

Mohammad Afzal Shadab

🌐 mashadab | **in** mashadab | 🌐 mashadab.github.io | ✉ mashadab@princeton.edu | 📞 +1(737)2062080

POSITIONS HELD

Future Faculty in the Physical Sciences Fellow Department of Civil and Environmental Engineering, <i>Princeton University</i>	2024- Present Princeton
Graduate Research Assistant Oden Institute for Computational Engineering and Sciences, <i>University of Texas at Austin</i>	2019-24 Austin
NASA-JPL Graduate Fellow Planetary Science Division, <i>NASA Jet Propulsion Laboratory, California Institute of Technology</i>	Summer 2023 Pasadena
NASA-JPL Graduate Fellow Earth Science Division, <i>NASA Jet Propulsion Laboratory, California Institute of Technology</i>	Spring 2022 Pasadena
MIT Visiting Graduate Student Researcher Department of Mechanical Engineering, <i>Massachusetts Institute of Technology</i>	2018-19 Cambridge
Graduate Research Assistant Dept. of Mechanical and Aerospace Engg., <i>Hong Kong University of Science and Technology</i>	2016-18 Hong Kong

EDUCATION

Doctor of Philosophy <i>Computational Science, Engineering & Mathematics</i> The University of Texas at Austin, United States <i>Title:</i> Modeling Subsurface Flow of Water in Earth and Planetary Sciences <i>Advisor:</i> Dr. Marc Hesse, Professor of Earth and Planetary Sciences	2024
Master of Science <i>Computational Science, Engineering & Mathematics</i> The University of Texas at Austin, United States <i>Advisor:</i> Dr. Marc Hesse, Professor of Earth and Planetary Sciences	2021 GPA: 3.90/4.0
Master of Philosophy <i>Mechanical Engineering</i> The Hong Kong University of Science and Technology <i>Thesis:</i> Fifth-Order Finite Volume WENO in General Orthogonally-Curvilinear Coordinates 📄 <i>Advisor:</i> Dr. Kun Xu, Chair Professor of Mathematics and Mechanical & Aerospace Engg.	2018 GPA: 4.0(A)/4.3(A+)
Bachelor of Technology <i>Mechanical Engineering</i> Aligarh Muslim University, India	2016 GPA: 9.62/10.0

RESEARCH EXPERIENCE

Modeling and Understanding Large-Scale Integrated Soil and Firn Hydrology Future Faculty in the Physical Sciences Postdoctoral Fellow <i>Advisor:</i> Prof. Reed Maxwell	Princeton University 2024- Present
<ul style="list-style-type: none">• Learning basics of ParFlow hydrologic model, overland flow modeling, and Community Land Model.• Analyzing effect of capillary forces on large scale hydrology using ParFlow with Community Land Model.• Extending conventional vertically-integrated models for unconfined aquifers to firn aquifers using scaling analysis and solving PDEs (semi-)analytically.	
Storage and Transport of Anthropogenic Alkalinity in Soil Collaborative Research <i>Collaborators:</i> Dr. Jacob Jordan (Mati), Prof. V. Prigiobbe (U. Padua), Prof. N. Planavsky (Yale)	Princeton University Summer 2024- Present
<ul style="list-style-type: none">• Assisting in development of a chromatographic theory to represent transport and exchange of cation assemblages through a soil column beneath an enhanced rock weathering deployment.• Constructed the analytic solutions for different cases involving wave propagation and coded them in Matlab.• Validating the solutions using PHREEQC geochemical modeling software.	

Modeling Subsurface Flow of Water in Earth and Planetary Sciences

UT Austin

Graduate Research Assistant, *Doctoral Thesis*

2019-24

Advisor: Prof. Marc Hesse

- Developed and validated a conservative finite-difference based discrete operator toolbox in Python for simulating 1D/2D two-phase flow in non-deforming porous media.
- Implemented the solver to investigate the melt percolation on ice masses and formation of ice layers.
- Formulated kinematic wave theories for infiltration in soil and firn to understand the physics of the process and compare the performance & improve existing models.

