Umair bin Waheed

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Research Interests Seismic anisotropy; Seismic modeling and inversion; Induced seismicity

Employment

King Fahd University of Petroleum & Minerals
Assistant Professor of Geophysics — 2017 – present

Princeton University
Writing in Science & Engineering Fellow — 2016 – 2017
Postdoctoral Research Associate — 2015 – 2017

Education

Ph.D., Earth Sciences & Engineering
King Abdullah University of Science and Technology (KAUST) — 2015
Thesis: Developing and utilizing the wavefield kinematics for efficient wavefield extrapolation
Adviser: Tariq Alkhalifah

M.S., Electronic Engineering
Politecnico di Torino & Université Catholique de Louvain (Erasmus Mundus double degree Masters program) — 2010

B.E., Electronic Engineering
NED University of Engineering & Technology, Pakistan — 2008

Research Experience

Princeton University, New Jersey — 2015 – 2017
Postdoctoral Research Associate; Advisers: Jeroen Tromp, Frederik Simons
Inversion of event locations, moment tensors, and velocity model for micro-earthquake data acquired using an array of four hundred and eighty three-component sensors over a 140×80 km^2 area

King Abdullah University of Science & Technology, Saudi Arabia — 2010 – 2015
Graduate Researcher; Adviser: Tariq Alkhalifah
Developed novel algorithms for computationally efficient modeling and inversion of seismic wavefields and traveltimes in complex anisotropic media

Schlumberger Technology Center, Houston — Summers 2013, 2014
Summer Intern; Adviser: Can Evren Yarman
Derived and implemented eikonal solver and traveltime tomography algorithms for near-surface modeling and inversion applications

Norwegian University of Science & Technology, Trondheim — Summer 2012
Research Visitor; Collaborator: Alexey Stovas
Developed theory and implemented it for modeling diffraction traveltimes in anisotropic media

Academy of Sciences of the Czech Republic, Prague — Summer 2011
Research Visitor; Collaborators: Ivan Pšenčík, Vlastislav Červený
Analyzed anisotropic ray based methods for fast traveltime computations

Teaching Experience

King Fahd University of Petroleum & Minerals

Teaching courses for the undergraduate and graduate programs in Geophysics

Machine Learning for Geoscientists	Spring 2019
Advanced Computational Geophysics	Spring 2018
Computational Geophysics	Spring 2018, 2019
Geophysical Data Inversion	Fall 2017, 2018

Princeton University

Taught a diverse group of graduate students from across disciplines on effective practices for critically reading and writing scientific literature

WRI 501 – Reading & Writing Scientific Literature	Fall 2016, Spring 2017
Led workshops on writing for undergraduate theses writers	Fall 2016, Spring 2017

King Abdullah University of Science & Technology

Teaching assistant for:

ErSE 214 – Seismic Exploration	Spring 2013
ErSE 260 – Seismic Imaging	Spring 2014, 2015
ErSE 360 – Mathematical Methods for Seismic Imaging	Spring 2014

Delivered tutorials on the use of *Madagascar* for open-source scientific computing

NED University of Engineering & Technology

Taught introductory courses on Electronic engineering to freshmen 2008

Student Advising

H. Wang (2014), M. Sc. thesis, KAUST, Wavefield matching for anisotropic media
W. Ibanez-Jacome (2013), M.Sc. thesis, KAUST, Anisotropic wavefield extrapolation

