Jeffrey Joseph McGuire
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Contact Information

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Education

Ph.D. 2000	MIT (Seismology).
B.A. 1994	Washington University, cum laude (Geophysics and Physics)

Professional History

2009-present Associate Scientist with Tenure, Woods Hole Oceanographic Institution
2005-2009 Associate Scientist, Woods Hole Oceanographic Institution
2008 Visiting Associate Professor, The Institute of Statistical Mathematics, Tokyo Japan.
2006 Visiting Associate Professor, The Earthquake Research Institute, Univ. of Tokyo
2002-2005 Assistant Scientist, Woods Hole Oceanographic Institution.
2004 Visiting Assistant Professor in Geophysics, California Institute of Technology
2000-2001: NSF Earth Sciences Post-Doctoral Fellow, Stanford University;
1995-2000: Graduate Research Assistant, Massachusetts Institute of Technology;
1991-1995: Research Assistant, Washington University

Honors and Awards

2001 National Science Foundation Earth Sciences Post-Doctoral Fellowship

Professional Affiliations

Member American Geophysical Union, Seismological Society of America

Research Interests and Expertise

My research utilizes recordings of the ground motion produced by earthquakes to constrain the basic physical properties occurring within fault-zones during earthquake rupture. I utilize both the dynamic wavefield (seismology) radiated by ruptures and the permanent deformation left behind after the shaking subsides (geodesy). The majority of my contributions have focused on the seismicity and deformation of two types of plate boundaries, oceanic transform faults and subduction zones. I developed new analytical techniques in both seismology and geodesy including the ability to resolve the "fault-plane ambiguity" that traditionally prevented seismologists from identifying the orientation of earthquake rupture surfaces from the radiated wave field. My research program at WHOI is actively pursuing the connection between rock mechanics processes, fault-zone geology/structure, and individual earthquake ruptures in both transform fault and subduction zone settings. Our group demonstrated that East Pacific Rise transform fault earthquakes have the highest degrees of both short and long-term predictability owing to their relatively simple geometrical and geological structure and the

preponderance of aseismic fault slip on these faults. We have developed and deployed the first U.S. Instrumentation for recording large earthquakes on the seafloor, including geodetic systems. We are also heavily involved in studying the seismicity of the Salton Sea Geothermal field, where the East Pacific Rise comes onshore and interacts with a large geothermal power generation operation to produce abundant seismicity and aseismic fault slip. Another major area of focus is the Cascadia subduction zone where we are involved in numerical modeling studies of megathrust rupture, ocean bottom seismometer deployments to understand the structure of the seismogenic zone, and seafloor geodesy deployments to understain the build up of strain in the offshore locked zone.

Field Experience

1. R/V Kilo Moana, October 2005 cruise to deploy acoustic extensometers on the Hilina Slump feature associated with the collapse of the Kilauea volcano.
2. R/V Kilo Moana, June 2006 cruise to recover acoustic extensometers from the Hilina Slump.
3. R/V Thomas Thompson, Dec 2007-Jan 2008, Chief Scientist, cruise to deploy 40 Ocean bottom seismometers and seafloor geodesy equipment at the Quebrada, Discovery, and Gofar transform faults of the East Pacific Rise.
4. R/V Marcus Langseth, April-May 2008, Chief Scientist, active source seismic refraction experiment to study the Quebrada and Gofar transform faults of the East Pacific Rise.
5. R/V Atlantis, January-February 2009, Chief Scientist, recovery of ocean bottom seismometers and geodesy equipment from the Quebrada, Discovery, and Gofar Transform Faults.
6. Obsidian Creep active source seismic experiment in the Salton Trough CA, March 2010. Co-PI, joint with USGS-Menlo Park, and Cornell Univ., Multiple reflection/refraction lines collected in the Salton Trough to better understand the material properties that lead to creep events.
7. R/V Wecoma, July 2010, Chief Scientist, deployment of ocean bottom seismometers offshore of Vancouver Island to study the Cascadia Subduction zone.
8. R/V Wecoma, June 2011, Chief Scientist, recovery of ocean bottom seismometers offshore of Vancouver Island to study the Cascadia Subduction zone.
9. R/V Connecticut, July 2012, WHOI-USGS deployment of ocean bottom seismometers to study submarine landslides on the continental shelf of the east coast U.S.
10. R/V Oceanus, September 2012, Co-Chief Scientist, deployment of ocean bottom seismometers off of northern California as part of the NSF Cascadia Initiative.