Vadose Zone and Groundwater Hydrology on Early Mars

UT Austin

Collaborative Research

2020- Present

Collaborators: Eric Hiatt, Rickbir Bahia (ESA), Eleni Bohacek (ESA), and Prof. Marc Hesse

- Utilized kinematic wave infiltration theory to study infiltration into Martian regolith to investigate its effects on surface geomorphological & water budget evolutions, and estimate water residence times in vadose zone.
- Developed theoretical groundwater (GW) model for deep crustal aquifer on a spherical shell with vertical heterogeneity and estimated GW residence times.
- Assisted ESA collaborators implement infiltration process in Martian aeolian-fluvial interaction (MAFI) model.

Improving the Numerical Toolset for Geodynamics of Icy Oceans World

Jet Propulsion Lab

NASA Jet Propulsion Lab Graduate Fellow

Summer 2023

Advisor: Dr. Steven Vance

- Developed multidimensional model and code for single phase flow in viscously compacting matrix, i.e., convecting ice sheet with pore fluid in cylindrical coordinates.
- Implemented tracers to track organics during melt migration across ice shells of icy ocean worlds.
- Formulated a theoretical model for calculating time scales of melt migration & validated with simulations.

Modeling Meltwater Percolation in Greenland's Firn

Jet Propulsion Lab

NASA Jet Propulsion Lab Graduate Fellow

Spring 2022

Advisor: Dr. Surendra Adhikari

- Developed a three-phase (snow / water / air) firn hydrology simulator.
- Derived and validated vertically integrated model for meltwater gravity currents.
- Estimated field parameters using kinematic wave theory and investigated meltwater infiltration in Greenland.

Investigating Groundwater Flows using Physics Informed Neural Networks

UT Austin

Collaborative Research

2020-23

Collaborators: DingCheng Luo, Yiran Shen, Eric Hiatt, and Prof. Marc Hesse

- Wrote python codes for data-driven discovery of steady-state PDE from experimental data.
- Investigated the effect of PDE regularization in PINNs and the role of PDE & data misfit.
- Learned the PDE model parameters and boundary conditions for the transient seepage across edge of a porous reservoir simulated using finite-element method based model (FEniCS).

Free Fall of a Viscous Drop in a Viscoelastic Medium

Massachusetts Institute of Technology

Visiting Graduate Student Researcher

2018-19

Advisor: Prof. Irmgard Bischofberger

- Performed a rheological characterization of viscoelastic polymers to estimate their Deborah numbers.
- Designed the drop dynamics experiments and apparatus with high-speed imaging.
- Wrote Matlab scripts for analyzing moving camera videos without fixed reference using template matching.

High-Order Finite-Volume Methods in Curvilinear Coordinates

HKUST, Hong Kong

Graduate Research Assistant, *M.Phil. Thesis*

2016-18

Advisor: Prof. Kun Xu

- Proposed a high order finite volume spatial reconstruction technique in curvilinear coordinates.
- Derived analytical relations, implemented in CFD codes and validated fifth order of spatial accuracy.

Modal Decomposition Techniques on a Thermoacoustic System

HKUST, Hong Kong





Collaborative Research

Fall 2016

Collaborators: Prof. Peter Schmid (Imperial), Prof. Simone Hochreiß (Cambridge), Prof. Larry Li



- Analyzed and compared the prominent modal decomposition techniques for developing low order models.
- Investigated the interaction between flame & external acoustic forcing with variable amplitudes & frequencies.

TEACHING EXPERIENCE

GEO 325C/398C Continuum Mechanics  (Graduate)	Fall 2022, 2023
University of Texas at Austin	Austin
<i>Position:</i> Teaching Assistant, <i>Instructor:</i> Prof. Marc Hesse	
<i>Responsibilities:</i> Taught tutorial lectures, clarified concepts on Piazza, evaluated assignments	
GEO 325M/398M Numerical Modeling in the Geosciences  (Graduate)	Spring 2023
University of Texas at Austin	Austin
<i>Position:</i> Teaching Assistant, <i>Instructor:</i> Prof. Marc Hesse	
<i>Responsibilities:</i> Conducted tutorials and coding exercises, resolved coding/conceptual issues	
SIAM Applied Mathematics Mentorship Program Lectures (Undergrad/Graduate)	Fall 2022
University of Texas at Austin	Austin
<i>Position:</i> Instructor	
<i>Responsibilities:</i> Designed and conducted lectures such as Intro to \LaTeX  , 	
MECH 1907 Introduction to Aerospace Engineering (Freshman, Sophomore)	Spring 2018
The Hong Kong University of Science and Technology	Hong Kong
<i>Position:</i> Teaching Assistant, <i>Instructor:</i> Prof. Rhea Liem	
<i>Responsibilities:</i> Designed & evaluated exams & HWs, taught tutorial and two class lectures	
MECH 3690 Aerospace Engineering Laboratory (Senior, Junior)	Spring 2017
The Hong Kong University of Science and Technology	Hong Kong
<i>Position:</i> Teaching Assistant, <i>Instructor:</i> Prof. Jinglei Yang	
<i>Responsibilities:</i> Taught multiple class lectures and lab briefings, contributed to lab manual	

