
Curriculum Vitae

Michael S. Thorne

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Professional Preparation

University of Alaska, Fairbanks	Seismology	Post Doc	2006-2007
Arizona State University	Geological Sciences	Ph.D.	2000-2005
Indiana University	Physics	B.S.	1996

Professional Appointments

07/2014 – present	Associate Professor Dept. of Geology & Geophysics, University of Utah
01/2008 – 06/2014	Assistant Professor Dept. of Geology & Geophysics, University of Utah
03/2006 – 12/2007	Post-Doctoral Research Fellow Arctic Region Supercomputing Center and Geophysical Institute, University of Alaska Fairbanks
08/2000-10/2005	Graduate Research and Teaching Assistant Dept. of Geological Sciences, Arizona State University

Research Interests

- Global seismic wave propagation
- Global seismic structure and dynamics of the Earth and Moon
- Core-mantle boundary structure
- Seismic array processing
- Environmental geophysics

Field Experience

2006 - 2008	MOOS – Multidisciplinary Onshore Observations for Subduction
2003 - 2005	CANOE - Canadian Northwest Experiment
2002 - 2005	COARSE - Consortium for an Arizona Reconnaissance Seismic Experiment
2004	LA RISTRA 1.5 - Colorado Plateau/Rio Grande Rift Seismic Transect Experiment

Professional Service

Peer referee	<i>Geophys. J. Int., Geophys. Res. Lett., J. Geophys. Res., Phys. Earth Planet. Int., Survey of Geophysics, Bulletin of the Seismological Society of America, Geophysics, AGU Books, Pure and Applied Geophysics, Frontiers, Nature Communications, Science, Science Advances, Nature Geoscience, Nature.</i>
Peer reviewer	NSF – Geophysics, NSF – Earthscope, NSF – CSEDI, NSF – Frontiers in Earth System Dynamics, NSF – Software Infrastructure for Sustained Innovation, DFG – German Research Foundation
Panelist	USGS – National Earthquakes Hazard Reduction Program (NEHRP); NSF – Geophysics (3×); NSF - CSSI Frameworks.
Committees	IRIS – Global Seismic Network standing committee (2011-2013); UU IRIS Institutional Representative (2010-2015); IRIS – Education and Public Outreach Standing Committee (2017-2020); IRIS Board nomination committee (2015); COMPRES institutional representative (2015-present). IRIS – EPOSC representative to International Development Seismology Committee (2017-2020). UU Institutional Representative to Earthscope Consortium (2022-present).

Professional Affiliations

- American Geophysical Union
- Seismological Society of America

Honors and Awards

2016	Outstanding Academic Visitor Award – University of Leeds
2015	Visiting Associate Professorship –Earthquake Research Institute, University of Tokyo
2014	Dept. G&G outstanding researcher of the year award
2011	2011 GJI outstanding reviewer of the year
2005	University Graduate Scholarship, Arizona State University
2001	Robert S. Dietz Scholarship, Arizona State University
1996	Sigma Pi Sigma National Physics Honor Society, Indiana University
1995	Golden Key National Honor Society, Indiana University

Internships

2005	Internship Program for Ph.D. students – Lawrence Livermore National Laboratory
1995	U.S. Dept. of State Summer Intern - Science and Technology Office U.S. Embassy, New Delhi, India

Courses Taught

GEO 3010	Geophysics	2008-2014, 2017, 2019-2021, 2023
GEO 3110	Dynamic Earth	2022

GEO 5210/6211	Seismology I	2008, 2010, 2013, 2016-2018, 2020-23
GEO 5060/6061	Global Geophysics	2009, 2012, 2014, 2015, 2018
GEO 5920/6920	ST: Seismic Array Processing	2009
GEO 5920/6920	ST: High Performance Computing in the Physical Sciences	2010, 2014
GEO 5920/6920	Introduction to Linux Computing	2023

Graduate Student Mentoring

Simin Huang	M.S.	co-advisor (w/ Pankow)	Defended 2010.
Sam Brown	Ph. D.	primary advisor	Defended March 22, 2013
Kevin Jensen	M.S.	primary advisor	Defended March 1, 2013
Mark Hale	M.S.	co-advisor (w/ Pankow)	Defended May 31, 2013
Yao Yao	Ph. D.	primary advisor	Defended MS May 10, 2013. Defended PhD in May, 2016.
Stefanie Whitaker	M.S.	primary advisor	Defended June 5, 2014

Post-doc Mentoring

Surya Pachhai	Post-doc	2019 - present
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Visiting PhD student Mentoring

Hannah Bentham	PhD	2013	Visiting researcher for 6 months from U. Leeds.
James Ward	PhD	2019	Visiting researcher for 6 months from U. Leeds.

