Brittany A. Erickson July 5th, 2024

Department of Computer Science
1202 University of Oregon
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Education

Ph.D. Mathematics, University of California, Santa Barbara.
Emphasis: Computational Science and Engineering, 2010.

M.A. Applied Mathematics, University of California, Santa Barbara, 2006.

B.S. Mathematical Science, University of California, Santa Barbara, 2004.

Employment

Associate Professor. June 2024 - present.
Assistant Professor. December 2018 - June 2024.
Department of Computer Science, University of Oregon.
Department of Earth Sciences, University of Oregon.

Assistant Professor. September 2014 - December 2018.
Department of Mathematics and Statistics, Portland State University.

Postdoctoral Scholar. January 2013 - September 2014.
Department of Geological Sciences, San Diego State University.

National Science Foundation Postdoctoral Fellow. September 2010 - January 2013.
Department of Geophysics, Stanford University.

Grants and Fellowships Awarded

NSF Research Grant "CAREER: Physics-Informed Deep Learning for Understanding Earthquake Slip Complexity" #2339996. Aug 2021 - July 2024. (Principal Investigator)

NSF Research Grant "Collaborative Research: Exploring System-Wide Events in Complex Fault Networks using Fully-Dynamic 3D Earthquake Cycle Simulations." #2053372. Aug 2021 - July 2024. Principal Investigator)

NSF Research Grant "Fluid Oscillations in Conduit-reservoir Systems, Very Long Period Seismic Signals at Kilauea Volcano, and the Phenomenology of Unsteady Magma Ascent." #2036980. March 2021 - March 2023. (Co-principal Investigator)

SCEC Research Grants "Advancing Simulations of Sequences of Earthquakes and Aseismic Slip (SEAS)." # 24087, # 23144, #22079, #21065, #20113, #19109, #18099. Feb 2018 - present. (Principal Investigator)

SCEC Research Grants "Workshop for Advancing Simulations of Sequences of Earthquakes and Aseismic Slip (SEAS)." #21139, #20120, #19110, #18102. Feb 2018 - Jan 2022. (Principal Investigator)

SCEC Research Grant "A Joint Workshop: Rupture Dynamics Code Validation and Comparing Simulations of Earthquake Sequences and Aseismic Slip." #17151. Feb 2017 - May 2018.

NSF Research Grant "Collaborative Research: From Loading to Rupture - How do Fault Geometry and Material Heterogeneity Affect the Earthquake Cycle?" EAR-1547603. Mar 2016 - Feb 2020. (Principal Investigator)

SCEC Research Grant "The Effects of Plasticity and the Evolution of Damage Zones in Earthquake Cycle Simulations". #15116. Feb 2014 - Jan 2015. (Co-principal Investigator)

Travel Grant, Portland State University, 2014.

SCEC Research Grant "The Influence of Fault Roughness and Damage Zones in 3D Earthquake Cycle Simulations." #14083. Feb 2013 - Jan 2014. (Co-principal Investigator)

Travel Grant, Association for Women in Mathematics, 2012.

NSF Postdoctoral Fellowship Research Grant "Single Event and Long Term Dynamics of Nonplanar Fault Systems." EAR-0948304. Sep 2010 - Aug 2012.

Refereed Publications
*student co-author under my direct mentorship

Rucker, C.* and **Erickson, B. A.** (2024), Physics-informed deep learning of rate-and-state friction, to appear in *Computer Methods in Applied Mechanics and Engineering*.

Chen, A.*, **Erickson, B. A.**, Kozdon, J. E. and Choi, J.-W. (2024), Matrix-free SBP-SAT finite difference methods and custom preconditioning on GPUs, *In Proceedings of the 38th ACM International Conference on Supercomputing (ICS '24), June 4-7, 2024, Kyoto, Japan.* ACM, New York, NY, USA, 13 pages. doi: 10.1145/3650200.3656614.

