Mohsen Kazemnia Kakhki

Seismologist

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SUMMARY

Geophysics researcher with over 4 years of experience in seismic exploration and seismology, specializing in numerical modeling, seismic signal processing, and image processing for the oil and gas industry. My seismic exploration expertise includes developing time-frequency decompositions to enhance data resolution, introducing high-resolution seismic attributes for detecting gas reservoirs and thin bed layers, and implementing deconvolutive short-time Fourier transforms to eliminate ground rolls in seismic shot gathers. I have conducted ambient noise tomography to identify hydrocarbon reservoirs and developed accurate forward models, along with robust full waveform inversion (FWI) and reverse time migration (RTM) techniques. In seismology, I have studied site response directivity, defined landslide slip surfaces, and defined soil properties using single-station ambient seismic noise data. Additionally, I have developed time-frequency polarization methods for earthquake analysis. My strong analytical approach to problem-solving, innovative thinking, and technical knowledge in applied mathematics and physics complement my programming experience, making me well-equipped for complex geophysical challenges.

SKILL

- Seismology
- Ambient noise tomography
- Seismic signal processing
- Landslide
- Full Waveform Inversion
- MATLAB & Python programming

EDUCATION

Doctor of Philosophy in Oil & Gas, Federal University of Rio de Janeiro, Brazil

- Year of Graduation: Jun 2020
- Dissertation: “Separation of Rayleigh waves in ambient noise using the polarization-based method"
- Supervisor: Prof. Webe Mansur

Master of Science in Seismology, Geophysics Institute of Tehran University, Iran

- Year of Graduation: Oct 2015
- Dissertation: “Evaluating and comparing landslide by Microtremor and Geoelectrical Methods in North Iran"
- Supervisor: Prof. A. Sadidkhouy

Bachelor of Science in Mining engineer, Technical University of Birjand, Iran

- Year of Graduation: Nov 2007
- Dissertation: “Earthquakes effect on landslide"
- Supervisor: Prof. G. Nouruzi

WORK EXPERIENCE

Post doctorate, Federal University of Rio de Janeiro, Brazil (Jan 2022 - 2025)

- *Project: High-resolution ambient noise tomography*
  A novel time-frequency decomposition method is devised to minimize noise, coupled with a polarization filter to isolate Rayleigh waves, facilitating the estimation of a 3D shear wave velocity model through inversion. This research has significant implications for pinpointing areas vulnerable to mass mobilization, detecting hydrocarbons, and monitoring carbon dioxide storage.

UNICAMP University of Campinas, Brazil (Jan 2021 - Jan2022)

- *Project: TV & Tikhonov regularization in FWI*
  FWI is presented with a robust objective function, relying less on the initial model to address cycle skipping. Furthermore, the incorporation of TV and Tikhonov regularization functions streamlines the process by offering a user-friendly parameter selection mechanism.

Ferdowsi University of Mashhad, Iran (Jan 2020 – Jan 2021)

- *Project: Develop software to model wave propagation*
  Developed software utilizing finite difference methods for forward modeling of wave propagation, incorporating topographical features to enhance accuracy and realism in simulations. This project aimed to improve understanding of wave behavior in complex geological settings, contributing valuable insights to the field of geophysics.

SEG student chapter secretary at UFRJ (May 2016 - Jun2020)

- This role allowed me to develop strong organizational and leadership skills while actively contributing to the growth and success of our student chapter.

EAGE student chapter president at UFRJ (Jul 2014 – Jun 2020)

- As President of the EAGE Student Chapter, I organized workshops, seminars, and networking events to engage students in geosciences. I worked with faculty and industry professionals to boost community involvement and promote the chapter's activities in line with EAGE's mission.

Head of Geophysics at Kavoh Kani Arad Company (Mar 2010 – May 2012)

- Conducted seismic reflection surveys, ambient noise tomography, and electrical resistivity tomography (ERT) to map subsurface structures and identify potential resources.
- Analyzed and interpreted geophysical data to create geological models and provide recommendations for further exploration or drilling.
- Worked with cross-functional teams, including geology, engineering, and operations, to incorporate geophysical insights into project planning and decision-making.

CERTIFICATIONS

- Python programming, University of Tehran, Iran **(Aug 2024)**
- Advanced level in MATLAB programming, University of Tehran, Iran **(Jun 2020)**

- Forward & inversion of geophysical data, University of Tehran, Iran **(Jul 2020)**
- GMT Software, University of Tehran, Iran **(Oct 2015)**
- International English Language Testing System, Cambridge, England **(Sep 2010)**
- GIS, South Khorasan Industry, Mining and Trade Organization, Iran **(Aug 2009)**
- Remote sensing, Industry, Mining and Trade Organization, Iran **(Jul 2009)**
- Principles of extraction, Industry, Mining and Trade Organization, Iran **(Jul 2009)**
- Technical supervisor of mine, Industry, Mining and Trade Organization, Iran **(Jul 2009)**
- Monitoring in mine, Industry, Mining and Trade Organization, Iran **(Sep 2009)**
- Mining exploring & exploitation, Industry, Mining and Trade Organization **(Sep 2009)**

