

Andrew M. Freed

Department of Earth, Atmospheric, and Planetary Sciences

Purdue University

West Lafayette, Indiana, 47907-1397

freed@purdue.edu

Phone: 765-496-3738

FAX: 765-496-1210

homepage: www.purdue.edu/eaps/freed/

EDUCATION

- 1998 Ph.D., Geophysics, University of Arizona, Tucson, Arizona, Advisor: Jay Melosh
- 1988 M.S., Applied Mechanics, Utah State University, Logan, Utah
- 1983 B.S., Mechanical Engineering, Cornell University, Ithaca, New York

EMPLOYMENT HISTORY

- 2013 - present Professor, Department of Earth, Atmospheric, and Planetary Sciences, Purdue University
- 2008 - 2013 Associate Professor, Department of Earth & Atmospheric Sciences, Purdue University
- 2003 - 2008 Assistant Professor, Department of Earth & Atmospheric Sciences, Purdue University
- 2001 - 2002 Visiting Postdoctoral Researcher, Berkeley Seismological Laboratory, Berkeley, CA
- 1998 - 2001 NSF Postdoctoral Fellow, Carnegie Institution of Washington, Washington, DC
- 1988 - 1992 Aerospace Engineer, Structural Dynamics Research Corporation, San Diego, CA
- 1983 - 1988 Aerospace Engineer, Morton Thiokol, Inc., Promontory Point, Utah

AWARDS AND HONORS

- 2021 – Charles B. Murphy Award for undergraduate teaching, Purdue University
- 2021 – Inducted into Purdue’s Teaching Academy
- 2021 – Dr. Gerald Krockover Outstanding Favorite Faculty Award, Purdue University
- 2021 – Exponent Readers’ Choice Award for the #1 overall “Best Professor / Instructor” for 2021
- 2019 – Most Outstanding Faculty Fellow, Purdue University
- 2014 – College of Science Leadership Award
- 2013 – College of Science Graduate Student Mentoring Award

TEACHING

- EAPS 105 – The Planets
- EAPS 106 – Geosciences in the Cinema
- EAPS 556 – Planetary Geology
- EAPS 580 – Geodynamics
- EAPS 602 – New Graduate Seminar

SERVICE TO THE PROFESSION

- 2018 – present Research Coordination Network: In situ Studies of Rock Deformation (ISRDR) Advisory Committee
- 2013 - 2016 Deformation Experimentalists at the Frontier Of Rock and Mineral research (DEFORM) Executive Committee (elected)
- 2008 - 2013 Steering Committee, CIG Short Term Crustal Dynamics

SERVICE TO THE DEPARTMENT

- 2021 – present Academic advisor to Purdue University Planetary Society (PUPS)
- 2014 – present Chair, Strategic Planning Committee
- 2017 – present Graduate Committee (Chair, 2017-2020)
- 2018 – 2019 Planetary Science Faculty Search Committee
- 2018 – 2019 Seismology Faculty Search Committee
- 2017 – present Faculty advisor to Graduate Student Association
- 2015 – 2017 Chair, Outreach and Recruitment Committee

2015 – 2017 Director, Planetary Wall Wrap Project

SERVICE TO THE UNIVERSITY

2022 Murphy Award Selection Committee
2017 – 2020 Chair, University Senate Educational Policy Committee (elected)
2017 – 2020 Purdue Faculty Senate (elected)
2019 – 2020 Faculty Senate Advisory Committee (elected)
2017 – 2020 CoS Graduate Curriculum and Academic Policy committee
2017 – 2020 University Grade Appeals Committee
2017 – present Academic advisor to Purdue Hiking and Lacrosse Clubs
2017 – present Faculty Fellow to Hillenbrand Residence Hall
2016 – 2018 College of Science Area committee (elected)
2015 – 2016 Chair, CoS Strategic Advisory Committee

STUDENT CLUB ADVISING

2021-present Faculty advisor to Purdue Undergraduate Planetary Society (PUPS)
2017-present Faculty adviser to Purdue's Men's Lacrosse team
2017-present Faculty adviser to Purdue's Hiking Club
2016-2020 Faculty advisor to Graduate Student Association (GSA)

PUBLICATIONS (students are underlined, ^P denotes postdocs)

