Bin He

CASCADIA REGION EARTHQUAKE SCIENCE CENTER (CRESCENT) COMMUNITY VELOCITY MODEL POSTDOCTORAL FELLOW

Purdue University and University of Oregon

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Education

Institute of Geology and Geophysics, Chinese Academy of Sciences   *Beijing, China*

DOCTOR OF PHILOSOPHY IN SOLID EARTH PHYSICS   *09/2014-01/2020*

- Advisor: Prof. Yike Liu
- Thesis: Wave-equation velocity reconstruction and imaging

China University of Geosciences (Beijing)   *Beijing, China*

MASTER OF SCIENCE IN GEOPHYSICS   *09/2010-09/2014*

- Undergrad research advisor: Prof. Guofeng Liu

Professional Experience

06/2024-	**Cascadia Region Earthquake Science Center (CRESCENT) Community Velocity Model Postdoctoral Fellow**, Purdue University and University of Oregon, USA
04/2022-05/2024	**Research Associate**, University of Texas at Dallas, TX, USA
03/2020-04/2022	**Postdoctoral Fellow**, University of Toronto, Toronto, ON, Canada

Research Interest

Seismic wave numerical simulations based on the spectral element and finite difference methods, I am interested in wavefield simulations including body wave and surface wave propagation in anisotropy and attenuating media to study wave propagation phenomena.

Structure seismology using receiver functions, reverse time migration and full waveform inversion of ambient noise, teleseismic body waves and local earthquakes to study the dynamic process of subduction zones and deformations through scales

Oil and Gas reservoir Seismic imaging migration velocity analysis, full waveform inversion and reverse time migration based on the reflection and free-surface multiples for high-resolution imaging using marine data

Publications

PATENT

Yike Liu, **Bin He**, Huiyi Lu, Zhendong Zhang, Inversion velocity model, method for establishing the same and method for acquiring images of underground structure, 2020, US Patent Number 10739479.

UNDER REVIEW

Junlin Hua, Vera Schulte-Pelkum, Thorsten W. Becker, **B. He**, Hejun Zhu, Waveform effects on shear wave splitting near fault zones, JGR Solid Earth, in production.

Yike Liu, **B. He**, Zhendong Zhang, Xiao-Bi Xie and Yingcai Zheng, Crosstalk-free full waveform inversion of blended surface-related multiple order, Geophysics, in production.

PEER-REVIEWED PUBLICATIONS

15. T.S. Liu, N.Q. Du, T. Lei, G. Grasselli, K. Wang, **B. He**, T. Ping, Q. Liu. Seismic wavefield injection based on interface discontinuity: Theory and numerical implementation based upon the spectral-element method, Geophysical Journal International

14. Tianfan Yan, Yike Liu, Zhendong Zhang, **B. He**, Haiwei Wang, Passive Sources and Diffracted Points Imaging Using Combinational Cross-correlation Imaging Condition, JGR Solid Earth.

13. **B. He**, Chen, Y., Lei, T., Lumley, D., Liu, Q., Takeuchi, N.,Kawakatsu, H., Zhu, H., 2024, Passive source reverse time migration based on the spectral element method, JGR Solid Earth.

12. **B. He**, Kai Wang, Tianshi Liu, Ting Lei, Nanqiao Du, Suzan van der Lee, Fiona Ann Darbyshire, Andrew Frederiksen, Hejun Zhu, David Lumley, Qinya Liu, 2024, Crustal and uppermost mantle structures of the North American Midcontinent Rift revealed by joint full-waveform inversion of ambient-noise data and teleseismic P waves, Earth and Planetary Science Letters, 641 (118797).

11. **B. He**, David Lumley and Hejun Zhu, Improving signal-to-noise ratios of ambient noise cross-correlation functions using local attributes, 2024, Geophysical Journal International.

10. Tianshi Liu, Kai Wang, Yujiang Xie, **B. He**, Ting Lei, Nanqiao Du, Ping Tong, Yingjie Yang, Catherine A Rychert, Nicholas Harmon, Giovanni Grasselli, Qinya Liu, 2024, Cube2sph: A toolkit enabling flexible and accurate continental-scale seismic wave simulations using the SPECFEM3D_Cartesian package, Computers and Geosciences, 190 (105644).

9. **He, B.**, Y. Liu. 2020. Efficient reflection waveform inversion using a locally normalized zero-lag correlative objective function. Geophysical Prospecting, 68(9): 2678-2696.

8. **He, B.**, Y. Liu. 2020. Wave-equation migration velocity analysis using radon-domain common-image gather. Journal of Geophysical Research: Solid Earth, 125(2),e2019JB018938.