For all teaching feedback reports and certificates, click .

PEDAGOGICAL TRAINING

Teaching Transcript Program 	Fall 2024 – Present
Princeton University	Princeton
Workshops and discussions on teaching and academic careers, and teaching observations.	
Inclusive Course Design Institute 2023 	Summer 2023
The University of Texas at Austin	Austin
Designed a course from ground up using Universal Design for Learning (UDL) and best practices.	
Inclusive Classrooms Leadership Certificate Seminar Series	Spring 2023
The University of Texas at Austin	Austin
Learned strategies for developing and sustaining an inclusive classroom along with course design.	
Advanced Teaching Preparation Series Certificate	Spring, Fall 2022
The University of Texas at Austin	Austin
Learned and practiced techniques of good classroom teaching.	
Graduate Teaching Assistant Training Program	2017-18
The Hong Kong University of Science and Technology	Hong Kong
Learned the fundamentals of teaching assistantship and effective pedagogy.	

SKILLS

Languages: C, C++, Fortran 77/90, Python (SciPy, NumPy, Matplotlib, Pandas, Pytorch, Tkinter, Tensorflow, GUI programming, Webscraping), HTML, Matlab, Mathematica, Shell Scripting, \LaTeX , High Performance Computing (SLURM), FEniCS

General Software: AutoCAD, SolidWorks, ANSYS, Fluent, COMSOL Multiphysics, TecPlot, ParaView, Microsoft Office, Git, Travis CI, Docker

Geoscience Software: Hydrus, VPlanet, QGIS, QGreenland, ENVI, PlanetProfile, PHREEQC, ParFlow, CLM

