Qi Hao

Associate Professor, Department of Geophysics, College of Geo-Exploration and Information Technology, Jilin University (JLU).
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Research Interests

Seismic attenuation and anisotropy, forward and inverse problems, applied artificial intelligence, high performance computation, and approximation methods.

Education

2007-2010 Department of Geophysics, Jilin University (Changchun, China): Ph.D in Geo-exploration and Information Technology (Graduated in June, 2010). Ph.D. Dissertation entitled "Study on the model-building of velocity and anisotropy parameters for VTI media". Advisors: Jiwen Teng (Professor, Chinese Academy of Sciences) and Qiaodeng He (Professor emeritus, Jilin University).

2005-2007 Department of Geophysics, Jilin University (Changchun, China): M.Sc in Geo-exploration and Information Technology (Graduated in June, 2007), Master's Thesis entitled "Seismic wavefield modeling in TTI media". Advisors: Jiwen Teng (Professor, Chinese Academy of Sciences) and Qiaodeng He (Professor emeritus, Jilin University).

2001-2005 Department of Geophysics, Jilin University (Changchun, China): B.Sc in Exploration Technology and Engineering (Applied Geophysics) (Graduated in July, 2005). Bachelor's Thesis entitled "P-wave moveout analysis for VTI media". Advisor: Deli Wang (Professor).

Continuing Education

01/04/2019-03/06/2019 Stanford Course: Unconventional Reservoir Geomechanics. Lecturers: Mark D. Zoback (Professor, Stanford University) and Arjun H. Kohli (Research Scientist). The Statement of Accomplishment.

16/01/2020-17/01/2020 CPG short course: Reservoir Simulation. Lecturer Matthew T. Balhoff (Professor, The University of Texas at Austin). The Statement of Accomplishment.

Professional Careers

11/2018-08/2021: Research Scientist III (assistant professor level), College of Petroleum Engineering and Geosciences, King Fahd University of Petroleum and Minerals. Advisors: Stewart Greenhalgh (ETH Zurich) and Peter Mora (KFUPM).

07/2017-12/2017: Project consultant (junior researcher), Physical Science and Engineering Division, King Abdullah University of Science and Technology (KAUST).

03/2013-03/2017: Postdoc. Department of Geosciences and Petroleum, Norwegian University of Science and Technology (NTNU). Advisors: Alexey Stovas (NTNU) and Tariq Alkhalifah (KAUST). Course: Seismic Wave Propagation (co-teach with Prof. Alexey Stovas).

07/2010-02/2013: Lecturer of the course: Elastodynamics. Teaching assistant of the course: Seismic Exploration. Department of Geophysics, China University of Petroleum.

Professional Societies

2013-Present: member of Society of Exploration Geophysicsts (SEG).

2013-Present: member of European Association of Geoscientists & Engineers (EAGE).

2005- 2010: student member of SEG.

Programming Experience

Good programming skills in using Python, C, Fortran, Matlab, Mathematica.

Good code development skills in open-source seismic software packages in Linux system: Seismic Unix and Madagascar.

Duties for Peer-reviewed Journals

Reviewer of the journals: Geophysics; Geophysical Prospecting.

Visiting Experience

18/01/2020-24/01/2020: visited Prof. Tariq Alkhalifah at KAUST, SA.

22/09/2019-28/09/2019: visited Prof. Ilya Tsvankin, the director of the Center for Wave Phenomena (CWP), at Colorado School of Mines (CSM), USA.

12/01/2019-18/01/2019: visited Prof. Tariq Alkhalifah at KAUST, SA.

25/02/2018-06/03/2018: visited Prof. Tariq Alkhalifah at KAUST, SA.

04/02/2017-10/02/2017: visited Prof. Tariq Alkhalifah at KAUST, SA.

11/07/2016-14/07/2016: visited Senior Lecturer Dr. Mark Chapman at The University of Edinburgh, UK.

25/01/2016-06/02/2016: visited Prof. Tariq Alkhalifah at KAUST, SA.

20/03/2014-27/03/2014: visited Prof. Tariq Alkhalifah at KAUST, SA.

