

Stanford



Eric Dunham

Associate Professor of Geophysics

Bio

BIO

Population growth is increasingly bringing more people into areas prone to natural hazards, especially earthquakes, tsunamis, and volcanic eruptions—as the events of the past few years have demonstrated. Motivated by both the desire to reduce risk and an innate curiosity about how the natural world operates, my personal research focuses on the development and use of physics-based computational simulations to characterize and understand earthquakes, tsunamis, and volcanoes, and similar phenomena. With a background in theoretical physics and mathematics, my approach is to identify the fundamental mechanical processes governing the system, develop numerical models incorporating these processes, validate them using geophysical observations, and then use the models to predict system behavior. Specific research areas include earthquake rupture dynamics, tsunami generation, volcano seismology and infrasound, ice stream stick-slip events and flexural-gravity waves in ice shelves, and numerical methods for wave propagation

ACADEMIC APPOINTMENTS

- Associate Professor, Geophysics
- Member, Institute for Computational and Mathematical Engineering (ICME)

ADMINISTRATIVE APPOINTMENTS

- Reginald A. Daly Postdoctoral Fellow, Department of Earth and Planetary Sciences, Harvard University, (2005-2007)
- Research Associate in Geophysics, Department of Earth and Planetary Sciences, Harvard University, (2007-2009)
- Lecturer on Applied Mathematics, School of Engineering and Applied Sciences, Harvard University, (2008-2009)
- Assistant Professor, Department of Geophysics, Stanford University, (2009- present)
- Affiliated Faculty Member, Institute for Computational and Mathematical Engineering, Stanford University, (2011- present)

HONORS AND AWARDS

- Jefferson Scholar, University of Virginia (1996-2000)
- Member, Phi Beta Kappa (1999)
- B.S. Physics with Highest Distinction, University of Virginia (2000)
- Parsons Fellow in computational science, University of California, Santa Barbara, Physics (2000)
- James W. Elkins Award, University of Virginia Physics (2000)
- John Cardy Award, UCSB Physics (2001)
- Graduate Fellow, National Defense Science and Engineering (2001-2005)
- Outstanding Student Paper, American Geophysical Union (2002)
- UCSB Affiliates Graduate Dissertation Fellowship, University of California, Santa Barbara (2004)

- Outstanding Student Paper, American Geophysical Union (2004)
- Student Presentation Award, Seismological Society of America (2004)
- Editors' Citation for Excellence in Refereeing, Geophysical Research Letters (2007)
- Certificate of Distinction in Teaching, Harvard University (2008)
- Terman Fellow, Stanford University (2009-2012)
- Best Poster Award, Society of Industrial and Applied Mathematics (SIAM) Geosciences (2011)
- Fellow, Physics, Alfred P. Sloan Foundation (2012)
- NSF CAREER award on Subduction Zone Hazards: Megathrust Rupture Dynamics and Tsunamis, National Science Foundation (2013-2017)
- School of Earth Sciences Excellence in Teaching Award, Stanford University (2014)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Invited speaker, Stanford Club of Marin (2015 - 2015)
- Invited speaker for Stanford Admit Weekend, Academic Expo, Stanford University (2015 - 2015)
- Faculty search committee, member, Department of Geophysics, Stanford University (2014 - 2015)
- External Program review panel member, USGS-NEHRP (National Earthquake Hazards Reduction Program) (2014 - 2014)
- Invited speaker, Stanford Alumni Club of the Desert (2014 - 2014)
- Invited speaker, Southern California Earthquake Center (SCEC) Annual Meeting (2014 - 2014)
- Invited speaker, Incorporated Research Institutions for Seismology, Grand Challenges in Faulting and Deformation Processes (2014 - 2014)
- Invited speaker, American Geophysical Union Fall Meeting (two invited talks) (2014 - 2014)
- Invited speaker, Computational Infrastructure for Geodynamics Crustal Deformation Modeling Workshop (2014 - 2014)
- Invited speaker, Penn State (2014 - 2014)
- Invited speaker, Caltech (2014 - 2014)
- Invited speaker for Stanford Admit Weekend, Academic Expo, Stanford University (2014 - 2014)
- Invited speaker, Annual meeting, Seismological Society of America (2014 - 2014)
- Invited speaker, Rock and Fluid Physics: Academic and Industrial Perspectives Conference, Shell Technology Centre, Amsterdam (2014 - 2014)
- Geophysics Admissions Committee, Stanford University (2013 - 2014)
- School of Earth Sciences Teaching Task Force, Stanford University (2013 - 2014)
- Co-organizer for annual meeting special session on Earthquake Source Physics, Seismological Society of America (2013 - 2013)
- External Program review panel member, USGS-NEHRP (National Earthquake Hazards Reduction Program) (2013 - 2013)
- Invited speaker, King Abdullah University of Science and Technology (2013 - 2013)
- Invited speaker, University of British Columbia (2013 - 2013)
- Invited speaker, Lockheed Martin Advanced Technology Center (2013 - 2013)
- Invited speaker at New Student Orientation, Engaging with Faculty, Stanford University (2013 - 2013)
- Invited speaker for Stanford Admit Weekend, Academic Expo, Stanford University (2013 - 2013)
- Advisory Board, Computational Geosciences MS Program, Institute for Computational and Mathematical Engineering, Stanford University (2012 - present)
- Co-leader of Computational Science disciplinary group, member of Planning Committee, Southern California Earthquake Center (SCEC) (2012 - present)
- Chair, 5th Chinese-American Kavli Frontiers of Science Symposium, Earthquake Mechanics and Forecasting, National Academy of Sciences, (2012 - 2012)
- Co-organizer for annual meeting special session on Seismicity in Volcanic Environments, Seismological Society of America (2012 - 2012)
- Invited speaker at New Student Orientation, Engaging with Faculty, Stanford University (2012 - 2012)
- Invited speaker, Fall Meeting, American Geophysical Union (2012 - 2012)

