

Tieyuan Zhu

Last updated: August 29, 2017

<i>Address</i>	Deike 406, Penn State University, University Park, PA 16802
<i>Phone</i>	(650) 308-6506
<i>Email</i>	tyzhu@psu.edu
<i>WWW</i>	http://sites.psu.edu/tzhu

APPOINTMENTS

Assistant Professor of Geophysics <i>Pennsylvania State University, Department of Geosciences</i>	2016-present
Postdoctoral Fellow <i>University of Texas at Austin, Jackson School of Geosciences</i>	2014-2016

EDUCATION

Ph.D. Geophysics <i>Stanford University</i> "Seismic modeling, inversion and imaging in attenuating media" Thesis advisor: Jerry M. Harris	2008-2014
M.S. Geophysics <i>Chinese Academy of Sciences, Institute of Geology and Geophysics</i> "Seismic wave propagation in fractured media"	2005-2008
B.S. Geophysics <i>China University of Geosciences (Beijing)</i>	2001-2005

RESEARCH INTERESTS

Physics of seismic wave propagation in Earth media, Seismic tomography/migration methods, CO2 monitoring, Microseismic imaging, Ground-penetrating radar, Seismic modeling of glacial ice

HONORS AND AWARDS

2014	Distinguished Postdoctoral Fellowship , UT-Austin
2013	Best Student Paper Award (one recipient per year), Society of Exploration Geophysicists
2008,2009,2012	Graduate Fellowships, Stanford University
2005	Best Student Thesis, China University of Geosciences (Beijing)

PEER-REVIEWED JOURNAL PAPERS [[Google Scholar](#)]

Citation statistics from Google Scholar: **Total citations = 398; h-index = 10; i10-index: 11.**
Underline denotes graduate student or post-doctoral fellow authors, * denotes undergraduate student

2017

19. [Sun J.](#) and [Zhu T.](#), “[Stable attenuation compensation in reverse time migration](#)”, *Geophysical Prospecting* Accepted, ().
18. [Zhu T.](#), Ajo-Franklin J., and T. Daley, “[The movement of sequestrated CO2 revealed by continuous seismic attenuation spatial-temporal changes in Frio Site, USA](#)”, *J. Geophys. Res.-Solid Earth* Accepted, (2017).
17. [Zhu T.](#), “[Generalized anisotropic wave propagation for modeling anisotropic attenuation](#)”, *submitted to Geophysics special section: Seismic Anisotropy*, ().
16. [Zhu T.](#) and [Sun J.](#), “[Viscoelastic reverse-time migration with attenuation compensation](#)”, *Geophysics* 82, (in press).
15. [Yao J.](#), [Zhu T.](#), Hussain F., and Kouri D. J., “[Locally solving fractional Laplacian viscoacoustic wave equation using Hermite distributed approximating functional method](#)”, *Geophysics* 82, T59–T67 (2017).

2016

14. [Sun J.](#), Fomel S., [Zhu T.](#), and J. Hu, “[Q-compensated least-squares reverse-time migration using lowrank one-step wave extrapolation](#)”, *Geophysics* 81, S271-S279 (2016).
13. [Zhu T.](#), Carcione J. M., and M. Botelho, “[Reverse-time imaging of ground-penetrating radar and SH-seismic data including the effects of wave loss](#)”, *Geophysics* 81, H21-H32 (2016).
12. Carcione J. M., [Zhu T.](#), Picotti S., and Gei D., “[Imaging septaria geobody in the Boom Clay using Q-compensated reverse-time migration](#)”, *Netherlands Journal of Geosciences* 95, 283-291 (2016).
11. [Zhu T.](#), “[Implementation aspects of attenuation compensation in reverse-time migration](#)”, *Geophysical Prospecting* 64, 657-670 (2016).