7. **He, B.**, Y. Liu, H. Lu, and Z. Zhang. 2020. Correlative Full-Intensity Waveform Inversion. IEEE Transactions on Geoscience and Remote Sensing, 58(10), 6983-6994

6. Y. Liu., **He, B.**, and Y. Zheng. 2020. Controlled-order multiple waveform inversion, Geophysics, 85(3), R243-R250.

5. Y. Liu., **He, B.**, Z. Zhang, Y. Zheng, and P. Li. 2020. Reflection intensity waveform inversion, Geophysics, 85(3), R263-R273.

4. **He, B.**, Y. Liu, and Y. Zhang. 2019. Improving the least-squares image by using angle information to avoid cycle skipping. Geophysics, 84(6), S581-S598.

3. Yi, J., Y. Liu, Z. Yang, H. Lu, **He, B.**, and Z. Zhang. 2019. A least-squares correlation-based full traveltime inversion for shallow subsurface velocity reconstruction, Geophysics, 84(4), R613-R624.

2. Zhang, Z., T. Alkhalifah, Z. Wu, Y. Liu, **He, B.**, and J. Oh. 2019. Normalized nonzero-lag crosscorrelation elastic full-waveform inversion, Geophysics, 84(1), R15-R24.

1. Y. Liu., **He, B.**, H. Lu, Z. Zhang, X.-B. Xie, and Y. Zheng. 2018. Full-intensity waveform inversion, Geophysics, 83(6), R649-R658.

Presentations

SELECTED CONFERENCE ABSTRACTS

He, B., Brandon Herr, Jonathan R Delph, Emilie E E Hooft, Alex Grant, Valerie J Sahakian, Pieter-Ewald Share, William J Stephenson, Erin A Wirth, Ross Maguire, Guoliang Li and Rasheed Ajala. 2024. CRESCENT Generation 0 Cascadia Community Velocity Model: initial constraints from teleseismic receiver functions and ambient noise data.

He, B., David E Lumley, and Hejun Zhu. 2023. Improving Signal-to-noise Ratios of Ambient Noise Cross-correlation Functions using Local Attributes, AGU Fall Meeting

He, B., Yu Chen, David Lumley, Qinya Liu, Nozomu Takeuchi, Hitoshi Kawakatsu, and Hejun Zhu. 2023. Passive Reverse Time Migration based on the Spectral Element Method: Methodology and Applications, AGU Fall Meeting.

T Lei, **B He**, N Du, K Wang, Q Liu. 2023. The Continental Collision and Rifting in Southern Appalachians Revealed by Full Waveform Tomography and Reverse Time Migration, AGU Fall Meeting.

T Liu, K Wang, C Tape, **B He**, Y Yang, P Tong, Q Liu. 2023. Mapping the Alaskan Lithosphere Based Upon Joint Full-waveform Inversion of Ambient Noise and Local Earthquake Data, AGU Fall Meeting.

N Du, **B He**, T Lei, Q Liu. 2023. Lithospheric Structures of the Central Cascadia Subduction Zone Resolved by Full-waveform Inversion of Ambient Noise and Receiver Functions, AGU Fall Meeting.

He, B., David E Lumley, and Hejun Zhu. 2022. Retrieving body waves from ambient seismic noise with local attributes, AGU Fall Meeting.

He, B., David E Lumley, and Hejun Zhu. 2022. Passive teleseismic imaging based on amplitude-preserved wave-mode decomposition, AGU Fall Meeting.

He, B., K Wang, T Liu, Y Yang, T Lei, L Ding, Q Liu. 2022. Lithospheric Structures beneath Mid-continent Rift Revealed by Full-waveform Joint inversion of Ambient-Noise Data and Teleseismic P waves, AGU Fall Meeting.

T Liu, K Wang, C Tape, **He, B.**, Y Yang, P Tong, Q Liu, 2022, Imaging the Alaskan Lithosphere Based on Full-waveform Joint Inversion of Seismic Ambient Noise and Local Earthquake Data, AGU Fall Meeting.

T Lei, **He, B.**, K Wang, N Du, Q Liu, 2022, The Remnants of Continental Collision in Southern Appalachians: Constraints from Joint Full-waveform Inversion, AGU Fall Meeting.

N Du, **He, B.**, T Lei, Q Liu, 2022, Lithospheric Imaging of the Central Cascadia Subduction Zone based on Full-waveform Inversion, AGU Fall Meeting.

Y Liu, **He, B.**, XB Xie, Y Zheng, 2022, Phase-encoded waveform inversion for multiples, Second International Meeting for Applied Geoscience & Energy.

Q Liu, T Liu, **He, B.**, K Wang, Y Xie, C Rychert, N Harmon, 2021, Cube2sph: a toolkit enabling accurate and efficient continental-scale seismic wave simulation using SPECFEM3D, AGU Fall Meeting.

T Lei, **He, B.**, K Wang, N Du, Q Liu, 2021, The Lithospheric Structures Beneath Appalachian Mountains Revealed by Joint Full-waveform Inversion of Ambient Noise and Teleseismic Data from MAGIC Array, AGU Fall Meeting.

