

Marion Y. Thomas

French Citizen, born April 5, 1983
 Sorbonne Université, IStEP
 4 Place Jussieu
 75005 Paris, France
 E-mail : marion.thomas@sorbonne-universite.fr
 mobile : (33) 781617985
 website: <http://marionthomas.weebly.com/>



Geodesy, Structural Geology and Computational Model of the Seismic Cycle

EDUCATION/ POSITION

Institut des Sciences de la Terre de Paris (IStEP), Sorbonne Université, Paris, France

Present, Chargée de Recherche CNRS

Ecole Normale Supérieure, Paris, France

2018 (8 months), Marie Curie & Prestige fellowship

University of Oxford, Earth Sciences department, Oxford, UK

2016-2017, Postdoctoral Research Assistant in Earthquake Cycle Modelling, supervised by B.Parsons and G. Houseman

Institut de Physique du Globe de Paris (IPGP), Equipe de Tectonique et Mécanique de la lithosphère, Paris, France

2013-2015, Postdoctoral Research Assistant, supervised by H. S. Bhat and Y. Klinger.

California Institute of Technology, Tectonics Observatory, Pasadena, CA, USA

2013, Doctor of Philosophy, major in Geology

California Institute of Technology, Tectonics Observatory, Pasadena, CA, USA

2011, Master of Science, major in Geology

European Institute for Marine Studies (IUEM), Plouzané, France

2007, Master of Science, with distinction (ranked 1st), major in Geophysics and Geodynamics

Université de Bretagne Occidentale (UBO), Brest, France

2005, Bachelor of Science (Licence), major in Earth and Planetary Sciences

RESEARCH EXPERIENCE

2018 (8 months) (ENS), Postdoctoral Research Assistant

- Numerical modeling of dynamic rupture propagation along geometrically complex fault system hosted in anelastic medium (Dynamic Damage). Collaboration with Harsha S. Bhat
- Numerical modelling of post- and interseismic motion along the Leyte Fault, Philippines. Co-advising PhD (Oxford).

2016-2017 (Oxford), Postdoctoral Research Assistant

- Numerical modelling of post- and interseismic motion during the earthquake cycle to interpret space geodetic and field observations. Supervised by Barry Parsons (Oxford) and Gregory Houseman (Leeds).
- Impact of fault gouge mineralogy on frictional properties and fault rheology, laboratory experiments, example of the Longitudinal Valley Fault (Taiwan). Collaboration with Daniel Faulkner (Liverpool).
- Dynamic modeling of earthquakes sequences on the Longitudinal Valley Fault: implications for frictional properties. Collaboration with Jean-Philippe Avouac and Nadia Lapusta (Caltech).

2013-2016 (IPGP), Postdoctoral Research Assistant

- Development of a computational model of off-fault dynamic damage during seismic rupture propagation. Supervised by Harsha S. Bhat and Yann Klinger.

2008-2013 (Caltech), Master + Phd thesis (advisor: Jean-Philippe Avouac)

- Spatio-temporal evolution of seismic and aseismic slip on the Longitudinal Valley Fault (Taiwan) from geodetic and seismological data.
- Lithological control on the deformation mechanism and the mode of fault slip on the Longitudinal Valley Fault, Taiwan.
- Quasi-dynamic versus fully-dynamic simulations of earthquakes sequences on heterogeneous faults with and without enhanced coseismic weakening.

2006-2008 (IUEM), master thesis (advisors: Christophe Delacourt and Philippe Davy)

- Quantification and modeling of the fluvial dynamics in New Zealand from satellite images.
- Optical image correlation to characterize gravitational instabilities, valley of Ubaye (Alpes, France).

2007 (BRGM, France), employment, Mapping of gravitational instabilities in Finistère (France).