Undergraduate Student Mentoring

Kevin Jensen	UROP – Undergraduate Research Opportunities Program	2008
Hobie Willis	Senior Thesis	2010-2011
Chris Volk	Undergraduate Research	2011-2012
Avery Waller	UROP	2012-2013
Clay Woods	Undergraduate Research	2017-2018
Justin Krier	2 UROP's and Undergraduate Research Assistant	2019-2020
Boe Ericksen	UROP and Undergraduate Research Assistant	2020-2021
Madeleine Festin	Undergraduate Research Assistant	2022-present
Mason Jacketta	Undergraduate Research Assistant	2022-present

Student Honors

Kevin Jensen	Bamberger Fellow award for top three research projects	2008
Samuel Brown	GG dept. outstanding PhD student award	2013

Graduate Student Committees

Student	Degree	Graduation Year	Advisor
Tori Pavlovics	MS	Current	Lippert
Mo Tau	PhD	Current	Zhdanov
Justin Tully	PhD	Current	C. Johnson
Qicheng Zheng	PhD	Current	Lin
Samantha Couper	PhD	2021	Miyagi
Elizabeth Berg	PhD	2021	Lin
Ben Grober	MS	2020	Zhdanov
Xiaolei Tu	PhD	2020	Zhdanov
Guanning Pang	PhD	2021	Koper
Sin-Mei Wu	PhD	2020	Lin
Feng Lin	PhD	2019	Miyagi
Yadong Wang	PhD	2019	Lin
Paul Geimer	PhD	2021	Moore
Trish Pedersen	MS	2018	Moore
Alison Starr	MS	2015	Moore
Adam Olsen	PhD	2018	B.J. McPherson
Michael Jorgensen	MS, PhD	2019, 2020	Zhdanov
Daeong Yoon	MS, PhD	2012, 2016	Zhdanov
Oner Sufri	PhD	Spring 2015	Koper
Marie Green	PhD	2013 or 2014?	Zhdanov
Zhengwei Xu	PhD	2013	Zhdanov
Christian Hardwick	MS	2012	Chapman
Hongzhu Cai	MS, PhD	2011, 2015	Zhdanov
Jamie Farrell	PhD	2013	Smith
Wei Dai	PhD	2012	Schuster
Xin Wang	PhD	2014	Schuster
Imam Raharjo	PhD	2011	Chapman
Weiping Cao	PhD	2009	Schuster
Shengdong Liu	MS	2009	Schuster
Yanwei Xue	PhD	2009	Schuster
Eric Sahn	MS	2008	Chapman
Bryce Johnson	MS	Incomplete	Chapman

Invited Talks/Seminars

2022	Invited speaker for Neutrino Factory, Multi-Messenger Tomography of the Earth Workshop
2021	Carnegie Institution for Science, Earth and Planets Seminar
2021	Plenary speaker for SAGE/GAGE workshop
2016	Westfälisch Wilhelms Universität, Münster, Germany, Geophysics Seminar

2016 University of California, Berkeley Seismo Seminar
 2016 Lawrence Livermore National Laboratory Seminar
 2015 Speaker at Ocean Hemisphere Research Center Seminar, Earthquake Research Institute, University of Tokyo
 2015 Keynote speaker at Earthscope National Meeting
 2015 Princeton University Dept. Seminar
 2014 University of California, Berkeley Seismo Seminar
 2014 University of Montana Dept. Colloquium
 2013 Invited Speaker UU Research Administration Nakama Program
 2013 Invited Speaker Global Arrays of BB Arrays Workshop, Raleigh, NC
 2012 Utah Valley University Earth Science Seminar
 2011 Invited Speaker AGU Fall 2012 in Deep Mantle Processes
 2011 Invited Speaker Cutting Edge Workshop: Visualizing Seismic Waves
 2010 Invited Speaker AGU Fall 2010 in Mineralogical Research of the Lower Mantle.
 2010 University of British Columbia Dept. Seminar
 2010 Scientist in the Spotlight – University of Utah Museum of Natural History
 2009 Science Movie Night – Salt Lake City Public Library
 2007 University of Utah Distinguished Lecture Series
 2006 University of Alaska Fairbanks Dept. Seminar
 2005 Lawrence Livermore National Laboratory Seismo Seminar
 2005 Caltech Dept. Seminar

