

ANNE F. SHEEHAN

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Education

Ph.D., Massachusetts Institute of Technology, Geophysics, 1991

ITT Fellow, Visiting Student/Researcher, University of Reading, England, 1984-1985

B.S., University of Kansas, Geophysics (Highest Distinction and Honors), 1984

Research Interests

Earthquake seismology, ocean bottom seismology, induced seismicity, tsunami studies, structure of the Earth's crust and upper mantle, mountain building processes, subduction zones, active tectonics, geophysical imaging, shallow subsurface geophysics

Professional Experience

2023-present *Chair*, Department of Geological Sciences, University of Colorado, Boulder, Colorado.

2006 - present *Professor*, Department of Geological Sciences, University of Colorado, Boulder, Colorado.

2000 - 2006 *Associate Professor*, Department of Geological Sciences, University of Colorado, Boulder, Colorado 80309

1993 - 2000 *Assistant Professor*, Department of Geological Sciences, University of Colorado, Boulder, Colorado 80309

1993 - present *Fellow* - Cooperative Institute for Research in Environmental Sciences (CIRES)

University of Colorado, Boulder, Colorado

2010 – 2022 *Associate Director for Solid Earth Sciences* - Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, Colorado

2015 *Visiting Professor*, University of Luxembourg, Luxembourg City, Luxembourg

2014 *Visiting Professor*, Earthquake Research Institute, University of Tokyo, Tokyo, Japan

2007 *Green Scholar, Visiting Professor*, Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, University of California, San Diego

2000 - 2001 *Visiting Professor*, Victoria University, Wellington, New Zealand

1992 - 1993 *Research Assistant Professor*, Seismological Laboratory, University of Nevada, Reno, Nevada

1991 - 1992 *Postdoctoral Fellow*, Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York

Honors and Awards

EarthScope Board of Directors	2023
President of Seismology Section of AGU	2018-20
New Zealand Geophysics Prize (E. Warren-Smith lead, with 9 coauthors)	2019
President, Seismology Section, American Geophysical Union	2019-20
New Zealand Geophysics Prize (L. Wallace lead, with 7 coauthors)	2016
American Geophysical Union (AGU) Fellow	2014
College Scholar Award, University of Colorado College of Arts & Sciences	2014
EarthScope Distinguished Lecturer	2013
Erasmus Haworth Distinguished Alumni Award, Univ. Kansas Dept. Geology	2009
Sloan Foundation Mentoring Award	2008
IRIS/SSA Distinguished Lecturer	2007
Green Scholar, IGPP, Scripps Inst. Oceanography, UCSD	2007

Geophysical Field Expeditions

Distributed Acoustic Sensing (DAS) field work, Milford, Utah, April 2022. Download DAS data and decommission 2 km of shallow trenched fiber-optic cable at UtahFORGE geothermal site.

Seismological Field work, Kodiak Island and Alaska Peninsula, May 2022. Download seismic data and decommission seismometers in remote locations throughout Kodiak Island and the Alaska Peninsula.

Co-Chief Scientist, Research Vessel R/V Marcus Langseth, Marine seismic reflection survey, Kodiak-Kodiak, AK, June 4-25, 2019.

Seismological Field work, Alaska Peninsula, May 15-27, 2019. Download seismic data and perform repairs of seismometers in remote locations throughout the Alaska Peninsula

Seismological Field work, San Luis Valley, Colorado, April 11-13, 2019. Deployment of seismometers near Great Sand Dunes National Park, Colorado.

Chief Scientist, SKQ201816S, R/V Sikuliaq, Deployment of 30 ocean bottom seismometers and differential pressure gauges along Aleutian trench, Alaska, July 11-25, 2018.