GRANTS

- (~$1 k) PACE grant, EAGE, Vienna **(Jun 2023)**
- (~$74 k) Research scholarship- FAPERJ Nota 10 – UFRJ, Brazil **(Jan 2022)**
- (~$74 k) PETROBRAS project, high resolution FWI and RTM **(Jan 2022)**
- (~$22 k) Research scholarship, UNICAMP University, São Paulo, Brazil **(Jan 2021)**
- (~$10 k) Research grant- Ferdowsi University – Mashhad, Iran **(Jan 2020)**
- (~$74 k) PETROBRAS project, software to solve PDE **(Jan 2019)**
- (~$1 k) PACE grant, EAGE, Porto **(Sep 2018)**
- (~$1 k) Student grant, EAGE, Vienna **(May 2016)**
- (~$40 k) Ph.D. governmental scholarship (CNPq), Brazil **(Jan 2015)**
- (~$1 k) PACE grant, EAGE, Turin **(Sep 2015)**
- (~$1 k) Student grant, EAGE, Madrid **(Jun 2015)**

BOOK CHAPTER

- (2023) **M. Kazemnia Kakhki**, W. J. Mansur. The Role of Polarization Analysis in Reducing Natural Hazard. *In Natural Hazards-New Insights. IntechOpen*. DOI: 10.5772/intechopen.109331

JOURNAL ARTICLES

- (2025) A. Vargas-Colorado, **M. Kazemnia Kakhki**, J. E. Barradas-Hernández, S. Márquez-Domínguez, F. A. Carpio-Santamaría, & J. Piña-Flores. Subsurface structure identification at the blind prediction site of ESG in Kumamoto under the diffuse field assumption. *Journal of Applied Geophysics*, 235, 105658.
- (2024) T. Shirzad, S. Vahidravesh, G. Mortezanejad, S. Abdollahi, **M. Kazemnia Kakhki**, and et al. The Crustal and Upper Mantle Structure beneath NW Iran: An Integrated Analysis of Surface Waves and Gravity Data. *Geophysical Journal International*
- (2024) **M. Kazemnia Kakhki**, A. Mokhtari, W. J. Mansur. Seismic data filtering using deconvolutive short-time Fourier transform. *Geophysics*, 89(3), pp.V243-V252. https://doi.org/10.1190/geo2023-0563.1
- (2024) **M. Kazemnia Kakhki**, J. Flores, W. J. Mansur. V. De Gaudio, N. Hafezi Soil characterization of Babol city using single-station ambient seismic noise. *Soil Dynamics and Earthquake Engineering*. https://doi.org/10.1016/j.soildyn.2023.108359
- (2024) **M. Kazemnia Kakhki**, A. Mokhtari, W. J. Mansur. Three-component high-resolution seismic time-frequency polarization filter. *Geophysical journal international*, DOI:10.1093/gji/ggad407.

- (2024) M. Rezaei, T. Shirzad, **M. Kazemnia Kakhki**, and I. Ullah. Crustal structure of Khorasan, NE Iran, using Rayleigh wave tomography. *Journal of Seismology* 28.2: 459-476. https://doi.org/10.1007/s10950-024-10199-3
- (2023) S. Vahidravesh, T. Shirzad, F. Yaminifard, **M. Kazemnia Kakhki**, and et al. The upper crustal shear wave structure of the Zagros collision zone from local earthquake Rayleigh wave tomography. *Physics of the Earth and Planetary Interiors*. , 343, 107079. https://doi.org/10.1016/j.pepi.2023.107079
- (2023) **M. Kazemnia Kakhki**, Taghi Shirzad, Nastaran Shakeri, et al. Shallow crustal model of the DehDasht in Zagros, Iran, using Rayleigh wave tomography. *Physics of the Earth and Planetary Interiors*, DOI:10.1016/j.pepi.2022.106972.
- (2023) T. Shirzad, N. Shakeri, **M. Kazemnia Kakhki**, and et al. Three-dimensional P-wave model of the shallow crustal structure, a complementary method for detecting a trapped hydrocarbon: a case study in the DehDasht region, SW Iran. *Journal of Geophysics and Engineering*, Volume 20, Issue 4, August 2023, Pages 621–634, https://doi.org/10.1093/jge/gxad031
- (2022) **M. Kazemnia Kakhki**, A. Mokhtari, W. J. Mansur. Three-Component Sparse S Transform. *IEEE Transactions on Geoscience and Remote Sensing*, 60, pp.1-7. DOI: 10.1109/TGRS.2022.3219420
- (2021) **M. Kazemnia Kakhki**, W. J. Mansur, H. Yazdanpanah, et al. High-resolution Time-frequency Hilbert transform using sparsity-aware weighting function. *Earth Science Informatics*. DOI: 10.1007/s12145-021-00628-z
- (2021) **M. Kazemnia Kakhki**, V. Del Gaudio, W. J. Mansur, et al. Studying Directional variations of site response in landslide area using ambient noise analysis via Nakamura's and polarization-based method. *Soil Dynamics and Earthquake Engineering*, 141. DOI:10.1016/j.soildyn.2020.106492
- (2020) **M. Kazemnia Kakhki**, K. Aghazade, W.J. Mansur, et al. Seismic attributes via robust and high-resolution seismic complex trace analysis. *Acta Geophysica*. DOI:10.1007/s11600-020-00499-w
- (2020) **M. Kazemnia Kakhki**, W.J. Mansure, F.C. Peters. Rayleigh wave separation using high-resolution time-frequency polarization filter. *Geophysical Prospecting* 68.7: 2104-2118. DOI: 10.1111/1365-2478.12994
- (2020) **M. Kazemnia Kakhki** , F.C. Peters, W.J. Mansur, et al. Deciphering site response directivity in landslide-prone slopes from ambient noise spectral analysis. *Engineering Geology*: 105542. DOI: 10.1016/j.enggeo.2020.105542

