship offer, start: Autumn 2015.

The successful applicant will be hosted by the laboratory Irstea Grenoble in the ETNA team (Research Unit on Torrential Erosion, Snow and Avalanches). He/she will work under the joint-supervision of Dr Thierry Faug from Laboratory Irstea Grenoble & University Grenoble-Alpes (France) and Prof. Itai Einav from the School of Civil Engineering, The University of Sydney (Australia). Two other laboratories will be involved in the project: INSA Lyon/LMFA (Lyon, France) and LEGI (Grenoble, France).

The gross salary will be 1787 euros/months, equivalent to a net salary of 1452 euros/month.

Qualifications of the applicant

The applicant should have preferably a formation in fluid and/or solid mechanics. More specific skills in granular physics will be appreciated. Skills in experimental fluid mechanics will be greatly appreciated as well as skills in numerical modeling. Finally, the applicant should be fluent in scientific English.

Applications

Interested candidates should send their CV and cover letter to:

- Dr. Thierry Faug, thierry.faug@irstea.fr (+33 4 76 76 28 28)
- Prof. Itai Einav, itai.einav@sydney.edu.au (+61 2 93 51 20 69)

Deadline for the application: 15 May 2015.