2015

10. [Zhu T.](#) and J. M. Harris, “[Estimation of P-wave velocity S-wave velocity and attenuation factor by iterative joint inversion of crosswell seismic data](#)”, *Journal of Applied Geophysics* 123, 71-80 (2015).
9. [Sun J.](#), [Zhu T.](#), and S. Fomel, “[Viscoacoustic modeling and imaging using the low-rank approximation](#)”, *Geophysics* 80, A103-A108 (2015).
8. [Zhu T.](#), and J. M. Harris, “[Improved seismic images by Q-compensated reverse-time migration: application to the crosswell field data, west Texas](#)”, *Geophysics* 80, B61-B67 (2015).
7. [Zhu T.](#), and J. M. Harris, “[Application of boundary-preserving seismic tomography for delineating boundaries of reservoir and CO2 saturated zone](#)”, *Geophysics* 80, M33-M41 (2015).
6. [Zhu T.](#), “[Viscoelastic time-reversal imaging](#)”, *Geophysics* 80, A45-A50 (2015).

2014

5. [Zhu T.](#), J. M. Harris, and B. Biondi, “[Q-compensated reverse time migration](#)”, *Geophysics* 79, S77-S87 (2014).
4. [Zhu T.](#) and J. M. Carcione, “[Theory and modeling of constant-Q P- and S-waves using fractional spatial derivatives](#)”, *Geophysical Journal International* 196, 1787-1795 (2014).

3. **Zhu T.**, “Time reverse modeling of acoustic wave propagation in attenuating media”, *Geophysical Journal International* 196, 483-494 (2014).
2. **Zhu T.** and J. M. Harris, “Modeling acoustic wave propagation in heterogeneous attenuating media using decoupled fractional Laplacians”, *Geophysics* 79, T105-T116 (2014).

2013

1. **Zhu T.**, J. M. Carcione, and J. M. Harris, “Approximating constant-Q seismic propagation in the time domain”, *Geophysical Prospecting* 61, 931-940 (2013).

SUBMITTED MANUSCRIPTS

1. Xue Z., Sun J., Fomel S., and **Zhu T.**, “Q-compensated full waveform inversion with attenuation compensation”, *submitted to Geophysics* In review, ().

MANUSCRIPTS IN PREPARATION

7. **Zhu T.**, Gei D., Carcione J.M., P. Cance, and Sun J., “Cross-correlation time-reversal imaging of microseismic events simulated in a CO₂ geological storage site”, *In preparation for submission to GJI*, ().
6. Shen Y. and **Zhu T.**, “Image domain wave equation Q analysis based on viscoacoustic wave equation”, *In preparation for submission to Geophysics*, ().
5. **Zhu T.**, Sun J., and Fomel S., “Data-driven diffraction imaging of natural fractures using passive seismic data”, *In preparation for submission to Geophysics*, ().
4. Sun J., **Zhu T.** and Fomel S., “Cross-correlation time-reversal source imaging”, *In preparation for submission to Geophysical Journal International*, ().
3. **Zhu T.**, Zhang J.H., and Y.T. Lin, “Numerical investigation of ground-penetrating radar imaging of the lunar regolith from the Chang’E 3 mission”, *In preparation for submission to Planetary and Space Sciences*, ().
2. **Zhu T.** and Chai C., “Crustal imaging by reverse-time migration of receiver functions”, *In preparation for submission to JGR*, ().
1. **Zhu T.**, “Simplified anelastic wave equation: Theory”, *In preparation for submission to Geophysics*, ().

ABSTRACTS

27. Ji M., **Zhu T.**, D. Kouri, and J. Yao, “Using PSPI to accelerate seismic Q modeling based on Hermite-distributed approximating functional”, *SEG Technical Program Expanded Abstracts 2017* 4091-4096, Houston, TX (September 24-29 2017).
26. Sun A. Y., Jeong H., Xu W., Hovorka S.D., **Zhu T.**, Templeton T., and Arctur D. K., “Development of an Intelligent Monitoring System for Geological Carbon Sequestration (GCS) Systems”, *AGU Fall Annual Meeting*, San Francisco, CA (December 11-16 2016).
25. **Zhu T.**, “Simulation of anisotropic wave propagation with anisotropic attenuation”, *17th International Workshop on Seismic Anisotropy*, Austin, TX (September 18-23 2016).
24. **Zhu T.**, Sun J., and Fomel S., “Data-driven diffraction imaging of fractures using passive seismic data”, *SEG Technical Program Expanded Abstracts*, 2679-2683 (2016).

