Curriculum vitae "Ai fini della pubblicazione in ottemperanza all'art. 15 del D. Lgs. 33/2013"

Nathalie Casas

Ph.D. in Geophysics

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Fault Mechanics – Granular materials – Tribology – Modelling

♦ Education

2018-2022 **PhD student in Geophysics,** at INSA Lyon, University of Lyon, Laboratories LaMCoS and GEOMAS. Defended the 10th of May 2022

2012-2017 **Master degree** of engineering of INSA de Lyon, **University of Lyon** (France), Mechanical engineering department

♦ Experience

2021-2022 Lecturer and Research Assistant (ATER) at ENS Lyon & Laboratory LGL-TPE, France.

2018-2022 University of Lyon, INSA Lyon (France), Thesis in ***Geophysics*, "*Insights on the behavior of fault gouges during seismic sliding: a numerical investigation from granular rheology to friction laws***". Under the supervision of Prof. G. Mollon and Prof. A. Daouadji. We have implemented a digital fault model (DEM - 2D) to try to understand slip mechanisms inside the fault, by studying contact interactions and rupture strength. Research has been carried out to study the influence of infill materials within fault gouge (cementation or matrix particles) on the rheological behaviour of the fault.

2018 Framatome, Lyon (France), ***Structural and Mechanical Engineer.*** Finite elements analyses and research on rapid dynamics for structures (code Ansys and VPS), thermomechanical studies with Systus code. *(10 months employment)*

2017 University Jaume I (Spain), ***Dynamic simulations*,** "Analyses of dynamic behaviours of buildings". Static and dynamic analyses with finite elements (SAP2000) on concrete structures to observe induced vibrations due to thermal dilatations of polycarbonate plates on the edifice. Under the supervision of Prof. A. Doménech and Prof. M. D. Martinez Rodrigo. *(6 months research internship)*

2016 Spretec (Artelia, France), ***Fluid-structure and seismicity***, " Simplified approaches to predict behaviours of hydraulic gates during earthquakes". Development of a method to calculate an added mass corresponding to the water acting on the gate, in order to execute seismic qualification. Under the supervision of Mr A. Isaac. *(6 months research internship)*

2015 Leeds University (UK), ***Tribology*,** " DLC coating failure mechanism in boundary lubrication regime". Under the supervision of Prof. A. Morina and Prof. V. Khetan. *(2 months internship)*.

♦ Scientific communication

1 Co-supervised Master thesis

Pons Heiarii, "Generation of real grain shapes and Discrete Element Modelling" (2020). Co-supervised with Prof. Guilhem Mollon.

4 Articles in international journals

4 Casas, N., Mollon, G., & Daouadji, A. (2022). Influence of Grain-Scale Properties on Localization Patterns and Slip Weakening within Dense Granular Fault gouges. *Submitted to Journal of Geophysical Research: Solid Earth*

3 Mollon G., Quacquarelli A., Zhang Y., Casas N., Bouillanne O., Madrignac A., and Daigne K.. (2022) Confined sheared flows of hard and soft granular materials: Some challenges in tribology and fault mechanics. *Papers in Physics*, *14*(January), 140012. https://doi.org/10.4279/pip.140012

2 Casas, N., Mollon, G., & Daouadji, A. (2022). DEM Analyses of Cemented Granular Fault Gouges at the Onset of Seismic Sliding: Peak Strength, Development of Shear Zones and Kinematics. *Pure and Applied Geophysics*. https://doi.org/10.1007/s00024-021-02934-5

1 Casas, N., Mollon, G., & Daouadji, A. (2021). Shear bands in dense fault gouge. *EPJ Web of Conferences - Powders and Grains*, 249, 1–4. https://doi.org/10.1051/epjconf/202124911006

9 International conferences

9 Casas, N., Mollon, G., & Daouadji, A. "Geological Third Bodies at the Onset of Sliding", *WTC 2022*, Jully 2022, Lyon, France

8 Casas, N., Mollon, G., & Daouadji, A. "Time and space evolution of R-bands in a dense granular material, relation to the evolution of the entire fault gouge", *ECCOMAS Congress*, June 2022, Oslo, Norway

7 Casas, N., Mollon, G., & Daouadji, A. "Shear bands in dense fault gouge", *Powders & Grains*, July-August 2021, online everywhere.

6 Casas, N., Mollon, G., & Daouadji, Rheology and kinematics of dense granular fault gouges with DEM: shear bands formation and evolution *European Geophysical Union General Assembly*, 19-30 April 2021, online everywhere.

