Marion Y. Thomas
French Citizen, born April 5, 1983
Sorbonne Université, ISTeP
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Geodesy, Structural Geology and Computational Model of Fault Zone System

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, Marie Curie & Prestige fellowship

University of Oxford, Earth Sciences department, Oxford, UK
2016-2017, Postdoctoral Research Assistant in Earthquake Cycle Modelling, advised 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, advised by H. S. Bhat and Y. Klinger.

California Institute of Technology, Tectonics Observatory, Pasadena, CA, USA
2013, Doctor of Philosophy, major in Geology, advised by J. P. Avouac

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 (License), major in Earth and Planetary Sciences

RESEARCH EXPERIENCE

2019-present (ISTeP), Chargée de Rechercher CNRS

- Interdependent Dynamics of EArthquake-prone fault Systems (CNRS project). Collaboration with B. Bellahsen, N. Cubas, L. Jolivet, L. Labrousse, S. Leroy, L. Le Pourhiet (ISTeP).
- Fault zone properties, from laboratory experiments to dynamic numerical modeling. Collaboration with T. Mitchell (UCL), F. Aben (UCL) and H. S. Bhat (ENS).

2018 (ENS), Marie Curie Prestige Postdoctoral Fellow

- Numerical modeling of dynamic rupture propagation along geometrically complex fault system hosted in anelastic medium (Dynamic Damage). Collaboration with H. S. Bhat
- Numerical modeling of coseismic and interseismic motion along the Leyte Fault, Philippines. Co-advising PhD (J.D.B. Dianala, Oxford). Collaboration with R. Jolivet (ENS) and R. Walker (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. Collaboration with B. Parsons (University of Oxford) and G. Houseman (University of Leeds).
- Impact of fault gouge mineralogy on frictional properties and fault rheology, laboratory experiments, example of the Longitudinal Valley Fault (Taiwan). Collaboration with D. Faulkner and S. den Hartog (University of Liverpool).

2013-2016 (IPGP), Postdoctoral Research Assistant

- Development of a computational model of off-fault dynamic damage during seismic rupture propagation. Collaboration with H. S. Bhat and Y. Klinger.
- Dynamic modeling of earthquakes sequences on the Longitudinal Valley Fault: implications for frictional properties. Collaboration with J.-P. Avouac and N. Lapusta (Caltech).

2008-2013 (Caltech), Master + Phd thesis (advisor: J.-P. 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: C. Delacourt and P. Davy)

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

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

TEACHING AND ADVISING EXPERIENCE

Teaching Instructor as a CNRS chargee de Recherche

2020-21	Master 1 class on friction, fracture mechanics and seismic cycle (UE Seismo-tectonics - ENS)
2018-21	Master 2 class on fracture mechanics and seismic cycle (UE MecaLith - Sorbonne Université)

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

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

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.

Advising

2020-23	Advising 1 PhD students (ANR IDEAS) : Joseph Flores Cuba
2020-22	Advising 1 postdoctoral fellow (ANR IDEAS): Louise Jeandet
2016-20	Co-advising 2 PhD students: J. Dianala (University of Oxford) and L. Brotherson (University of Liverpool)
2014-15	Co-advising two Master 2 thesis (M. Bernaudin, E. Kolokyte)

INSTITUTIONAL RESPONSIBILITIES AND SOCIETAL SERVICES

Institutional responsibilities

2021-..	Elected member of the Council of the Faculty of Sciences and Engineering, Sorbonne University.
2019-..	In charge of the ISTeP departement seminars, Sorbonne University.
2013-15	In charge of the "Lithosphere Tectonics and Mechanics" departement seminars, IPGP.
2010-11	Member of the organizing committee of the Caltech Geoclub.