Invited talks

2012

Columbia University
Stanford University
Lawrence Livermore National Lab

2011

NSF GeoPRISMS workshop

European Science Foundation, LFUI Conference on Continuing Challenges in Earthquake Dynamics, Austria
Harvard University

2010

Hokudan Symposium, Kobe Japan,

2008

Kyoto Univ., Disaster Prevention Research Institute,
Univ. of Tokyo, Earthquake Research Institute,
Brown Univ., Department of Geological Sciences,
The Carnegie Institution of Washington, Department of Terrestrial Magnetism,
Pennsylvania State Univ., Department of Geosciences
Canadian Geological Survey, Pacific Geosciences Centre,
United States Japan Natural Resources Panel

2007

Seismological Society of America, Annual Meeting,

2006

Univ. of Southern California, Department of Earth Sciences
Univ. of Tokyo, Department of Earth and Planetary Sciences
Univ. of Tokyo, Earthquake Research Institute
JAMSTEC, Institute for Frontier Research on Earth Evolution

2005

Harvard University, Division of Applied Mechanics
Princeton University, Department of Geosciences

2004

Univ. of Southern California, Dept. of Earth Sciences
UCLA, Dept of Earth and Space Sciences
Johns Hopkins Univ
Lamont Doherty Earth Observatory
American Geophysical Union, Fall Meeting

2003

University of California, Berkley, Geology Department
California Institute of Technology, Seismological Laboratory

2002

Lamont Doherty Earth Observatory
Massachusetts Institute of Technology, Dept. of Earth, Atmospheric, and Planetary Sci.
Univ. of Rhode Island

2001

Univ. of California, Berkeley, Seismological Laboratory
Univ. of North Carolina
North Carolina State Univ
Woods Hole Oceanographic Institution, Dept. of Geology and Geophysics

2000

Univ. of Hawaii, Hawaii Institute of Geophysics
Univ. of Southern California, Dept. of Earth Sciences
Woods Hole Oceanographic Institution, Dept. of Geology and Geophysics
Georgia Institute of Technology

1999
California Institute of Technology, Seismological Laboratory

Education Program

Students/Post-docs

Post-doctoral Advisor for Rowena Lohman (now Assistant Professor at Cornell Univ.), Matt Wei (current), Yoshi Kaneko (current), and Hongfeng Yang (current).

Doctoral Advisor for: Margaret Boettcher, PhD 2005 (joint w/ J. G. Hirth and T. H. Jordan; now Assistant Professor at UNH); Andrea Llenos PhD 2010 (now USGS Mendenhall Post-doc), and Emily Roland PhD 2012 (now USGS Mendenhall Post-doc).

Teaching Experience:

Fall 2002, 2005: MIT-WHOI joint program upper-level graduate course (12.755) "Mechanics of Earthquakes and Faulting". This course covers the processes involved in brittle deformation and the constraints placed on them by rock mechanics, seismology, and geodesy.

Spring 2003: Co-organizer of the WHOI geodynamics seminar on "Catastrophes and Instabilities in solid earth systems". This course, which has a long history as a core component of the MIT-WHOI joint graduate program, involves students discussing papers and talks from a number of outside speakers organized around a particular theme followed by a ~2 week field trip to examine in detail a relevant site. We focused on earth system instabilities, such as earthquakes, land-slides, and mass extinctions, and the historical physics theories that are attempting to explain the common features among the different systems. The field trip was to various earthquake and volcano related sites in the pacific northwest.

