

**Marion Y. Thomas**

French Citizen

Born April 5, 1983

University of Oxford,

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**Geodetic Analysis, Structural Geology  
and Numerical Modeling of the Seismic Cycle**

*CURRENT POSITION*


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*University of Oxford, Earth Sciences department, Oxford, UK*

2016-present, Postdoctoral Research Assistant in Earthquake Cycle Modelling, collaboration with B.Parsons and G. Houseman

*EDUCATION/ POSITION*


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

2013-2015, Postdoctoral Research Assistant, collaboration with H. S. Bhat and Y. Klinger.

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

2013, Doctor in 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 (rank 1st), major in Geophysics and Geodynamics

*Université de Bretagne Occidentale (UBO), Brest, France*

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

*Lycée Brizeux, Quimper, France*

2002, Preparatory class in Physics and Chemistry (PCSI)

*Lycée Le Likès, Quimper, France*

2001, Baccalauréat in Sciences (major in Physics and Chemistry)

*RESEARCH EXPERIENCE*


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 2016-Present (Oxford), Postdoctoral Research Assistant

- Numerical modelling of post- and interseismic motion during the earthquake cycle to interpret space geodetic and field observations. Collaboration with 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.

2013-2015 (IPGP), Postdoctoral Research Assistant

- Numerical modeling of dynamic rupture propagation along geometrically complex fault system hosted in anelastic medium (Dynamic Damage). Collaboration with Harsha 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.
- Potential and limitation of the optical imagery correlation to characterize gravitational instabilities, valley of Ubaye (Alpes, France).

2007 (BRGM, France), employment

- Mapping of gravitational instabilities in Finistère (France).

**TEACHING EXPERIENCE**

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**Tutorials** at the University of Oxford, in the Earth Department

- 2017 3rd year undergraduate tutorial on Geodynamics and Continental Deformation *Instructor: Richard Katz and Philip England.*

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

**Outreach Experience:**

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

**Students**

- 2016/19 Co-advising PhD student  
2015 Co-advising two Master 2 thesis

**FIELD EXPERIENCE**

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8 weeks of research fieldwork, 12 weeks of field experience as a student, 40 days as teaching assistant.

- 2017 Field trip in Greece organized for the 4th years students (10 days). *Organized by R. Walker (Oxford).*
- 2017 Field trip in Scotland organized for the 1st years students (10 days). *Organized by C. MacNiocail (Oxford).*
- 2016 Field trip in Greece organized for the 4th years 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) for the Ge136 course (4 days) as a teaching assistant. *Instructor: J. Kirschvink (Caltech).*  
Grand Canyon field trip (Arizona) for the "Earth and Environment" course (Ge136, 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).  
3 days field trip in Owen's Valley (California) for the "Active Tectonics" course (Ge177) as a teaching assistant. *Instructor: J.-P. Avouac (Caltech).*
- 2007 Landslide hazard survey for the "Bureau de Recherche Géologique et Minière" (BRGM).  
Advanced field class in geophysics (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.*  
Stratigraphy and tectonics study of the French pre-Alps near Vesc (10 days). *Instructors: P. Le Roy, M. Caroff.*  
Field mapping in an igneous area, Massif Central, France (10 days). *Instructors: C. Hemon, R. Maury, M. Caroff, J.A. Barrat.*
- 2004 Field mapping in a metamorphic area, Ouessant, France (5 days). *Instructors: M. Caroff, J.R. Darboux.*  
Advanced field class in geophysics (gravity, magnetic and electrical fields) in Finistère, France, (3 days). *Instructors: P. Tarits, J. Perrot, C. Tisseau.*  
Stratigraphy and tectonic study of the Crozon peninsula, France (5 days). *Instructors: A. Coutelle, J.-R. Darboux.*
- 2002/07 Several one-day field trips to study metamorphic, igneous, and sedimentary rocks and structural geology.

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**FELLOWSHIP AND GRANTS**

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- 2017 co-PI on the NSF grant EarthScope #1735630/1735448.  
 2013-15 Institut de Physique du Globe (IPGP) Post-doctoral Scholar Fellowship.  
 2012-13 W. M. Keck Institute for Space Studies Graduate Student Fellowship.  
 2009-12 Centre National d'Etudes Spatiales (CNES) Graduate Student Fellowship.

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**REFEREED PUBLICATIONS**

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*Peered-reviewed:*

Y. Zhou, **M. Y. Thomas**, B. Parsons, R. T. Walker, 2017. 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* (submitted).

**M. Y. Thomas**, and H. S. Bhat, 2017. Dynamic Evolution Of Off-Fault Medium During An Earthquake: A Micromechanics Based Model, *Geophysical Journal International* (submitted).