TEACHING EXPERIENCE

Tutorials / Teaching Assistant at the University of Oxford, in the Earth Department:

- 2017 3rd year undergraduate tutorial on Geodynamics and Continental Deformation. *Instructor: R. Katz & P. England.*
1st year undergraduate field trip in Scotland, regional geology (10 days). *Instructor: C. MacNiocail (Oxford).*
- 2016 4th year undergraduate field trip in Greece, active tectonics (10 days). *Organized by R. Walker (Oxford)*

Teaching Assistant at Caltech, in the Geological and Planetary Sciences Division:

- 2012 Ge177 - Active Tectonics. Introduction to techniques for identifying and quantifying active tectonic processes. Advanced course for graduate students. *Instructor: J.-P. Avouac .*
Ge136abc - Regional Field Geology of the Southwestern United States. Field work course for undergrads and gradstudents. *Instructor: J.Kirschvink.*
- 2011 Ge1 - Earth and Environment. An introduction to the ideas and approaches of earth and environmental sciences. Course taken by undergraduate students. *Instructor: B. Wernicke.*
- 2010 Ge177 - Active Tectonics. Introduction to techniques for identifying and quantifying active tectonic processes. Advanced course for gradstudents. *Instructor: J.-P. Avouac.*

Outreach Experience:

- 2014 "Ces séismes qui façonnent la Terre", 2h Lecture to 11th-grade students
"Fête de la science", Elementary School and Middle School students.
- 2013 "Why study Geology?", 45min lecture to 6th-grade students.
"The earthquake machine", 45 min lecture to 6th-grade students.
- 2012 "Pourquoi étudier la géologie? ", 45 min lecture to 6th-grade students (French international school).
- 2010 "What does a scientist look like?", 2h Lecture + activities for 6th-grade students.

Students

- 2016/19 Co-advising PhD student (John Dianala)
- 2014/15 Co-advising two Master 2 thesis (Maxime Bernaudin, Eleni Kolokyte)

FIELD EXPERIENCE

8 weeks of research fieldwork, 12 weeks of field experience as a student, 30 days as a teaching assistant.

- 2017 •Field trip in Scotland organized for the 1st year students (10 days). *Organized by C. MacNiocail (Oxford).*
- 2016 •Field trip in Greece organized for the 4th year students (10 days). *Organized by R. Walker (Oxford).*
- 2014 •Trenching along the Dead Sea transform fault, paleoseismicity. *Organized by Y. Klinger.*
- 2012 •Field work on the Longitudinal Valley Fault (Taiwan), to map the Coastal Range and sample the fault zone for microstructural analysis (3 weeks).
- 2011 •Field trip in Baja California, Mexico (4 days) as a teaching assistant. *Instructor: J. Kirschvink (Caltech).*
•Grand Canyon field trip (Arizona) for the "Earth and Environment" course (3 days) as a teaching assistant. *Instructor: B. Wernicke (Caltech).*
- 2010 •Field work on the Longitudinal Valley Fault (Taiwan) for field mapping and to collect samples for microstructural analysis (2 weeks).
•Field trip in Owen's Valley (California) for the "Active Tectonics" course (3 days) as a teaching assistant. *Instructor: J.-P. Avouac (Caltech).*
- 2007 •Landslide hazard survey for the "Bureau de Recherche Géologique et Minière" (BRGM).
•Geophysics field class (seismic refraction and GPS) in Finistère, France, (1 week). *Instructor: J. Perrot.*
- 2006 •Field mapping in a metamorphic area, Armorican Massif, France (1 week). *Instructors: J. Rolet, C. Sue.*
•Landslide survey in the valley of Ubaye (French Alps) for the master thesis (1 week).
•Marine geophysics training (seismic reflection and bathymetry, 4 days). *Instructor: J.-P. Rehault.*
- 2005 •Tectonic and sedimentary study of the coast of Brittany, France (1 week). *Instructors: M. Caroff, J. Rolet.*
•Field mapping in an igneous area, Massif Central, France (10 days). *Instructors: C. Hemon, R. Maury, M. Caroff, J.A. Barrat.*
•Field mapping in a metamorphic area, Ouessant, France (5 days). *Instructors: M. Caroff, J.R. Darboux.*
•Stratigraphy and tectonics study of the French pre-Alps near Vesc (10 days). *Instructors: P. Le Roy, M. Caroff.*
- 2004 •Geophysics field class in (gravity, magnetic and electrical fields) in Finistère, France, (3 days). *Instructors: P. Tarits, J. Perrot, C. Tisseau.*
•Field mapping of the Crozon peninsula, France (5 days). *Instructors: A. Coutelle, J.-R. Darboux.*

FELLOWSHIP AND GRANTS

- 2018 Marie Curie PRESTIGE Re-integration mobility Fellowship #PCOFUND-GA-2013-609102.
- 2017 co-PI on the NSF grant EarthScope #1735630/1735448.
- 2012-13 W. M. Keck Institute for Space Studies Graduate Student Fellowship.
- 2009-12 Centre National d'Etudes Spatiales (CNES) Graduate Student Fellowship.