Fall 2003: 2007; 2009; 2011; MIT-WHOI joint program upper-level graduate reading seminar "Oceanic Faulting and Earthquakes". This reading seminar focused on evaluating the current state of knowledge of how faults form, rupture, and evolve over time in the oceanic lithosphere from its creation at spreading ridges to the deepest earthquakes in subduction zones. Papers from rock mechanics, localization theory, marine geology, and earthquake seismology were discussed.

Spring 2004: Caltech-Ge169: "Slow Earthquakes". This reading seminar covers the wide variety of aseismic slip events that have been observed by geodetic instrumentation in the last ten years, the analysis techniques used to interpret this data, and the rheological models proposed to explain these phenomena.

Spring 2006. MIT-WHOI joint program upper-level graduate class "Advanced Seismology" focused on inversion of seismic and geodetic data for understanding earthquake source processes.

Service And Committees (general)

Associate Editor, Journal of Geophysical Research., 2005-2011

Member of the Incorporated Research Institutions for Seismology (IRIS) Standing Committee for the Global Seismic Network 2008-2010,

USGS National Earthquake Hazards Reduction Program (NEHRP) proposal panel 2008,2009, 2012

Science Plan writing committee for NSF-MARGINS SEIZE initiative, 2008
NSF Amphibious Array Steering Committee, 2010-2012
NSF Cascadia Initiative Workshop Organizing Committee, chair, 2010.
Cascadia Initiative Expedition Team 2010-present
USGS- National Earthquake Prediction Evaluation Council subcommittee on Potential Earthquake Forewarning Scenarios in the Pacific Northwest, 2012

Service and Committees (WHOI)

Marine Hydrogeology Search Committee (2008)
Submarine GeoHazards Search Committee (2008)
Benefits Task Force (2006)
DOEI Proposal Review Committee (2004)
Green Proposal Review Committee (2007)
G+G Postdoc Advisory Committee (2009-2012)

Peer Reviewed Publications

1) Wiens, D. A., J. J. McGuire, and P. J. Shore, Evidence for Transformational Faulting from Deep Double Seismic Zone in Tonga, *Nature*, **364**, 790-793., 1993.
2) Wiens, D. A., J. J. McGuire, P. J. Shore, M. G. Bevis, K. Draunidalo, G. Prasad, and S. P. Helu, A Deep Earthquake Aftershock Sequence and Implications for the Rupture Mechanism of Deep Earthquakes, *Nature*, **372**, 540-543, 1994.
3) Wiens, D. A., and J. J. McGuire, The 1994 Bolivia and Tonga events: Fundamentally different types of deep earthquakes?, *Geophys. Res. Lett.*, **22**, 2245-2248, 1995.
4) McGuire, J. J. and D. Wiens, A Double Seismic Zone in New Britian and the Morphology of the Downgoing Plate, *Geophys. Res. Lett.,* **22**, 1965-1968, 1995.
5) McGuire, J. J., P. F. Ihmlé, and T. H. Jordan, Time-Domain Observations of a Slow Precursor to the 1994 Romanche Transform Earthquake, *Science*, **274**, 82-85, 1996.
6) McGuire, J. J., D. A. Wiens, P. J. Shore, and M. G. Bevis, The March 9th, 1994 Deep Tonga Earthquake: Rupture Outside the Seismically Active Slab. *J. Geophys. Res*., **102**, 1997.
7) Wiens, D. A. and J. J. McGuire, Aftershocks of the March 9, 1994 Tonga earthquake: The strongest known deep aftershock sequence, *J. Geophys. Res.*, **105**, 19067-19083, 2000.
8) McGuire, J. J. and T. H. Jordan, Further Evidence for the Compound Nature of Slow Earthquakes: The Prince Edward Island Earthquake of April 28, 1997, *J. Geophys. Res.*. **105**, 7819-7828, 2000.
9) McGuire, J. J., L. Zhao, and T. H. Jordan, Rupture Dimensions of the 1998 Antarctic Earthquake from Low-Frequency Waves, *Geophys. Res. Let.*, **27**, 2305-2308, 2000.
10) McGuire, J. J., L. Zhao, and T. H. Jordan, Teleseismic inversion for the 2nd-degree moments of earthquake space-time distributions, *Geophys. J. Intl.,* **145**, 661-678, 2001.
11) McGuire, J. J., T. H. Jordan, and J. Lin, Complexities of Transform Boundaries in the Oceans, in "*Plate Boundary Zones*", ed Stein and Freymueller, AGU, Washington D.C. 2002.