Weld County induced seismicity study, NE Colorado, telemetered earthquake network	2014-20
Hikurangi Ocean Bottom Investigation of Tremor and Slow Slip (HOBITSS), New Zealand	
R/V Tangaroa, deploy ocean bottom seismometers, ocean bottom pressure recorders,	2014
R/V Roger Revelle, recover ocean bottom sensors	2015
Deep Rift Electrical Resistivity (DRIFTER) experiment, Magnetotellurics	
Rio Grande Rift, Colorado and New Mexico	2012, 2013
Bighorns Arch Seismic Experiment (BASE), Wyoming 2009-2010	
Broadband seismometer deployment, Sheridan, Wyoming	2009
Intermediate period seismometer deployment, Buffalo, Wyoming	2010
Active source experiment, Buffalo and Shell, Wyoming	2010
New Zealand Ocean Bottom Seismometer deployment,	
Marine Observations of Anisotropy near Aeterea (MOANA)	
Cruise TN229, R/V Thomas G. Thompson, Lyttleton-Lyttleton, New Zealand,	2009
Cruise RR1002, R/V Roger Revelle, Wellington-Wellington, New Zealand,	2010
Boulder Creek Critical Zone Observatory,	
Shallow subsurface geophysics (seismic refraction, GPR, ERT)	2008, 2009
EM31 ground conductivity, DC electrical resistivity	2012
Rio Grande Rift GPS project, Colorado and New Mexico	2006-2013
Joya de Ceren, El Salvador, Electrical resistivity survey of archeological site	2005
Himalayan Nepal Tibet Seismic Experiment (HIMNT), Nepal	2001-2002
New Zealand Marlborough Fault Zone Seismic Experiment	2000-2001

Publications

Books

Burger, R. L., A. F. Sheehan, and C. H. Jones, Introduction to Applied Geophysics: Exploring the Shallow Subsurface, 554 pages, *W. W. Norton Publishers*, New York, 2006.

Peer-reviewed Papers (since 2013)

- Bogolub, K. R., J. P. Bell, E. R. Chon, R. M. Kirkham, A. F. Sheehan (2023), Earthquake swarm near Great Sand Dunes, Colorado, investigated with temporary seismic network and machine learning seismic phase analysis, *Mountain Geologist*, Vol. 60, no. 3, p. 81-102.
- Yarce J; Sheehan AF; Roecker S. (2023). Temporal Relationship of Slow Slip Events and Microearthquake Seismicity: Insights from Earthquake Automatic Detections in the Northern Hikurangi Margin, Aotearoa New Zealand. *Geochemistry, Geophysics, Geosystems*, 24(3). 10.1029/2022gc010537
- Stokes, S. M., Ge, S., Brown, M. R. M., Menezes, E. A., Sheehan, A. F., & Tiampo, K. F. (2023). Pore Pressure Diffusion and Onset of Induced Seismicity. *Journal of Geophysical Research: Solid Earth*, 128, e2022JB026012. <https://doi.org/10.1029/2022JB026012>
- Clifford, T., A. Sheehan, M. P. Moschetti (2023); Investigations of Ambient Noise Velocity Variations in a Region of Induced Seismicity near Greeley, Colorado. *The Seismic Record* 2023; 3 (1): 12–20. doi: <https://doi.org/10.1785/0320220033>
- Liu C; Zhang S; Sheehan AF; Ritzwoller MH. (Nov 2022). Surface Wave Isotropic and Azimuthally Anisotropic Dispersion across Alaska and the Alaska-Aleutian Subduction Zone. *Journal of Geophysical Research. Solid Earth*. 10.1029/2022jb024885
- Plescia, S. M., A. F. Sheehan, S. S. Haines (2022), Active-Source Interferometry in Marine and Terrestrial Environments: Importance of Directionality and Stationary Phase. *Bulletin of the Seismological Society of America* 2022; doi: <https://doi.org/10.1785/0120210160>
- Iwasaki Y; Mochizuki K; Ishise M; Todd EK; Schwartz SY; Zal H; Savage M; Henrys S; Sheehan AF; Ito Y. (2021). Continuous tremor activity with stable polarization direction following the 2014 large slow slip event in the Hikurangi subduction margin offshore New Zealand. *Journal of Geophysical Research. Solid Earth*. 10.1029/2021jb022161
- Hossen, M. J., Mulia, I. E., Mencin, D., & Sheehan, A. F. (2021). Data assimilation for tsunami forecast with ship-borne GNSS data in the Cascadia subduction zone. *Earth and Space Science*, 8, e2020EA001390. <https://doi.org/10.1029/2020EA001390>
- Yarce, J., Sheehan, A., Roecker, S., & Mochizuki, K. (2021). Seismic velocity heterogeneity of the Hikurangi subduction margin, New Zealand: Elevated pore pressures in a region with repeating slow slip events. *Journal of Geophysical Research: Solid Earth*, 126, e2020JB021605. <https://doi.org/10.1029/2020JB021605>
- Nakai, J. S., Sheehan, A. F., Abercrombie, R. E., & Eberhart-Phillips, D. (2021). Near trench 3D seismic attenuation offshore Northern Hikurangi subduction margin, North Island, New Zealand. *Journal of Geophysical Research: Solid Earth*, 126, e2020JB020810. <https://doi.org/10.1029/2020JB020810>
- Plescia, S. M., A. F. Sheehan, S. S. Haines, L. L. Worthington, S. Cook, J. S. Ball (2020); Teleseismic *P*-Wave Coda Autocorrelation Imaging of Crustal and Basin Structure, Bighorn Mountains Region, Wyoming, U.S.A. *Bulletin of the Seismological Society of America* 2020; 111 (1): 466–475. doi: <https://doi.org/10.1785/0120200177>