- Invited speaker, New Perspective on Great Earthquakes Along Subduction Zones, International Conference (2012 - 2012)
- Stanford School of Earth Sciences Council, Stanford University (2011 - present)
- Geophysics Department Seminar Series Organizer, Stanford University (2011 - 2012)
- Co-organizer for Geosciences Minisymposium on Computational Challenges in Earthquake Simulation, Society for Industrial and Applied Mathematics (SIAM) (2011 - 2011)
- Invited speaker, University of California, Santa Cruz (2011 - 2011)
- Invited speaker at New Student Orientation, Engaging with Faculty, Stanford University (2011 - 2011)
- Invited speaker, Fall Meeting, American Geophysical Union (2011 - 2011)
- Undergraduate Premajor Advisor, Stanford University (2010 - present)
- Co-convenor for International Workshop on Multiscale and Multiphysics Processes in Geomechanics, Stanford University (2010 - 2010)
- Delegate, Panel on Earthquake Research, U.S.-Japan Natural Resources (UJNR) (2010 - 2010)
- External Program review panel member, USGS-NEHRP (National Earthquake Hazards Reduction Program) (2010 - 2010)
- Invited speaker, Lawrence Livermore National Laboratory (2010 - 2010)
- Invited speaker, University of California, Berkeley, Seismological Laboratory (2010 - 2010)
- Invited speaker, University of Oregon (2010 - 2010)
- Invited speaker, Lockheed Martin Advanced Technology Center (2010 - 2010)
- Invited speaker, University of California, Berkeley, Applied Mathematics (2010 - 2010)
- Geophysics Undergraduate Curriculum Committee, Stanford University (2009 - 2010)
- Co-convenor, Workshop on Dynamic Weakening Mechanisms, Southern California Earthquake Center (2009 - 2009)
- Co-organizer for earthquake rupture code validation project, Southern California Earthquake Center (2007 - 2011)
- Associate Editor, Journal of Geophysical Research-Solid Earth (2005 - 2008)

PROFESSIONAL EDUCATION

- Ph.D., University of California, Santa Barbara , Physics (2005)
- B.S., University of Virginia , Physics (2000)

LINKS

- Personal Website: <http://pangea.stanford.edu/~edunham/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research