Refereed Journal Publications

15. **U. Waheed**. "A fast marching algorithm for the tilted transversely isotropic media." *Geophysics*, Submitted, 2019.
14. M. Almadani, **U. Waheed**, M. Masood, and Y. Chen. "Dictionary learning with convolutional structure for seismic data denoising and interpolation." *Geophysics*, Submitted, 2019.
13. D. Alexandrov et al. "Normal faulting activated by hydraulic fracturing: A case study from the Barnett Shale, Fort Worth Basin, Texas, USA." *The Leading Edge*, Accepted, 2019.
12. Q. Hao, **U. Waheed**, and T. Alkhalifah. "P-wave complex-valued traveltimes in homogeneous attenuating transversely isotropic media." *Geophysical Prospecting*, 67.9 (2019): 2402–2413.
11. **U. Waheed**, and T. Alkhalifah. "A fast sweeping algorithm for accurate solution of the tilted transversely isotropic eikonal equation using factorization." *Geophysics*, 82.6 (2017): WB1–WB8.
10. **U. Waheed**, A. Stovas, and T. Alkhalifah. "Anisotropy parameter inversion in vertical axis of symmetry media using diffractions." *Geophysical Prospecting*, 65.1 (2017), 194–203.
9. **U. Waheed**, G. Flagg, and C. Yarman. "First-arrival traveltime tomography for anisotropic media using the adjoint-state method." *Geophysics*, 81.4 (2016): R147–R155.

8. **U. Waheed**, and T. Alkhalifah. "Effective ellipsoidal models for wavefield extrapolation in tilted orthorhombic media." *Studia Geophysica et Geodaetica*, 60.3 (2016): 349–369.

7. **U. Waheed**, C. Yarman, and G. Flagg. "An iterative fast sweeping eikonal solver for 3-D tilted anisotropic media." *Geophysics*, 80.3 (2015): C49–C58.

6. **U. Waheed**, and T. Alkhalifah. "An efficient wave extrapolation method for anisotropic media with tilt." *Geophysical Prospecting*, 63.5 (2015): 1126–1141.

5. **U. Waheed**, T. Alkhalifah, and H. Wang. "Efficient traveltime solution of the acoustic TI eikonal equation." *Journal of Computational Physics*, 282.1 (2015): 62–76.

4. D. Ketcheson, and **U. Waheed**. "A comparison of high order explicit Runge-Kutta, extrapolation, and deferred correction methods in serial and parallel." *Communications in Applied Mathematics and Computational Science*, 9.2 (2014): 175–200.

3. W. Ibanez-Jacome, T. Alkhalifah, and **U. Waheed**. "Effective orthorhombic anisotropic models for wavefield extrapolation." *Geophysical Journal International*, 198.3 (2014): 1653–1661.

2. **U. Waheed**, I. Pšenčík, V. Červený, E. Iversen, and T. Alkhalifah. "Two-point paraxial traveltime formula for inhomogeneous isotropic and anisotropic media: Tests of accuracy." *Geophysics*, 78.5 (2013): WC65–WC80.

1. **U. Waheed**, T. Alkhalifah, and A. Stovas."Diffraction traveltime approximation for TI media with an inhomogeneous background." *Geophysics*, 78.5 (2013): WC103–WC111.

Patents

2. **U. Waheed**, C. Yarman, and G. Flagg. "Eikonal solver for quasi-P waves in anisotropic media." US patent application PCT/US2014/056539, filed September 2014, patent pending.

1. T. Alkhalifah, X. Ma, **U. Waheed**, and M. Zuberi. "Efficient wavefield extrapolation in anisotropic media." U.S. patent 9,588,245, issued March 7, 2017.

Awards and Recognition

Best student poster award, EAGE Forum for Students & Young Professionals	2014
Third place, EAGE Geo-creativity prize competition	2014
Third prize, SIAM 'Math Matters, Apply It!' competition	2013
Academic Excellence Award, KAUST	2010 – 2011
MERIT Erasmus Mundus scholarship for Masters program	2008 – 2010

Services

Reviewer for journals: Geophysics, Geophysical Prospecting, Geophysical Journal International, Pure and Applied Geophysics, Studia Geophysica et Geodaetica, International Journal of Geophysics, Arabian Journal of Geosciences

Organized Princeton University's Solid Earth Brown Bag 2016 Seminar Series

Professional Associations

Society of Exploration Geophysicists

European Association of Geoscientists & Engineers

Society of Industrial & Applied Mathematics

Computational Skills	Programming: C, C++, Python, Matlab/Octave, Java, Fortran Seismic packages: Madagascar, SU, SPECFEM
Citation Statistics	**Google Scholar** Total citations: 255 h-index: 9 i10-index: 8