

## Jordan R. Muller

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**Current Position:** National Research Council Research Associate, *NASA Goddard Space Flight Center*

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### EDUCATION

- 9/99-6/04**     **Ph.D. Geology, Stanford University**, Stanford, CA. Advisor: Dr. Atilla Aydin  
Topic: *Earthquake fault interaction in northwestern Anatolia, Turkey.*
- 7/96-7/99**     **M.S. Geology and Geophysics, University of Hawaii**, Honolulu, HI. Advisor: Dr. Stephen Martel  
Topic: *Topographic and gravitational stresses: Effects on translational landslide rupture surface growth and the propagation of dikes beneath volcanoes.*
- 8/92-6/96**     **B.A. Geosciences, Franklin and Marshall College**, Lancaster, PA. Advisor: Dr. Dorothy Merritts  
Topic: *Faulting and deformation at the northern termination of the San Andreas fault.*
- 6/94-7/94**     **Geology Field Camp, University of Missouri at Columbia**, Lander, Wyoming

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### TEACHING EXPERIENCE

- 8/94-5/95**     **Teaching assistant**, Geosciences Department, Franklin and Marshall College  
Classes: Geomorphology, History of the Earth  
Duties: Assisting in preparation and teaching of field trips
- 9/02-12/03**     **Teaching assistant**, Department of Geological and Environmental Sciences, Stanford University  
Class: Fundamentals of geology (three times)  
Duties: Teaching laboratory sections and leading of field trips
- 6/02 & 6/03**     **Field trip co-leader**, Stanford Rock Fracture Project, Stanford University  
Performed site reconnaissance, field mapping, field guide preparation, and outcrop lectures for petroleum industry affiliates field trips.  
6/02: Characterizing faults and fractures in the Sierra Nevada granitic batholith, California  
6/03: Deformation in poorly consolidated sediments in a compressional setting, northern California

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### RESEARCH AND FIELD EXPERIENCE

- 6/04-present**     **LIDAR Mapping and Neotectonics in Puget Sound**, NASA Goddard Space Flight Center  
Developed methodologies for using LIDAR (ALSM) high-resolution topographic data in conjunction with geomechanical modeling to make improved earthquake hazard assessments for the Puget Lowland region of Washington State. Uplifted shorelines mapped in the LIDAR images provide a surface deformation data set to better constrain the location, magnitude, and slip characteristics of the A.D. ~900 earthquake on the Seattle fault system. Forward or inverse boundary element modeling incorporates the surface deformation data to provide earthquake source parameters. The results of this study will be used to improve the Federal Emergency Management Agency earthquake loss scenarios for the Puget Lowland region.
- 9/00-6/04**     **Earthquake Triggering in Northwestern Turkey**, Stanford University  
Investigated the interaction between the latest sequence of large ( $M > 7$ ) earthquakes in the Anatolia region of Turkey. Conducted three week field season in Turkey to map large-scale fault patterns. Numerical method then used to calculate the stress that one earthquake exerts on neighboring faults in an attempt to identify which faults are most susceptible to future rupture. Used seismic fault interpretation and mechanical modeling (Poly3D) to constrain the fault geometry within the Marmara Sea strike-slip extensional basin in northwest Turkey.
- 7/98-7/99**     **Effects of Surface Loads on Dike Propagation**, University of Hawaii  
Conducted original research on the effects of topographic surface loads on dike propagation beneath volcanoes. Investigated effects of topographic and tectonic stresses on the trajectories of buoyant fluid-filled cracks by developing a numerical boundary element model and conducting photoelastic analysis of laboratory gelatin models. Results have implications on the transport of magma through the lithosphere.
- 7/96-7/98**     **Initiation of Translational Landslides**, University of Hawaii  
Conducted original research on gravitational sliding along fractures within a slope. Performed a theoretical study using a two-dimensional boundary element modeling and discrete element modeling to investigate the

effects of varied topographies on subsurface stress fields and the resultant sliding along fractures of varied orientations.

- 8/98**      **JAMSTEC Submarine Landslide Research Cruise**, University of Hawaii  
Assisted in SeaBeam sonar mapping and dredge sample collection of large Hawaiian submarine landslides.
- 7/96-8/96**      **Fault and Fracture Mapping in Sierra Nevada**, University of Hawaii  
Assisted in mapping and interpreting large-scale fractures and faults in granitic rock. Maps produced in the field highlighted structural phenomena that were later interpreted with numerical mechanical models.
- 6/95-6/96**      **Uplift and Deformation at the Northernmost San Andreas Fault**, Franklin and Marshall College  
Conducted field mapping and total station surveying to characterize the deformation of uplifted marine terraces in northern California. Personally orchestrated a six-week total station survey with a four-person crew followed by data interpretation and presentation.