International Collaboration

Visit	Location	Professor
2016	University of Leeds, Leeds, United Kingdom	Sebastian Rost
2016	Westfälisch Wilhelms Universität, Münster, Germany	Christine Thomas
2015	Earthquake Research Institute, University of Tokyo	Hitoshi Kawakatsu
2012	University of Leeds, Leeds, United Kingdom	Sebastian Rost
2002, 2003, 2004	Ludwig-Maximilians Universität, München, Germany	Heiner Igel

Refereed Publications (*denotes my advisee as author)

- Pachhai, S.*, Thorne, M.S., and Rost, S. (2024) Examining the influence of 2.5-D ultra-low velocity zone morphology on ScP waveforms and estimated elastic parameters, *Geophysical Journal International*, in review.
- Festin, M.*, Thorne, M.S., and Li, M. (2024) Evidence for ultra-low velocity zone genesis in downwelling subducted slabs at the core-mantle boundary, *The Seismic Record*, in review.
- Thorne, M.S., Pachhai, S., Li, M. (2024) MORB melt pockets identified as sources of PKP scattering in the lowermost mantle beneath North America and the western Pacific Ocean, in review.

- Ward, J.*, Nowacki, A., Thorne, M.S., and Rost, S. (2023) Upper mantle structure beneath the contiguous US resolved with array observations of SKS multipathing and slowness vector perturbations, *Journal of Geophysical Research*, **128**, doi: 10.1029/2022JB026260.
- Pachhai, S.*, Thorne, M.S., and Rost, S. (2023) Improved characterization of ultralow-velocity zones through advances in Bayesian inversion of ScP waveforms, *Journal of Geophysical Research*, **128**, doi: 10.1029/2023JB026415.
- Pachhai, S.*, Thorne, M.S., and Nissen-Meyer, T. (2022) Quantification of small-scale heterogeneity at the core-mantle boundary using sample entropy of SKS and SPdKS synthetic waveforms, *Minerals*, **12**, 813, doi:10.3390/min12070813.
- Pachhai, S.*, Li, M., Thorne, M.S., Dettmer, J., and Tkalcic, H. (2022) Internal structure of ultralow-velocity zones consistent with origin from a basal magma ocean, *Nature Geoscience*, **15**, 79-84, doi: 10.1038/s41561-021-00871-5.
- Krier, J*., Thorne, M.S., Leng, K., and Nissen-Meyer, T. (2021) A compositional component to the Samoa ultralow-velocity zone revealed through 2- and 3-D waveform modeling of SKS and SKKS differential travel-times and amplitudes, *Journal of Geophysical Research - Solid Earth*, **126**, 1-20, doi: 10.1029/2021JB021897.
- Ward, J.*, Thorne, M.S., Nowacki, A., and Rost, S. (2021) Automatic slowness vector measurements of seismic arrivals with uncertainty estimates using bootstrap sampling, array methods and unsupervised learning, *Geophysical Journal International*, **226** (3), 1847-1857, doi: 10.1093/gji/ggab196.
- Thorne, M.S., Leng, K., Pachhai*, S., Rost, S., Wicks, J.K., and Nissen-Meyer, T. (2021) The most parsimonious ultralow-velocity zone distribution from highly anomalous SPdKS waveforms, *Geochemistry, Geophysics, Geosystems (G³)*, doi: 10.1029/2020GC009467.
- Thorne, M.S., *Pachhai, S., Leng, K., Wicks, J.W., Nissen-Meyer, T. (2020) New candidate ultralow-velocity zone locations from highly anomalous SPdKS waveforms, *Minerals, Special Issue: Properties of Melt and Minerals at High Pressures and Temperatures*, **10**, 221, pp. 1-24, doi: 10.3390/min10030211.
- Thorne, M.S., Takeuchi, N., and Shiomi, K. (2019) Melting at the edge of a slab in the deepest mantle, *Geophysical Research Letters*, **46**, 8000-8008, doi: 10.1029/2019GL082493.
- Moore, J.R., Geimer, P.R., Finnegan, R., and Thorne, M.S. (2018) Use of seismic resonance measurements to determine the elastic modulus of freestanding rock masses, *Rock Mechanics and Rock Engineering*, 1-8, doi: 10.1007/s00603-018-1554-6.
- Haugland, S.M., Ritsema, J., Kaneshima S., and Thorne, M.S. (2017) Estimate of the rigidity of eclogite in the lower mantle from waveform modeling of broadband S-to-P wave conversions, *Geophysical Research Letters*, **44**, doi: 10.1002/2017GL075463.