- (54) Denton, C. A., Johnson, B. C., Wakita, S., **Freed, A. M.**, Melosh, H. J., & Stern, S. A. (2021). Pluto's antipodal terrains imply a thick subsurface ocean and hydrated core. *Geophys. Res. Letters*, 48, doi.org/10.1029/2020GL091596.
- (53) Trowbridge, A. J., **A. M. Freed**, B. C. Johnson, H. J. Melosh (2020), Why the lunar south Pole-Aitken Basin is not a mascon, *Icarus* 352, doi.org/10.1016/j.icarus.2020.113995.
- (52) Becker, Thorsten W, Hashima, Akinori, **Freed, Andrew M.**, and Sato, Hiroshi. (2019). Stress change before and after the 2011 M9 Tohoku-oki earthquake. *Earth and Planetary Science Letters*. 504, 174-184, doi:10.1016/j.epsl.2018.09.035
- (51) Johnson, B. C., Andrews-Hanna, J. C., Collins, G. S., **Freed, A. M.**, Melosh, H. J., & Zuber, M. T. (2018). Controls on the formation of lunar multiring basins. *J. Geophys. Res.*, 123, 3035–3050, https://doi.org/10.1029/2018JE005765, 2018.
- (50) Elliott, J. R., Y-H Huang, D. A. Minton, **A. M. Freed**, The length of lunar crater rays explained using secondary crater scaling, *Icarus*, 312, 231-246, 2018.
- (49) Dickinson, H., M-H Huang^P, **A. M. Freed**, E. J. Fielding, R. Bürgmann, C. Andronico, Inferred rheology and mantle conditions from postseismic deformation following the 2010 Mw 7.2 El Mayor-Cucapah Earthquake, *Geophys. J. Inter.*, 213, 1720-1730, 2018.
- (48) Blair, D. M., L. Chappaz, R. Sood, C. Milbury, A. Bobet, H. J. Melosh, K. C. Howell, **A. M. Freed**, Determining the structural stability of lunar lava tubes, *Icarus*, 282, 47-55, 2017.
- (47) Douilly, R., W. L. Ellsworth, E. Kissling, **A. M. Freed**, A. Deschamps, and B. M. de Lépinay, 3D Velocity Structure in Southern Haiti from Local Earthquake Tomography, *J. Geophys. Res.*, 121, 8813–8832, 2016.
- (46) Huang, M-H, H. Dickinson, E. J. Fielding, J. Sun, **A. M. Freed**, R. Bürgmann, Fault Geometry and Slip Distribution of the 2010 M_w 7.2 El Mayor-Cucapah Earthquake from Geodetic Data, *J. Geophys. Res.*, 121, 2016.

- (45) Johnson, B. C., T. J. Bowling^P, A. J. Trowbridge, **A. M. Freed**, Formation of the Sputnik Planum basin and the thickness of Pluto's subsurface ocean, *Geophys. Res. Lett.*, 43, 10,068–10,077, doi:10.1002/2016GL070694, 2016.
- (44) **Freed, A. M.**, A. Hashima^P, A., T. W. Becker, and D. A. Okaya, H. Sato, Y. Hatanaka, Resolving depth-dependent subduction zone viscosity and afterslip from postseismic displacements following the 2011 Tohoku-oki, Japan earthquake, *Earth Planet. Sci. Lett.*, 459, 279-290, 2016.
- (43) Hashima^P, A., T. W. Becker, **A. M. Freed**, H. Sato, and D. A. Okaya, Coseismic deformation due to the 2011 Tohoku-oki earthquake: influence of 3-D elastic structure around Japan, *Earth Planets Space*, 68, 159. doi:10.1186, 2016.
- (42) Johnson, B. C., D. M. Blair, G. S. Collins, H. J. Melosh, **A. M. Freed**, G. J. Taylor, J. W. Head, M. A. Wicczorek, J. C. Andrews-Hanna, F. Nimmo, J. T. Keane, K. Miljković, J. M. Soderblom, M. T. Zuber, Formation of the Orientale lunar multiring basin, *Science*, 441-444, 2016.
- (41) Trowbridge, A. J., H. J. Melosh, J. K. Steckloff, and **A. M. Freed**, Vigorous convection as the explanation for Pluto's polygonal terrain, *Nature* 534, 79–81, doi:10.1038/nature18016, 2016.
- (40) Dickinson, H., **A. M. Freed**, and C. Andronicos, Inference of the viscosity structure and mantle conditions beneath the Central Nevada Seismic Belt from combined postseismic and lake unloading studies, *Geochem., Geophys., Geosys.*, DOI: 10.1002/2015GC006207, 2016.
- (39) Symithe, S., E. Calais, **A. M. Freed**, Present-day shortening in Southern Haiti from GPS measurements and implications for seismic hazard, *Tectonophysics*, 679, 117-124, 2016.
- (38) Wiseman, K., R. Bürgmann, **A. M. Freed**, Viscoelastic relaxation in a heterogeneous Earth following the 2004 Sumatra-Andaman earthquake, *Earth Planet. Sci. Lett.*, 431, 308-317, 2015.
- (37) Douilly, R., H. Aochi, E. Calais and **A. M. Freed**, Three-dimensional dynamic rupture simulations across interacting faults: The M_w 7.0, 2010, Haiti earthquake, *J. Geophys. Res.*, 120, doi:10.1002/014JB011595, 2015.
- (36) Huang, M-H, R. Bürgmann, and **A. M. Freed**, Probing the lithospheric rheology across the eastern margin of the Tibetan Plateau, *Earth Planet. Sci. Lett.*, 396, 88-96, 2014.
- (35) **Freed, A. M.**, B. C. Johnson, D. M. Blair, H. J. Melosh, G. A. Neumann, R. J. Phillips, S. C. Solomon, M. A. Wicczorek, M. T. Zuber, The Formation of Lunar Mascon Basins from Impact to Contemporary Form, *J. Geophys. Res. Planets*, 119, doi:10.1002/2014JE004657, 2014.
- (34) Melosh, H. J., **A. M. Freed**, B. C. Johnson, D. M. Blair, J. C. Andrews-Hanna, G. A. Neumann, R. J. Phillips, D. E. Smith, S. C. Solomon, M. A. Wicczorek, M. T. Zuber, The Origin of Lunar Mascon Basins, *Science*, 340, 1552-1555, 2013.
- (33) Guilhem, A., Roland Bürgmann, **A. M. Freed**, T. S. Ali, Testing the Accelerating Moment Release (AMR) Hypothesis in Areas of High Stress, *Geophys. J. Int.*, 195, 785-798, 2013.
- (32) Symithe, S. J., E. Calais, **A. M. Freed**, J. Haase, Coseismic slip distribution of the 2010 M7.0 Haiti Earthquake and resulting stress changes on regional faults, *Bull. Seis. Soc. Am.*, 103, 2326-2343, 2013.
- (31) Blair, D. M., **A. M. Freed**, P. K. Byrne^P, C. Klimczak^P, L. M. Prockter, C. M. Ernst, S. C. Solomon, H. J. Melosh, M. T. Zuber, The origin of graben and ridges in Rachmaninoff, Raditladi, and Mozart basins, Mercury, *J. Geophys. Res.*, 118, 1–12, doi:10.1029/2012JE004198, 2013.
- (30) **Freed, A. M.**, D. M. Blair, T. R. Watters, C. Klimczak^P, P. K. Byrne^P, S. C. Solomon, M. T. Zuber, and H. J. Melosh, On the Origin of Graben and Ridges at Buried Basins in Mercury's Northern Plains, *J. Geophys. Res.*, 117, doi:10.1029/2012JE004119, 2012.
- (29) Klimczak^P, C., T. R. Watters, C. M. Ernst, **A. M. Freed**, P. K. Byrne^P, S. C. Solomon, D. M. Blair, and J. W. Head, Deformation associated with ghost craters in smooth volcanic plains units on Mercury: Stain analysis and implications for smooth plains evolution, *J. Geophys. Res.*, 117, doi:10.1029/2012JE004100, 2012.