12) McGuire, J. J., L. Zhao, and T. H. Jordan, Predominance of Unilateral Rupture for a Global Catalog of Large Earthquakes, *Bull. Seism. Soc. Am,* **92**, 3309-3317, 2002.
13) Perez-Campos, X., J. J. McGuire, and G. C. Beroza, Resolution of the Slow Earthquake/Apparent Stress Paradox for Oceanic Transform Fault Earthquakes, *J. Geophys. Res*., **108**, doi:10.1029/2002JB002312, 2003.
14) Miyazaki, S. J. J. McGuire, and P. Segall, A Transient Subduction Zone Slip Episode in Southwest Japan Observed by the Nationwide GPS Array, *J. Geophys. Res,* **108,** *10.1029/2001JB000456, 2003.*
15) McGuire*, J. J.* Immediate Foreshock Sequences of Oceanic Transform Earthquakes on the East Pacific Rise*, Bull. Seism. Soc. Am., **93**(2) 948-952,* 2003.
16) McGuire, J. J., and P. Segall, Imaging of Aseismic Slip Transients recorded by continuous GPS arrays, *Geophys. J. Intl*., **155**, doi.10.1111/j.1365-246X.2003.02022.x., 2003.
17) McGuire, J. J., Estimating the finite source properties of small earthquake ruptures, *Bull. Seismol. Soc. Am*., **94**, 377-393, 2004.
18) Ide, S., G. C. Beroza, and J. J. McGuire, Imaging Earthquake Source Complexity, in "Seismic Earth: Array Analysis of Broadband Seismograms", *Geophysical Monograph Series*, **157**, 280p, 2005.
19) McGuire, J. J., M. Boettcher, and T. H. Jordan, Foreshock Sequences and Earthquake Predictability on East Pacific Rise Transform Faults, *Nature*, **434**, 457-461, 2005.
20) McGuire, J. J. and Y. Ben-Zion, High-resolution imaging of the Bear Valley section of the San Andreas Fault at seismogenic depths with fault zone head waves and relocated seismicity, *Geophys. J. Intl*., **163**, 152-164, 2005.
21) Miyazaki, S., P. Segall, J. McGuire, T. Kato, and Y. Hatanaka, Spatial and Temporal evolution of Stress and Slip-rate during the 2000 Tokai Slow earthquake, *J. Geophys. Res*., **111**, doi:10.1029/2004JB003426, 2006.
22) Lewis, M., Y. Ben-Zion, and J. J. McGuire, Imaging the deep structure of the San Andreas Fault south of Hollister with joint analysis of fault-zone head and direct P wave arrivals, *Geophys. J. Intl*., **169**, 1028-1042, doi:10.1111/j.1365-246X.2006.03319.x, 2007.
23) *Lohman, R. and J. J. McGuire, Earthquake swarms driven by aseismic creep in the Salton Trough, *J. Geophys. Re*s. **112**, B04405, doi:10.1029/2006JB004596, 2007.
24) *Llenos, A. L. and J. J. McGuire, Influence of forearc structure on the extent of great subduction zone earthquakes, *J. Geophys. Res*. **112**, B09301, doi:10.1029/2007JB004944, 2007.
25) McGuire, J. J., Seismic Cycles and Earthquake Predictability on East Pacific Rise Transform Faults, *Bull. Seism. Soc. Am*. **98**, 1067-1084, 2008.
26) Brooks, B. A., J. H. Foster, J. J. McGuire, and M. Behn, Submarine Landslides and Slow Earthquakes: Monitoring Motion with GPS and Seafloor Geodesy, submitted to Springer Complexity Encyclopedia on Complexity in Earthquakes, Tsunamis, and Volcanoes, and Forecasting and Early Warning of their Hazards (http://refworks.springer.com/complexity), 2008.