- Bentham, H.L.M., Rost, S., and Thorne, M.S. (2017) Fine-scale structure of the mid-mantle characterized by global stacks of PP precursors, *Earth and Planetary Science Letters*, 472, 164-173 doi: 10.1016/j.epsl.2017.05.027.
- Vanacore, E.A., Rost, S., and Thorne, M.S. (2016) Ultralow-velocity zone geometries resolved by multi-dimensional waveform modeling, *Geophysical Journal International*, 206, 659-674, doi: 10.1093/gji/ggw114.
- *Whittaker, S., Thorne, M.S., Schmerr, N.C., and Miyagi, L. (2016), Seismic array constraints on the D" discontinuity beneath Central America, *Journal of Geophysical Research - Solid Earth*, 120, 1-18, doi: 10.1002/2015JB012392.
- Moore, J.R., Thorne, M.S., Koper, K.D., Wood, J.R., Goddard, K., Burlacu, R., Doyle, S., Stanfield, E., and White, B. (2016) Anthropogenic sources stimulate resonance of a natural rock bridge, *Geophysical Research Letters*, 43, doi: 10.1002/2016GL070088.
- *Yao, Y., *Whittaker, S., and Thorne, M.S. (2015) D" discontinuity structure beneath the North Atlantic from *Scd* observations, *Geophysical Research Letters*, 42, 1-9, doi: 10.1002/2015GL063989.
- Starr, A.M., Moore, J.R. and Thorne, M.S. (2015) Ambient resonance of Mesa Arch, Canyonlands National Park, Utah, *Geophysical Research Letters*, 42, 1-7, doi: 10.1002/2015GL064917.
- *Brown, S., Thorne, M.S., Miyagi, L., and Rost, S. (2015) A compositional origin to ultralow velocity zones, *Geophysical Research Letters*, 42, 1-7, doi: 10.1002/2014GL062097.
- *Jensen, K.J., Thorne, M.S., and Rost, S. (2013), SPdKS analysis of ultralow-velocity zones beneath the western Pacific, *Geophysical Research Letters*, 40, 1-5, doi: 10.1002/grl.50877.
- *Brown, S. and Thorne, M.S. (2013), Viterbi Sparse Spike Detection, *Geophysics*, 78 (4), 1-13, doi: 10.1190/GEO2012-0209.1.
- Schmerr, N.C., Kelly, B.M., and Thorne, M.S., (2013), Broadband array observations of the 300 km seismic discontinuity, *Geophysical Research Letters*, 40, 1-6, doi: 10.1002/grl.50257.
- Thorne, M.S., Crotwell, H.P., and Jahnke, G. (2013), An educational resource for visualizing the global seismic wavefield, *Seismological Research Letters*, 84 (4), 1-7, doi: 10.1785/0220120134.
- Thorne, M.S., Zhang, Y., and Ritsema, J. (2013), Evaluation of 1D and 3D seismic models of the Pacific lower mantle with S, SKS, and SKKS traveltimes and amplitudes, *Journal of Geophysical Research*, 118, 1-11; doi: 10.1002/jgrb.50054.
- Thorne, M.S., Garnero, E.J., Jahnke, G., Igel, H., McNamara, A.K. (2013), Mega Ultra Low Velocity Zone and Mantle Flow, *Earth and Planetary Science Letters*, 364, 59-67, doi: 10.1016/j.epsl.2012.12.034.