- (28) Watters, T. R., S. C. Solomon, C. Klimczak^P, **A. M. Freed**, J. W. Head, C. M. Ernst, M. S. Robinson, D. M. Blair, T. A. Goudge, and P. K. Byrne^P (2012). Extension and Contraction within Volcanically Buried Impact Craters and Basins on Mercury, *Geology*, doi 10.1130/G33725.1, 2012.
- (27) Zuber, M. T., Smith, D. E., Phillips, R. J., Solomon, S. C., Neumann, G. A., Hauck, S. A. II, Peake, S. J., Barnouin, O. S., Head, J. W., Johnson, C. L., Lemoine, F. G., Mazarico, E., Sun, X., Torrence, M. H., **Freed, A. M.**, Klimczak, C., Margot, J.-L., Oberst, J., Perry, M. E., McNutt, R. L., Balcerski, J. A., Michel, N., Talpe, M. J. Yang, D. Topography of the Northern Hemisphere of Mercury from MESSENGER Laser Altimetry, *Science*, 10.1126/science.1218805, 2012.
- (26) **Freed, A. M.**, G. Hirth, and M. D. Behn, Using short-term postseismic displacements to infer the ambient deformation conditions of the upper mantle, *J. Geophys. Res.*, doi:10.1029/2011JB008562, 2011.
- (25) Calais, E., **A. M. Freed**, G. Mattioli, F. Amelung, S. Jónsson, P. Jansma, S.-H. Hong, T. Dixon, C. Prépetit, and R. Momplaisir, Transpressional rupture of an unmapped fault during the 2010 Haiti earthquake, *Nature Geoscience*, 3, 794-799, 2010.
- (24) **Freed, A. M.**, T. Herring, and R. Bürgmann, Steady-State Laboratory Flow Laws Alone Fail To Explain Postseismic Observations, *Earth Planet. Sci. Lett.*, 300, 1-10, 2010.
- (23) Ali, S. T. and **A. M. Freed**, Contemporary deformation and stressing rates in Southern Alaska, *Geophys. J. Inter.*, 183, 557-571, 2010.
- (22) Calais, E., **A.M. Freed**, R. Van Arsdale, and S. Stein, Triggering of New Madrid Seismicity by Late Pleistocene Erosion, *Nature*, 466, 608-611, 2010.
- (21) **Freed, A. M.**, S. C. Solomon, T. R. Watters, R. J. Phillips, M. T. Zuber, Could Pantheon Fossae be the result of the Apollodorus crater-forming impact within the Caloris Basin, Mercury? *Earth Planet. Sci. Lett.*, doi:10.1016/j.epsl.2009.02.038, 2009.
- (20) Ganguly, J., **A. M. Freed**, and S. K. Saxena, Density profiles of oceanic slabs and surrounding mantle: Integrated thermodynamic and thermal modeling, and implications for the fate of slabs at the 660 km discontinuity, *Phys. Earth Planet. Int.*, 172, 257-267, 2009.
- (19) Kalbas, J. L., **A. M. Freed**, and K. D. Ridgway, Contemporary fault mechanics in southern Alaska, in Active tectonics and seismic potential of Alaska, in Active Tectonics and Seismic Potential of Alaska, *Geophys. Mono. Series* 179, 321-337, doi:10.1029/179GM18, 2008.
- (18) Ali, S. T., **A. M. Freed**, E. Calais, D. Manaker, and W. R. McCann, Coulomb stress evolution on the Caribbean Plate for the past 250 years from coseismic, postseismic, and interseismic deformation, *Geophys. J. Int.*, 174, 904-918, 2008.
- (17) Manaker^P, D. M., E. Calais, **A. M. Freed**, S. T. Ali*, P. Przybylski*, G. Mattioli, P. Jansma, C. Prépetit, and J. B. de Chabaliér, Interseismic Plate coupling and strain partitioning in the Northeastern Caribbean, *Geophys. J. Int.*, 174, 889-903, 2008.
- (16) Kennedy, P. J., **A. M. Freed**, and S. C. Solomon, Mechanics of faulting in and around Caloris Basin, Mercury, *J. Geophys. Res.*, 113, doi:10.1029/2007JE002992, 2008.
- (15) Mahsas, A., K. Yelles, K. Lammali, E. Calais, **A. M. Freed**, and P. Briole, Shallow afterslip following the May 21st, 2003, Mw=6.9 Boumerdes earthquake, Algeria, *Geophys. J. Inter.*, 172, 155-166, 2008.
- (14) **Freed, A. M.**, R. Bürgmann, and T. Herring, Far-reaching transient motions after Mojave earthquakes require broad mantle flow beneath a strong crust, *Geophys. Res. Lett.*, 34, doi: 10.1029/2007GL030959, 2007 (chosen by chief editor to be an AGU journal Highlight).
- (13) **Freed, A. M.**, Afterslip (and only afterslip) following the 2004 Parkfield, California earthquake, *Geophys. Res. Lett.*, 34, doi:10.1029/2006GL029155, 2007.