OS: Linux, Windows, Mac

HONORS AND AWARDS

Princeton University Future Faculty in the Physical Sciences Fellowship 	2024-27
A postdoctoral fellowship to increase research excellence and faculty diversity	
NASA Open Science Badge 	2024
Completed five modules on open science including tools offered by NASA TOPS Program .	
AGU Cryosphere Innovation Award / Flash Freeze Competition Winner 	2023
Awarded based on a two-minute pitch of innovative idea to a panel of five judges at AGU 2023.	
UT Austin Graduate School Summer Fellowship 	Summer 2024
Awarded summary salary and tuition based on academic standing and research experience.	
UT Austin Graduate School Spring Dissertation Writing Fellowship 	Spring 2024
Received spring semester salary and tuition for academic and research excellence.	
NASA Jet Propulsion Laboratory Graduate Fellowship 	Summer 2023
To investigate life-supporting conditions on Europa with Dr. Steve Vance at JPL.	
Purdue Climate Scholar by Purdue University and Office of Naval Research 	Summer 2022
To attend Summer Institute for Sustainability & Climate Change at Purdue University.	
NASA Jet Propulsion Laboratory Graduate Fellowship 	Spring 2022
To study effect of climate change on Greenland ice sheet with Dr. Surendra Adhikari at JPL.	
MIT - Houston Energy Innovation Student Fellow 	2022-23
Representing UT Austin as a liaison between MIT's Martin Trust Center and Greentown Labs.	
Lunar and Planetary Institute Career Development Award 	2022
For first author abstract and application materials submitted at LPSC 2022.	
UT Austin Cactus Standout Award 	2022
For academic excellence and leadership contributions. Inducted into UT Annual Yearbook 2022.	
Research Award in Planetary Habitability by Cent. for Planetary Sys. Habitability 	Spring 2022
Semester long fellowship for proposal on finding life-supporting conditions on Europa.	
Outstanding Student Presenters Award by Unsaturated Zone Technical Committee, AGU 	2021
For oral presentation: <i>H52D-10 Rainwater Infiltration</i> at AGU Fall Meeting 2021. 	
Certificate of Recognition by Society for Industrial and Applied Mathematics	2021
For outstanding service and contributions to the UT Austin Student Chapter of SIAM.	
Blue Sky Student Fellowship by University of Texas Institute for Geophysics	2021-22
Year-long fellowship covering tuition, insurance & stipend awarded for research proposal.	
Best Teaching Assistant Award by Dept of Mech & Aero Engg, HKUST	2018
Awarded for <i>MECH-1907 Introduction to Aerospace Engineering</i> course.	
Judge's Award and Audience Award at MIT MEMSI Program	2018
Awarded by MIT and Hong Kong Innovation Node for best startup idea & pitch in the program.	
Recognitions in Reviewing	2018, 2023
Outstanding Contribution in Reviewing Recognition by <i>Journal of Computational Physics</i> .	
Mentioned in <i>Geophysical Research Letters</i> , <i>Journal of Geophysical Research - Planets</i> 	
Postgraduate Studentship by HKUST	2016-18
Competitive stipend for research postgraduate students (M.Phil.) at HKUST.	
Global Scholar Award by Sir Syed Education Society of North America	2015
For top 20 students of AMU based on their academic achievements and research, for higher education.	
National Summer Research Fellowship by Indian Academy of Sciences	Summer 2015
Awarded national fellowship to pursue research in Indian research institutes like IITs/IISc.	
University Merit Scholarship by AMU Alumni Association Toronto, Canada	2015
Merit based scholarship for students pursuing education at AMU.	

TRAVEL GRANTS AND FUNDED SHORT SCHOOLS

AGU Cryosphere Section Student Travel Grant for Diversity (CryoStuD) 	2024
Travel grant for uplifting traditionally marginalized scientists to present research at AGU'24.	
Center for Planetary Systems' Habitability Student Travel Award	2022, 2023, 2024
Awarded a travel grant to attend the LPSC.	
UT Austin Professional Development Awards 	2022, 2024
For presenting two research works conducted at UT Austin.	
Early Career Travel Award by European Space Agency	2023
Received a travel award to attend the FAIRPLAY 2023 Workshop in the Netherlands.	
Early Career Tiny Grants - AGU Ecohydrology Committee	2022
For early-career scientists presenting ecohydrology-related work at the AGU Fall Meeting 2022.	
SIAM Student Travel Award	2021
Awarded a student travel grant by SIAM to attend the SIAM Annual Meeting 2021.	
ICOSAHOM Conference Travel Grant	2018
Awarded a student travel grant to attend the International Conference on Spectral And High Order Methods at Imperial College London.	
Numerical Simulations ICNM 2017 Conference Travel Grant	2017
Awarded full funding for attending the 5th International Conference on Numerical Simulations for Multimaterial and Multiphysics Problems in China.	
Advanced Research in Turbomachinery Summer School Grant	Summer 2019
Received a scholarship to attend this summer school organized by the University of Florence, Italy and sponsored by ANSYS and GE.	
MIT StartMIT Course Grant	Winter 2019
Received full sponsorship from MIT Martin Trust Center for this course on entrepreneurship.	
Fluid Dynamics across Scales Summer School Grant	Summer 2018
Received funding to participate in the Centre for Doctoral Training in Fluid Dynamics across Scales at Imperial College London.	
MIT Entrepreneurship and Maker Skills Integrator Bootcamp Funding	Summer 2018
Received full funding from MIT and Hong Kong Innovation Node to attend the program.	

INVITED TALKS AND SEMINARS

- [9] April 2024: Mathematics on Ice Forum 
- [8] Jan 2024: California Institute of Technology - *Graduate Aerospace Laboratories (GALCIT) and Fu Research Group*
- [7] Oct 2023: The University of Texas at Austin - *Center for Planetary Systems Habitability*
- [6] Sept 2023: The University of Texas Institute for Geophysics
- [5] August 2023: NASA Jet Propulsion Laboratory, *Planetary Science Division Seminar*
- [4] June 2022: NASA Jet Propulsion Laboratory, *Earth Science Division Seminar*
- [3] June 2022: California Institute of Technology, *Fu Research Group*
- [2] May 2017: 5th International Conference on Numerical Simulation for Multimaterial and Multiphysics Problems
- [1] 2016-2017: The Hong Kong University of Science and Technology - *Aeronautics Interest Group (AIG)*.