23. [Sun J.](#), [Xue Z.](#), Fomel S., **Zhu T.**, and Nakata N., “[Full-waveform inversion of passive seismic data for sources and velocities](#)”, *SEG Technical Program Expanded Abstracts* , 1405-1410 (2016).
22. [Yao J.](#), **Zhu T.**, Hussain F., and Kouri D. J., “[Solving fractional Laplacian viscoacoustic wave equation using distributed approximation functional method](#)”, *SEG Technical Program Expanded Abstracts* , 3966-3971 (2016).
21. [Xue Z.](#), [Sun J.](#), Fomel S., and **Zhu T.**, “[Q-compensated full-waveform inversion using constant-Q wave equation](#)”, *SEG Technical Program Expanded Abstracts* , 1063-1068 (2016).
20. **Zhu T.**, Ajo-Franklin J., and Daley T., “The movement of sequestered CO₂ using seismic attenuation spatial-temporal changes in Frio Site, USA”, *AGU Fall Meeting* , (2015).
19. [Shen Y.](#) and **Zhu T.**, “[Image-based Q tomography using reverse time Q migration](#)”, *SEG Technical Program Expanded Abstracts* , 3694-3698 (2015).
18. [Sun J.](#), **Zhu T.**, Fomel S., and W. Z. Song, “[Investigating the possibility of locating microseismic sources using distributed sensor networks](#)”, *SEG Technical Program Expanded Abstracts* , 2485-2490 (2015).
17. [Sun J.](#) and **Zhu T.**, “[Stable attenuation compensation in reverse time migration](#)”, *SEG Technical Program Expanded Abstracts* , 3942-3947 (2015).
16. [Sun J.](#), Fomel S., and **Zhu T.**, “[Preconditioning least-squares RTM in viscoacoustic media by Q-compensated RTM](#)”, *SEG Technical Program Expanded Abstracts* , 3959-3965 (2015).
15. **Zhu T.**, “[Wave propagation and wavefield reconstruction in viscoelastic media](#)”, *SEG Technical Program Expanded Abstracts* , 3972-3976 (2015).
14. **Zhu T.**, “[Better imaging the hydrocarbon reservoir using Q-compensated reverse-time migration](#)”, *77th EAGE Conference and Exhibition 2015* , (2015).
13. Harris J. M. and **Zhu T.**, “Q-compensation for high resolution seismic imaging”, *SBGF Technical Program Expanded Abstracts* , (2015).
12. [Sun J.](#), **Zhu T.**, and S. Fomel, “[Viscoacoustic modeling and imaging using the low-rank approximation](#)”, *SEG Technical Program Expanded Abstracts* , 3997-4002 (2014).
11. **Zhu T.**, “[An approach to compensate for attenuation effects in reverse-time migration](#)”, *SEG Technical Program Expanded Abstracts* , 3796-3800 (2014).
10. **Zhu T.**, “Retrieval of the Green’s function in lossy media using time-reversal propagation”, *AGU Fall Annual Meeting* , (2014).
9. **Zhu T.**, “Beyond kinematics: seismic imaging with attenuation compensation”, *AGU/SEG workshop – Full waveform tomography* , (2014).
8. **Zhu T.** and J. M. Harris, “[A constant-Q time-domain wave equation using the fractional Laplacian](#)”, *SEG Technical Program Expanded Abstracts* , 3997-4002 (2013).
7. **Zhu T.** and J. M. Harris, “[Application of seismic boundary-preserving constrained inversion for delineating reservoir body](#)”, *SEG Technical Program Expanded Abstracts* , 562-566 (2013). **SEG Best Student Paper!**
6. **Zhu T.**, “Time reversal imaging in attenuating media”, *AGU Fall Annual Meeting* , (2013).
5. **Zhu T.**, “Deriving time-domain constant-Q wave propagation using the fractional Laplacian”, *AGU Fall Annual Meeting* , (2012).
4. Shen X., **Zhu T.**, and J. M. Harris, “Early-arrival waveform inversion: Application to cross-well field data”, *SEP 147 report* , 1-5 (2012).