- (12) **Freed, A. M., S. T. Ali,** and R. Bürgmann, Evolution of stress in southern California for the past 200 years from coseismic, postseismic, and interseismic processes, *Geophys. J. Inter.*, 169, 1164-1179, 2007.
- (11) **Freed, A. M.,** R. Bürgmann, E. Calais, J. Freymueller, Stress-dependent power-law flow in the upper mantle following the 2002 Denali, Alaska, earthquake, *Earth Planet. Sci. Lett.*, 252, 481-489, 2006.
- (10) **Freed, A. M.,** R. Bürgmann, E. Calais, J. Freymueller, and S. Hreinsdóttir, Implications of deformation following the 2002 Denali, Alaska earthquake for postseismic relaxation processes and lithospheric rheology, *J. Geophys. Res.*, 111, B01401, doi:10.1029/2005JB003894, 2006.
- (9) **Freed, A. M.,** Earthquake triggering by static, dynamic, and postseismic stress transfer, *An. Rev. Earth Planet. Sci.*, 33, 335-367, 2005.
- (8) **Freed, A. M.** and Bürgmann, R., Evidence of power-law flow in the Mojave Desert mantle, *Nature*, 430, 548-551, 2004.
- (7) Lin, J. and **A. M. Freed**, Time-dependent viscoelastic stress transfer and earthquake triggering, In: Environment, Natural Hazards, and Global Tectonics of the Earth, ed. Y. J. Chen, *Advances in Earth Sciences Monograph*, 2, 21 - 38, Higher Education Press, Beijing, 2004.
- (6) **Freed, A. M.** and J. Lin, Accelerated stress buildup on the southern San Andreas Fault and surrounding regions caused by Mojave Desert earthquakes, *Geology*, 30, 571-574, 2002.
- (5) Dombard, A. J., and **A. M. Freed**, Thermally induced lineations on the asteroid Eros: Evidence of orbital Transfer, *Geophys. Res. Lett.*, 29, 1818, DOI 10.1029/2002GL015181, 2002.
- (4) **Freed, A. M.** and J. Lin, Delayed triggering of the 1999 Hector Mine earthquake by viscoelastic stress transfer, *Nature*, 411, 180-183, 2001.
- (3) **Freed, A. M.,** H. J. Melosh and S. C. Solomon, Tectonics of mascon loading: Resolution of the strike-slip faulting paradox, *J. Geophys. Res.*, 106, 20603-20620, 2001.
- (2) **Freed, A. M.** and J. Lin, Time-dependent changes in failure stresses following thrust earthquakes, *J. Geophys. Res.*, 103, 24393-24409, 1998.
- (1) **Freed, A. M.,** J. Lin, P. R. Shaw, and H. J. Melosh, Long-term survival of the axial valley morphology at abandoned slow-spreading centers, *Geology*, 23, 971-974, 1995.