Main Monograph Editor for the American Geophysical Union

Manuscript Reviewer

- Tectonophysics
- Journal of Geophysical Research
- Bulletin of Seismological Society of America
- Philosophical Transactions A
- Earth and Planetary Science Letters

Convened conference sessions

2017 Co-convener of the “Earthquake Rupture Processes, Confronting Field Observations and Models" session, 2017 AGU Fall meeting.

2015 Co-convener 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.

FELLOWSHIP AND GRANTS

2020-22 PI on the ANR young researcher grant IDEAS #ANR-19-CE31-0004-01.

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

Submitted publications or in advanced stages of preparation

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.

Peered-reviewed:

J. Jara, L. Bruhat, **M. Y. Thomas**, S. Antoine, K. Okubo, E. Rougier, A. J. Rosakis, C. G. Sammis, Y. Klinger, R. Jolivet, H. S. Bhat, 2021. Signature of transition to supershear rupture speed in the coseismic off-fault damage zone. *Proceedings of the Royal Society A.*.477:20210364. 20210364. doi: 10.1098/rspa.2021.0364

S. A. M. den Hartog, **M. Y. Thomas**, and D. R. Faulkner, 2021. How do Laboratory Friction Parameters Compare With Observed Fault Slip and Geodetically Derived Friction Parameters? Insights From the Longitudinal Valley Fault, Taiwan, *Journal of Geophysical Research: Solid Earth*, v. 126, e2021JB022390. doi: 10.1029/2021JB022390

A. Canitano, M. Godano, and **M. Y. Thomas**, 2021. Inherited state of stress as a key factor controlling slip and slip mode: inference from the study of a slow slip event in the Longitudinal Valley, Taiwan, *Geophysical Research Letters*, v. 48. doi: 10.1029/2020GL090278

J. D. B., Dianala, R. Jolivet, **M. Y. Thomas**, Y. Fukushima, B. Parsons, and R. Walker, 2020. The relationship between seismic and aseismic slip on the Philippine Fault on Leyte Island: Bayesian modeling of fault slip and geothermal subsidence, *Journal of Geophysical Research: Solid Earth*, v. 125, p2169-9313. doi: 10.1029/2020JB020052

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, 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. 31153137. 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. 4863. 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, and H. S. Bhat (in prep.) Loi de friction et modelisation numerique du cycle sismique, *Ouvrage ISTE on "Le cycle Sismique"*

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

SELECTED CONFERENCE PRESENTATIONS (ORALS)

M. Y. Thomas (**invited talk**), The Constitutive Behavior of Active Faults: Constraints from Observations and Dynamic Modeling, *2020 Gordon Research Conference on Rock Deformation*, USA, 2022

M. Y. Thomas (**invited talk**), and H. S. Bhat, Impact of coseismic off-fault damage on the overall energy budget. *EGU General Assembly: The energy budget of tectonic systems*, Austria, 2020.

M. Y. Thomas (**invited talk**), Dynamic Evolution Of Off-Fault Medium During An Earthquake. *AGU Fall Meeting: The Spatiotemporal Evolution of Structure and Fault Properties During the Seismic Cycle*, USA, 2018.

H. S. Bhat, **M. Y. Thomas**, Earthquake-related off-fault damage on nonplanar fault. *AGU Fall Meeting: 3D Fault Architecture and Geometrical Segmentation from Fault Observations to Seismic Hazard Assessment I*, USA, 2018.

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 SEMINARS

2019 • *Séminaire de Géosciences Rennes.*. Active Faults Behavior: on the Importance of Considering the Fault Zone structure.
• *Journée "Failles Actives - Paris"*. Dynamic Modeling of Earthquakes on Complexe Fault-Zone Structure.
• *ISTerre, University of Grenoble Alpes*. Seismic and aseismic behavior of fault zones: influence of the coupling between fault slip and the conjointly evolving medium.

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-temportal 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 (Taïwan) 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, IPGP*3. 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.
• *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.

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. MacNiocaill (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 Geologique et Minière" (BRGM).
• Geophysic 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 Finisère, 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.*

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

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