

Eric Hiatt

GRADUATE STUDENT · UNIVERSITY OF TEXAS INSTITUTE FOR GEOPHYSICS · THE JACKSON SCHOOL OF GEOSCIENCES

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Research Interests

Examining early Mars hydrology through numeric models and laboratory-based analogue experiments to understand the global-scale effects of basin-forming impact events on early Mars. Conducting laboratory experiments on basic fluid dynamic problems related to the applicability and accuracy of commonly used governing equations in groundwater flow models.

Education

The University of Texas at Austin

Austin, TX

PHD CANDIDATE PLANETARY GEOPHYSICS

Aug. 2019 - Present

- Dissertation: Understanding spatio-temporal scales between large impacts and hydrosphere equilibrium on early Mars
- Co-advised by Dr. Sean Gulick and Dr. Marc Hesse
- Areas of Study: Impact cratering processes, Planetary surface processes, groundwater hydrology, cryosphere, numeric modeling, fluid dynamics, applied mathematics
- Relevant Coursework: Continuum Mechanics, Geological Measurement and Monitoring (Sensor Design), Numerical Modeling in Geosciences, Planetary Geophysics, Numerical Simulations of Reservoirs, Numerical Analysis: Differential Equations, Numerical Methods in Petroleum and Geosystems Engineering, Physical Hydrology, Computational Environmental Fluid Dynamics

The University of Texas at Austin

Austin, TX

B.S. GEOPHYSICS

Aug. 2016 - May 2019

- Relevant Coursework: Python in Geoscience Research, Thermodynamics and Phase Behavior, Introduction to Remote Sensing, Modeling Fluid Flow in Porous Media, Mathematical Methods in Geophysics, Computational Methods, Advanced Calculus for Applications II, Structural Geology, Marine Geophysics Field Course, Programming in Fortran and Matlab, Physics of the Earth, Matrices and Matrix Calculations, Differential Equations

Austin Community College

Austin, TX

A.S. GEOLOGY

Jan. 2015 - May 2016

- Austin Community College Geology Club President Aug. 2015- May 2016

Central Texas College

Killeen, TX

A.A. INTERDISCIPLINARY STUDIES

Aug. 2006 - July 2014

Research Experience

Geocrustal Fluid Mechanics Group (Prof. Marc Hesse)

Austin, TX

GRADUATE RESEARCH

Jan. 2020 - Present

- Developed a proprietary finite difference model that is implemented through a second order, mass conservative method based on a staggered grid approach, with spherical shell geometry, periodic boundary conditions, irregular domain, and a Newton-Raphson solver.
- Designed, fabricated, constructed, and operated a 2m by 0.5m bead pack cell utilized in fluid dynamical experiments resulting in a robust data set of 147 experiments over an 11 month period.
- Designed and implemented data processing work flow standards to orthorectify photos, extract data via a custom data picking program, built and maintained a user friendly data structure, and created a data archive that will facilitate use and access to the scientific community.
- Self taught autoCAD and 3-D printing techniques enabling custom fabrication of parts and accessories utilized in experiments allowing for validation of numeric models with varying boundary conditions (Dirichlet and Neumann).
- Fabricated a custom digital sensor system using off the shelf Arduino components resulting in digital collection of data previously collected in analogue.

Bureau of Oceanic Energy Management (BOEM) Grant (Prof. Sean Gulick)

Austin, TX

UNDERGRADUATE RESEARCH

May 2018 - Aug. 2019

- Prepared and conducted at sea operations for CHIRP surveys aiming to identify future sand resources during two BOEM funded expeditions into the Gulf of Mexico.
- Preserved seafloor core data and pictures via digitization of more than 360 photos and 36 well logs. Created work flow allowing for the digitization of 36 single cores recorded in segmented pictures while preserving true color and aspect ratios. Data was archived on university servers and BOEM Arc Map repositories allowing greater access to data that was previously inaccessible.

- Examined 450 open and closed basin crater lakes via ArcGIS as candidates for future studies based on availability of specific coverage of remotely sensed data.