GRANTS

Testing the effects of cooling history and rheology on oceanic plateau accretion and their role in tectonic modification of convergent margins, NSF, 5/22-4-25 \$575,072 (Co-I, Mike Eddy)

An Incremental Ice-Wedging Model for Europa's Ridges, NASA, 8/16-8/20, \$157,000 (Co-I, J. Melosh).

Collaborative Research: Multi-scale models of subduction zone earth-quake cycle observations, NSF, 8/17-7/19, \$124,087 (Co-PI, Thorsten Becker).

The Evolution of Large Impact Basins on the Moon, Mercury, and Mars, NASA, 5/14-4/17, \$382,025

Collaborative Research: Reorganization of stresses beneath greater Tokyo after the 2011 Tohoku-Oki M9 earthquake, Award No. EAR-1215358, Sep., 2012 to Aug., 2014, \$148,151 (PI).

Postseismic Deformation and Stress Transfer after the 2010 M7.2 El Mayor-Cucapah (Baja California) Earthquake, NASA (thru JPL), June, 2012 to May, 2016, \$200,000 (Co-PI, E. Fielding).

COCONet Graduate Fellowship, UNAVCO, for graduate student Roby Douilly, Sept 2013-Aug 2014, \$25,000 (PI)

COCONet Graduate Fellowship, UNAVCO, for graduate student Steeve Smithe, Sept 2013-Aug 2014, \$25,000 (PI)

Gravity Anomalies of Large Impact Basins: A Complete Modeling Approach, NASA Earth and Space Science Fellowship Program, for David Blair, Sept 2013-Aug 2014, \$30,000 (PI)

Postseismic GPS Survey, Modeling, and Education following the M7.0 January 12, 2010 Earthquake in Haiti, Award No. EAR-1045809, Jan, 2011 to Dec, 2014, \$410,687 (Co-PI, PI: Calais).

Identification of Postseismic Transients in PBO GPS Time-Series, National Science Foundation, Award No. EAR-0952234, Jan., 2010 to Dec., 2012, \$151,190 (PI).

Basin Tectonics and Volcanism on Mercury, NASA, Award No. 09-PGG09-0053, Jan., 2010 to Dec., 2013, \$177,300 (PI).

Contemporary Stressing of the Alaskan Crust from Coseismic, Postseismic, and Interseismic Processes, U. S. Geological Survey, Award No. 104266, Jan., 2010 to Dec., 2011, \$59,525 (PI).

Intraplate strain and stress in the North American plate interior: Collaborative Research with Purdue University and University of Wisconsin, U. S. Geological Survey, Award No. 104327, Jan., 2010 to Dec., 2011, \$166,415 (Co-PI, PI: Calais).

Collaborative Research: Kinematic constraints on mantle-lithosphere interactions in Eastern Africa, National Science Foundation, Award No. 0538119-EAR, March, 2006 to February, 2011, \$420,000, (Co-PI, PI: Calais).

Geodetic and Geologic Field Response to the January 12, 2010, Mw 7.0 Haiti Earthquake, National Science Foundation, Award No. EAS-1024990, Feb. 1, 2010 to Jan 31, 2011, \$133,804 (Co-PI, PI: Calais).

Workshop: Numerical Modeling of Crustal Deformation Associated with Earthquake Faulting, Southern California Earthquake Center, February 1, 2010 to January 31, 2011, \$10,000 (PI).

Contemporary strain and stressing rates in central and southern Alaska through the earthquake cycle, National Science Foundation, Award No. EAR-0710937, July, 2007 to June, 2010, \$151,961 (PI).

Workshop: Numerical Modeling of Crustal Deformation Associated with Earthquake Faulting, Southern California Earthquake Center, February 1, 2009 to January 31, 2010, \$10,000 (PI).