5 Casas, N., Mollon, G., & Daouadji, A. "The role of cohesion in granular fault gouges on the initiation of sliding: slip-weakening mechanisms and energy budget." *AGU Fall Meeting*, 1st-17th of December 2020, online everywhere

4 Casas, N., Mollon, G., & Daouadji, A. "A small-scale numerical study of fault slip mechanisms using DEM". *European Geophysical Union General Assembly*, 4th-8th May 2020, Vienna, Austria.

3 Casas, N., Mollon, G., & Daouadji, A. "Physics of slip triggering: from DEM to friction into granular gouges". *AGU Fall Meeting*, 9th-13th of December 2019, San Francisco, US.

2 Casas, N., Mollon, G., & Daouadji, A. "Slip in granular fault gouges". *46th Leeds-Lyon Symposium on Tribology*, 1st -4th of September 2019, Lyon, France. *Best poster price.*

1 Casas, N., Mollon, G., & Daouadji, A. "Slip in granular fault gouges". *EMI International Conference*, 3rd -5th of July 2019, Lyon, France.

6 Seminars and workshops

6 The role of matrix particles within a dense granular fault gouge through Riedel band observations and slip weakening. 16th of Mai 2022, Mechanics & Geosciences Workshop, Laboratoire de Géologie et ENS Paris

5 Toward a realistic model of granular fault gouges under shearing: from granular mechanics to rheological behaviours. 6th of July 2021, Laboratoire LaMCoS, Lyon, France.

4 Rheology and kinematics of dense granular fault gouges with DEM: shear bands formation and evolution. 21st of June 2021, Laboratoire GEOMAS, Lyon, France.

3 Rheology and kinematics of dense granular fault gouge with DEM. 8th of February 2021, Laboratoire LaMCoS (INSA Lyon) & LGL-TPE (Lyon 1)

2 Slip triggering in granular fault gouges: from micro-mechanical studies to Discrete Element Modelling. 2nd of July 2020, Laboratoire GEOMAS, Lyon, France.

1 Influence of grains shapes on the slip regime
3rd Schatzalp Workshop on Induced Seismicity (SED), 5-8 of March 2019, Davos, Switzerland.

♦ Teaching

2021-2022 Temporary Lecturer and Research Assistant at ENS Lyon. Teaching assignment: mathematics (80h), IT (20h), Continuum mechanics (14h), Geo-magnetisms (8h), Fault mechanics (4h) & Lab courses of Geosciences (9h).

2019-2021 Teaching assignment at INSA Lyon, Initial Formation for Engineering Student (FIMI), in charge of tutorials courses of General Mechanics (25 students - 120h) and, Civil engineering Department (GCU), Lab courses of Fluid Mechanics (8 students – 30h).

♦ Scientific community and professional activities

2018-2021 Member of the Scientific Council –INSA Lyon (University of Lyon)

2019 Co-chair, "Induced Seismicity" symposium, EMI International Conference, Lyon July 2019.

2020 Member of the Sustainable Development steering committee - INSA Lyon (University of Lyon)

♦ Memberships

European Geophysical Union (EGU)
American Geophysical Union (AGU)
Association Française de la Mécanique (AFM)

♦ Technical Strengths

French Native speaker
English Fluent
Spanish Advanced (B2)
Technical skills

Modelling and software - Discrete Element Modelling, Matlab, Paraview, Ansys, Comsol, Systus, Scilab, Mathcad, MELODY, base of C++, Python, Latex, Linux
Experimental - Tribometer, Raman spectroscopy, Profilometer
Topics – Mechanics (Granular materials, Faulting and rock mechanics, Fluid Mechanics, Continuum Mechanics, Solid and Dynamic Mechanics…), Geophysics, Discrete and Finite Element Analyses, Tribology and contacts, Vibrations and earthquakes, Mathematics (operators, Fourier series, matrix calculations, probabilities…), Science of materials, Numerical analyses, Heat transfers, Physics & Scientific Computing general skills

Autorizzo il trattamento dei miei dati personali ai sensi ai sensi del Decreto Legislativo 101/2018 e dell'art. 13 GDPR (Regolamento UE 2016/679) ai fini della ricerca e selezione del personale.

Nathalie Casas

Firma autografa sostituita a mezzo stampa ai sensi dell'art. 3, comma 2, del D.Lgs.39/93.