Referees

Prof. Tariq Alkhalifah, King Abdullah University of Science and Technology, Thuwal,

Email: tariq.alkhalifah@kaust.edu.sa

Assoc. Prof. Jingyi Chen, The University of Tulsa, Tulsa, Email: jingyi-chen@utulsa.edu

Prof. Stewart Greenhalgh, ETH Zurich, Zurich, Email: gstewart@retired.ethz.ch.

Prof. Qiaodeng He, Department of Geophysics, Jilin University, Changchun, email: 15901333690@139.com

Senior Geoscience Advisor, Enru Liu, ExxonMobil Upstream Research Company, Houston, Email: eliu0103@hotmail.com

Prof. Alexy Stovas, Department of Geosciences and Petroleum, Norwegian University of Science and Technology, Trondheim, Email: alexey.stovas@ntnu.no

Prof. Jiwen Teng, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, Email: jwteng@mail.iggcas.ac.cn

Peer-reviewed Journal Papers (* important publications)

[25*]   Hao, Q., and S. Greenhalgh, 2021, Viscoacoustic wave equations for the power law dependence of Q on frequency: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences. Submitted for Peer Review.

[24]   Tariq Alkhalifah, Chao Song, U. Waheed, and Q. Hao, 2021, Wavefield solutions from machine learned functions constrained by the Helmholtz equation: Artificial Intelligence in Geosciences, vol. 2, 11-19.

[23]   Waheed, U., Ehsan Haghighat, Tariq Alkhalifah, Chao Song, and Q. Hao, 2021, PINNeik: Eikonal solution using physics-informed neural networks: Computer and Geosciences, vol. 155, 104833.

[22*]   Hao, Q., and S. Greenhalgh, 2021, Nearly constant Q dissipative models and wave equations for general viscoelastic anisotropy: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, vol. 477, no.2251, 20210170.

[21*]   Hao, Q., and S. Greenhalgh, 2021, Nearly constant Q models of the generalized standard linear solid type and the corresponding wave equations: Geophysics, vol. 86, no. 4, T239-T260.

[20*]   Hao, Q., and T. Alkhalifah, 2019, Viscoacoustic anisotropic wave equations: Geophysics, vol. 84, no. 6, C323-C337 (This paper is nominated by Geophysics editors to be highlighted in Geophysics Bright Spots in The Leading Edge, vol. 38, no. 12, 966-968).

[19*]   Hao, Q., and S. Greenhalgh, 2019, The generalized standard-linear-solid model and the corresponding viscoacoustic wave equations revisited: Geophysical Journal International, vol. 219, no. 3, 1939-1947, in press.

[18]   Hao, Q., U. Waheed and T. Alkhalifah, 2019, P-wave complex-valued traveltimes in homogeneous attenuating transversely isotropic media: Geophysical Prospecting, vol. 67, no. 9, 2402-2413.

[17]   Hao, Q., and A. Stovas, 2018, Approximate reflection and transmission coefficients for a thin transversely isotropic layer with a vertical symmetry axis: Geophysics, vol. 83, no. 1, C1-C11.

[16]   Hao, Q., and T. Alkhalifah, 2017, An acoustic eikonal equation for attenuating orthorhombic media: Geophysics, vol. 82, no. 4, WA67-WA81.

[15*]   Hao, Q., and T. Alkhalifah, 2017, An acoustic eikonal equation for attenuating transversely isotropic media with a vertical symmetry axis: Geophysics, vol. 82, no. 1, C9-C20.

[14]   Xu, S., A. Stovas, and Q. Hao, 2016, Perturbation-based moveout approximations in anisotropic media: Geophysical Prospecting, vol. 65, no. 5, 1218-1230.

[13]   Sripanich, Y., S. Fomel, A. Stovas and Q. Hao, 2016, 3D generalized nonhyperboloidal moveout approximation: Geophysics, vol. 82, no. 2, C49-C59.

[12]   Hao, Q., A. Stovas and T. Alkhalifah, 2016, The offset-midpoint traveltime pyramid of P-waves in orthorhombic media: Geophysics, vol. 81, no.5, C151-C162.

[11]   Hao, Q., A. Stovas, 2016, P-wave slowness surface approximation for tilted orthorhombic media: Geophysics, vol. 81, no. 3, C99-C112.