Publications

PUBLISHED

- Hiatt, E.**, Shadab, M.A., Gulick, S., Goudge, T., & Hesse, M.A. (2023). Limited Recharge of the Southern Highland Aquifer on Early Mars. *Icarus*, 115774.
- Shadab, M. A., Luo, D., **Hiatt, E.**, Shen, Y., & Hesse, M. A. (2023). Investigating steady unconfined groundwater flow using Physics Informed Neural Networks. *Advances in Water Resources*, 177, 104445.

UNDER REVIEW

- Hiatt, E.**, Shadab, M., & Hesse, M.A., Polubarinova-Kochina solutions for steady unconfined groundwater flow: a free tool and its applicability, in review at *Groundwater*
- Salese, F., **Hiatt, E.**, Pondrelli, M., Hesse, M., Mitri, G., Soldano, M., & Fairén, A.G. Volcanic outgassing, flooding and volume of the Martian lowlands constrained by Early Noachian crater distribution. In review at *Scientific Reports*

CONFERENCE TALKS

- Hiatt, E.**, Shadab, M., Hesse, M.A., Gulick, S., & Goudge, T., Limited Recharge on Early Martian Aquifers: Numeric & Analytic Recharge Rate Estimates As Constrained By Geomorphic and Geochemical Observations. American Geophysical Union Annual Meeting 2022. Abstract ID 1073684.

CONFERENCE ABSTRACTS

- Hiatt E.**, Shadab M.A., Gulick S.P.S., Goudge T.A., & Hesse M.A (2023). Limited Recharge of the Southern Highlands Aquifer on Early Mars. *Texas Area Planetary Science (TAPS) Conference, contribution TAPS2023-55*.
- Hiatt, E.**, Shadab, M. A., & Hesse, M. A. (2023). Planetary Scale Groundwater and Surface Water Interaction on Early Mars. *LPI Contributions*, 2806, 2415.
- Hiatt, E.**, Shadab, M. A., Hesse, M. A., Gulick, S. P. S., & Goudge, T. A. (2022, March). Estimates of Groundwater Divides and Basins on Noachian Mars. In *53rd Lunar and Planetary Science Conference* (Vol. 2678, p. 2618).
- Hiatt, E.**, Shadab, M., Hesse, M.A. , & Gulick, S., Experimental and Numerical Investigations of Seepage Face Dynamics. American Geophysical Union Annual Meeting 2021. Abstract # P25G-2228.
- Hiatt, E.**, Shadab, M., Hesse, M.A., Gulick, S., Goudge, T., & Liebeck, J., Numerical Modeling of the Formation of Hellas Planitia with Focus on Spatio-Temporal Scales Required for Hydrologic Equilibration. American Geophysical Union Annual Meeting 2021. Abstract # P25G-2228.
- Hiatt, E.**, Hesse, M.A., Gulick, S., & Goudge, T., Groundwater filling times for large impact basins on early Mars and implications for the onset of post impact hydrothermal systems. *American Geophysical Union Annual Meeting 2020*. Abstract # P055-0011.
- Hesse, M. A., Shadab, M. A., & **Hiatt, E.** (2023). Timescales for Terminal Groundwater Drainage from the Southern Highlands on Mars. *LPI Contributions*, 2806, 1637.
- Shadab, M. A., **Hiatt, E.**, & Hesse, M. A. (2023). Investigating Groundwater Dynamics and Residence Times on Early Mars Using Unconfined Aquifer Model with Vertical Heterogeneity. *LPI Contributions*, 2806, 1736.
- Shadab, M.A., **Hiatt, E.**, & 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*.
- Shadab, M. A., **Hiatt, E.**, & Hesse, M. A. (2022). Estimates of Martian Mean Recharge Rates from Analytic Groundwater Models. *LPI Contributions*, 2678, 1775.
- Hesse, M.A., Shadab, M.A., & **Hiatt, E.**, Groundwater-ocean interaction on Mars. American Geophysical Union Annual Meeting 2021. Abstract # P23B-08.
- Hesse, M.A., Shadab, M., Luo, D., Shen, Y., & **Hiatt, E.**, Investigating Groundwater Flow Dynamics using Physics Informed Neural Networks (PINNs). American Geophysical Union Annual Meeting 2021. Abstract # H34F-03.
- Shadab, M., Luo, D., Shen, Y., **Hiatt, E.**, & Hesse, M.A., Investigating fluid drainage from the edge of a porous reservoir Using Physics Informed Neural Networks. Society for Applied and Industrial Mathematics Annual Meeting 2021.