- Barcheck, G., et al. (2020); The Alaska Amphibious Community Seismic Experiment. *Seismological Research Letters* doi: <https://doi.org/10.1785/0220200189>
- Zal, H. J., et al. (2020), Temporal and spatial variations in seismic anisotropy and VP/VS ratios in a region of slow slip, *Earth Planet. Sci. Letters*, 532, 2020, 115970, <https://doi.org/10.1016/j.epsl.2019.115970>.
- Hossen, M.J., Sheehan, A.F. & Satake, K (2020). A Multi-fault Model Estimation from Tsunami Data: An Application to the 2018 M7.9 Kodiak Earthquake. *Pure Appl. Geophys.* 177, 1335–1346. <https://doi.org/10.1007/s00024-020-02433-z>
- Wang Y, Maeda T, Satake K, Heidarzadeh M, Su H, Sheehan AF, Gusman AR. (2019). Tsunami Data Assimilation Without a Dense Observation Network, *Geophys. Res. Lett.*, 46 (4): 2045-2053.
- Feucht DW, Bedrosian PA, Sheehan AF. (2019), Lithospheric Signature of Late Cenozoic Extension in Electrical Resistivity Structure of the Rio Grande Rift, New Mexico, USA, *J. Geophys. Res.- Solid Earth*, 124 (3) (March 01, 2019): 2331-2351.
- Yarce J, Sheehan AF, et al. (2019), Seismicity at the Northern Hikurangi Margin, New Zealand, and investigation of the potential spatial and temporal relationships with a shallow slow slip event. *J. Geophys. Res. Solid Earth*, 124 (5), 4751-4766.
- Schulte-Pelkum V, Monsalve G, Sheehan AF, Shearer P, Wu F, Rajaure S. (2019) Mantle earthquakes in the Himalayan collision zone, *Geology*. 47 (9), 815-819.
- Warren-Smith E, Fry B, Wallace L, Chon E, Henrys S, Sheehan A, et al. (2019), Episodic stress and fluid pressure cycling in subducting oceanic crust during slow slip *Nature Geoscience*, 12 (6), 475-481.
- Murray, K., M. Murray, and A. Sheehan (2018), Active deformation near the Rio Grande Rift and Colorado Plateau as measured by continuous GPS, *Journal of Geophysical Research: Solid Earth*, 123, <https://doi.org/10.1029/2018JB016626>.
- Sheehan, A. F., A. R. Gusman, and K. Satake (2019), Improving forecast accuracy with tsunami data assimilation: The 2009 Dusky Sound, New Zealand, tsunami, *Journal of Geophysical Research: Solid Earth*, 124, <https://doi.org/10.1029/2018JB016575>.
- Todd, E. K., Schwartz, S. Y., Mochizuki, K., Wallace, L. M., Sheehan, A. F., et al. (2018). Earthquakes and tremor linked to seamount subduction during shallow slow slip at the Hikurangi Margin, New Zealand. *Journal of Geophysical Research: Solid Earth*, 123. <https://doi.org/10.1029/2018JB016136>
- Zietlow, D. W., A. F. Sheehan, and M. J. Bernardino (2018), Teleseismic S-wave tomography of South Island, New Zealand upper mantle, *Geosphere*, 14(3), 1343-1364, doi:10.1130/GES01591.1.
- Feucht, D. W., A. F. Sheehan, and P. A. Bedrosian (2017), Magnetotelluric imaging of lower crustal melt and lithospheric hydration in the Rocky Mountain Front transition zone, Colorado, USA, *J. Geophys. Res.: Solid Earth*, 122, 9489-9510, doi:10.1002/2017JB014474.