REFEREED PUBLICATIONS

Peered-reviewed:

- M. Y. Thomas**, and H. S. Bhat, 2018. Dynamic Evolution Of Off-Fault Medium During An Earthquake: A Micromechanics Based Model, *Geophysical Journal International*, v. 214, p1267-1280. doi: 10.1093/gji/ggy129
- Y. Zhou, **M. Y. Thomas**, B. Parsons, R. T. Walker, 2018. Time-dependent postseismic slip following the 1978 Mw 7.3 Tabas-e-Golshan, Iran earthquake revealed by over 20 years of ESA InSAR observations, *Earth and Planetary Science Letters*, v. 483, p. 64-75. doi: 10.1016/j.epsl.2017.12.005
- M. Y. Thomas**, T. Mitchell, and H. S. Bhat, 2017c. Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture, an Introduction, *AGU monograph on "Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture"*, v. 227, p. xi-xii. doi: 10.1002/9781119156895.fmatter
- M. Y. Thomas**, H. S. Bhat, and Y. Klinger, 2017b. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics, *AGU monograph on "Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture"*, v. 227, p. 255-280. doi: 10.1002/9781119156895.ch14
- M. Y. Thomas**, J.-P. Avouac, and N. Lapusta, 2017a. Rate-and-state friction properties of the Longitudinal Valley Fault from kinematic and dynamic modeling of seismic and aseismic slip, *Journal of Geophysical Research-solid Earth*, v. 122, p. 3115–3137. doi:10.1002/2016JB013615
- M. Y. Thomas**, N. Lapusta, H. Noda, H. and J.-P. Avouac, 2014c. Quasi-dynamic versus fully-dynamic simulations of earthquakes and aseismic slip with and without enhanced coseismic weakening, *Journal of Geophysical Research-solid Earth*, v. 119, p. 1986-2004. 10.1002/2013JB010615
- M. Y. Thomas**, J.-P. Avouac, J.-P. Gratier, and J.-C. Lee, 2014b. Lithological control on the deformation mechanism and the mode of fault slip on the Longitudinal Valley Fault, Taiwan, *Tectonophysics*, v. 632, p. 48–63. doi: 10.1016/j.tecto.2014.05.038
- M. Y. Thomas**, J.-P. Avouac, J. Champenois, J.-C. Lee, and L.-C. Kuo, 2014a. Spatiotemporal evolution of seismic and aseismic slip on the Longitudinal Valley Fault, Taiwan, *Journal of Geophysical Research-solid Earth*, v. 119, p. 5114-5139. doi: 10.1002/2013JB010603
- T. Ader, J.-P. Avouac, J. Liu-Zeng, H. Lyon-Caen, L. Bollinger, J. Galetzka, J. Genrich, **M. Thomas**, K. Chanard, S. N. Sapkota, P. L. Shrestha, S. Rajaure, D. Lin, and M. Flouzat, 2012. Convergence rate across the Nepal Himalaya and interseismic coupling on the Main Himalayan Thrust, implications for seismic hazard, *Journal of Geophysical Research-Solid Earth*, v 117, p. B04403. doi: 10.1029/2011JB009071
- C. Hamelin, L. Dosso, B. B. Hanan, M. Moreira, A. P. Kositsky, and **M. Y. Thomas**, 2011. Geochemical portray of the Pacific Ridge: New isotopic data and statistical techniques, *Earth and Planetary Science Letters*, v. 302, p. 154-162. doi: 10.1016/j.epsl.2010.12.007

Books & Special volumes

- M. Y. Thomas**, H. S. Bhat , and T. Mitchell (Eds.), 2017. Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture, AGU monograph

Publications in advanced stages of preparation

- S. A. M. den Hartog, **M. Y. Thomas**, and D. R. Faulkner (to be submitted), Geodetic observations on mode of fault slip underpinned by experiments, *Journal of Geophysical Research - Solid Earth*.
- M. Y. Thomas**, and H. S. Bhat (in preparation). Combined Effect of Off-Fault damage and Fault Roughness on Earthquake Rupture Dynamics and Ground Motion.
- M. Bernaudin, J.-P. Avouac, and **M. Y. Thomas** (in preparation). Inversion of geodetic time series to constrain faults rheology : Example of seasonal creep on the Longitudinal Valley Fault, Taiwan.