Crozier, J., Karlstrom, L., Montgomery-Brown, E., Angarita, M., Cayol, V., Bato, M.-G., Wang, T. A., Grapenthin, R., Shreve, T., Anderson, K. R., Astort, A., Bodart, O., Cannavó, F., Currenti, G., Dabaghi, F., Erickson, B. A., Garg, D., Head, M., Iozzia, A., Cheol Kim, Y., Le Mével, H., Novoa Lizama, C., Rucker, C.*, Silverii, F., Trasatti, E., Zhan, Y. (2023), Understanding the drivers of volcano deformation through geodetic model verification and validation, *Bulletin of Volcanology*, 85, 74, doi: 10.1007/s00445-023-01687-4.

Harvey, T.*, **Erickson, B. A.**, Kozdon, J. E. (2022), A high-order accurate summation-by-parts finite difference method for fully-dynamic earthquake sequence simulations within sedimentary basins, *Journal of Geophysical Research: Solid Earth*, 128, doi: 10.1029/2022JB025357.

Erickson, B. A., Jiang, J., Lambert, Barbot, S., V., Abdelmeguid, M., Almquist, M., Ampuero, J.-P., Ando, R., Cattania, C., Chen, A.*, Dal Zilio, L., Deng, S., Dunham, E. M., Elbanna, A., Gabriel, A.-A., Harvey, T.*, Huang, Y., Kaneko, Y., Kozdon, J., Lapusta, N., Li, D., Li, M., Liang, C., Liu, Y., Ozawa, S., Perez, A., Pranger, C., Segall, P., Sun, Y., Thakur, P., Uphoff, C., van Dinther, Y., Yang, Y. (2023), Incorporating full elastodynamics effects and dipping fault geometries in community code verification exercises for simulations of earthquake sequences and aseismic slip (SEAS), *Bulletin of the Seismological Society of America*, 1-25, doi: 10.1785/0120220066.

Liao, Y., Karlstrom, L. And **Erickson, B. A.** (2023), History-dependent volcanic ground deformation from broad spectrum viscoelastic rheology around magma reservoirs, *Geophysical Research Letters*, 1-11, doi: 10.1029/2022GL101172.

Erickson, B. A., Kozdon, J. E. and Harvey, T.* (2022), A non-stiff summation-by-parts finite difference method for the wave equation in second order form: Characteristic boundary conditions and nonlinear interfaces, *Journal of Scientific Computing*, 93, p. 1-17, doi: 10.1007/s10915-022-01961-1.

Rucker, C.*, **Erickson, B. A.**, Karlstrom, L., Lee, B. and Gopalakrishnan, J. (2022), A computational framework for time dependent deformation in viscoelastic magmatic systems, *Journal of Geophysical Research*, 127, p. 1-29, doi: 10.1029/2022JB024506.

Jiang, J., **Erickson, B. A.**, Lambert, V. R., Ampuero, J.-P., Ando, R., Barbot, S., Cattania, C., Dal Zilio, L., Duan, B., Dunham, E. M., Gabriel, A.-A., Lapusta, N., Li, D., Li, M., Liu, D., Liu, Y., Ozawa, S., Pranger, C. C., van Dinther, Y. (2021), Community-driven code comparisons for three-dimensional dynamic modeling of Sequences of Earthquakes and Aseismic Slip (SEAS), *Journal of Geophysical Research*, 127, p. 1-30, doi:10.1029/2021JB02351.

Kozdon, J. E., **Erickson, B. A.**, and Wilcox, L. C. (2021), Hybridized summation-by-parts finite difference methods, *Journal of Scientific Computing*, 87, p. 1-28, doi: 10.1007/s10915-021-01448-5.

Schumacher, T., Hameed, A. W, Higgins, C. and **Erickson B. A.** (2021), Characterization of hydrodynamic properties from free vibration tests of a large-scale bridge model, *Journal of Fluids and Structures*, 106, doi:10.1016/j.jfluidstructs.2021.103368.