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## ACADEMIC SERVICE

- 1999-2003**      **Stanford Rock Fracture Group website developer and manager**  
*<http://pangea.stanford.edu/research/geomech/index.html>*
- 8/98-5/99**      **High School Student Mentor**, Department of Geology and Geophysics, University of Hawaii  
Advised high school senior Richard Catungal on State Science Fair project investigating x-ray diffraction of landslide prone soils on island of Oahu, Hawaii. Coordinated use of XRD facility at University of Hawaii and assisted interpretation of results.
- 1998-1999**      **Hawaii State Science Fair Judge**
- 1997-1999**      **Graduate Student Coordinator**, Geology and Geophysics, University of Hawaii  
Duties: Represented graduate student body at faculty meetings, arranged visiting speaker schedule, planned department social events

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## HONORS AND AWARDS

- 2003**      **GSA Structural Geology and Tectonics Division Field Trip Scholarship**
- 2003**      **GSJ/AIST paleoseismology scholarship**, Geological Survey of Japan
- 2002**      **McGee Grant**, Stanford University
- 2000**      **Geological Society of America Student Research Grant**
- 2000**      **McGee Grant**, Stanford University
- 1998**      **J. Watamull Merit Scholarship** (Outstanding geology graduate student), University of Hawaii
- 1997**      **Harold T. Stearns Fellowship**, University of Hawaii
- 1997**      **William T. Coulbourn Fellowship in Marine Geology**, University of Hawaii

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## PROFESSIONAL EXPERIENCE

- 6/02-9/02**      **British Petroleum**, Houston, TX, summer internship  
Characterized Pre-Pennsylvanian structure and historical oil and gas production for SE New Mexico and W. Texas Delaware Basin reservoirs. Utilized PI/Dwights data sources and dbMap and Landmark softwares for well retrieval and cross-section preparation to evaluate reservoir potential.
- 4/02-5/02**      **Advanced Resources International, Inc.**, Denver CO, consultant  
Prepared numerical algorithms and provided technical advise on developing geomechanics software for naturally fractured reservoir evaluation and development.
- 6/00-9/00**      **Cotton, Shires, and Associates**, Los Gatos, CA, summer internship  
Slope stability analysis of open quarry rock face, study of settlement caused by subway tunneling in Los Angeles, nuclear gauge compaction testing, engineering geologic mapping, and landslide repair monitoring.
- 6/97-9/97**      **Woodward-Clyde Geotechnical Engineers**, Honolulu, HI, summer internship  
Borehole logging and interpretation; well sampling for microtunneling pipeline; on-site borehole sample testing, logging, and tiltmeter installation for active landslide project.

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## REFEREED PUBLICATIONS

- Muller, J.R., Aydin, A., and Wright, T.J., 2005, Using an Elastic Dislocation Model to Investigate Static Coulomb Stress Change Scenarios for Earthquake Ruptures in the Eastern Marmara Sea Region, Turkey: Geological Society of London Special Publication – Analogue and Numerical Modelling of Crustal-Scale Processes, *in press*.
- Muller, J.R., and Aydin, A., 2005, Using Geomechanical Modeling to Constrain the Fault Geometry within the Marmara Sea, Turkey: Journal of Geophysical Research, v. 110, B03407, doi:10.1029/2004JB003226.