27) McGuire, J. J., F. J. Simons, and J. A. Collins, Analysis of Seafloor Seismograms of the 2003 Tokachi-Oki Earthquake Sequence for Earthquake Early Warning, *Geophys. Res. Lett*. **35**, L14310, doi:10.1029/2008GL033986, 2008.
28) *Llenos, A. L., J. J. McGuire, and Y. Ogata, Modeling Seismic Swarms Triggered by Aseismic Transients, Earth and Planetary Science Letters, 281, 59-69, 2009.
29) *Roland, E. and J. J. McGuire, Earthquake Swarms on Transform Faults, Geophysical Journal International., 178, 1677-1690, 2009.
30) Boettcher, M. S. and J. J. McGuire, Scaling Relations for Seismic Cycles on Mid-Ocean Ridge Transform Faults, *Geophys. Res. Lett*., 36, L21301, doi:10.1029/2009GL040115 2009.
31) Ohtani, R., J. J. McGuire, and P. Segall, The Network Strain Filter – A New Tool for Monitoring and Detecting Transient Deformation Signals in GPS Arrays, J. Geophys. Res., 115, B12418, doi:10.1029/2010JB007442, 2010.
32) *Llenos, A. L., and J. J. McGuire, Detecting Aseismic Strain Transients From Seismicity Data, submitted to J. Geophys. Res., 2010.
33) H. Yao, P. Gouedard, J. J. McGuire, J. A. Collins, R. D. van der Hilst, Structure of young East Pacific Rise lithosphere from ambient noise correlation analysis of fundamental- and higher-mode Rayleigh waves, Comptes Rendus Geoscience, 343, 571-583, 2011.
34) Miyazaki, S., J. J. McGuire, and P. Segall, Seismic and Aseismic Fault Slip Before and During the 2011 Tohoku Earthquake, Earth, Planets, Space, **63**, 637-642, 2011.
35) McGuire, J.J., J. A. Collins, P. Gouedard, E. Roland, D. Lizarralde, M. S. Boettcher, M. D. Behn, R. D. van der Hilst, Capturing the End of a Seismic Cycle on the Gofar Transform Fault, *Nature Geoscience*, DOI:10.1038/NGEO1454, 2012
36) Liu, Y., J. J. McGuire, and M. D. Behn, Frictional behavior of oceanic transform faults and its influence on earthquake characteristics, *J. Geophys. Res.*, **117**, B04315, 2012
37) Collins, J. A., J. J. McGuire, D. K. Smith, Seismicity of the Atlantis Massif detachment fault, 30 N at the Mid-Atlantic Ridge, *Geochem Geophys. Geosys.*, doi:10.1029/2012GC004210, 2012.
38) *Roland, E., Lizarralde, D., J. A. Collins, and J. J. McGuire, Constraints on the material properties that control earthquake behavior from seismic velocity structure at the Quebrada-Discovery-Gofar transform faults, East Pacific Rise, *J. Geophys. Res*., submitted 2012.
39) McGuire, J. J. and G. C. Beroza, A Rogue Earthquake off Sumatra, *Science*, **336**, 1118-1119, 2012.
40) *Wei, M., J. J. McGuire, and E. Richardson, A slow slip event in the south central Alaska Subduction Zone and related seismicity anomaly, *Geophysical Research Letters*, **39**, 15, doi:10.1029/2012GL052351, 2012.

*denotes students and post-docs advised by McGuire

Other Publications

1) McGuire, J., D. Toomey, C. Goldfinger, S. Schwartz, R. Allen, and K. Wang, Cascadia Initiative Workshop Update, GEOPRISMS Newsletter No 26, Spring 2011.
2) Scherwath, M. George Spence, Koichiro Obana, Shuichi Kodaira, Kelin Wang, Michael Riedel, Jeffrey McGuire, and John Collins, Monitoring Earthquakes in Northern Cascadia With a Japan-Canada-US Seafloor Seismometer Array, EOS, 2011.
3) Cascadia Initiative Expedition Team, Status of the Ocean Bottom Seismology Component of the Cascadia Initiative, GEOPRISMS Newsletter, 2011.