



Adrien IZZET

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Nationality : French

Higher Education

September 2013-present : Ph.D candidate

Topic : Dynamics and jamming of granular media : non-local rheology of dense granular avalanches and acoustics in weightless environment

Supervisors : Professor Eric Clément and Professor Bruno Andreotti

Lab. : Physique et Mécanique des Milieux Hétérogènes UMR 7636 (PMMH)

2012-2013 : MSc 2nd year : Fluid Mechanics (scholarship from École Polytechnique)

École Polytechnique, UPMC

[website of the MSc programm]

2011-2012 : Agrégation of Engineering Sciences, specialization : Mechanics and Mechanical Engineering

- Preparation curriculum at École Normale Supérieure de Cachan. The *Agrégation* is the most selective recruiting competition to teach in high schools and Higher School Preparatory Classes (intensive College level) in France.

- Master in Teaching for the Higher Education system.

2009-2013 : Mechatronics, double curriculum : Mechanics and Electronics (4 years government scholarship)

École Normale Supérieure de Cachan, Brittany Antenna (now ENS de Rennes).

- Double Bachelor and double MSc 1st year : Mechanics/Mechanical Engineering and Electrical Engineering, robotics.

- Magistère in Mechatronics.

<http://www.mecatronique.ens-rennes.fr/cursus-type/>

2006-2009 : Higher School Preparatory Classes (CPGE). Intensive program in Mathematics, Physics and Engineering Sciences

CPGE are to prepare the competitive examination to enroll in High Education Schools, such as Écoles Normales Supérieures (ENS).

<http://en.wikipedia.org/wiki/CPGE>

University Internships

Seismic study on a Near Earth Object, June-August 2011

Center for Astrodynamics research, University of Colorado in Boulder, USA

Supervisor : Professor Daniel J. Scheeres

Low ambient gravity on small asteroids is determining for the effect of an impact or a blast on the surface of such little bodies. We use a simple analytical model to compute the behaviour of a surface pod for BASiX mission (NASA Discovery proposal). Any object sitting on the surface has the same response and is launched from the surface, as the mass has no effect on the path. Studying the influence of the amplitude and the frequency of the shock on the launch velocity, we use an analytical wave propagation theory compared to numerical simulations to find the attenuation factor of the asteroid (KW4) and compute the launch velocity-distance from the blast function in order to foresee the path of the pod from any position on the equator of the asteroid. Simulations of the path of the pod are performed and we isolate several zones according to the fact that the pod is either ejected definitively from the asteroid or comes back after a couple of revolutions.

Seismic study on a Near Earth Object, June-July 2010

Laboratoire de Géophysique Spatiale et Planétaire, Institut de Physique du Globe de Paris

Supervisor : Philippe Lognonné

Seismology is actually one of the most effective ways to study the internal structure of planets and small objects like asteroids. The BASIX mission is a seismic study of a very small NEO. As a consequence the gravity on its surface is very low which is a problem for an efficient installation of the seismometers. The technical solution foreseen is to use the geophones in actuator mode in order to vibrate the whole pod and bury the structure. This study is an evaluation of this technical option. An experimental approach has been adopted : we made a CAD of a pod and created an on-board interface to control wirelessly the input signal of the geophones installed in the pod. The micro-gravity has been simulated by a counterweight system and the dust has been reproduced using polystyrene balls.

Consulting studies

Conception of a parametric model of a thrust reverser, 2012

Industrial : ECM-be (<http://ecm-be.fr/uk/>)

The parametric model allows the industrial to make qualitative pre-dimensional structural studies and design choices for a wide variety of thrust reversers models.