- Muller, J.R., and Aydin, A., 2004, Rupture Progression Along Discontinuous Oblique Fault Sets: Implications for the Karadere Rupture Segment of the 1999 Izmit Earthquake, and Future Rupture in the Marmara Sea: *Tectonophysics (Special Issue)*, v. 391, p. 283-302.
- Fielding, E.J., Wright, T.J., Muller, J.R., Parsons, B.E., Walker, R., 2004, Aseismic deformation of a fold-and-thrust belt imaged by synthetic aperture radar interferometry near Shahdad, southeast Iran: *Geology*, v. 32, p. 577-580.
- Muller, J.R., Aydin, A., and Maerten, F., 2003, Investigating the transition between the 1967 Mudurnu Valley and 1999 Izmit earthquakes along the North Anatolian fault with static stress changes: *Geophysical Journal International*, v. 154, p. 471-482.
- Muller, J.R., Ito, G., and Martel, S.J., 2001, Effects of volcano loading on the propagation of dikes in the lithosphere: *Journal of Geophysical Research*, v. 106, n. B6, p. 11,101-11,113.
- Muller, J.R., and Martel, S.J., 2000, Numerical models of translational landslide rupture surface growth: *Pure and Applied Geophysics*, v. 157, n. 6-8, p. 1009-1038.
- Martel, S.J., and Muller, J.R., 2000, A two-dimensional boundary element method for calculating the elastic gravitational stresses in slopes: *Pure and Applied Geophysics*, v. 157, n. 6-8, p. 989-1007.
- Prentice, C., Merritts, D., Bodin, P., Beutner, E., Schill, A., and Muller, J., 1999, Evidence of an onshore location for the northern termination of the San Andreas fault: *GSA Bulletin*, v. 111, n. 4, p. 512-523.

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## TECHNICAL REPORTS

- Muller, J.R., 2000, Failure progression along the 1999 Turkish earthquake faults: *Proceedings of the Stanford Rock Fracture Project Workshop, Stanford University*, p. PJ1-15.
- Muller, J.R., 2001, Using Poly3D to constrain proposed fault geometries for the Marmara Sea strike-slip pull-apart basin: *Proceedings of the Stanford Rock Fracture Project Workshop, Stanford University*, p. PG1-9.
- Muller, J.R., 2002, Kinematic attributes of intersecting faults in strike-slip environments: Effects of regional stress, stress triggering, and slip interaction: *Proceedings of the Stanford Rock Fracture Project Workshop, Stanford University*, p. P11-8.
- Muller, J.R., 2003, Seismic reflection profiles, high-resolution bathymetry, and fault pattern prediction in a strike-slip pull-apart basin: *Proceedings of the Stanford Rock Fracture Project Workshop, Stanford University*, p. PG1-10.

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## ABSTRACTS

- Muller, J., and Harding, D., 2005, Mw = 7.2-7.4 estimated for AD900 Seattle fault earthquake by geomechanical modeling the uplift of a LIDAR-mapped marine terrace, Fall AGU Meeting, San Francisco.
- Harding, D., and Muller, J., 2005, Sumatra-Andaman Megathrust Earthquake Slip: Insights from Mechanical Modeling of ICESat Surface Deformation Measurements, Fall AGU Meeting, San Francisco.
- Muller, J., and Harding, D., 2005, Constraining the Kinematics of the A.D. 900 Seattle Fault Earthquake with Geomechanical Modeling and LIDAR Surface Elevation Data, Spring AGU Meeting, New Orleans.
- Muller, J., and Aydin, A., 2005, Modeling Uncertainty in Fault Locations and Earthquake Rupture Configurations in Northwest Anatolia, Spring AGU Meeting, New Orleans.
- Muller, J., and Aydin, A., 2004, Static Coulomb stress scenarios for earthquake ruptures in the eastern Marmara Sea: *Geological Society of America Abstracts with Programs, 2004 Annual Meeting*.
- Muller, J., and Aydin, A., 2003, Using geomechanical modeling to constrain the fault geometry within the Western Marmara Sea, Turkey: *Geological Society of America Abstracts with Programs, 2003 Annual Meeting*, vol. 35, no. 6.
- Muller, J., and Aydin, A., 2003, Using geomechanical modeling to constrain the fault geometry within the Western Marmara Sea, Turkey: *International Workshop on the North Anatolian, East Anatolian and Dead Sea Fault Systems (abstract)*, Ankara, Turkey, v. 1, p. 37.
- Maerten, F., Maerten, L., Resor, P., Muller, J., Pollard, D., 2003, A new method for slip inversion for faults with complex geometry: *EGS - AGU - EUG Joint Assembly (abstract)*, Nice, France.
- Muller, J.R., Aydin, A., and Maerten, F., 2002, Rupture progression along discontinuous oblique fault sets: Implications for the Karadere rupture segment of the 1999 Izmit earthquake, and a future rupture in the Marmara Sea: *1<sup>st</sup> International Symposium of the Faculty of Mines (ITU) on Earth Sciences and Engineering (abstract)*, Istanbul, Turkey, v. 1, p. 13.
- Maerten, L., Maerten, F., Muller, J.R., and Pollard, D.D., 2001, Modeling three-dimensional (3D) complex fault geometries using elastic boundary element code: *Proceedings of Fault Zone Characterization for Tectonic Numerical Modeling* sponsored by the Heidelberg Academy of Sciences and Humanities, Frankfurt, Germany.
- Muller, J.R., Aydin, A., and Maerten, F., 2000, Mechanical interaction between the July 1967 Mudurnu Valley and August 1999 Izmit earthquakes using detailed fault mapping and 3-D BEM modeling: *American Geophysical Union Transactions (abstract)*, v. 81, p. F818.
- Muller, J., Martel, S.J., and Ito, G., 1998, Effects of surface loads on feeder dike growth: *American Geophysical Union Transactions (abstract)*, v. 79, p. F1006.
- Muller, J.R., and Martel, S.J., 1997, Nucleation and growth of landslide failure surfaces: *American Geophysical Union Transactions (abstract)*, v. 78.
- Muller, J. R., 1996, Locating the active trace of the northernmost San Andreas fault and analyzing the surface uplift and deformation produced by it, Point Delgada, California: *The Ninth KECK Research Symposium in Geology Proceedings*, v. 9, p. 150-153.