Collaborative Research: GPS measurements and deformation modeling of oblique subduction and strain partitioning in the northeastern Caribbean, National Science Foundation, Award No. 0409487-EAR, July 1, 2004 to June 30, 2008, \$286,291 (Co-PI).

Workshop: Numerical Modeling of Crustal Deformation Associated with Earthquake Faulting, Southern California Earthquake Center, February 1, 2008 to January 31, 2009, \$10,000 (PI).

Accelerating moment release in areas of high stress? Southern California Earthquake Center, Award No. 07014 (EAR 5029922), February 1, 2007 to January 31, 2008, \$9,000 (Co-PI).

Collaborative Research: Mechanisms of postseismic deformation following the 2002 Denali Fault earthquake sequence, National Science Foundation, Award No. 0309620-EAR, May 13, 2003 to Oct 31, 2007, \$249,989 (Co-PI).

Inference of crustal rheology from observations of postseismic deformation following the 2004 Parkfield, California earthquake, Southern California Earthquake Center, Award No. 101574, February 1, 2005 to January 31, 2006, \$15,000 (PI).

Collaborative Research: Evolution of stress along the southern San Andreas Fault system for the past two centuries, United States Geological Survey, Award No. 03HQGR0082, July 1, 2003 to June 30, 2005, \$59,403 (PI).

Collaborative Research: Constraining non-linear lithospheric flow laws from post-Landers and post-Hector Mine SCEC GPS measurements, Southern California Earthquake Center, February 1, 2002 to January 31, 2003, \$15,000 (PI).

Constraining Non-Linear Lithospheric Viscous Flow Laws from Postseismic Surface Deformation Measurements, National Science Foundation, Award No. 0122868-EAR, January 1, 2002 to August 31, 2004, \$71,991 (PI).

Collaborative Research Modeling of 3D viscoelastic stress transfer in the California crust: Implications

for earthquake triggering and seismic hazard migration, National Science Foundation, Award No. 0122868-EAR, August 1, 2001 to December 31, 2004, \$109,000 (PI)

Three-dimensional modeling of lower crustal flow following earthquakes, National Science Foundation, Earth Sciences Postdoctoral Research Fellowship, Award No. 9704677-EAR, January 1, 1998 to December 31, 2000, \$72,000 (PI).

Toward and understanding of the strike-slip paradox of Lunar mascon basins, NASA graduate research fellowship, Aug. 1, 1995 to June 1, 1998 \$60,000 (PI).

INVITED TALKS/SEMINARS

- (29) **Freed, A. M.** Earthquakes' Silver Lining: Using the 2011 M9 Tohoku, Japan Earthquake to Probe the Earth's Deep Interior, Dept. of Geological Sciences, Cornell U., 2016.
- (28) **Freed, A. M.** The origin of lunar mascon basins, Dept. of Planetary Science, Cornell U., 2016.
- (27) **Freed, A. M.** Earthquakes' Silver Lining: Using the 2011 M9 Tohoku, Japan Earthquake to Probe the Earth's Deep Interior, Dept. of Physics, Purdue U., 2016.
- (26) **Freed, A. M.** Implications of postseismic deformation following the 2011 Tohoku, Japan earthquake, Univ. of Tokyo, Japan, 2014.
- (25) **Freed, A. M.** Using large earthquakes as *in situ* rock squeezing experiments, Univ. of Tokyo, Japan, 2013.
- (24) **Freed, A. M.** Using large earthquakes as *in situ* rock squeezing experiments, Berkeley Seismological Laboratory Colloquium, Univ. of California, Berkeley, 2012.
- (23) **Freed, A. M.** Using large earthquakes as *in situ* rock squeezing experiments, Dept. of Earth and Planetary Sciences Seminar, Washington University, St. Louis, 2012.
- (22) **Freed, A. M.** Using large earthquakes as *in situ* rock squeezing experiments, Dept. of Earth and Atmospheric Sciences Seminar, Purdue University, West Lafayette, IN, 2012.
- (21) **Freed, A. M.** Implications of Postseismic Surface Displacements for the Nature of the Mantle and Earthquake Triggering, Department Colloquium, University of Colorado, Boulder, 2011.
- (20) **Freed, A. M.**, G. Hirth, M. Behn: Using postseismic displacements to infer the long-term tectonic environment of the upper mantle at an active plate boundary, Earthscope National Meeting, Austin, TX, 2011.
- (19) **Freed, A. M.** An Overview of Models to Explain New Madrid Seismic Activity, New Madrid Seismic Zone Geodesy Workshop, Norwood, MA, 2011.
- (18) **Freed, A. M.**, The January 12, 2010 Haiti Earthquake: Causes, consequences, and the future, Indiana Council on World Affairs, Indianapolis, 2011.
- (17) **Freed, A. M.**, Validation of a constitutive relationship for transient power-law flow in the upper mantle, Geology and Geophysics Dept. Seminar, Woods Hole Oceanographic Institution, 2010.
- (16) **Freed, A. M.**, The January 12, 2010 Haiti Earthquake: An overview, Computational Infrastructure for Geodynamics, Short-Term Crustal Dynamics Workshop, Golden, CO, 2010.
- (15) **Freed, A. M.**, Viscous Flow in the Upper Mantle: A Process for Earthquake Triggering, Research Center for the Prediction of Earthquakes and Volcanoes, Tohoku University, Sendai, Japan, 2010.
- (14) **Freed, A. M.**, Detecting Viscous Flow in the Upper Mantle: Implications for Earthquake Triggering, Department of Terrestrial Magnetism, Carnegie Institution of Washington, DC, 2009.
- (13) **Freed, A. M.**, Could Pantheon Fossae be the result of the Apollodorus crater-forming impact within the Caloris Basin, Mercury?, Department of Terrestrial Magnetism, Carnegie Institution of Washington, DC, 2009.
- (12) **Freed, A. M.**, S. C. Solomon, and P. J. Kennedy, Mechanics of faulting in and around Caloris Basin, Mercury, 39th Lunar and Planetary Science Conference, 1189, 2008.