[10*]   Hao, Q. and A. Stovas, 2016, Analytic calculation of phase and group velocities of P-waves in orthorhombic media: Geophysics, vol. 81, no. 3, C79-C97.

[9]   Hao, Q. and A. Stovas, 2016, Generalized moveout approximation for converted P-SV wave in vertically inhomogeneous VTI media: Geophysical Prospecting, vol. 64, no. 6, 1469-1482.

[8]   Hao, Q. and A. Stovas, T. Alkhalifah, 2015, The offset-midpoint traveltime pyramid in 3D transversely isotropic media with a horizontal symmetry axis: Geophysics, vol. 80, no. 1, T51-T62.

[7]   Hao, Q. and A. Stovas, 2015, The offset-midpoint traveltime pyramid in 2D transversely isotropic media with a tilted symmetry axis: Geophysical Prospecting, vol. 63, no. 3, 587-596.

[6]   Hao, Q. and A. Stovas, 2014, P-wave diffraction and reflection traveltimes for a homogeneous 3D TTI medium: Journal of seismic exploration, vol. 23, 405-429.

[5]   Hao, Q. and Q. He, 2013, A standard linear solid model representation of Chapman's frequency-dependent anisotropy induced by two sets of aligned mesoscale fractures: Journal of Seismic Exploration, vol. 22, no. 2, 169-182.

[4]   Zhang, X., D. Wang, Z. Wang and Q. Hao, 2011, The study on azimuth characteristics of attenuation and dispersion in 3D two-phase orthotropic crack medium based on BISQ mechanism: Chinese Journal of Geophysics. (in Chinese), 53, 2452-2459.

[3]   Hao, Q., Q. He, D. Wang, 2010, Inhomogeneous plane wave in anisotropic weakly viscoelastic media by improved perturbation theory: Journal of Jilin University (Earth Science Edition), (in Chinese), vol. 40, 195-202.

[2]   Hao, Q., Q. He, and Q. Zhang, 2010, Trapezoid block modeling and qP/qSV reflection wave kinematic ray tracing in 2D layered VTI media: Oil Geophysical Prospecting, vol. 45(Supplement 2), 84-92.

[1]   Hao, Q., Q. He, and S. Shi., 2008, A new splitting PML algorithm for the second-order anisotropic wave equation: Journal of Seismic Exploration, vol. 17, 229-236.

Peer-reviewed Conference Papers (* important publications)

[27]   Wang, H., T. Alkhalifah, and Q. Hao, 2020, Predict passive seismic events with a convolution neural network, 90th SEG annual meeting, https://doi.org/10.1190/segam2020-3425457.1.

[26*]   Hao, Q., U. Waheed, M. Babatunde, and L. Eisner, 2020, Microseismic source localization using an artificial neural network, 82nd EAGE Conference & Exhibition, https://doi.org/10.3997/2214-4609.202010583.

[25*]   Alkhalifah, T., C. Song, U. bin Waheed, and Q. Hao, 2020. Wavefield solutions from machine learned functions that approximately satisfy the wave equation, 82nd EAGE Conference & Exhibition, https://doi.org/10.3997/2214-4609.202010588.

[24]   Waheed, U., E. Haghighat, T. Alkhalifah, C. Song, and Q. Hao, 2020, Eikonal solution using physics-informed neural networks, 82nd EAGE Conference & Exhibition, https://doi.org/10.3997/2214-4609.202011041.

[23]   Hao, Q. and T. Alkhalifah, 2019, Viscoacoustic anisotropic wave equations: 89th SEG Annual meeting, expanded abstract, 494-498.

[22]   Hao, Q., U. Waheed and T. Alkhalifah, 2019, A comparison between two fast sweeping algorithms for solving the attenuating VTI eikonal equation: 89th SEG Annual meeting, expanded abstract, 469-473.

[21]   Hao, Q. and T. Alkhalifah, 2018, An approximate method for the acoustic attenuating orthorhombic eikonal equation: 88th SEG Annual meeting, expanded abstract, 261-265.

