Mohamed Abdelmeguid

California Institute of Technology, Graduate Aerospace Laboratories
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Current Appointment

California Institute of Technology 12/2022 - Present
Postdoctoral Scholar, Graduate Aerospace Laboratories
Supervisor: Prof. Ares J. Rosakis

Education

University of Illinois at Urbana-Champaign 01/2018 - 12/2022
Ph.D. Civil and Environmental Engineering
Advisor: Prof. Ahmed Elbanna
Committee: Prof. Philippe H. Geubelle, Prof. Ares Rosakis, and Prof. Jinhui Yan
Thesis Title: "Physics-based Modeling of Earthquake Cycles and Tsunamis in Strike-slip Fault Zones"

University of Illinois at Urbana-Champaign 08/2016 - 12/2017
M.Sc. Civil and Environmental Engineering
Advisor: Prof. Ahmed Elbanna
Thesis Title: "Ruga Mechanics of Composite Media with Soft Inclusions"

The British University in Egypt 09/2008 - 06/2013
B.Sc. Mechanical Engineering

Research Interests

Geomechanics; Multi-scale Modeling and Simulation; Laboratory Earthquakes; Wave Propagation in Solids; Structural Analysis.

Journal Publications

Google Scholar: Mohamed Abdelmeguid - GS ResearchGate: Mohamed Abdelmeguid - RG

J.14 S. E. Godínez, **M. Abdelmeguid**, J. I. Restrepo, A. Rosakis. "Do Earthquake-Induced Rotational Ground Motions Matter on Building Safety? A Case Study From the Pazarcik Mw7.8 Earthquake", 2024, *to appear in Bulletin of the Seismological Society of America.*

J.13 A. Elbanna, **M. Abdelmeguid**, D. Asimaki, N. Tainpakdipat, G. Lavrentadis, A. Rosakis, Y. Ben-Zion (2025). "Supershear Earthquakes: Their Occurrence and Importance for Seismic Hazard, Early Warning, and Design Standards", *Seismological Research Letters*, https://doi.org/10.1785/0220250118

J.12 A. Rosakis, **M. Abdelmeguid**, A. Elbanna (2025). "Near-field evidence for early supershear rupture of the Mw 7.8 Kahramanmaraş earthquake in Turkey", 2023, *Nature Geoscience*, doi:10.1038/s41561-025-01707-2

J.11 **M. Abdelmeguid**, A. Elbanna, A. Rosakis (2024). "Ground Motion Characteristics of Subshear and Supershear Ruptures in the Presence of Sediment Layers", *Geophysical Journal International*, Volume 240, Issue 2, February 2025, Pages 967–987, https://doi.org/10.1093/gji/ggae422

J.10 **M. Abdelmeguid**, M. S. Mia, A. Elbanna (2024). "On the interplay between distributed bulk plasticity and local fault slip in evolving fault zone complexity", *Geophysical Research Letters*, 51(14), e2023GL108060.

J.9 M. S. Mia, **M. Abdelmeguid**, M., R. A. Harris, A. E. Elbanna (2024). "Rupture Jumping and Seismic Complexity in Models of Earthquake Cycles for Fault Stepovers with Off-Fault Plasticity", *Bulletin of the Seismological Society of America*, 114(3), 1466-1480.

J.8 **M. Abdelmeguid**, C. Zhao, E. Yalcinkaya, G. Gazetas, A. Elbanna, A. Rosakis (2023). "Dynamics of episodic supershear in the 2023 M7.8 Kahramanmaraş/Pazarcik earthquake, revealed by near-field records and computational modeling", *Commun Earth Environ* 4, 456. https://doi.org/10.1038/s43247-023-01131-7

J.7 Md Shumon Mia, **M. Abdelmeguid**, A. Elbanna (2023). "The Spectrum of Fault Slip in Elastoplastic Fault Zones", *Earth and Planetary Sciences*, 619. https://doi.org/10.1016/j.epsl.2023.118310

J.6 Brittany Angela Erickson, Junle Jiang, Valere Lambert, **Mohamed Abdelmeguid** et al. (2023). "Incorporating Full Elastodynamic Effects and Dipping Fault Geometries in Community Code Verification Exercises for Simulations of Earthquake Sequences and Aseismic Slip (SEAS)", *Bulletin of the Seismological Society of America*. doi: https://doi.org/10.1785/0120220066

J.5 **M. Abdelmeguid**, A. Elbanna (2023). "Modeling Sequences of Earthquakes and Aseismic Slip (SEAS) in Elasto-Plastic Fault Zones With a Hybrid Finite Element Spectral Boundary Integral Scheme", *Journal of Geophysical Research: Solid Earth*, 127, e2022JB024548.