Platform and Coding Proficiencies

Fluent	Matlab, Python, LaTeX, Microsoft, and Adobe Suites
Proficient	Arduino, ArcGIS PRO, ENVI, AutoCAD
Novice	Linux, Paradigm

Service

Department of Geologic Sciences Assistant Professor Search Committee

SEARCH COMMITTEE MEMBER

Oct. 2022 - Apr. 2023

- Selected to be the graduate student representative, as a full voting member, on the Department of Geological Sciences Assistant Professor Search Committee. This was an open search that resulted in more than 300 applicants and the successful hiring of two tenure track assistant professors.

Internships

Eagle Eye Geospatial

Midland, TX

INTERN

Aug. 2019

- Acquired remotely sensed data via drone reconnaissance resulting in two completed work orders. Learned real world applications for Lidar and NDVI datasets.
- Produced point cloud-based survey data, according to company standard operating procedures and customer specifications, using drone imagery and Structure from Motion and Multiview Stereopsis software. Resulting in 2 delivered products.

Dawson Geophysical Company

Midland, TX

INTERN

June 2018 - Aug. 2019

- Operated Vibrosies seismic equipment in the field.
- Aquired, processed, and interpreted land-based seismic data.

Honors & Awards

Apr. 2023	Student Service Award , Jackson School of Geosciences
Fall 2022	Outstanding Graduate Teaching Assistant , Jackson School of Geosciences
Jan. 2022	Student Support Grant , University of Texas, Center for Planetary Systems Habitability
Aug. 2021	Graduate Student Fellowship , University of Texas Institute of Geophysics
Apr. 2021	Student Research Award in Planetary Habitability , Center for Planetary Systems Habitability
Sept. 2020	Endowed Presidential Fellowship , University of Texas at Austin
Aug. 2019	Entry Fellowship , University of Texas Institute for Geophysics
Oct. 2018	Ann and Henry Hamman Scholarship in Geosciences , Jackson School of Geosciences
May 2018	Greater Texas Foundation Endowed Scholarship , Jackson School of Geosciences

Outreach

AR Sandbox

- Created an Augmented Reality Sandbox as Austin Community College's Geology Club President. The sandbox was purchased by the college and is in use in the geology lab on the Highland campus.
- Engaged community using augmented reality sandbox by participating in public demonstrations at Makers Space symposiums held at local Barnes and Noble stores.
- Participated in local school system's science night exposing elementary students to geology utilizing the augmented reality sandbox in an interactive and tactile manner. Contacted local FOX news station and presented the augmented reality sand box to the public in a local news feature segment.
- Presented to approximately 100 high school Geoforce summer science camp participants as an invited speaker on remote sensing applications. Geoforce is an organization whose purpose is to promote diversity within geosciences by exposing under represented students to the geologic sciences.

Education

- Gave two invited talks to Longview Micro School in Austin Tx on planetary science and in situ resource utilization.
- Actively involved in Skype a Scientist program resulting in 8 presentations in 3 years to students across the country ranging from K-5th grade. Created novel instruction methods to create excitement for planetary science in the students. Prioritized examples of under-represented scientists were prioritized as a means to promote diversity and inclusion by encouraging students in under represented demographics to consider careers in STEM.

Mentoring

Research Traineeship Experience Program

MENTOR

May 2023 - Aug. 2023

- Mentored two undergraduate students: Paola Avina from the University of Texas San Antonio and Jhovanni Loeza from the University of Texas A & M Kingsville. Each student conducted a three month research project culminating in poster presentations.
- Provided guidance and mentoring for Paola Avina's project entitled "Up and over. How do rivers climb mountains? Constraining groundwater's role in forming crater lake inlets on early Mars." This work required mentoring the student in use of ArcGIS Pro to analyze the inlet valley orientation for 221 Noachian aged open basin crater basins and then comparing the orientations with numeric models of possible groundwater gradients.
- Provided guidance and mentoring for Jhovanni Loeza's project entitled "Groundwater and Topography Interaction on Early Mars. This work required the mentoring of the student in the fabrication of three Hele-Shaw flow cells to conduct fluid dynamics experiments. The goal of this work was to understand the effects of topography to groundwater interaction that may be consequential on early Mars, however, are not included in standard groundwater modeling.