SELECTED CONFERENCE PRESENTATIONS (ORALS)

- M. Y. Thomas** (invited talk), and H. S. Bhat, The constitutive behavior of active faults, constraints from observations and dynamic modeling. *EGU General Assembly: The Interplay between Earthquakes, the Seismic Cycle and Long-term Deformation: Models and Observations*, Austria, 2018.
- M. Y. Thomas**, H. S. Bhat, and Y. Klinger, Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics. *EGU General Assembly: Earthquake source processes - Imaging methods, numerical modeling and scaling*, Austria, 2017.
- H. S. Bhat, **M. Y. Thomas**, Effect of Brittle off-fault Damage on Earthquake Rupture dynamics. *AGU Fall Meeting: Physics of Earthquake Rupture Propagation IV*, USA, 2016.
- M. Y. Thomas**, J.-P. Avouac, N. Lapusta, Frictional properties of the Longitudinal Valley Fault from kinematic and dynamic modeling of earthquake sequences. *AGU Fall Meeting: Bridging Tectonics and Earthquake Cycles III*, USA, 2016.

- H. S. Bhat , **M. Y. Thomas**, Brittle dynamic damage due to earthquake rupture. *EGU: Open Session on Rock Physics*, Austria, 2016.
- M. Y. Thomas** (invited talk), Quasi-dynamics versus fully-dynamic simulations of long-term fault slip. *Advances in Earthquake Source Physics Workshop, UCL, London*, September 2014.
- M. Y. Thomas**, J.-P. Avouac, J. Champenois, J.-C. Lee, Spatio-temporal evolution of seismic and aseismic slip on the Longitudinal Valley Fault, Taiwan, *AGU Fall Meeting : The Extent to Which Large Portions of Major Faults Slip Both Seismically and Aseismically — Observations and Implications III*, USA, 2013.
- M. Y. Thomas**, J.-P. Avouac, J.-C. Lee, Imaging seismic and aseismic fault slip on the Longitudinal Valley Fault, Taiwan. *AGU Fall Meeting: Fault Slip Rate Variability: New Constraints on Temporal and Spatial Patterns II*, USA, 2011.
- M. Y. Thomas**, N. Lapusta, H. Noda, J.-P. Avouac, Quasi-dynamic versus fully-dynamic simulations of slip accumulation on faults with heterogeneous friction properties, *GSA Annual Meeting: Where Does Earthquake Physics Meet Earthquake Geology?*, USA, 2010.