PEER REVIEWED PUBLICATIONS


- [10] Barnes, R., ... **Shadab, M.A.**, 2025. History and habitability of the LP 890-9 planetary system, *The Planetary Science Journal*, 6(1), p.25, 13pp.
<https://www.doi.org/10.3847/PSJ/ad94dc>
- [9] Vanek, S., ..., **Shadab, M.A.**, 2024. Exploring the past, present, and future of USAPECS: Lessons from a decade of supporting early career research across national and international polar networks. *Arctic Yearbook*, 14pp.
<https://arcticyearbook.com/>
- [8] **Shadab, M.A.**, Adhikari, S., Rutishauser, A., Grima, C. and Hesse, M.A., 2024. A mechanism for ice layer formation in glacial firn. *Geophysical Research Letters*, 51(15), p.e2024GL109893, 12+37pp.
<https://doi.org/10.1029/2024GL109893>
- [7] **Shadab, M.A.** and Hesse, M.A., 2024. A hyperbolic-elliptic PDE model and conservative numerical method for gravity-dominated variably-saturated groundwater flow. *Advances in Water Resources*, p.104736, 17pp.
<https://doi.org/10.1016/j.advwatres.2024.104736>
- [6] Hiatt, E. **Shadab, M.A.**, Hesse, M., Goudge, T., Gulick, S., 2024. Limited recharge of the southern highlands aquifer on early Mars, *Icarus*, 408, p.115774, 10+16pp.
<https://doi.org/10.1016/j.icarus.2023.115774>
- [5] **Shadab, M.A.**, Hiatt, E. and Hesse, M.A., 2023. PKgui: A GUI software for Polubarinova-Kochina's solutions of steady unconfined groundwater flow, *SoftwareX*, 24, p.101573, 5+5pp.
<https://doi.org/10.1016/j.softx.2023.101573>
- [4] **Shadab, M.A.**, Luo, D., Hiatt, E., Hiatt, E. and Hesse, M.A., 2023. Investigating steady unconfined groundwater flow using physics informed neural networks, *Advances in Water Resources*, 177, p.104445, 16+18pp.
<https://doi.org/10.1016/j.advwatres.2023.104445>
- [3] **Shadab, M.A.** and Hesse, M.A., 2022. Analysis of gravity-driven infiltration with the development of a saturated region, *Water Resources Research*, 58(11), p.e2022WR032963, 27pp.
<https://doi.org/10.1029/2022WR032963>
- [2] **Shadab, M.A.**, Balsara, D., Shyy, W. and Xu, K., 2019. Fifth-order finite volume WENO in general orthogonally - curvilinear coordinates. *Computers & Fluids*, 190, 26pp.
<https://doi.org/10.1016/j.compfluid.2019.06.031>
- [1] **Shadab, M.A.**, Ji, X. and Xu, K., 2018. Fifth-order finite volume WENO on cylindrical grids. *Spectral and High Order Methods for Partial Differential Equations (Springer)*, 10pp.
https://doi.org/10.1007/978-3-030-39647-3_51

UNDER REVIEW

- [3] **Shadab, M.A.**, Hiatt, E., Bahia, R.S., Bohacek, E.V., Steinmann, V. and Hesse, M.A., 202X. Infiltration dynamics on early Mars: Geomorphic, climatic, and water storage implications. (Minor revision in *Geophysical Research Lett.*)
- [2] **Shadab, M.A.**, Rutishauser, A., Grima, C. and Hesse, M.A., 202X. A unified kinematic wave theory for melt infiltration into firn. arXiv:2403.15996. (Minor revision in *Journal of Glaciology*).
- [1] **Shadab, M.A.**, Vance, S.D., Silber, E A., Crósta, A.P., Carnahan, E., Jordan, J.S., Hesse, M.A., 202X. Rapid migration of impact melt through ocean world ices: Selk crater on Titan and Mannann'an crater on Europa. (Under review in *Earth and Planetary Science Letters*)