**M. Y. Thomas**, J.-P. Avouac, and N. Lapusta, 2017. Dynamic modeling of earthquake sequences on the Longitudinal Valley Fault: implications for friction properties, *Journal of Geophysical Research-solid Earth*, v. 122, p. 3115–3137.

**M. Y. Thomas**, T. Mitchell, and H. S. Bhat, 2016. 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.

**M. Y. Thomas**, H. S. Bhat, and Y. Klinger, 2016. 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.

**M. Y. Thomas**, J.-P. Avouac, J.-P. Gratier, and J.-C. Lee, 2014. Lithological control on the deformation mechanism and the mode of fault slip on the Longitudinal Valley Fault, Taiwan, *Tectonophysics*, v. 632, p. 48–63.

**M. Y. Thomas**, J.-P. Avouac, J. Champenois, J.-C. Lee, and L.-C. Kuo, 2014. Spatiotemporal evolution of seismic and aseismic slip on the Longitudinal Valley Fault, Taiwan, *Journal of Geophysical Research-solid Earth*, v. 119, p. 5114-5139.

**M. Y. Thomas**, N. Lapusta, H. Noda, H. and J.-P. Avouac, 2014. 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.

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. Rajauri, 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.

C. Hamelin, L. Dosso, B. B. Hanan, M. Moreira, A. P. Kositsky, and **M. Y. Thomas**, 2011. Geochemical portrait of the Pacific Ridge: New isotopic data and statistical techniques, *Earth and Planetary Science Letters*, v. 302, p. 154-162.

*Books & Special volumes*

**M. Y. Thomas**, H. S. Bhat, and T. Mitchell (Eds.), in print (2016), Fault Zone Dynamic Processes: Evolution of Fault Properties During Seismic Rupture, AGU monograph

*Publications in advanced stages of preparation*

**M. Y. Thomas**, P. Romanet and H. S. Bhat. On short and long term dynamics of rough faults, in preparation.

M. Bernaudin, J.-P. Avouac, and **M. Y. Thomas**, Inversion of geodetic time series to constrain faults rheology : Example of seasonal creep on the Longitudinal Valley Fault, Taiwan, in preparation

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**SELECTED CONFERENCE PRESENTATIONS**

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*Orals:*

**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**, Quasi-dynamic versus fully-dynamic simulations of long-term fault slip. *Advances in Earthquake Source Physics Workshop, UCL, London*, September 2014, (invited talk).

**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.

#### Posters:

**M. Y. Thomas**, H. S. Bhat, Effect of Brittle off-fault Damage on Earthquake Rupture Dynamics. *Royal Society Meeting: Faulting, friction and weakening: from slow to fast motion*, UK, 2016.

H. S. Bhat, **M. Y. Thomas**, Towards Developing Constitutive Models for Hydro-Mechanical Behaviour of Faults. *AGU Fall Meeting: Pore Fluids, Faulting, and (A)seismicity I*, USA, 2015.

J.-P. Avouac, **M. Y. Thomas**, J. Gratier, Lithological control on the deformation mechanism and the mode of fault slip on the Longitudinal Valley Fault, Taiwan, *AGU Fall Meeting: The Microstructural Record of Aseismic to Seismic Fault Slip II*, USA, 2013.

**M. Y. Thomas**, J.-P. Avouac, J. Champenois, J.-C. Lee, Spatial and temporal evolution of fault slip on the longitudinal valley fault Taiwan, *AGU Fall Meeting: Seismic Rupture and Fault Zone Properties V*, USA, 2012.

N. Lapusta, **M. Y. Thomas**, H. Noda, J.-P. Avouac, Quasi-dynamic versus fully-dynamic simulations of slip accumulation on faults with enhanced dynamic weakening, *AGU Fall Meeting: Theory and Practice in Studies of the Earthquake Cycle: How Do We Reconcile Laboratory Constraints With Field Observations? II*, USA, 2012.

**M. Y. Thomas**, J.-P. Avouac, J.-C. Lee, B. Pyussegur, Y.-J. Hsu, Y.-C. Tsai, H.-Y. Chen, Exploring the conditions for seismic or aseismic fault slip on the Longitudinal Valley Fault, Taiwan, *GEEA Meeting: Neotectonic and seismotectonic studies*, France, 2010.

#### INVITED TALKS

- 2017 *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, IGGP*. 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?  
*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?  
*IGT seminars, University of Leeds*. 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.  
*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, 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.  
*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) small skip

PhD Thesis committee:

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

## PROFESSIONAL SOCIETIES AND SERVICES

*Main Monograph Editor* for the American Geophysical Union

Manuscript Reviewer

- Tectonophysics, American Geophysical Union
- 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 Convenor 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

<b>Language</b>	French(native), English(fluent), German (basic notions).
<b>Technical skills</b>	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