T Liu, K Wang, C Tape, **He, B.**, Y Yang, P Tong, Q Liu, 2021, Shear-velocity and anisotropic model of the Alaskan lithosphere obtained by ambient-noise adjoint tomography, AGU Fall Meeting.

L Ding, T Liu, K Wang, **He, B.**, G Yang, T Lei, C Tape, J Thurin, G Grasselli, Q Liu, 2021, Simultaneous inversion and uncertainty analysis of moment tensor and source location based on 3D strain Greens function database computed by spectral-element methods: with applications to the 2019 Ridgecrest sequence, AGU Fall Meeting.

Y Liu, **He, B.**, XB Xie, Y Zheng, 2021, Amplitude versus angle (AVA) using controlled-order multiples, First International Meeting for Applied Geoscience & Energy.

He, B., T. Liu, K. Wang, Y. Yang, T. Lei, L. Ding, and Q. Liu. 2020. High-Resolution Lithospheric Structures Beneath Central California Revealed by Two-Dimensional Linear-Array Ambient-Noise Adjoint Tomography, AGU Fall Meeting 2020.

T Liu, Q Liu, **He, B.**, K Wang, Y Yang, Y Xie, C Rychert, N Harmon, 2020. Implementing perfectly matched layer (PML) boundary conditions for curvilinear grids in the SPECFEM3D package, AGU Fall Meeting 2020.

T Liu, K Wang, C Tape, **He, B.**, Y Yang, P Tong, Q Liu, 2020. Radial anisotropy of the Alaskan lithosphere revealed by multi-component ambient-noise adjoint tomography, AGU Fall Meeting 2020.

Invited Talks

Summer, 2021 (online only). *Lithospheric Structures of Mid-continent Rift Revealed by Full-waveform Joint Inversion of Ambient-Noise Data and Teleseismic P waves*. Invited talk: University of Toronto, ON, Canada.

Summer 2024. *Lithospheric Structures of Mid-continent Rift Revealed by Full-waveform Joint Inversion of Ambient-Noise Data and Teleseismic P waves*. Invited talk: Institute of Geophysics, China Earthquake Administration.

Autumn 2024. *Crustal and Uppermost mantle structures of the North American Mid-continent Rift: Full-waveform Joint Inversion of Ambient-Noise Data and Teleseismic P waves*. Invited talk: Purdue University, Department of Earth, Atmospheric and Planetary Sciences.

Professional Services

Journal Reviewer

Science Bulletin

Journal of Geophysical Research: Solid Earth

Computational Geosciences

Geophysics

Journal of Applied Geophysics

Frontiers in Earth Science

Journal of Geophysics and Engineering

Field Experience

NODAL ARRAY DEPLOYMENT

Urban noise from traffic, construction, and ocean waves recorded by nodal arrays, in West Lafayette, IN, USA, 2024

Teaching Experience

Fall 2024	**EAPS116,Earthquakes and Volcanoes**, Guest Lecture	*Purdue University*
Spring 2025	**EAPS 354: Earth and Planetary Geophysics**, Guest Lectures	*Purdue University*

Grants

1. PIs: Dr. David Lumley and Hejun Zhu. UT Dallas 3D+4D Seismic Full Waveform Inversion research consortium—Phase2; various energy industry sponsors; $540,000, 2022-2024; Participate

2. PI: Dr. Hejun Zhu. Developing a Multi-Parameter Seismic Model of North America, National Science Foundation, Grant Number: EAR 2042098. $536,729. 2021-. Participate

3. PI: Dr. Diego Melgar, Co-PIs: Dr. Amanda Thomas, Timothy Melbourne, Pieter-Ewald Share and Harold Tobin. Cascadia Region Earthquake Science Center, The National Science Foundation, 15 million dollars, 2023-, Participate

Skills and Abilities

C/C++, FORTRAN, Python along with OpenMPI for Parallel computing

Large Ambient Noise and teleseismic data processing

Full wavefield simulation and inversion based on SPECFEM3D

Awards, Fellowships

2020	**Chinese National Scholarship**, Chinese Academy of Sciences	*¥ 30,000*
2020	**Top Poster Paper Presented at SEG's 89th Annual Meeting—San Antonio, Texas**, Society of Exploration Geophysicists	
2018	**Excellent Scientific and Technological Achievements of the Institute of Geology and Geophysics, Chinese Academy of Sciences** , Institute of Geology and Geophysics, Chinese Academy of Sciences	*¥ 50,000*
2012	**Liu Guangding Geophysics Scholarship**, Prof. Guangding Liu	*¥ 10,000*
2011	**Chinese National Scholarship**, China University of Geosciences(Beijing)	*¥ 8,000*