- Nakai, J., M. Weingarten, A. F. Sheehan, S. L. Bilek, S. Ge. (2017), Understanding spatial patterns of small-magnitude earthquakes in the Raton Basin from 2008-2010 in the context of larger magnitude historical and post-2010 seismicity, *Journal of Geophysical Research: Solid Earth*, 122, 8051-8065, <https://doi.org/10.1002/2017JB014415>.
- Brown, M.R.M., S. Ge, A. F. Sheehan, J. Nakai (2017), Evaluating the effectiveness of induced seismicity mitigation: Numerical modeling of wastewater injection near Greeley, Colorado, *J. Geophys. Res. Solid Earth*, 122, doi:10.1002/2017JB014456.
- Yeck, W.L., A.F. Sheehan, J.C. Stachnik, F.C. Lin (2017), Offshore Rayleigh group velocity observations of the South Island, New Zealand, from ambient noise data, *Geophysical Journal International*, v. 209, 827-841, 2017, doi: 10.1093/gji/ggx054
- Nakai, J. S., A. F. Sheehan, and S. L. Bilek (2017), Seismicity of the Rocky Mountains and Rio Grande Rift from the EarthScope Transportable Array and CREST temporary seismic networks, 2008–2010, *J. Geophys. Res. Solid Earth*, 122, doi:10.1002/2016JB013389.
- Gusman, A. R., I. E. Mulia, K. Satake, S. Watada, M. Heidarzadeh, and A. F. Sheehan (2016), Estimate of tsunami source using optimized unit sources and including dispersion effects during tsunami propagation: The 2012 Haida Gwaii earthquake, *Geophys. Res. Lett.*, 43, 9819–9828, doi:10.1002/2016GL070140.
- O'Rourke, C. T., G. E. Baker, and A. F. Sheehan (2016), Using P/S Amplitude Ratios for Seismic Discrimination at Local Distances, *Bulletin of the Seismological Society of America*, v. 106, no. 4, doi:10.1785/0120160035.
- Yeck, W. L., A. F. Sheehan, H. M. Benz, M Weingarten, J Nakai (2016), Rapid response, monitoring, and mitigation of induced seismicity near Greeley, Colorado, *Seismological Research Letters*, v. 87, no. 4, July/August 2016, doi:10.1785/0220150275.
- Wallace, L. M., S. C. Webb, Y. Ito, K. Mochizuki, R. Hino, S. Henrys, S. Y. Schwartz, A. F. Sheehan (2016), Slow slip near the trench at the Hikurangi subduction zone, New Zealand, *Science*, 06 May 2016, Vol. 352, Issue 6286, pp. 701-704, DOI: 10.1126/science.aaf2349
- Ball, J. S., A. F. Sheehan, J. C. Stachnik, F.-C. Lin, W. L. Yeck, and J. A. Collins (2016), Lithospheric shear velocity structure of South Island, New Zealand, from amphibious Rayleigh wave tomography, *J. Geophys. Res. Solid Earth*, 121, 3686–3702, doi:10.1002/2015JB012726.
- Zietlow, D. W., P. H. Molnar, and A. F. Sheehan (2016), Teleseismic P wave tomography of South Island, New Zealand upper mantle: Evidence of subduction of Pacific lithosphere since 45 Ma, *J. Geophys. Res. Solid Earth*, 121, 4427–4445, doi:10.1002/2015JB012624.