I study the mechanics and physics of earthquakes, volcanoes, and tsunamis. Our group has been developing numerical models of earthquake rupture propagation that incorporate sophisticated descriptions of the processes within and around the fault zone that are thought to control how fault strength evolves during rapid slip. The models include transport of heat and pore fluid within fault zones, microscopic weakening processes that have been observed in laboratory experiments, and inelastic deformation of the off-fault material. We are using these models to explore how earthquake ruptures excite seismic waves, with a particular focus on strong ground motion and seismic hazard. Recently, my group and I have been working to understand the origin of incoherent high frequency ground motion by directly modeling rupture propagation on fractally rough fault surfaces. We are also studying subduction zone megathrust earthquakes, like the March 2011 Tohoku-Oki event that was responsible for the devastating tsunami in Japan. In addition to the rupture process, we are studying the excitation of ocean acoustic waves and tsunamis in these events. These modeling efforts involve high-performance computing, using resources at the Stanford Center for Computational Earth and Environmental Science and elsewhere. In addition to earthquakes, we study seismic waves from volcanic eruptions. We have developed a code that solves for the fully coupled flow of a

compressible, viscous magma through cracks and conduits in deformable solids. We hope to learn about the dynamics of eruptions from seismic signals recorded at Earth's surface.

Teaching

As part of the geophysics undergraduate curriculum I teach a course (Geophysics 120: Ice, Water, Fire) in which we apply the principles of continuum mechanics to explain readily observed properties of tsunamis and ocean waves, volcanic eruptions, and ice sheets and glaciers. At the graduate level, I teach earthquake seismology (Geophysics 287: Earthquake Seismology) and have lead seminars on several topics including strong ground motion modeling for seismic hazard analysis, fluid dynamics of volcanic eruptions, and earthquake rupture dynamics. I am also an affiliated faculty member of Stanford's Institute for Computational and Mathematical Engineering (ICME) program. As part of that program, I teach an undergraduate scientific computing course (CME 108: Introduction to Scientific Computing).

Professional Activities

NSF CAREER award, 2013; Alfred P. Sloan Fellow in Physics, 2012; Co-leader of Computational Science disciplinary group and member of Planning Committee, Southern California Earthquake Center (SCEC), 2011-present; Co-organizer for Seismological Society of America annual meeting special session on Seismicity in Volcanic Environments, 2012; Co-organizer for SIAM Geosciences Minisymposium on Computational Challenges in Earthquake Simulation, 2011; Delegate for U.S.-Japan Natural Resources (UJNR) Panel on Earthquake Research, 2010; Co-convener for International Workshop on Multiscale and Multiphysics Processes in Geomechanics, 2010; USGS-NEHRP (National Earthquake Hazards Reduction Program) External Program review panel, 2010; Co-organizer for Southern California Earthquake Center earthquake rupture code validation project, 2007-present; Co-convener for Southern California Earthquake Center Workshop on Dynamic Weakening Mechanisms, 2009; Associate Editor, Journal of Geophysical Research-Solid Earth, 2005-08; Certificate of Distinction in Teaching, Harvard University, 2008; Editors' Citation for Excellence in Refereeing for Geophysical Research Letters, 2007

PROJECTS

- Collaborative Development of Numerical Methods for Wave Propagation - Stanford University and Uppsala University
- Villarica Volcano
- Antarctic Ice Shelves
- Kilauea Volcano
- 2011 Tohoku Earthquake and Tsunami

Teaching

COURSES

2021-22

- Earthquake Rupture Dynamics: GEOPHYS 229 (Aut)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut)
- Introduction to Scientific Computing: CME 108, MATH 114 (Win)
- Physical Volcanology: GEOPHYS 385R (Sum)
- Theoretical Geophysics: GEOPHYS 385D (Aut, Win, Spr, Sum)

2020-21

- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Win)
- Introduction to Scientific Computing: CME 108, MATH 114 (Win)
- Theoretical Geophysics: GEOPHYS 385D (Aut, Win, Spr, Sum)
- Waves in Solids and Fluids: GEOPHYS 238 (Spr)

2019-20

- Diversity and Inclusion in the Geosciences: EARTH 203 (Win)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Win, Spr)
- Ice, Water, Fire: GEOPHYS 120, GEOPHYS 220 (Win)
- Theoretical Geophysics: GEOPHYS 385D (Aut, Win, Spr, Sum)