- (11) **Freed, A. M.**, Using earthquakes to infer crustal and mantle rheology, Lunar & Planetary Institute, Houston, TX, 2006.
- (10) **Freed, A. M.**, Using an earthquake as a large rock deformation experiments, Department of Geosciences, University of Arizona, Tucson, AZ, 2006.
- (9) **Freed, A. M.**, T. Ali, R. Bürgmann, Evolution of stress in southern California for the past 200 years from coseismic, postseismic, and interseismic processes, EOS Trans. AGU, 87(36), Fall Meeting, 2006.
- (8) **Freed, A. M.**, Challenges to inferring the mechanisms and nature of postseismic processes following strike-slip earthquakes, computational infrastructure for geodynamics, Community Finite Element Models for Fault Systems and Tectonic Modeling workshop, Golden, CO, 2006.
- (7) **Freed, A. M.**, Using NX MasterFEM in large scale geophysical studies, Pace Conference, West Lafayette, IN, 2006.
- (6) **Freed, A. M.**, Inferring lithospheric rheology from postseismic deformation following the 2002 Denali, Alaska earthquake, Dept. of Earth & Environmental Sciences seminar series, University of Illinois, Chicago, 2005.
- (5) **Freed, A. M.**, R. Bürgmann, E. Calais, J. T. Freymueller, S. Hreinsdóttir, Deep Lithospheric Mantle and Heterogeneous Crustal Flow Following the 2002 Denali, Alaska Earthquake, EOS Trans. AGU, 85(47), Fall Meeting, San Francisco, CA, 2004.
- (4) **Freed, A. M.** and R. Bürgmann, Combined study of the 1992 Landers, 1999 Hector Mine, and 2002 Denali postseismic deformations: In search of a common lithospheric rheology, EOS Trans. AGU, 85(47), Fall Meeting, San Francisco, CA, 2004.
- (3) **Freed, A. M.**, Evidence of power-law flow in the Mojave Desert mantle, Department of Earth and Atmospheric Sciences seminar series, Purdue University, 2003.
- (2) **Freed, A. M.**, Evidence of power-law flow in the Mojave Desert mantle, Department of Geology Seminar, University of Illinois, Urbana, 2003.
- (1) **Freed, A. M.**, Earthquakes as large rock deformation experiments, Earth & Space Sciences seminar series, University of Washington, Seattle, 2002.

GRADUATE STUDENTS ADVISED AND POSTDOCTORAL SPONSORSHIPS

Current

Alex Trowbridge – Ph.D. (expected graduation, 2019)

Greg Gosselin – Ph.D. (expected graduation, 2022)

Past

Steeve Julien Symithe – Ph.D. (graduated, 2016), now at Univ. of Haiti

Roby Douilly – Ph.D. (graduated, 2016), now a postdoc UC Riverside

Haylee Dickinson – Ph.D. (graduated, 2015), now working for Shell Oil Company

David Blair – Ph.D. (graduated, 2014), now at Brown U.

Laura Bennati-Rassion – M.S., graduated 12/10. Now working for ExxonMobil.

Tabrez Ali – Ph.D., graduated 5/09. Now a Postdoctoral Fellow at U. of Wisconsin

Patrick Kennedy – M.S., graduated 5/07. Now working with the U.S. Air Force.

Jay Kalbas – Ph.D. (co-advised with Ridgway) 12/06. Now working for ExxonMobil.

David Manaker – Postdoc (co-advised with Calais), 9/06-5/07

OUTREACH TALKS/PANELS

(33) HyFlex model for large lecture science electives, Sloan Equity and Inclusion in STEM Introductory Courses Showcase, University of Michigan, 2021.