Erickson, B. A., Jiang, J., Barall, M., Lapusta, N., Dunham, E. M., Harris, R., Abrahams, L. S., Allison, K. L., Ampuero, J. P., Barbot, S., Cattania, C., Elbanna, A., Fialko, Y., Idini, B., Kozdon, J. E., Lambert, V., Liu, Y., Luo, Y., Ma, X., Mckay, M. B.*, Segall, P., Shi, P., van den Ende, M., Wei, M. (2020), The community code verification exercise for simulating Sequences of Earthquakes and Aseismic Slip (SEAS), *Seismological Research Letters*, 91, p. 874–890, doi: 10.1785/0220190248.

Erickson, B. A., O'Reilly, O. and Nordström, J. (2019), Accuracy of stable, high-order finite difference methods for hyperbolic systems with non-smooth wave speeds, *Journal of Scientific Computing*, 81, p. 2356–2387, doi: 10.1007/s10915-019-01088-w.

Mckay, M. B.*, **Erickson, B. A.** and Kozdon, J. E. (2019), A computational method for earthquake cycles within anisotropic media, *Geophysical Journal International*, 219, p. 816–833, doi: 10.1093/gji/ggz320.

Erickson, B. A., Dunham, E. M. and Khosravifar, A. (2017), A finite difference method for off-fault plasticity throughout the earthquake cycle, *Journal of the Mechanics and Physics of Solids*, 109, p. 50–77, doi: https://doi.org/10.1016/j.jmps.2017.08.002.

Erickson, B. A. and Day, S. M. (2016), Bimaterial effects in an earthquake cycle model using rate-and-state friction, *Journal of Geophysical Research, Solid Earth*, 121, p. 1–26, doi: 10.1002/2015JB012470.

Erickson, B. A. and Nordström, J. (2014), Stable, high order accurate adaptive schemes for long time, highly intermittent geophysics problems, *Journal of Computational and Applied Mathematics*, 271, p. 328–338, doi: https://doi.org/10.1016/j.cam.2014.04.019.

Sleep, N. H. and **Erickson, B. A.** (2014), Nonlinear attenuation of S-waves and Love waves within ambient rock, *Geochemistry, Geophysics, Geosystems*, p. 1–21, doi:10.1002/2014GC005250.

Erickson, B. A. and Dunham E. M. (2014), An efficient numerical method for earthquake cycles in heterogeneous media: Alternating sub-basin and surface-rupturing events on faults crossing a sedimentary basin, *Journal of Geophysical Research*, p. 1–26, doi:10.1002/2013JB010614.

Nordström, J., Abbas, Q., **Erickson, B. A.** and Frenander, H. (2013), A flexible boundary procedure for hyperbolic problems: Multiple penalty terms applied in a domain, *Communications in Computational Physics*, p. 541–570, doi: 10.4208/cicp.020313.120314a.

Erickson, B. A., Birnir B., and Lavallée, D. (2011), Periodicity, chaos and localization in a Burridge-Knopoff model of an earthquake with rate-and-state friction, *Geophysical Journal International*, 187, p. 178–198, doi: https://doi.org/10.1111/j.1365-246X.2011.05123.x.

Erickson, B. A., Birnir B., and Lavallée, D. (2008), A model for aperiodicity in earthquakes, *Nonlinear Processes Geophysics*, 15, p. 1–12, doi: 10.5194/npg-15-1-2008.

Selected Presentations at Recent Professional Meetings
*student presenter under my direct mentorship

Rucker, C.* and Erickson, B. A. (2023), "Physics-informed deep learning of rate-dependent friction parameters in antiplane strike-slip faults", contributed talk at the 4th Biennial Meeting of SIAM Pacific Northwest Section, Bellingham, WA.

Chen, A.* and Erickson, B. A. (2022), "Matrix-free methods for summation-by-parts finite difference operators on GPUs", contributed talk at the 3rd Biennial Meeting of SIAM Pacific Northwest Section, Vancouver, WA.

Erickson, B. A. (2022), "A non-stiff, high-order accurate finite difference method for fully-dynamic earthquake sequence simulations within sedimentary basins", invited talk in the Seismic Cycle Modeling Symposium organized by the Computational Infrastructure for Geodynamics, Davis, CA.