2018-19

- Earthquake Rupture Dynamics: GEOPHYS 229 (Spr)
- Earthquake Seismology: GEOPHYS 287 (Aut)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Win, Spr)
- Ice, Water, Fire: GEOPHYS 120, GEOPHYS 220 (Win)
- Physical Volcanology: GEOPHYS 385R (Aut, Win, Sum)
- Theoretical Geophysics: GEOPHYS 385D (Aut, Win, Spr, Sum)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Ben Mullet, Nadim Saad

Postdoctoral Faculty Sponsor

So Ozawa

Doctoral Dissertation Advisor (AC)

Lauren Abrahams, Kate Coppess, Fredric Lam, Nurbek Tazhimbetov

Publications

PUBLICATIONS

- **Community-Driven Code Comparisons for Three-Dimensional Dynamic Modeling of Sequences of Earthquakes and Aseismic Slip** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Jiang, J., Erickson, B. A., Lambert, V. R., Ampuero, J., Ando, R., Barbot, S. D., Cattania, C., Zilio, L., Duan, B., Dunham, E. M., Gabriel, A., Lapusta, N., Li, et al
2022; 127 (3)
- **Infrasound Radiation From Impulsive Volcanic Eruptions: Nonlinear Aeroacoustic 2D Simulations** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Watson, L. M., Dunham, E. M., Mohaddes, D., Labahn, J., Jaravel, T., Ihme, M.
2021; 126 (9)
- **Effect of Porosity and Permeability Evolution on Injection-Induced Aseismic Slip** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Yang, Y., Dunham, E. M.
2021; 126 (7)
- **Influence of Shear Heating and Thermomechanical Coupling on Earthquake Sequences and the Brittle-Ductile Transition** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Allison, K. L., Dunham, E. M.
2021; 126 (6)
- **Elastic wave propagation in anisotropic solids using energy-stable finite differences with weakly enforced boundary and interface conditions** *JOURNAL OF COMPUTATIONAL PHYSICS*
Almquist, M., Dunham, E. M.
2021; 424

- **Earthquake Sequence Dynamics at the Interface Between an Elastic Layer and Underlying Half-Space in Antiplane Shear** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Abrahams, L. S., Allison, K. L., Dunham, E. M.
2020; 125 (12)
- **Fault valving and pore pressure evolution in simulations of earthquake sequences and aseismic slip.** *Nature communications*
Zhu, W., Allison, K. L., Dunham, E. M., Yang, Y.
2020; 11 (1): 4833
- **Role of Fluid Injection on Earthquake Size in Dynamic Rupture Simulations on Rough Faults** *GEOPHYSICAL RESEARCH LETTERS*
Maurer, J., Dunham, E. M., Segall, P.
2020; 47 (13)
- **Non-stiff boundary and interface penalties for narrow-stencil finite difference approximations of the Laplacian on curvilinear multiblock grids** *JOURNAL OF COMPUTATIONAL PHYSICS*
Almquist, M., Dunham, E. M.
2020; 408
- **Lava lake sloshing modes during the 2018 Kilauea Volcano eruption probe magma reservoir storativity** *EARTH AND PLANETARY SCIENCE LETTERS*
Liang, C., Dunham, E. M.
2020; 536
- **Influence of fault roughness on surface displacement: from numerical simulations to coseismic slip distributions** *GEOPHYSICAL JOURNAL INTERNATIONAL*
Bruhat, L., Klinger, Y., Vallage, A., Dunham, E. M.
2020; 220 (3): 1857–77
- **The Community Code Verification Exercise for Simulating Sequences of Earthquakes and Aseismic Slip (SEAS)** *SEISMOLOGICAL RESEARCH LETTERS*
Erickson, B. A., Jiang, J., Barall, M., Lapusta, N., Dunham, E. M., Harris, R., Abrahams, L. S., Allison, K. L., Ampuero, J., Barbot, S., Cattania, C., Elbanna, A., Fialko, et al
2020; 91 (2): 874–90
- **The State of Stress on the Fault Before, During, and After a Major Earthquake** *ANNUAL REVIEW OF EARTH AND PLANETARY SCIENCES, VOL 48, 2020*
Brodsky, E. E., Mori, J. J., Anderson, L., Chester, F. M., Conin, M., Dunham, E. M., Eguchi, N., Fulton, P. M., Hino, R., Hirose, T., Ikari, M. J., Ishikawa, T., Jeppson, et al
2020; 48: 49–74
- **Magma Oscillations in a Conduit-Reservoir System, Application to Very Long Period (VLP) Seismicity at Basaltic Volcanoes: 2. Data Inversion and Interpretation at Kilauea Volcano** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Liang, C., Crozier, J., Karlstrom, L., Dunham, E. M.
2020; 125 (1)
- **Magma Oscillations in a Conduit-Reservoir System, Application to Very Long Period (VLP) Seismicity at Basaltic Volcanoes: 1. Theory** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Liang, C., Karlstrom, L., Dunham, E. M.
2020; 125 (1)
- **Dynamic rupture and earthquake sequence simulations using the wave equation in second-order form** *GEOPHYSICAL JOURNAL INTERNATIONAL*
Duru, K., Allison, K. L., Rivet, M., Dunham, E. M.
2019; 219 (2): 796–815
- **Fully Coupled Simulations of Megathrust Earthquakes and Tsunamis in the Japan Trench, Nankai Trough, and Cascadia Subduction Zone** *PURE AND APPLIED GEOPHYSICS*
Lotto, G. C., Jeppson, T. N., Dunham, E. M.
2019; 176 (9): 4009–41
- **Poroelastic effects destabilize mildly rate-strengthening friction to generate stable slow slip pulses** *JOURNAL OF THE MECHANICS AND PHYSICS OF SOLIDS*
Heimisson, E. R., Dunham, E. M., Almquist, M.
2019; 130: 262–79