Jackson School of Geosciences Peer Mentor Support Program

MENTOR

Aug. 2021 - Aug. 2023

- Endeavored to build interpersonal relationships as a means to accelerate mentees' involvement in the JSG's community and culture. Aided students' family in this transition through navigation of the university's systems and with personal children's items to alleviate sources of stress associated with moving to America.
- Mentored Chengwei Zhang Aug. 2022 - Aug. 2023.
- Mentored Shuhua Hu Aug. 2021 - Aug. 2022.

Research Traineeship Experience Program

MENTOR

May. 2020 - Aug 2020

- Mentored undergraduate student Sebastian Alonso Perez (May 2020 - Aug 2020), Stanford University.
- Encouraged and facilitated a 3 month experience in a data based research project by providing personal laboratory data, project idea, and mentorship resulting in the successful completion of the student's project using machine learning based software to find phreatic surfaces in fluid dynamical experiments.

Big Brothers big Sisters of Austin

MENTOR

Jan. 2015 - May 2021

- Mentored Devonte (DJ) from age 12 to 18 through weekly outings via Big Brothers/Sisters of Austin.

Student Leadership

Graduate Student Executive Committee

PRESIDENT

Aug. 2023 - Present

- Responsible for the operations of the Graduate Student Executive Committee with an annual budget of more than \$40,000. The committee is composed of 15 officers who serve a graduate student population of more than 250.

Graduate Student Executive Committee

RESEARCH SYMPOSIUM CHAIR

Aug. 2022 - Feb. 2023

- The symposium goals include providing an opportunity for cross-disciplinary collaboration among graduate/undergraduate students and faculty/research scientists through presentation of current research as well as aiding in industry recruitment. The symposium included 105 participants and had a budget of \$25,000.
- Initiated changes to the format of the event as well as function so as to improve the equity of the event and promote an inclusive environment. This work led to a student service award in the spring of 2023
- Lead in the solicitation of funding, recruitment of judges within industry, acquiring and reserving facilities, catering, disbursing funds, organizing and conducting day of operations, accommodating distinguished guests and university administrators, and returning feedback to participants.

Graduate Student Executive Committee

GRADUATE STUDENT ASSEMBLY REPRESENTATIVE

Aug. 2022 - Present

- The graduate student assembly is a university wide governing body for graduate students. Duties include faithfully summarizing and reporting proceedings to Jackson School of Geosciences' graduate students and utilizing their informed positions to represent and advocate their interests within the assembly.

Geocrustal Fluid Mechanics Group

LABORATORY LEAD

Jan 2019 - Present

- Maintain and account for university laboratory equipment valued in excess of \$400,000 dollars.
- Lead and organize laboratory operations, and maintenance. Ensure compliance with all university standards regarding laboratory safety passing all safety inspections.
- Responsible for scheduling and allocating time in the lab. This task required flexibility to successfully overcome the challenges created during the pandemic.

Graduate Student Executive Committee

TREASURER

Aug. 2021 - May. 2022

- Responsible for committee budget including allocation of event funding and payment of vendors. Planned and disbursed funding for Jackson School of Geosciences' year end holiday party, First Friday happy hour and grill events, and food and refreshments for all committee meetings facilitating the development of community for and between faculty and students.

Graduate Student Executive Committee

GEOLOGY CLUB PRESIDENT

Aug. 2015 - Aug. 2016

- Planned, scheduled, reserved space, and budgeted for 8 club meetings. Responsible for meeting content and/or activities for example guest speakers from local geoscience companies such as Advanced Geosciences Inc. and the Austin Geological Society.
- Conducted outreach at Austin community college events raising awareness of career opportunities in geology as well as promoting club activities. Expanded club membership from 8 to 32 members in a semester.
- Planned, coordinated, acquired funding, and executed field trips to local field sites of geologic interest.

Teaching Experience

Deep Earth Processes (undergraduate course)

LEAD GRADUATE TEACHING ASSISTANT

June. 2023 - Present

- Selected as the lead teaching assistant for a new, major required course resulting from a curriculum overhaul.
- Solely responsible for the design and construction of the laboratory portion of the course. This included the creation of 12 laboratory readings, pre-lab quizzes, laboratory exercises, grading keys, and teaching material per lab.