Harvey, T.*, Erickson, B. A. and Kozdon, J. E. (2021), "Exploring the effects of a sedimentary basin on the earthquake cycle using a non-stiff finite difference method for elastodynamics", poster 167 presented at the

SCEC annual meeting, Palm Springs, CA.

Erickson, B. A. et al. (2021), "Community code verification exercises for Simulations of Earthquake Sequences and Aseismic Slip (SEAS): Dynamic effects and dipping fault geometries", poster 145 presented at the SCEC annual meeting, Palm Springs, CA.

Erickson, B. A. (2019), "Convergence of high-order accurate SBP-SAT methods for hyperbolic systems with non-smooth wave speeds", presented in the Applied Mathematics and Computation Seminar at Oregon State University, Corvallis, OR.

Jiang, J., and B. A. Erickson (2018), "Advancing simulations of Sequences of Earthquakes and Aseismic Slip (SEAS)", invited (plenary) talk presented at the SCEC annual meeting, Palm Springs, CA.

Erickson, B. A. (2018), "A linearized stability analysis of acoustic-gravity waves in a volcanic conduit with a spatially variable background state", talk presented at the SIAM annual meeting, Portland OR.

Erickson, B. A. (2018), "Do waves drive conduit flow instabilities during explosive volcanic eruptions?" talk presented at the Cascade Rain Mathematics Meeting, Portland OR.

McKay, M. B.* and Erickson, B. A. (2017), "Incorporating anisotropic material properties into simulations of the earthquake cycle", poster 176 presented at the SCEC Annual Meeting, Palm Springs, CA.

Erickson, B. A. (2017), "Modeling the earthquake cycle with heterogeneous materials and off-fault plasticity", invited talk at the U.S. Geological Survey, Menlo Park, CA.

Erickson, B. A. (2016), "Integration algorithms and finite difference methods for plastic deformation", talk presented at the Cascade Rain Mathematics Meeting, Portland OR.

Teaching Appointments

Instructor at the University of Oregon (2018-present)

- CS 210 (W20, W21), CS 410/510 Computational Science[1] (S20, F20, F22, W24)
- MATH 421/521 (F21), MATH 422/522 (W22, W23), MATH 607 (F23)
- ERTH 363 (S21, S23)

Seminars:

- CS 607 Physics-Informed Machine Learning[1] (F22)
- CS 607 GPU programming for Scientific Computing[1] (F21)
- CS 607 MPI for Scientific Computing[1] (F20)
- CS 607 Computational Methods for Partial Differential Equations[1] (F19)

[1]denotes a new course developed at University of Oregon

Instructor at Portland State University (2014-2018)

- Undergraduate Level Courses: Linear Algebra, Differential Equations
- Graduate Level Courses: Numerical Calculus, Theory of Ordinary Differential Equations, Advanced Linear Algebra, Advanced Numerical Analysis, An Introduction to Finite Difference Methods for Partial Differential Equations[2], Continuum Mechanics and Mathematical Modeling[2]

Instructor at University of California, Santa Barbara (2008-2010)

- Undergraduate Level Courses: Calculus with Applications, I and II, Mathematics for Elementary Teaching

Professional Development Activities

Vice-president of the Society for Industrial and Applied Mathematics (SIAM) Pacific Northwest sectional `https://sites.google.com/site/siampnwsection`. 2024 - present.

Co-leader for the SCEC working group for Advancing Simulations of Sequences of Earthquakes and Aseismic Slip (SEAS), with over 80 research scientists from 10+ countries from the scientific community `https://strike.scec.org/cvws/seas/`. 2018 - present.

Co-organizer and leader for four SCEC workshops for "Advancing Simulations of Sequences of Earthquakes and Aseismic Slip (SEAS)", involving over 30 participants from 5 different countries, 2018 - present.

Memberships in Professional Societies

Official member of the Society for Industrial and Applied Mathematics (SIAM) and the Southern California Earthquake Center (SCEC).

[2]denotes a new course developed at Portland State University