- Gusman, A. R. A. F. Sheehan, K. Satake, M. Heidarzadeh, I. E. Mulia, and T. Maeda (2016), Tsunami data assimilation of Cascadia seafloor pressure gauge records from the 2012 Haida Gwaii earthquake, *Geophysical Research Letters*, vol. 43, issue 9, p. 4189-4196, doi:10.1002/2016GL068368.
- O'Rourke, C. T., A. F. Sheehan, E. A. Erslev, and M. L. Anderson (2015), Small-Magnitude Earthquakes in North-Central Wyoming Recorded during the Bighorn Arch Seismic Experiment Bulletin of the Seismological Society of America, vol. 106, no. 1, p. 281-288, doi:10.1785/0120150114
- Worthington, L. L., K. C. Miller, E. A. Erslev, M. L. Anderson, K. R. Chamberlain, A. F. Sheehan, W. L. Yeck, S. H. Harder, and C. S. Siddoway (2015), Crustal structure of the Bighorn Mountains region: Precambrian influence on Laramide shortening and uplift in north-central Wyoming, *Tectonics*, 34, doi:10.1002/2015TC003840.
- Sheehan, A. F., A. R. Gusman, M. Heidarzadeh, and K. Satake (2015), Array observations of 2012 Haida Gwaii tsunami using Cascadia Initiative absolute and differential seafloor pressure gauges, *Seismological Research Letters*, v. 86, no. 5, September/October 2015, doi: 10.1785/0220150108.
- Karalliyadda, S. C., M. K. Savage, A. Sheehan, J. Collins, D. Zietlow, and A. Shelley (2015), S-wave splitting in the offshore South Island, New Zealand: Insights into plate-boundary deformation, *Geochem. Geophys. Geosyst.*, 16, doi:10.1002/2015GC005882.
- McGarr, A., B. Bekins, N. Burkardt, J. Dewey, P. Earle, W. Ellsworth, S. Ge, S. Hickman, A. Holland, E. Majer, J. Rubinstein, and A. Sheehan (2015), Coping with earthquakes induced by fluid injection, *Science*: 347 (6224), 830-831. (DOI:10.1126/science.aaa0494).
- Ball, J. S., A. F. Sheehan, J. C. Stachnik, F.-C. Lin, and J. A. Collins (2014), A joint Monte Carlo analysis of seafloor compliance, Rayleigh wave dispersion and receiver functions at ocean bottom seismic stations offshore New Zealand, *Geochem. Geophys. Geosyst.*, 15, 5051-5068, doi:10.1002/2014GC005412.
- Yeck, W. L., A. F. Sheehan, M. Anderson, E. A. Erslev, K. C. Miller, C. S. Siddoway (2014), Structure of the Bighorn Mountain region from teleseismic receiver function analysis: Implications for the mechanics of Laramide shortening, *J. Geophys. Res.*, 119, doi:10.1002/2013JB010769.
- Godin, O. A., N. A. Zlotin, A. F. Sheehan, and J. A. Collins (2014), Interferometry of infragravity waves off New Zealand, *J. Geophys. Res.-Oceans*, 119, doi:10.1002/2013JC009395, 2014.
- Sheehan, A. F., T. L. de la Torre, G. Monsalve, G. A. Abers, and B. R. Hacker (2014), Physical state of Himalayan crust and uppermost mantle: Constraints from seismic attenuation and velocity tomography, *J. Geophys. Res. Solid Earth*, 119, doi:10.1002/2013JB010601.
- Zietlow, D. W., A. F. Sheehan, P. H. Molnar, M. K. Savage, G. Hirth, J. A. Collins, and B. H. Hager (2014), Upper mantle seismic anisotropy at a strike slip boundary: South Island, New Zealand, *J. Geophys. Res. Solid Earth*, 119, doi:10.1002/2013JB010676.
- O'Rourke, C., A. Sheehan, E. Erslev, and K. Miller (2013), Estimating Basin Thickness using a high density passive source geophone array, *Earth & Planetary Science Letters*, <http://dx.doi.org/10.1016/j.epsl.2013.10.035>.
- Yeck, W., L., A. F. Sheehan, and V. Schulte-Pelkum (2013), Sequential H-K Stacking to obtain accurate crustal thicknesses beneath sedimentary basins, *Bulletin of the Seismological Society of America*, vol. 103, no. 3, p. 2142-2150, doi: 10.1785/0120120290.
- Godin, O. A., N. A. Zlotin, A. F. Sheehan, Z. Yang, and J. A. Collins (2013), Power spectra of infragravity waves in a deep ocean, *Geophysical Research Letters*, V. 40, no. 10, p. 2159-2165, doi: 10.1002/grl.50418.
- Wech, A.G., A. F. Sheehan, C. M. Boese, J. Townend, and T. A. Stern (2013), Tectonic tremor recorded at ocean bottom seismometers, *Seismological Research Letters*, 84(5), p. 752-758, doi: 10.1785/0220120184.
- Boese, C.M., T. A. Stern, J. Townend, S. Bourguignon, A. Sheehan, and E. G. C. Smith (2013), E.G.C., Sub-crustal earthquakes within the Australia-Pacific plate boundary zone beneath the Southern Alps, New Zealand, *Earth and Planetary Science Letters*, 376, p. 212-219.