Muller, J. R., Merritts, D. J., Griffiths, R., Pease, S., Heyes, J. and Bodin, P., 1995, Surface uplift and deformation produced by northern San Andreas fault-bend geometry: Geological Society of America Abstracts with Programs, 1995 Annual Meeting, vol. 27, no. 6, p. 54-55.

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## FIELD TRIP GUIDES

Eichhubl, P., Muller, J., and Aydin, A., 2003, Deformation structures in poorly consolidated sediments in a compressional setting, northern California: Proceedings of the 2003 Stanford Rock Fracture Project, 35 p.

Aydin, A., Muller, J., Bergbauer, S., Eichhubl, P., Du Bernard, X., Fractures and faults in basaltic volcanic and granitic intrusive rocks, Donner Pass, Sierra Nevada: Proceedings of the 2002 Stanford Rock Fracture Project, 35 p.

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## INVITED TALKS

- 2004 Seminar, Department of Geosciences, Franklin and Marshall College  
*Earthquake fault interaction in northwestern Anatolia, Turkey*
- 2004 Seminar, Department of Geosciences, Dickinson College  
*Earthquake fault interaction in northwestern Anatolia, Turkey*
- 2004 Presentation, Association of Engineering Geologists, San Francisco, CA  
*Using Geomechanical modeling to constrain the fault geometry within the Marmara Sea, Turkey*
- 2004 Presentation, ExxonMobil Upstream Research Company, Houston, TX  
*Using geomechanical modeling to constrain earthquake fault interaction along the North Anatolian fault system, Turkey*
- 2002 Presentation, ChevronTexaco Research Corporation, San Ramon, CA  
*Seismic reflection profiles, high-resolution bathymetry, and fault pattern prediction in a strike-slip pull-apart basin*
- 2001 Seminar, Department of Geological Sciences, Northwestern University  
*Earthquake triggering along the North Anatolian fault, Turkey*
- 2001 Presentation, Association of Engineering Geologists, San Francisco, CA  
*Mechanical interaction between the July 1967 Mudurnu Valley and August 1999 Izmit earthquakes using detailed fault mapping and 3-D BEM modeling*
- 2000 Presentation, Cotton, Shires, and Associates, Los Gatos, CA  
*Mechanical interaction between the July 1967 Mudurnu Valley and August 1999 Izmit earthquakes using detailed fault mapping and 3-D BEM modeling*
- 2000 Presentation, Association of Engineering Geologists, San Francisco, CA  
*Numerical models of translational landslide rupture surface growth*

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## FIELD TRAINING AND WORKSHOPS ATTENDED

inSAR Working Group, Oct. 20-22, Oxnard, CA

*A three-day workshop seeking input from geologists and geophysicists to best plan future inSAR satellite missions*

Paleoseismology Field Training Course at the International Workshop on the North Anatolian, East Anatolian, and Dead Sea Fault Systems, Sept. 5-12, 2003, Ankara, Turkey

*A seven-day field course along the North Anatolian fault that included instruction in surface rupture characterization, geomorphic mapping, trench site selection, and trench wall mapping*

Southern California Earthquake Center (SCEC) Borderland Initiative Workshop, Mar. 8-10, 2002, Catalina Island, CA

*A three-day workshop convened to coordinate and prioritize research on the onland seismic hazards due to active faults and folds offshore in the California Borderland region.*

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## REFERENCES

Dr. Dorothy J. Merritts  
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