- Ford, S. R., Garnero, E.J., Thorne, M.S., (2012), Differential t^* measurements via instantaneous frequency matching: Observations of lower mantle shear attenuation heterogeneity beneath western Central America, *Geophysical Journal International*, 189, doi: 10.1111/j.1365-246X.2011.05348.x.
- Rost, S., Garnero, E.J., Thorne, M.S., Hutko, A.R. (2010), On the absence of an ultralow-velocity zone in the North Pacific, *Journal of Geophysical Research*, 115, B04312, doi:10.1029/2009JB006420.
- Zhang, Y., Ritsema, J., and Thorne, M. (2009) Modeling the ratios of SKKS and SKS amplitudes with ultra-low velocity zones at the core-mantle boundary, *Geophysical Research Letters*, 36, L19303, doi:10.1029/2009GL040030.
- Jahnke, G., Thorne, M.S., Cochard, A., and Igel, H., (2008) Global SH-wave propagation using a parallel axi-symmetric finite-difference scheme: application to whole mantle scattering, *Geophysical Journal International*, doi: 10.1111/j.1365-246X.2008.03744.x.
- Yang, X., Xie, X.-B., Lay, T., and Thorne, M.S., (2007) Geometric spreading of P_N and S_N in a spherical Earth: I. Constant velocity mantle lid, *Bulletin of the Seismological Society of America*, 97, doi: 10.1785/0120070031.
- Thorne, M.S., Lay, T., Garnero, E.J., Jahnke, G., and Igel, H., (2007) Seismic imaging of the laterally varying D" region beneath the Cocos Plate, *Geophysical Journal International*, 170, pp. 635-648, doi: 10.1111/j.1365-246X.2006.03279.x.
- Garnero, E.J., and Thorne, M.S., (2007) Earth's ULVZ: Ultra-Low Velocity Zone, In: *Encyclopedia of Geomagnetism and Paleomagnetism* (David Gubbins and Emilio Herrero-Bervera, Editors), Kluwer Publishing, The Netherlands.
- Garnero, E.J., Thorne, M.S., McNamara, A., and Rost, S., (2007) Fine scale ultra-low velocity zone layering at the core-mantle boundary and superplumes, In: D. Yuen et al. (ed), *Superplumes: Beyond Plate Tectonics*, Springer, New York, pp. 139-158.
- Lay, T., Hernlund, J., Garnero, E.J., and Thorne, M.S., (2006) A lens of post-perovskite and CMB heat flux in an iron-rich pile in D" beneath the Central Pacific, *Science*, 314, 1272-1276.
- Rost, S., Thorne, M.S., and Garnero, E.J. (2006), Imaging global seismic phase arrivals by stacking array processed short-period data, *Seismological Research Letters*, 77 (6).
- Thorne, M.S. (2005), Broadband waveform modeling of deep mantle structure, *Ph.D. Dissertation*, Arizona State University.
- Thorne, M.S., and E.J. Garnero (2004), Inferences on ultralow-velocity zone structure from a global analysis of SPdKS waves, *Journal of Geophysical Research – Solid Earth*, 109, B08301, doi:10.1029/2004JB003010.
- Thorne, M.S., Garnero, E.J., and S. Grand (2004), Geographic correlation between hot spots and deep mantle lateral shear-wave velocity gradients, *Physics of the Earth and Planetary Interiors*, 146, 47-63.

- Ashbridge, D.A., Thorne, M.S., Rivers, M.L., Muccino, J.C., and O'Day, P.A. (2003), Image optimization and analysis of synchrotron X-ray computed microtomography (CμT) data, *Computers & Geosciences* 29 (7), 823-836.

Published Software

- Thorne, M. S. (2018), SACTOOLS v1.0.0, *Zenodo*, doi:10.5281/zenodo.1314738.

Grants Funded

Title	Agency	Funds	Duration	Role/ Collaborators Sole PI
<i>Interferometric Imaging of Deep Mantle Reflectors Beneath the Western US.</i> NSF/EAR-0952187.	NSF - Earthscope	\$155,000	2010-2011	Sole PI
<i>Collaborative Research: Bridging the gap between long- and short-wavelength structure in the mantle.</i> NSF/EAR-1014749.	NSF - Geophysics	\$199,000 (UU)	2010-2012	Lead PI Co-PI: J. Ritsema (U. Michigan)
<i>A seismic investigation of the Lunar Interior.</i> NASA/NNX11AH47G.	NASA - LASER	\$125,000 (UU)	2010-2012	Lead PI Co-PI: Rene Weber (USGS Flagstaff), M. Fouch (ASU)
<i>Structural Health Monitoring of Natural Landmarks</i>	UU Seed Grant Program	\$31,750	2014-2015	Co-PI Lead PI: Jeff Moore
<i>Collaborative Research: Deep Mantle Cycling of Oceanic Crust.</i> NSF/EAR-1401097.	NSF – CSEDI	\$24,000 (UU) \$564,000 (total)	2014-2018	Co PI. Lead PIs: Garnero, McNamara, Shim (ASU)
<i>Structural Health Monitoring of Rock Arches.</i> NSF/EAR-1424896.	Co-Sponsored: NSF Geomorphology and Landuse Dynamics AND NSF Geophysics	\$355,109 (UU)	2015-2018	Co PI. Lead PI: Jeff Moore