Courses Taught

Introduction to Physical Geology (GEOL 1010); Our Deadly Planet (GEOL 1170) ; Principles of Geophysics (GEOL 4130, GEOL 3330); Field Geophysics (GEOL 4714/5714); Geophysical Inverse Theory (GEOL/PHYS 6670); Graduate Seminar in Geophysics (GEOL/PHYS/ASTR 6650); Grad Seminar: Induced Earthquakes; Grad Seminar: Magnetotellurics; Grad Seminar: Geomagnetism; Grad Seminar: Earthquake Source Mechanics ; Grad Seminar: Earthquake Seismology; Earth and Planetary Physics I, Seismology (GEOL/PHYS/ASTR 6610)

Professional Service

EarthScope Board of Directors, 2023

Incorporated Research Institutions for Seismology (IRIS) Chair, Ocean Bottom Instrumentation Pool Oversight Committee (OBSIP OC), 2015-2019; IRIS Board of Directors, 2005-2008; Passcal Committee, GSN Committee.

UNAVCO Board of Directors, 2022

EarthScope EarthScope Speaker, 2013; Pre-GSA EarthScope workshop organizer, 2013;

EarthScope National Meeting, Organizing Committee, 2009

American Geophysical Union Seismology Section President, 2019-2020; Seismology Section President-elect, 2017- 2018
Seismology Section Fellows committee, 2016- 2018; Paul Silver Award Committee, 2017-2020

Gutenberg Lecture Committee, 2014-2015, 2020, Seismology Section Canvassing Committee 2022
State of Colorado Testimony regarding induced seismicity, COGCC hearing, 2014, 2020
Colorado Earthquake Hazard Mitigation Council, 2000-2009; State of Colorado, Colorado Earthquake Resilience
Investigation Working Group, CDPS (Colorado Department of Public Safety) 2022-2023
United States Geological Survey (USGS) National Earthquake Hazard Program Review Panels, 2019, 2021
National Science Foundation Review Panels 2006, 2011-2013, 2015, 2020