Physical Geology (undergraduate course)

GRADUATE TEACHING ASSISTANT

Aug. 2022 - Dec. 2022

- Instruct 3 weekly laboratory sections with a total of 42 non-major students. As a result, I received the outstanding teaching assistant for the fall.

Undergraduate Research Traineeship Experience

GRADUATE TEACHING ASSISTANT

Jul. 2022

- Overhauled and customized existing Numeric Modeling course curriculum by converting Matlab based code to Python code for Geoforce's exchange program that taught 12 undergraduate students from universities across the country.

Introduction to Geology (undergraduate, non-major course)

GRADUATE TEACHING ASSISTANT

Jan. 2021 - May 2021

- Accountable for the instruction and grading of 24 students in three weekly, online laboratory sections.
- Leveraged previous pedagogical methods to teach geologic principles virtually while incorporating flexibility in the methods/availability to students to overcome challenges posed by teaching non-geology major students remotely.

Physical Geology (undergraduate, non-major course)

GRADUATE TEACHING ASSISTANT

Jan. 2021 - May 2021

- Instructed 4 sections of weekly, online laboratory instruction totaling 35 students.
- Designed and implemented novel pedagogical methods to adapt to online laboratory instruction during the pandemic.
- Facilitated students' understanding despite limitations posed by at home physical sample kits by using a personal microscope shared over the internet to examine samples.

Relevant Work Experience

Austin Community College

LABORATORY ASSISTANT

Aug. 2004 - June 2013

- Prepared laboratory lessons for two Physical Geology course laboratory sections facilitating positive educational outcomes for 40 students. Prepared, stored, and organized specimens, as well as maintained laboratory equipment.

U.S. Army

STAFF SERGEANT

Aug. 2004 - June 2013

- Deployed 1068 days to a combat zone supporting Operations Iraqi Freedom and Enduring Freedom in Iraq and Afghanistan. Highly decorated to include five Army Commendation Medals for actions in combat theater. Medically retired with a service connected disability due to injuries sustained in combat.
- The kinetic and frenetic pace associated with combat environments and military culture allowed for the cultivation of a skill set that can not be obtained in any other way. Accountability, attention to detail, high stakes decision making under extreme stress, flexibility, integrity, interpersonal skills, stress tolerance, team building, self-management, and the ability to read complex situation reports to learn and adapt to evolving conditions were all skills gained to a proficiency.
- Promoted to the rank of staff sergeant in the fastest time allowed by Army regulations.
- Selected from 100 junior enlisted as commanders driver during a year tour in Iraq and conducted over 90 combat missions ensuring the mobility and command effectiveness of the company commander.
- Completed the Army's two week intensive Primary Leadership Development Course as well as the 6 week Basic Non-Commissioned Officer Course.
- Selected ahead of peers as the 2nd Platoon Headquarters section sergeant responsible for 15 soldiers, nearly four million dollars in US Army property and tasked with supporting the combat effectiveness of a 60 man platoon during 70+ combat missions in 15 months tour of duty in central Iraq.
- Selected from 180 peers to command the forward operating base security commander accountable for the safety of 1500 personnel residing on the installation.
- Responsible for the health, welfare, and combat readiness of 150 personnel at the forward operating base. This included 60 U.S. soldiers and approximately 90 local national contracted security forces.
- Navigated complex cultural and organizational structures to ensure battlefield effectiveness between International Security Forces Afghanistan (ISAF) partners (US Marine, Romanian, Australian, and British forces) and the local Afghan National Police (ANP), Afghan National Army (ANA), and local national security contractors.
- Engaged with local Afghani leaders in Qalat city jirga (town elder meetings) to resolve conflict with local populace and gain battlefield intelligence. The role required an understanding of the complex relationships between tribal interests in the region, as well as the impact of ANA and ANP ineffectiveness and corruption on the populace.
- Conducted 10 SigInt (Signal Intelligence) missions near the Pakistan border.
- Selected as a battalion level operations sergeant in a customer service role that balanced the training needs of six 150 man units (roughly 900 total personnel) with available training funds, range availability, and individual unit training needs. This role was two pay grades above rank at that time.