J.4 M. S. Mia, **M. Abdelmeguid**, A. Elbanna (2022). "Spatio-Temporal Clustering of Seismicity Enabled by Off-Fault Plasticity", *Geophysical Research Letters*, 49, e2021GL097601.

J.3 **M. Abdelmeguid**, A. Elbanna (2021). "Sequences of seismic and aseismic slip on bimaterial faults show dominant rupture asymmetry and potential for elevated seismic hazard", *Journal of Earth and Planetary Sciences.*

J.2 A. Elbanna, **M. Abdelmeguid**, X. Ma, F. Amlani, H. S. Bhat, C. Synolakis, A. J. Rosakis (2021). "Anatomy of Strike Slip Fault Tsunami-genesis", *Proceedings of the National Academy of Sciences*, May 2021, 118 (19) e2025632118. doi: 10.1073/pnas.2025632118

J.1 **M. Abdelmeguid**, X. Ma, A. Elbanna (2019). "A Novel Hybrid Finite Element-Spectral Boundary Integral Scheme for Modeling Earthquake Cycles: Application to Rate and State Faults with Low-Velocity Zones", *Journal of Geophysical Research: Solid Earth*, 124, 12854– 12881. doi: 10.1029/2019JB018036

Manuscripts under Review

R.3 Md Shumon Mia[$], **M. Abdelmeguid**[$], A. Elbanna. "Fluid injection induced seismicity in complex fault zone architecture", 2025, *submitted to Geophysical Research Letters.*

R.2 N. Tainpakdipat, **M. Abdelmeguid**, C. Zhao, A. Elbanna. "Modeling Dynamic Rupture Propagation of Faults Using Fourier Neural Operators", 2025, *submitted to Journal of Geophysical Research: Solid Earth.*

R.1 **M. Abdelmeguid**, G. Lavrentadis, A. Rosakis, D. Asimaki. "Ground motion characteristics of idealized supershear ruptures: Do they matter for engineering applications?", 2025, *submitted to Bulletin of the Seismological Society of America.*

[$] equal contributing author

Manuscripts in Preparation

M.3 **M. Abdelmeguid**, N. Lapusta. "Influence of Fault Roughness, Dilatancy, and Compaction on Earthquake Sequences".

M.2 **M. Abdelmeguid** A. Rosakis. "Experimental Investigation on the Role of Fault Branches on Frictional Sliding and Delayed Triggering".

M.1 Md Shumon Mia, **M. Abdelmeguid**, A. Elbanna. "Coevolution of Fault Zones and Earthquakes in a Multi-Cycle Simulation of Fault Networks".

Proceedings, Presentations, and Posters

Presentations

P.10 **M. Abdelmegiud**, A. Rosakis, V. Rubino, A. Sáez (2025, 10). "Effects of interface healing on fluid-induced seismicity". Oral Presentation at Center of Geomechanics and Mitgation of Geohazard Fall Meeting, Pasadena, CA.

P.9 **M. Abdelmegiud**, A. Rosakis, N. Lapusta, V. Rubino (2025, 10). "Fully 3D FEM modeling of fluid injection experiments". Oral Presentation at Center of Geomechanics and Mitgation of Geohazard Fall Meeting, Pasadena, CA.

P.8 **M. Abdelmegiud**, A. Rosakis (2025, 05). "Experimental Investigation of Rupture Dynamics in the Presence of Orthogonal Branching Faults". Oral Presentation at 2025 Engineering Mechanics Institute Conference, Anaheim, CA.