INVITED TALKS

- 2018 • *Séminaire de Sismologie, IPGP*. Dynamic Evolution Of Off-Fault Medium During An Earthquake: A Micromechanics Based Model.
- 2017 • *School of Environmental Science, University of Liverpool*. Dynamic Evolution Of Off-Fault Medium During An Earthquake: A Micromechanics Based Model.
• *ISTep seminar, UMPC, Paris*. What are the properties and processes controlling the constitutive behavior of active faults?
• *ENS, Paris*. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics.
• *Foalab seminars, University of Oxford*. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics.
- 2016 • *GEOAzur seminars, University of Nice*. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics.
• *ISTerre seminars, University of Grenoble*. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics.
• *Active tectonics seminars, University of Oxford*. Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics.
• *Active tectonics seminars, University of Oxford*. Seismic vs aseismic behavior on fault : what controls the spatio-temporal evolution of slip mode? The study case of the longitudinale valley fault, Taiwan.
• *IGT seminars, University of Leeds*. Towards more realistic modeling of earthquake cycles accounting for geological and geodetic observations.
• *Séminaire Tectonique and Mechanics, IPGP*. Effect of Damage on Earthquake Rupture Dynamics
• *ISTep seminar, UMPC, Paris*. Comportement sismique et asismique des failles actives: quels sont les facteurs contrôlant le mode de glissement? Cas de la faille de la vallée longitudinale, Taiwan
- 2015 • *Séminaire de l'IUEM, Brest*. Fluage ou glissement sismique sur la faille de la Vallée Longitudinale à Taïwan: quels sont les paramètres qui contrôlent le mode de glissement?
• *Séminaire de Géosciences Montpellier*. Seismic versus Aseismic behavior of fault: what controls the spatio-temporal evolution of slip mode?
• *Bullard Seminar, University of Cambridge*. Seismic versus aseismic behavior on the Longitudinal Valley Fault (Taiwan): what controls the slip mode?
• *Séminaire Lyon*. Seismic versus aseismic behavior on the Longitudinal Valley Fault (Taiwan): what controls the slip mode?
- 2014 • *Séminaire IPGS*. Seismic versus aseismic behavior on the Longitudinal Valley Fault (Taiwan): what controls the slip mode?
• *Séminaire de Géosciences Montpellier*. Propriétés frictionnelles des failles: de l'observation sur la faille de la vallée longitudinale à Taïwan, aux simulations numériques.
• *IGT seminars, University of Leeds*. Seismic versus aseismic behavior on the Longitudinal Valley Fault (Taiwan): what controls the slip mode?
• *Séminaire de Géosciences Rennes*. Frictional properties of faults : from observation on the Longitudinal Valley Fault (Taiwan) to dynamic simulations.
• *Séminaire Mécanique des Failles, ISTerre*. Frictional properties of faults : from observation on the Longitudinal Valley Fault (Taiwan) to dynamic simulations.
- 2013 • *Séminaire Tectonique et Mécanique de la Lithosphère, IPGP3*. Frictional Properties of faults: from observation on the Longitudinal Valley Fault, Taiwan, to dynamic simulations.
• *Seismology and Tectonics Seminar, UCLA*. Spatial and Temporal Evolution of Fault Slip on the Longitudinal Valley Fault, Taiwan.
• *Tectonic Observatory seminar, Caltech*. Spatial and temporal evolution of fault slip on the longitudinal valley fault, Taiwan.
- 2010 • *Academia Sinica geosciences seminar*. Exploring the conditions for seismic or aseismic fault slip on the Longitudinal Valley Fault, Taiwan.

- 2010 • *Séminaire Tectonique et Mécanique de la Lithosphère, IPGP*. Exploring the conditions for seismic or aseismic fault slip on the Longitudinal Valley Fault, Taiwan.
 • *Tectonic Observatory seminar, Caltech*. Exploring the conditions for seismic or aseismic fault slip on the Longitudinal Valley Fault, Taiwan.

PHD THESIS

Frictional Properties of faults: from observation on the Longitudinal Valley Fault, Taiwan, to dynamic simulations. Division of Geological and Planetary Sciences, California Institute of Technology (Caltech)

PhD Thesis committee:

Paul Asimow	Caltech	Chair of the Committee
Brian Wernicke	Caltech	Committee Member
Tom Heaton	Caltech	Committee Member
Nadia Lapusta	Caltech	Committee Member
Jean-Philippe Avouac	Caltech	PhD Advisor

PROFESSIONAL SOCIETIES AND SERVICES

Main Monograph Editor for the American Geophysical Union

Manuscript Reviewer

- Tectonophysics
- Journal of Geophysical Research
- Bulletin of Seismological Society of America
- Philosophical Transactions A

Convened conference sessions and seminars

- 2017 Co-convenor of the "Earthquake Rupture Processes, Confronting Field Observations and Models" session, 2017 AGU Fall meeting.
- 2015 Co-convenor of the "Diversity of fault slip modes and the interplay between seismic and aseismic behavior of faults: insights from geodesy, geology and rock mechanics" session, 2015 AGU Fall meeting (co-sponsored by The Tectonics and Structural Geology Division of EGU).
- 2014 Main Convener of the "Fault Zone Properties And Processes During Dynamic Rupture" session, 2014 AGU Fall meeting.
- 2013/15 In charge of the "Lithosphere Tectonics and Mechanics" department seminars, IPGP.
- 2010/11 Member of the organizing committee of the Caltech Geoclub.

TECHNICAL STRENGTHS

Language &	French(native), English(fluent), German (basic notions).
Technical skills	Geological field work, microscope analysis, x-ray diffraction, SEM, EDS, microprobe InSAR, Optical imagery correlation Matlab, IDL, ArcMap, Fortran, Bash, Generic Mapping Tools (GMT), Latex