IN PREPARATION

- [6] **Shadab, M.A.**, Hiatt, E. and Hesse, M.A., 202X. Analytical solutions of a low-aspect-ratio unconfined aquifer on a spherical shell: Application to early Mars. (for *Journal of Geophysical Research - Planets*)
- [5] **Shadab, M.A.** and Hesse, M.A., 202X. An open source discrete operator toolbox (DOT) to solve geophysical flow problems. (for *Geoscientific Model Development*)
- [4] Hiatt, E. **Shadab, M.A.**, Hesse, M., Goudge, T., Gulick, S., 202X. Transient groundwater models suggest short lived recharge events on early Mars. (for *Nature Geoscience*)

- [3] Hiatt, E. **Shadab, M.A.**, 202X. Experimental and numerical investigations of seepage face dynamics: A physics solution. (for *Journal of Fluid Mechanics*)
- [2] Jordan, J.S., **Shadab, M.A.**, et al., 202X. On the storage and transport of anthropogenic alkalinity in porous media: Soil as a chromatographic column, (for *American Journal of Science*)
- [1] Hesse, M.A. and **Shadab, M.A.**, 202X. Numerical modeling for geoscientists. (book draft )

EXTENDED CONFERENCE ABSTRACTS

- [12] Hiatt, E., **Shadab, M.A.** et al., 2025. Transient Groundwater Recharge of Early Mars' Groundwater Systems & Subsequent Climate Constraints *56th Lunar and Planetary Science Conference*, #2629, 2pp.
- [11] **Shadab, M.A.**, Vance, S.D., Styczinski M.J., Silber E.A., Crósta, A.P., Carnahan, E., Jordan, J.S. and Hesse, M.A., 2024. Evolution of impact generated melt at Selk crater: Effect of phase change, percolation, and viscous foundering. *55th Lunar and Planetary Science Conference*, #1317, 2pp.
- [10] **Shadab, M.A.** et al., 2024. Infiltration on early Mars & its implications toward aeolian-fluvial interactions. *55th Lunar and Planetary Science Conference*, #1383, 2pp.
- [9] Hiatt, E., **Shadab, M.A.**, Gulick, S.P.S., Goudge, T. and Hesse, M.A., 2024. Martian lakes: a critical requirement for transient groundwater models. *55th Lunar and Planetary Science Conference*, #2408, 2pp.
- [8] **Shadab, M.A.**, Hiatt, E. and Hesse, M.A., 2023. A deep crustal aquifer model for southern highlands of Noachian Mars shows groundwater age and near-surface dynamics. *NASA Exploration Science Forum*, 2pp.
- [7] **Shadab, M.A.**, Hiatt, E. and Hesse, M.A., 2023. A deep crustal aquifer model for southern highlands of Noachian Mars shows groundwater age and near-surface dynamics. *Brines Across the Solar System: Ancient and Future Brines Conference*, #2025, 2pp.
- [6] **Shadab, M.A.**, Hiatt, E. and Hesse, M.A., 2023. Investigating groundwater dynamics and residence times on early Mars using unconfined aquifer model with vertical heterogeneity. *54th Lunar and Planetary Science Conference*, #1736, 2pp.
- [5] Hesse, M.A., **Shadab, M.A.** and Hiatt, E., 2023. Time scales for terminal groundwater drainage from the southern highlands on Mars. *54th Lunar and Planetary Science Conference*, #1637, 2pp.
- [4] Hiatt, E., **Shadab, M.A.** and Hesse, M.A., 2023. Planetary scale groundwater and surface water interaction on early Mars. *54th Lunar and Planetary Science Conference*, #2415, 2pp.
- [3] **Shadab, M.A.**, Hiatt, E., and Hesse, M.A., 2022. Estimates of Martian mean recharge rates from analytic groundwater models. *53rd Lunar and Planetary Science Conference*, #1775, 2pp.
- [2] Hiatt, E., **Shadab, M.A.**, Gulick, S.P.S., Hesse, M.A., Goudge, T. and Hesse 2022. Estimates of groundwater divides and basins on Noachian Mars. *53rd Lunar and Planetary Science Conference*, #2618, 2pp.
- [1] **Shadab, M.A.** and Baig, M.F., 2017. Investigation and control of unstart phenomenon in scramjets. In *21st AIAA International Space Planes and Hypersonics Technologies Conference* (p. 2298), 16pp.
<https://doi.org/10.2514/6.2017-2298>