<i>NSFGEO-NERC: Global ultralow-velocity zone properties from seismic waveform modeling.</i> NSF/EAR-1723081.	NSFGEO- NERC.	\$448,323 (UU)	2017-2021	Lead PI. Co PI: Tarje Nissen-Meyer (Oxford)
<i>NSFGEO-NERC: Global ultralow-velocity zone properties from seismic waveform modeling, 1-year extension.</i> NSF/EAR-2139966	NSFGEO- NERC	\$123,668 (UU)	2021-2022	Lead PI.
<i>Global search for D'' discontinuity structure.</i> NSF/EAR -2132400	NSF Geophysics	\$343,014 (UU)	2022-2025	Sole PI.
<i>The future of glaciers using a novel, multi-disciplinary approach</i>	Wilkes Center for Climate Science and Policy	\$25,000	2023-2024	Co PI. PI: Anderson
<i>RAPID: Investigating spatiotemporal groundwater variations in the Wasatch Front using geophysical methods</i>	NSF Rapid	\$49,979 (UU)	2023-2024	Co PI. PI: Lin

Conference Proceedings since 2008

- McNamara, A.K., Garnero, E.J., Rost, S., **Thorne, M.S.** (2008), Dynamics of the ultralow velocity zone (Fall AGU, San Francisco, CA).
- Lay, T., Hutko, A.R., Garnero, E.J., **Thorne, M.S.** (2008), Modeling and interpretation of localized P-wave and S-wave reflectivity in D'' (Fall AGU, San Francisco, CA).
- **Thorne, M.S.**, Garnero, E.J., McNamara, A.K., Jahnke, G., Igel, H. (2008) Broadband SPdKS waveforms reveal ULVZ ridge in the central Pacific (Fall AGU, San Francisco, CA).
- Hayward, C., Pankow, K.L., **Thorne, M.S.** (2008) Observations of infrasound-to-seismic coupling at Earthscope stations using co-located infrasound microphones (Fall AGU, San Francisco, CA).
- **Thorne, M.S.** (2009), On the relationship between deep mantle chemical piles and ultralow-velocity zones (Earthscope meeting, Boise, ID).
- Garnero, E.J., and **Thorne, M.S.** (2009) USArray data support whole mantle convection (Earthscope National Meeting, Boise, ID).

- Zhang, Y., Ritsema, J. and **Thorne, M.S.** (2009), SKKS/SKS amplitude ratios and ULVZs, (Gordan Conference, Mt. Holyoke, MA).
- Garnero, E.J., and **Thorne, M.S.** (2009) present day mantle flow revealed by seismology (Gordan Conference, Mt. Holyoke, MA).
- **Thorne, M.S.**, Fouch, M.J., and Garnero E.J. (2009) Computation of realistic Lunar Seismograms, (Ames Lunar Planetary Conference, Moffett Field, CA).
- Garnero, E.J., Rost, S., McNamara, A., **Thorne, M.S.** (2009). Tracking mantle chemistry with ultra-low velocity zones (Fall AGU, San Francisco, CA).
- Fouch, M.J., E.J. Garnero, **M.S. Thorne**, P. Lin, N. Schmerr, R. Weber, M.S. Robinson, and H. Yu, (2010) Small aperture lunar seismic arrays (SALSAs) (Lunar and Planetary Institute, Houston, TX).
- **Thorne, M.S.**, N. Schmerr, R. Weber, M.J. Fouch and E. J. Garnero (2010) Analysis of seismic scattering on the Moon by waveform modeling (Lunar and Planetary Institute, Houston, TX).
- Huang, S., Pankow, K., **Thorne, M.S.**, (2010) Characterization of shallow seismic velocity structure in southwestern Utah using spatial autocorrelation (Seismological Society of America, Portland, OR).
- Garnero, E.J, **Thorne, M.S.**, McNamara, A.K., and Rost, S. (2010) Ultra-low velocity zones and mantle dynamics (Studies of Earth's Deep Interior, Santa Barbara, CA).
- **Thorne, M.S.**, Garnero, E.J., McNamara, A.K, Igel, H. (2010) Detection of present-day slab-driven mantle flow (**INVITED**, Fall AGU, San Francisco, CA).
- Jensen, K.J., **Thorne, M.S.**, Rost, S., and Nissen-Meyer, T. (2010) Constraining physical properties of ultra-low velocity zones using multiple seismic phases (Fall AGU, San Francisco, CA).
- Rost, S. and **Thorne, M.S.** (2010) Lateral variations in mantle heterogeneity from scattered seismic waves (**INVITED**, Fall AGU, San Francisco, CA).
- Zhao, C., Garnero, E.J., **Thorne, M.S.**, McNamara, A.K. (2010) Fine scale deep mantle structure beneath central Pacific: LLSVP heterogeneity and edge, ULVZ, and CMB topography (Fall AGU, San Francisco, CA).
- Garnero, E.J., Zhao, C., **Thorne, M.S.**, and McNamara, A.K. (2010) Multi-scale lower mantle structure and dynamics (**INVITED**, Fall AGU, San Francisco, CA).
- Anderson, H.R., **Thorne, M.S.**, Schmerr, N.C., Brown, S.P. (2011) Seismic interferometry of the mantle transition zone beneath the western United States (Fall AGU, San Francisco, CA).
- Rost, S., **Thorne, M.S.**, and Earle, P.S. (2011) Mapping the Earth's small scale seismic heterogeneities (**INVITED**, Fall AGU, San Francisco, CA).