P.7 **M. Abdelmegiud**, N. Lapusta (2025, 05). "Influence of Fault Roughness Coupled with Shear-Induced Inelastic Dilatancy on Earthquake Sequences". Oral Presentation at 2025 Engineering Mechanics Institute Conference, Anaheim, CA.

P.6 **M. Abdelmeguid**, A. Elbanna, A. Rosakis (2024, 12). "Ground Motion Characteristics of Subshear and Supershear Ruptures in the Presence of Sediment Layers". Oral Presentation at 2024 American Geophysical Union Annual Meeting, San Francisco, CA.

P.5 **M. Abdelmeguid**, Mia, M., Elbanna, A. E. (2022, 09). "Modeling co-evolution of slip and fault zones in a Sequence of Earthquakes and Aseismic Slip (SEAS) model with off-fault plasticity". Oral Presentation at 2022 SCEC Annual Meeting. SCEC Contribution 12495.

P.4 A. Elbanna, **M. Abdelmeguid**, X. Ma, F. Amlani, H. S. Bhat, C. Synolakis, A. J. Rosakis (2021). "Anatomy of Strike Slip Fault Tsunami-genesis". Oral Presentation at Seismological Society of America Annual Meeting.

P.3 **M. Abdelmeguid**, A. Elbanna (2021). "An Efficient Numerical Algorithm for Modeling of Seismic Cycles: Effect of Low Velocity Zones". Oral Presentation at 16th U.S. National Congress on Computational Mechanics.

P.2 **M. Abdelmeguid**, X. Ma, A. Elbanna (2019). "A Novel Hybrid Numerical Finite Element-Spectral Boundary Integral Scheme For Modeling Earthquake Cycles". Engineering Mechanics Institute Conference, Pasadena, CA.

P.1 **M. Abdelmeguid**, X. Ma, A. Elbanna (2018). "Ruga Mechanics of Composite Media with Soft Inclusions". 18th U.S. National Congress for Theoretical and Applied Mechanics (USCTAM) Conference, Chicago, IL.

Posters

T.10 **M. Abdelmeguid**, G. Lavrentadis, A. Rosakis, D. Asimaki (2025, 09). "Ground motion characteristics of idealized supershear ruptures: Do they matter for engineering applications?". Poster Presentation at 2025 SCEC Annual Meeting.

T.9 **M. Abdelmeguid**, Elbanna, A., Mia, M., Zhao, C. (2024, 09). "On the Interplay Between Distributed Bulk Plasticity and Local Fault Slip in Evolving Fault Zone Complexity". Poster Presentation at 2024 SCEC Annual Meeting.

T.8 **M. Abdelmeguid**, A. Elbanna, A. Rosakis (2024, 09). "Ground Motion Characteristics of Subshear and Supershear Ruptures in the Presence of Sediment Layers". Poster Presentation at 2024 SCEC Annual Meeting.

T.7 **M. Abdelmeguid**, Zhao, C., Yalcinkaya, E., Gazetas, G., Elbanna, A. E., Rosakis, A. J. (2023, 09). "Revealing the Dynamics and Episodic Supershear in the Feb 6th 2023 M7.8 Kahramanmaraş/Pazarcik Earthquake: Near-field Records and Dynamic Rupture Modeling". Poster Presentation at 2023 American Geophysical Union Meeting.

T.6 **M. Abdelmeguid**, Zhao, C., Yalcinkaya, E., Gazetas, G., Elbanna, A. E., Rosakis, A. J. (2023, 09). "Revealing the Dynamics and Episodic Supershear in the Feb 6th 2023 M7.8 Kahramanmaraş/Pazarcik Earthquake: Near-field Records and Dynamic Rupture Modeling". Poster Presentation at 2023 SCEC Annual Meeting. SCEC Contribution 13273.

T.5 **M. Abdelmeguid**, Mia, M., Elbanna, A. E. (2022, 09). "Modeling Sequence of Earthquakes and Aseismic Slip on Fault Step-Overs with Off-Fault Plasticity". Poster Presentation at 2022 SCEC Annual Meeting. SCEC Contribution 12458.