SELECTED CONFERENCE TALKS

- [6] **Shadab, M.A.** et al., 2023. Mechanism & factors controlling ice layer formation in glacial firn, *AGU Fall Meeting*.
- [5] **Shadab, M.A.** et al., 2023. A unified kinematic wave theory for melt infiltration into firn, *AGU Fall Meeting*.
- [4] **Shadab, M.A.** et al., 2023. Infiltration on early Mars and its implications toward aeolian-fluvial interactions, *Fluvial-Aeolian Interactions on Planetary Surfaces (FAIRPLAY)*, European Space Agency.
- [3] **Shadab, M.A.**, and Hesse, M.A., 2022. Extending Richards equation to simulate variably saturated flows, *AGU Fall Meeting*.
- [2] **Shadab, M.A.**, and Hesse, M.A., 2021. Fluid infiltration in unsaturated porous medium with the development of a saturated region, *AGU Fall Meeting*.
- [1] **Shadab, M.A.** et al., 2021. Investigating fluid drainage from the edge of a porous reservoir using physics informed neural networks, *SIAM Annual Meeting*.










OPEN SOURCE SOFTWARE

- [6] **Shadab, M.A.** et al., 2024. mashadab/ice-layer-formation: v1.0.0, Zenodo. <https://doi.org/10.5281/zenodo.12706191>
- [5] **Shadab, M.A.** and Hesse, M. A., 2024. mashadab/VarSatFlow: v1.0 (v1.0), Zenodo. <https://doi.org/10.5281/zenodo.11398273>
- [4] **Shadab, M.A.** et al., 2023. mashadab/PKgui (v1.0.1), Zenodo. <https://doi.org/10.5281/zenodo.8034146>
- [3] **Shadab, M.A.** et al., 2021. PINNs for unconfined groundwater flow (v1.0), Zenodo. <https://doi.org/10.5281/zenodo.5803542>
- [2] **Shadab, M.A.** and Hesse, M.A., 2022. Gravity driven infiltration with the development of a saturated region (v1.0), Zenodo. <https://doi.org/10.5281/zenodo.6558260>
- [1] **Shadab, M.A.**, 2021. Reservoir-Simulator, Zenodo. <https://doi.org/10.5281/zenodo.6581752>

REVIEWER

Geoscience: Comp. Geoscience, Water Resources Research, Geophysical Research Lett., J. of Geophysical Research
Numerical Methods: Journal of Computational Physics, Geoscientific Model Development, Computer and Fluids

SERVICE

Mentor, Interagency Arctic Research Policy Committee Mentorship program 	2024-25
Providing career counseling and skills training.	Virtual
AGU24 Sessions' Convener and OSPA Liaison and Judge, Three Sessions 	2024
Designing oral/poster/e-lightening sessions with AGU Cryo team titled C24A/C41C/C43C <i>The Cryosphere Is for All: Overcoming Barriers to Participation in the Cryospheric Sciences</i> at AGU24.	
Executive Secretary and/or Reviewer, Six NASA ROSES Review Panels 	2023- Present
Managed panel reviews or reviewed proposals in panels, receiving honorariums	
Executive Committee Member, AGU Cryosphere Division 	2024- Present
Serving in the Diversity, Equity, and Inclusion (DEI) and Canvassing Working groups.	Virtual
Judge, AGU Fall Meeting Travel Award 	Fall 2024
Reviewed cryosphere division related applications for AGU 2024 from around the world.	Virtual
Judge, International Mission to Mars Engineering Design Contest 	Summer 2024
Organized by Mars Society for high school students from around the world.	Virtual
Young Professional Mentor, Zed Factor Fellowship Program 	2023-24
Mentor rising undergraduate students in aerospace engineering.	Virtual
Team Member, UT Austin Libraries HELIOS team 	2023-24
To advance Higher Education Leadership Initiative for Open Scholarship (HELIOS). Gave a speech at <i>US White House</i> Listening Sessions on Open Science (News  , Post  , Video ). Panelist at multiple open science events , ,  .	Austin
Co-Chair & DEI Team Lead, US Assoc. of Polar Early Career Scientists 	2022- Present
Fostering climate and DEI-conscious collaborations between academia & polar organizations.	Virtual
Board Member, AGU Hydrology Section Student Subcommittee (AGU-H3S) 	2023- Present
Providing professional development & networking opportunities to early career hydrologists.	Virtual
Volunteer, MIT Energy Conference 	2023
Assisted in organizing in-person sessions at the conference.	Boston
Coordinator, Center for Planetary Systems Habitability Student Travel Award 	Spring 2023
Organized, coordinated and liaised the application process for student travel to LPSC 2023.	Austin