- **Thorne, M.S.**, Rost, Sebastian, McNamara, A.K., Hernlund, J., Zhao, C., and Garnero, E.J. (2011) What do seismologists really know about ultra-low velocity zones? (**INVITED**, Fall AGU, San Francisco, CA)
- Schmerr, N., Lin, P., **Thorne, M.S.**, Weber, R., and Garnero, E.J. (2011) Towards simulating a realistic planetary seismic wavefield: The contribution of the megaregolith and low-velocity waveguides (Fall AGU, San Francisco, CA).
- Vanacore, E.A., Rost, S., and **Thorne, M.S.** (2012) Hunting ultra-low velocity zones: constructing a pseudo-automatic method of detection (Studies of Earth's Deep Interior, Leeds, UK).
- Vanacore, E.A., Rost, S. and **Thorne, M.S.** (2012) Mapping small-scale mantle heterogeneities using seismic arrays (Fall AGU, San Francisco, CA).
- **Thorne, M.S.**, Brown, S., and Rost S. (2012) ScP constraints on ultralow-velocity zone parameters using Viterbi Sparse Spike Detection (Fall AGU, San Francisco, CA).
- Weber, R.C., Schmerr, N.C., Garnero, E.J., Lin, P.-Y., **Thorne, M.S.**, Han, S.-C. (2012) GRAIL Refinements to Lunar Seismic Structure (Fall AGU, San Francisco, CA).
- Yao, Y., **Thorne, M.S.**, Weber, R.C., Schmerr, N. (2012) Evaluating 1D seismic models of the lunar interior (Fall AGU, San Francisco, CA).
- Schmerr, N.C., **Thorne, M.S.**, Yao, Y. (2013) Seismic properties of the lunar megaregolith (Lunar and Planetary Science Conference, Houston, TX).
- **Thorne, M.S.**, and Schmerr, N.C. (2013) Broadband array processing of the Scd seismic phase (Earthscope National Meeting, Raleigh, NC).
- **Thorne, M.S.**, Brown, S.P., Miyagi, L., and Rost, S. (2013) Compositional origins of ULVZs (**INVITED**, Fall AGU, San Francisco, CA).
- Whittaker, S., **Thorne, M.S.**, Koper, K.D., and Schmerr, N.C., (2013) Broad array observations of the D" discontinuity (Fall AGU, San Francisco, CA).
- Moore, J., Dorsey, A., Wood, J., **Thorne, M.S.**, and Bilderback, E., (2014) Modal analysis of Landscape and Double-O Arches (Fall AGU, San Francisco, CA).
- Yao, Y., Whittaker, S., and **Thorne, M.S.** (2014) D" discontinuity structure beneath the North Atlantic based on observations from the Deep 2010 Spanish earthquake (Fall AGU, San Francisco, CA).
- Dorsey, A., Moore, J., **Thorne, M.S.**, and Culp, J. (2014) Resonant frequency monitoring at Mesa Arch, Canyonlands National Park (Fall AGU, San Francisco, CA).
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