(32) HyFlex Teaching – The Purdue Experience, Technological University of Dublin, 2021.

(31) Master of Ceremonies, Movie Night, Purdue Student Government Sustainability Committee, 2021.

- (30) Sustainability Summit, Purdue Student Government Sustainability Committee, 2021.
- (29) A breakdown in ethics that led to the Space Shuttle Challenger Disaster, AAE Space Flight Operations class, 2021.
- (28) Faculty Panel, Boiler Cold Rush, 2021.
- (27) CoS Snack and Chat Networking Event sponsored by the Purdue Science Student Council (PSSC), 2021.
- (26) HyFlex model for large lecture science electives, Seismic Showcase, Sloan Equity and Inclusion in STEM Introductory Courses, 2021.
- (25) Resilient Pedagogy – Guiding Principles, Purdue IMPACT X+: Resilient Pedagogy & Learner-Center Design, Office of the Provost, 2020.
- (24) Hy-Flex lecture classes, Purdue Teaching & Learning Forum, 2020.
- (23) Hy-Flex large lecture course design, Purdue Faculty Open Forum: Teaching for Fall 2020, 2020.
- (22) A breakdown in ethics that led to the Space Shuttle Challenger Disaster, National Honor Society in Aerospace Engineering, Purdue, 2019.
- (21) Separating fact from fiction in the movies, Science on Tap, Lafayette Brewing Company, West Lafayette, IN, 2018.
- (20) Separating fact from fiction in Space movies, Purdue’s astronomy club, West Lafayette, IN, 2018.
- (19) Viewing the Moon through a telescope, Klondike Elementary School, 3rd Grade classes, West Lafayette, IN, 2013.
- (18) Cool things about the Moon, Klondike Elementary School, 3rd Grade classes, West Lafayette, IN, 2013.
- (17) Groundbreaking Earthquakes: Haiti, Japan, & Indiana, Frankfort Community Public Library, Frankfort, Indiana, 2013.
- (16) Groundbreaking Earthquakes: Haiti, Japan, & Indiana, Tippecanoe Public Library, Campus Branch, Lafayette, Indiana, 2013.
- (15) Freed, A. M. and D. Minton, Exploring your Solar System, West Lafayette Public Library, 2012.
- (14) Freed, A. M., Tale of two earthquakes, Japan and Haiti, Sciencetech Club, Indianapolis, Indiana, 2012.
- (13) Freed, A. M., Tale of two earthquakes, Japan and Haiti, President’s Council Mollenkopf/Keyes Weekend (Best of Back to Class), Naples, Florida, 2012.
- (12) Freed, A. M., Tale of two earthquakes, Japan and Haiti, President’s Council Back to Class, Purdue University, West Lafayette, IN, 2011.
- (11) Freed, A. M., The 2011 Japan and 2010 Haiti Earthquakes: A Geophysics Perspective, Purdue Women's Club International Friendship Group, West Lafayette, IN, 2011.
- (10) Freed, A. M. Cool things about the Moon and Mercury, Ms. Scanlon’s 3rd Grade Class, Klondike Elementary School, West Lafayette, IN, 2011.
- (9) Freed, A. M., The 2011 M9 Tohoku, Japan Earthquake: A Geophysics Perspective, Chilmark Public Library, Chilmark, MA, 2011.
- (8) Freed, A. M., The 2011 Japan and 2010 Haiti Earthquakes: A Geophysics Perspective, Martha’s Vineyard Men’s Conversation Club, Edgartown, MA, 2011.
- (7) Freed, A. M., What modern technology can tell us about earthquakes?, Purdue Elderhostel program, West Lafayette, IN, 2011.
- (6) Freed, A. M., Using Earthquakes As Large Rock Squeezing Experiments To Infer the Rheology of the Mantle, Research Experience for Undergraduates Seminar, Physics Department, Purdue University, West Lafayette, IN, 2011.

- (5) Freed, A. M., The 2010 Great Tohoku, Japan earthquake: Implications for Nuclear Facilities in Southern California, Panel discussion on the cause and ramifications of Japan's nuclear crisis, hosted by Purdue Student PUGWASH, Purdue Energy Club, and the American Nuclear Society, West Lafayette, IN, 2011.
- (4) Freed, A. M., The January 12, 2010 Haiti Earthquake: Causes, consequences, and the future, Indiana Council on World Affairs, Indianapolis, IN, 2011.
- (3) Freed, A. M., The 2010 Haiti Earthquake: Causes and consequences, Chilmark Public Library, 2010
- (2) Freed, A. M., The Cause of the 2010 Haiti Earthquake: What does the future hold?, West Lafayette High School, IN, 2010
- (1) Freed, A. M., Consequences of the 2010 Haiti earthquake, Department of Earth and Atmospheric Sciences special seminar, West Lafayette, IN, 2010