CONFERENCE ARTICLES

- (2023) **M. Kazemnia Kakhki**, A. Mokhtari, W. J. Mansure, Wavefield separation using time-frequency polarization analysis. 84th *EAGE Annual Conference & Exhibition*, Jun 2023, Volume 2023, 1-5.
- (2022) **M. Kazemnia Kakhki**, W. J. Mansure, S. Rezaei, N. Hafezi Moghadam, S. Soltani. Studying the soil charecterization using ambient noise methods in the Babol city. *LACSC 4th Assembly of the Latin American and Caribean seismological commission*, October 2022.
- (2021) **M. Kazemnia Kakhki**, K Aghazade, PP Moghadam. High-resolution time-frequency decomposition with adaptive filter. *The 19th Iranian Geophysical Conference*, November 2020, 19, 1379-1382
- (2021) **M. Kazemnia Kakhki**, T Shirzad, N Shakeri, S Norouzi, SA Motlagh. Sallow crustal model of the DehDasht in Zagros, Iran, using classical Rayleigh wave tomography. *AGU Fall Meeting* 2021
- (2018) **M. Kazemnia Kakhki**, F.C. Peters, W. J. Mansure and S. Hooshmand Ghazvini. Detection of landslide direction based on HVNR method. *80th EAGE*

Conference and Exhibition 2018, Jun 2018, Volume 2018, p.1 – 3. DOI: https://doi.org/10.3997/2214-4609.201801738

- (2018) **M. Kazemnia Kakhki**, F.C. Peters, W. J. Mansure and SHG. Separation of Rayleigh Wave from Ambient Noise Data by Instantaneous Polarization. *24th European Meeting of Environmental and Engineering Geophysics*, Porto, Sep 2018, Volume 2018, pp 1–5. DOI: https://doi.org/10.3997/2214-4609.201802572
- (2015) **M. Kazemnia kakhki**, H. Rezaiy. Comparison of Geotechnical and Geophysical Prospecting Approaches in the Study of a Landslide in Northern Iran. *Near Surface Geoscience 2015-21st European Meeting of Environmental and Engineering Geophysics*. Turin, pp 1–5. DOI: https://doi.org/10.3997/2214-4609.201413719
- (2016) **M. Kazemnia Kakhki**, W. J. Mansure. Comparison of Microtremor and Electrical Resistivity in Detecting Sliding Surface. *78th EAGE Conference & Exhibition.*, Vienna, May 2016, Volume 2016, pp 1–5. DOI: https://doi.org/10.3997/2214-4609.201600669
- (2015) **M. Kazemnia Kakhki**. Landslide evaluation by Schlumberger-Wennere method and Geotechnic. *Second Applied Geology International Congress, IAGC*. Mashhad
- (2015) **M. Kazemnia Kakhki**. Evaluation of Intensity-Acceleration relation in Iran zone. *Second Applied Geology International Congress, IAGC*, Mashhad
- (2015) **M. Kazemnia Kakhki**, M. Ansari far. 1D tomography in Booshehr region. *77th EAGE annual meeting*. Madrid. Jun 2015, Volume 2015, p.1 – 4. DOI: https://doi.org/10.3997/2214-4609.201412463

LANGUAGES

- Portuguese - Intermediate
- English - Advance
- Farsi/Persian – Native

REFERENCES

- Prof. ***Webe João Mansur***, Federal University of Rio de Janeiro, Brazil, webe@coc.ufrj.br
- Prof. ***Vincenzo Del Gaudio***, University of Bari, Italy, vincenzo.delgaudio@uniba.it
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