- **Simulation and inversion of harmonic infrasound from open-vent volcanoes using an efficient quasi-1D crater model** *JOURNAL OF VOLCANOLOGY AND GEOTHERMAL RESEARCH*
Watson, L. M., Dunham, E. M., Johnson, J. B.
2019; 380: 64–79
- **Combining Dynamic Rupture Simulations with Ground-Motion Data to Characterize Seismic Hazard from M-w 3 to 5.8 Earthquakes in Oklahoma and Kansas** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Bydlon, S. A., Withers, K. B., Dunham, E. M.
2019; 109 (2): 652–71
- **What controls the initial peak of an air-gun source signature?** *GEOPHYSICS*
Watson, L. M., Werpers, J., Dunham, E. M.
2019; 84 (2): P27–P45
- **Tsunami Wavefield Reconstruction and Forecasting Using the Ensemble Kalman Filter** *GEOPHYSICAL RESEARCH LETTERS*
Yang, Y., Dunham, E. M., Barnier, G., Almquist, M.
2019; 46 (2): 853–60
- **Simulation of acoustic and flexural-gravity waves in ice-covered oceans** *JOURNAL OF COMPUTATIONAL PHYSICS*
Mattsson, K., Dunham, E. M., Werpers, J.
2018; 373: 230–52
- **A finite difference method for earthquake sequences in poroelastic solids** *COMPUTATIONAL GEOSCIENCES*
Torberntsson, K., Stiernstrom, V., Mattsson, K., Dunham, E. M.
2018; 22 (5): 1351–70
- **Mach wave properties in the presence of source and medium heterogeneity** *GEOPHYSICAL JOURNAL INTERNATIONAL*
Vyas, J. C., Mai, P. M., Galis, M., Dunham, E. M., Imperatori, W.
2018; 214 (3): 2035–52
- **Earthquake cycle simulations with rate-and-state friction and power-law viscoelasticity** *TECTONOPHYSICS*
Allison, K. L., Dunham, E. M.
2018; 733: 232–56
- **A Suite of Exercises for Verifying Dynamic Earthquake Rupture Codes** *SEISMOLOGICAL RESEARCH LETTERS*
Harris, R. A., Barall, M., Aagaard, B., Ma, S., Roten, D., Olsen, K., Duan, B., Liu, D., Luo, B., Bai, K., Ampuero, J., Kaneko, Y., Gabriel, et al
2018; 89 (3): 1146–62
- **Forecasting the Eruption of an Open-Vent Volcano Using Resonant Infrasound Tones** *GEOPHYSICAL RESEARCH LETTERS*
Johnson, J. B., Watson, L. M., Palma, J. L., Dunham, E. M., Anderson, J. F.
2018; 45 (5): 2213–20
- **Accounting for Fault Roughness in Pseudo-Dynamic Ground-Motion Simulations** *PURE AND APPLIED GEOPHYSICS*
Mai, P., Galis, M., Thingbaijam, K. S., Vyas, J. C., Dunham, E. M.
2017; 174 (9): 3419–50
- **Treatment of the polar coordinate singularity in axisymmetric wave propagation using high-order summation-by-parts operators on a staggered grid** *COMPUTERS & FLUIDS*
Prochnow, B., O'Reilly, O., Dunham, E. M., Petersson, N. A.
2017; 149: 138–149
- **Slow-slip events on the Whillans Ice Plain, Antarctica, described using rate-and-state friction as an ice stream sliding law** *JOURNAL OF GEOPHYSICAL RESEARCH-EARTH SURFACE*
Lipovsky, B. P., Dunham, E. M.
2017; 122 (4): 973–1003
- **The effect of compliant prisms on subduction zone earthquakes and tsunamis** *EARTH AND PLANETARY SCIENCE LETTERS*
Lotto, G. C., Dunham, E. M., Jeppson, T. N., Tobin, H. J.
2017; 458: 213–222