[20*] Hao, Q., U. Waheed and T. Alkhalifah, 2018, A fast sweeping scheme for P-wave traveltimes in attenuating VTI media: 80th EAGE Conference & Exhibition, expanded abstract, doi: 2214-4609.201801124.

[19]   Hao, Q. and T. Alkhalifah, 2017, Acoustic eikonal solutions for attenuating VTI media: 87th SEG Annual meeting, expanded abstract, 289-293.

[18]   Hao, Q. and T. Alkhalifah, 2017, An approximate method for the acoustic attenuating VTI eikonal equation: 79th EAGE Conference & Exhibition, expanded abstract, We B4 08.

[17]   Hao, Q. and T. Alkhalifah, 2016, An acoustic eikonal equation for attenuating, orthorhombic media: 17th International Workshop on Seismic Anisotropy, expanded abstract, 59-60.

[16]   Hao, Q. and A. Stovas, 2016, P-, SV- and PSV-wave reflections from a thin VTI layer: 17th International Workshop on Seismic Anisotropy, expanded abstract, 10-11.

[15]   Xu, S., A. Stovas and Q. Hao, 2016, New moveout approximations for orthorhombic media: 86th SEG Annual meeting, expanded abstract, 464-468.

[14]   Hao, Q. and T. Alkhalifah, 2016, An acoustic eikonal equation for attenuating VTI media: 86th SEG Annual meeting, expanded abstract, 458-463.

[13]   Hao, Q. and A. Stovas, 2016, Analytic formulae for wave normal of P-waves in orthorhombic media: 78th EAGE Conference & Exhibition, expanded abstract, We P4 10.

[12]   Hao, Q. and A. Stovas, 2016, Analytic formulae for vertical slowness and tau-p intercept time of P-waves in tilted orthorhombic media: 78th EAGE Conference & Exhibition, expanded abstract, We P4 09.

[11]   Hao, Q. and A. Stovas, 2016, Analytic formulae for wave normal of P-waves in TI and orthorhombic media: AAPG&SEG International Conference & Exhibition – Barcelona, expanded abstract.

[10]   Hao, Q. and A. Stovas, 2016, P-wave slowness surface approximation for tilted orthorhombic media: AAPG&SEG International Conference & Exhibition – Barcelona, expanded abstract.

[9]   Hao, Q. and A. Stovas, 2015, The offset-midpoint traveltime pyramid for P-waves in orthorhombic media: 77th EAGE Conference & Exhibition, expanded abstract, We N114 13.

[8]   Hao, Q. and A. Stovas, 2015, Anelliptic approximation for P-wave phase and group velocities in orthorhombic media: 77th EAGE Conference & Exhibition, expanded abstract, We N114 15.

[7]   Hao, Q. and A. Stovas, 2014, Anelliptic approximation for P-wave phase-velocity in orthorhombic media, 16th International Workshop on Seismic Anisotropy, expanded abstract.

[6]   Hao, Q. and A. Stovas, 2014, Generalized group- and phase-domains moveout approximations for converted-wave in a horizontal and homogeneous VTI layer: 76th EAGE Conference & Exhibition, expanded abstract, Tu P03 11.

[5]   Hao, Q. and A. Stovas, 2014, Three-dimensional generalized nonhyperbolic moveout approximation: Application on a 3D HTI model: 76th EAGE Conference & Exhibition, expanded abstract, Tu P03 10.

[4]   Hao, Q. and A. Stovas, 2014, Plane wave in vertically heterogeneous anisotropic media: CPS/SEG international meeting, expanded abstract, 661-664.

[3]   Hao, Q. and A. Stovas, 2014, Three-dimensional generalized nonhyperbolic moveout approximation - 3D HTI model test: CPS/SEG international meeting, expanded abstract, 665-668.

[2]   Hao, Q., A. Stovas, and T. Alkhalifah, 2013, The azimuth-dependent offset-midpoint traveltime pyramid in 3D HTI media: 83rd SEG Annual meeting, expanded abstract, 3335-3339.

[1]   Hao, Q. and A. Stovas, 2013, The offset-midpoint traveltime pyramid in TTI media: 75th EAGE
           Conference & Exhibition, expanded abstract, Th P01 05.