T.4 **M. Abdelmeguid** & Elbanna, A. E. (2021, 08). "Advanced Earthquake Cycle Simulations: Bimaterial Interfaces, LVFZ, and Nonlinear Bulk Rheology". Poster Presentation at 2021 SCEC Annual Meeting. SCEC Contribution 11514.

T.3 A. Elbanna, **M. Abdelmeguid**, X. Ma, F. Amlani, H. S. Bhat, C. Synolakis, A. J. Rosakis (2021). "Anatomy of Strike Slip Fault Tsunami-genesis". American Geophysical Union Meeting.

T.2 **M. Abdelmeguid**, X. Ma, A. Elbanna (2019). "Modeling Sequence of Earthquakes and Aseismic Slip (SEAS) in Complex Faults Zones Using a Computationally Efficient Numerical Algorithm". American Geophysical Union Fall Meeting.

T.1 **M. Abdelmeguid**, X. Ma, A. Elbanna (2019). "A Novel Hybrid Numerical Finite Element-Spectral Boundary Integral Scheme For Modeling Earthquake Cycles". Society of Engineering Science Conference.

Conference Proceedings

Mohamed E. Abdel-Meguid used in earlier publications

C.2 Ahmed E. El-Etriby, **Mohamed E. Abdel-Meguid**, Tarek M. Hatem, Yehia A. Bahei-El-Din. "A multiscale-based approach for composite materials with embedded PZT filaments for energy harvesting". Proc. SPIE 9058, Behavior and Mechanics of Multifunctional Materials and Composites 2014, 90581K (20 March 2014); doi: 10.1117/12.2051830

C.1 Khalid M. Shalan, **Mohamed E. Abdel-Meguid**, Tarek M. Hatem, Yehia A. Bahei-El-Din. "Multi-scale Model And Experimental Study Of Damage In Piezoelectric Fiber-Based Composite". EWSHM - 7th European Workshop on Structural Health Monitoring, IFFSTTAR, Inria, Universite de Nantes, Jul 2014, Nantes, France. hal-01022979

Teaching

American University in Sharjah, Sharjah, UAE
Department of Mechanical Engineering

- Teaching Assistant, Spring 2016
  - MCE223 Mechanics of Materials
  - MCE226L Computer Applications in Mechanical Engineering I

The British University in Egypt, Cairo, Egypt
Department of Mechanical Engineering

- Teaching Assistant, Fall 2014 - Spring 2015
  - EAXS264 Structural and Stress Analysis
  - MECH28H Heat Transfer Equipment
  - MECH02P Engineering Drawing and Descriptive
  - MECH03C Manufacturing Engineering (1)
  - MECH02P Engineering Drawing and Descriptive Geometry

Service

Reviewer,

- Geophysical Research Letters
- Nature Communications
- Communications Earth and Environment
- Scientific Reports
- Earth and Planetary Sciences
- Tectonophysics
- National Science Foundation
- Seismica
- Science
- Journal of Geophysical Research Solid Earth
- Geophysical Journal International

Media Coverage

- L.A. Could See Damaging "Supershear" Earthquake, Scientists Warn. USC Dornsife News 2025.

- Contrary to previous belief strike-slip faults can generate large tsunamis. Caltech News 2021.
- Previously unrecognized tsunami hazard identified in coastal cities. Illinois News Bureau 2021.
- Al Jazeera News 2021 صدوع القشرة الأرضية يمكن أن تتسبب في حدوث موجات تسونامي

Awards and Honors

Academic Achievement Scholarship, The British University in Egypt 2008 - 2013
Conference Travel Award, University of Illinois at Urbana–Champaign 2018 & 2019

Other Research experience

University of Illinois at Urbana-Champaign 08/2015 - 11/2015
Visiting Researcher
Host: Prof. Ahmed Elbanna. Modeling of programable multifunctional materials using nonlinear finite element methods.

Politecnico di Torino 01/2013 - 03/2013
Undergraduate Visiting Researcher
Host: Prof. Erasmo Carerra. FEM modeling of piezoelectric material for structural health monitoring application using unified plate theory.