- **Excitation and resonance of acoustic-gravity waves in a column of stratified, bubbly magma** *JOURNAL OF FLUID MECHANICS*
Karlstrom, L., Dunham, E. M.
2016; 797: 431-470
- **Dynamic earthquake rupture simulations on nonplanar faults embedded in 3D geometrically complex, heterogeneous elastic solids** *JOURNAL OF COMPUTATIONAL PHYSICS*
Duru, K., Dunham, E. M.
2016; 305: 185-207
- **Rupture complexity and the supershear transition on rough faults** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Bruhat, L., Fang, Z., Dunham, E. M.
2016; 121 (1): 210-224
- **Tremor during ice-stream stick slip** *CRYOSPHERE*
Lipovsky, B. P., Dunham, E. M.
2016; 10 (1): 385-399
- **Nucleation and dynamic rupture on weakly stressed faults sustained by thermal pressurization** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Schmitt, S. V., Segall, P., Dunham, E. M.
2015; 120 (11): 7606-7640
- **High-order finite difference modeling of tsunami generation in a compressible ocean from offshore earthquakes** *COMPUTATIONAL GEOSCIENCES*
Lotto, G. C., Dunham, E. M.
2015; 19 (2): 327-340
- **Rupture dynamics and ground motions from earthquakes in 2-D heterogeneous media** *GEOPHYSICAL RESEARCH LETTERS*
Bydlon, S. A., Dunham, E. M.
2015; 42 (6): 1701-1709
- **Vibrational modes of hydraulic fractures: Inference of fracture geometry from resonant frequencies and attenuation** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Lipovsky, B. P., Dunham, E. M.
2015; 120 (2): 1080-1107
- **Simulation of Earthquake Rupture Dynamics in Complex Geometries Using Coupled Finite Difference and Finite Volume Methods** *COMMUNICATIONS IN COMPUTATIONAL PHYSICS*
O'Reilly, O., Nordstrom, J., Kozdon, J. E., Dunham, E. M.
2015; 17 (2): 337-370
- **Constraining shallow slip and tsunami excitation in megathrust ruptures using seismic and ocean acoustic waves recorded on ocean-bottom sensor networks** *EARTH AND PLANETARY SCIENCE LETTERS*
Kozdon, J. E., Dunham, E. M.
2014; 396: 56-65
- **An efficient numerical method for earthquake cycles in heterogeneous media: Alternating subbasin and surface-rupturing events on faults crossing a sedimentary basin** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Erickson, B. A., Dunham, E. M.
2014; 119 (4): 3290-3316
- **A 2D Pseudodynamic Rupture Model Generator for Earthquakes on Geometrically Complex Faults** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Trugman, D. T., Dunham, E. M.
2014; 104 (1): 95-112
- **Predicting fault damage zones by modeling dynamic rupture propagation and comparison with field observations** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Johri, M., Dunham, E. M., Zoback, M. D., Fang, Z.
2014; 119 (2): 1251-1272
- **Strong Ground Motion Prediction Using Virtual Earthquakes** *SCIENCE*
Denolle, M. A., Dunham, E. M., Prieto, G. A., Beroza, G. C.