Teaching Experience

- **Master student internship (Darith Hun)** : Acoustics in a confined granular media. (5 months)
- **Bachelor student project for High Education Schools entrance examination (Emilie Marphay)** : Flow and jamming of a granular media in a reservoir. (over 1 year. Cumulative time : ~one week)
- **Mathematics (Partial Differential Equations, Analytics and Topology)** : tutorial classes for third year bachelor students, Pierre et Marie Curie University - UPMC Paris 6 (2014-2015). Total : 16 hours.
- **Fluid Mechanics** : practical classes for third year bachelor students, Pierre et Marie Curie University - UPMC Paris 6 (2014-2016). Total : 63 hours.
- **Strength of materials** : lecture classes and tutorials for third year bachelor students, Pierre et Marie Curie University - UPMC Paris 6 (2012-2013). Total : 18 hours + 12 hours.
- **General Mechanics** : tutorials for first year bachelor students, Pierre et Marie Curie University - UPMC Paris 6 (2013-2015). Total : 40 hours + 40 hours.
- **Engineering Sciences and Mechanics** : oral examination of CPGE students (two first years of intensive college classes). Preparatory classes : Louis-le-Grand and Saint Louis high schools, Paris. (2012-2013). Total : 38 hours.

Publications

- Mehdi Bouzid, Adrien Izzet, Martin Trulsson, Éric Clément, Philippe Claudin and Bruno Andreotti
Non-local rheology in dense granular flows : Revisiting the concept of fluidity
Eur. Phys. J. E **38**, 125. (2015)
- Adrien Izzet, Adeline Pons, Xavier Benoit-Gonin, Thierry Darnige, Bruno Andreotti and Éric Clément
Wave propagation in weakly confined granular medium
(*in prep.*)
- Adrien Izzet, Éric Clément, and Bruno Andreotti
Non-local rheology of dense granular flows on an inclined plane
(*in prep.*)
- Adrien Izzet, Éric Clément, and Bruno Andreotti
Discharge of an infinitely high granular bin
(*in prep.*)
- Adrien Izzet, Éric Clément and Bruno Andreotti
Non-local rheology for dense granular flows
ESPCI Soft Matter Days, (2015)
- Robert O., Lognonné P., Scheeres D. J., Goujon N., Le Feuvre M., Izzet A., Blitz C., Bowman L.
Seismology on a small body : expected results for the BASiX Discovery Mission proposal
American Geophysical Union, Fall Meeting (2010).

Conference posters

Seminars and conferences

- Journées de Physique Statistique, January 2016 (Talk 10 min)
- ESPCI Soft Matter Days, July 2015 (Poster)
- GDR MéPhy, June 2015 (Talk 10 min)
- Annual European Rheology Conference, April 2015 (Talk 20 min)
- Journées de Physique Statistique, January 2015 (Talk 10 min)
- Condensed Matter Days, August 2014 (Talk 10min)
- Summer school at CISM : **Flowing soft matter : Bridging the gap between statistical physics and fluid mechanics**, June 2014

Languages

- French : Mother-tongue
- English : Fluent (lived one year in Philadelphia, USA. 2001-2002)
- Italian : Good skills both written and oral

Computer skills

- Linux, Mac Os, Windows
- Shell and Bash scripts, use of the local cluster of the lab. (admin. Sylvain Patinet)
- C, Matlab (also Simulink), Python, Igor Pro
- Mathematica, Maple, Gnuplot
- ImageJ, Labview (basics)
- Adobe Illustrator, Office, L^AT_EX
- freefem++, Gerris, Comsol Multiphysics
- CAD softwares : Catia, SolidWorks

Technical skills

- Molecular Dynamic simulations
- Experiments in weightless environment (CNES campaign with the Airbus ZeroG, 248 parabola)
- Fast-camera imaging (Phantom, Photron)
- Technical design, Computer Assisted Design
- Manufacturing : use of machine tools (lathe and milling machine), laser cutter, 3D printer

Other activities

- Representative of Ph.D students in the Lab.
- Organizer of the internal lab. seminars
- Co-organizer of the **Physique en Ile-de-France Conference** (first edition, Paris June 23rd 2015). This conference gave the opportunity to second-year Phd students (in any field of physics in Paris area) to present their work by giving a talk or presenting a poster.

References

- **Prof. Bruno Andreotti**
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- **Prof. Eric Clément**
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- **Prof. Pierre-Yves Lagrée**
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