MIT - Houston Energy Innovation Student Fellow 	2022-23
Cultivated & supported energy innovation startup ecosystem considering threat of climate change.	Austin
Volunteer / Braindate Lounge Assistant, AGU Fall Meeting 2022 	2022
Facilitated collaborations between researchers and scientists through Braindate at AGU 2022.	San Francisco
Mentor, American Geophys. Union Earth & Planetary Surface Processes (EPSP) 	2022- Present
Mentoring graduate students across the world to develop technical and research skills in EPSP.	Virtual
Geoscience Ambassador, Jackson School of Geosciences, UT Austin 	2021-22
Making geoscience accessible to broader community & promoting interdisciplinary research.	Austin
Session Chair, Society for Industrial & Applied Mathematics Annual Meeting 	2021
Chaired the CP15: <i>Machine Learning and Data Mining</i> Session.	Virtual
President & Senior Advisor, SIAM Chapter of UT Austin 	2020-23
Spearheaded several programs & won Best Graduate Organization at UT Austin Award.	Austin
Mentor, Mentoring365, American Geophysical Union 	2021- Present
Facilitating an exchange of professional knowledge, skills, and experiences in Earth and space sciences.	Virtual
Mentor, SIAM Applied Mathematics Mentorship 	2021-23
Conceptualized the program and mentoring UT students for applied math concepts and prospects.	Austin
Volunteer, Lunar and Planetary Science Conference 2022 	2021
Managed a virtual and an in-person session and moreover conference logistical tasks.	Houston
Mentor, Sir Syed Global Scholar Award 	2016- Present
Mentoring top AMU students from humble backgrounds for US grad school applications.	Virtual
Zonal Head & College Head Ambassador, Smilyo Educational Charitable Society 	2014-15
Managed multi-university teams & provided educational resources to not-so-privileged.	New Delhi, India

MEDIA COVERAGE

Understanding ice layer formation to estimate sea level rise - UT , AAAS , Phys.org 	2024
For the thesis work on understanding ice layer formation done in collaboration with NASA-JPL.	
Little groundwater recharge in ancient Mars aquifer - UT , EurekAlert , AAAS , Phys.org 	2024
For the collaborative work with Eric Hiatt on water on early Mars.	
Fulfilling my NASA dream - Sir Syed Global Scholar Award Story of the Month 	2022
On my post-baccalaureate experience towards landing a graduate fellowship at NASA JPL.	
Mars may have less water than previously estimated - Multiple news outlets	2022
UT Austin Website (front cover) , & , Phys.org , Times of India , Bailey Universe 	
Outstanding Student Presentation Award at AGU 2021 - UT Austin 	2022
For outstanding student presentation on Rainwater Infiltration in AGU Fall Meeting 2021.	
CPSH Travel Grant sends 11 students to LPSC - UT Austin 	2022
For travel grant from Center for Planetary Systems Habitability to attend LPSC 2022.	
Lunar & Planetary Institute Career Devel. Award News - UT Austin , LPI News 	2022
For outstanding first-authored work on fate of water on early Mars at LPSC conference.	
How to stay productive while in quarantine - Oden Institute Feature Article 	2021
For academic & research achievements and service at Oden Institute during quarantine.	

MEMBERSHIPS

American Geophysical Union
 International Glaciological Society
 Association of Polar Early Career Scientists
 Society for Industrial and Applied Mathematics
 American Physical Society