2014; 343 (6169): 399-403

- **Frictional-faulting model for harmonic tremor before Redoubt Volcano eruptions** *NATURE GEOSCIENCE*
Dmitrieva, K., Hotovec-Ellis, A. J., Prejean, S., Dunham, E. M.
2013; 6 (8): 652-656
- **Additional shear resistance from fault roughness and stress levels on geometrically complex faults** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Fang, Z., Dunham, E. M.
2013; 118 (7): 3642-3654
- **Rupture to the Trench: Dynamic Rupture Simulations of the 11 March 2011 Tohoku Earthquake** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Kozdon, J. E., Dunham, E. M.
2013; 103 (2B): 1275-1289
- **Ground motion prediction of realistic earthquake sources using the ambient seismic field** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
Denolle, M. A., Dunham, E. M., Prieto, G. A., Beroza, G. C.
2013; 118 (5): 2102-2118
- **Simulation of Dynamic Earthquake Ruptures in Complex Geometries Using High-Order Finite Difference Methods** *JOURNAL OF SCIENTIFIC COMPUTING*
Kozdon, J. E., Dunham, E. M., Nordstrom, J.
2013; 55 (1): 92-124
- **Solving the Surface-Wave Eigenproblem with Chebyshev Spectral Collocation** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Denolle, M. A., Dunham, E. M., Beroza, G. C.
2012; 102 (3): 1214-1223
- **Special Issue Honoring Professor James R. Rice** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*
Lapusta, N., Dunham, E., Gao, H.
2012; 79 (3)
- **Guided Waves Along Fluid-Filled Cracks in Elastic Solids and Instability at High Flow Rates** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*
Dunham, E. M., Ogden, D. E.
2012; 79 (3)
- **Observation of far-field Mach waves generated by the 2001 Kokoxili supershear earthquake** *GEOPHYSICAL RESEARCH LETTERS*
Vallee, M., Dunham, E. M.
2012; 39
- **Interaction of Waves with Frictional Interfaces Using Summation-by-Parts Difference Operators: Weak Enforcement of Nonlinear Boundary Conditions** *JOURNAL OF SCIENTIFIC COMPUTING*
Kozdon, J. E., Dunham, E. M., Nordstrom, J.
2012; 50 (2): 341-367
- **Earthquake Ruptures with Strongly Rate-Weakening Friction and Off-Fault Plasticity, Part 2: Nonplanar Faults** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Dunham, E. M., Belanger, D., Cong, L., Kozdon, J. E.
2011; 101 (5): 2308-2322
- **Earthquake Ruptures with Strongly Rate-Weakening Friction and Off-Fault Plasticity, Part 1: Planar Faults** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Dunham, E. M., Belanger, D., Cong, L., Kozdon, J. E.
2011; 101 (5): 2296-2307
- **Verifying a Computational Method for Predicting Extreme Ground Motion** *SEISMOLOGICAL RESEARCH LETTERS*
Harris, R. A., Barall, M., Andrews, D. J., Duan, B., Ma, S., Dunham, E. M., Gabriel, A., Kaneko, Y., Kase, Y., Aagaard, B. T., Oglesby, D. D., Ampuero, J., HANKS, et al
2011; 82 (5): 638-644

- **EARTHQUAKE RUPTURES ON ROUGH FAULTS** *International Workshop on Multiscale and Multiphysics Processes in Geomechanics*
Dunham, E. M., Kozdon, J. E., Belanger, D., Cong, L.
SPRINGER-VERLAG BERLIN.2011: 145-148
- **Coherence of Mach fronts during heterogeneous supershear earthquake rupture propagation: Simulations and comparison with observations** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
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