3. **Zhu T.**, J.M. Carcione, and J. M. Harris, “[Approximating constant-Q seismic propagation in the time domain](#)”, *SEG Technical Program Expanded Abstracts* , 1-5 (2012).
2. **Zhu T.** and J. M. Harris, “[Iterative joint inversion of P wave and S wave crosswell traveltime data](#)”, *SEG Technical Program Expanded Abstracts* , 497-483 (2011).
1. Quan Y., **Zhu T.**, J.M. Harris, R. M. Burnstad and S. E. Zarantonello, “[Image integration with learned dictionaries and application to seismic monitoring](#)”, *SEG Technical Program Expanded Abstracts* , 1-5 (2011).

RESEARCH GRANTS

Pending

- | | |
|---------------------|---|
| 01/2018-
12/2021 | <i>Department of Energy (DOE)</i> , ”Integration of seismic-pressure-petrophysics inversion of continuous active-source seismic monitoring for monitoring and quantifying CO2 plume”, (2,500,000, PI) |
| 08/2017-
08/2018 | <i>Penn State Institute of Environment and Energy (PSIEE) Seed Grant</i> , ”Can Seismic Attenuation Data Sense Temperature of Glacial Ice? A Sensitivity Study”, (10,000, PI: Tieyuan Zhu, Co-PI: Sridhar Anandakrishnan) |

Active

- | | |
|---------------------|---|
| 09/2016-
09/2019 | <i>Department of Energy (DOE)</i> , ”Validation of MVA Tools for Offshore Carbon Capture and Sequestration: Novel Ultra-High-Resolution 3D Marine Seismic Technology Integrated with Coring and Geochemistry”, (3,000,000, Co-PI, PI: Timothy Meckel (UT-Austin)) |
| 08/2014-
08/2016 | <i>Jackson School of Geosciences, UT-Austin</i> , ”Postdoc Fellowship Research Grant”, (20,000, PI) |

MENTORING AND ADVISEMENT

Current Graduate Student Advisees

- 8/2017- Aoshuang Ji, Ph.D. candidate, ”TBD”
- 8/2017- Guangchi Xing, Ph.D. candidate, ”TBD”

Current Undergraduate Student Advisees

- 09/2016- Alonso Alzua, B.S., ”Microseismic data analysis”
- 01/2017- Ziyad, B.S., ”Near-surface seismic full waveform inversion”
- 04/2017- Jiawen He, B.S., ”Q model”
- 06/2017- Abdulrahman Abdulla, B.S., ”Fresnel effects for CO2 monitoring”

Committee member for

- 8/2016-present Xiong Lei, Ph.D. candidate in PE, ”Characterization of gas-charged sediments from joint inversion of both compressional and shear wave attenuation” (Advisor: Eugene Morgan)

SEMINARS AND COLLOQUIA

September 2015 – China University of Petroleum (Beijing), Geophysics colloquium
September 2015 – Research Institute of Petroleum Exploration and Development, CNPC, Geophysics colloquium
August 2015 – Institute of Geology and Geophysics, Chinese Academy of Sciences,
May 2015 – University of Texas at Austin, BEG colloquium
April 2015 – University of Texas at Austin, Geoscience seminar
March 2015 – Pennsylvania State University, Geoscience colloquium
March 2015 – University of Texas at Dallas, Geoscience seminar
March 2015 – University of Oklahoma, Geophysics colloquium
September 2014 – University of Texas at Austin, FRAC consortium colloquium
March 2014 – San Diego State University, Geology colloquium
February 2014 – Lawrence Berkeley National Lab, Geophysics colloquium
January 2014 – University of Texas at Austin, Geophysics colloquium

TEACHING

- 2017 Spring: **12 students**
GEO558 Multi-channel Seismic Data Processing
- 2017 Fall: **14 students**
GEO497 Introduction to Applied Seismology

PROFESSIONAL SERVICES

I. Service to Penn State

2016 - 2017 Graduate Admission Committee, Department of Geosciences
2017 - 2018 Sedimentary Geology Faculty Search Committee, Department of Geosciences

II. Journal Review

Geophysics, Geophysical Journal International, Journal of Applied Geophysics, Geophysical Research Letter, Natural Hazards, Journal of Geophysics and Engineering, Chinese of Geophysics, Solid Earth, Computers & Geosciences, Wave Motion, Computational Geosciences, International Journal of Solids and Structures Registration

Research reviewer: Italy Scientific Research Quality in 2004-2010 & 2011-2014.