

# KAUSHIK MITRA

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Department of Earth & Planetary Sciences, The University of Texas at San Antonio,  
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## PROFESSIONAL APPOINTMENTS

**Assistant Professor** *Aug' 2023-present*

The Department of Earth & Planetary Sciences  
The University of Texas at San Antonio, San Antonio, TX, USA

**Postdoctoral Research Associate** *Nov' 2021-Jul' 2023*

The Department of Geosciences  
Stony Brook University, Stony Brook, NY, USA

## EDUCATION

**A.M. & Ph.D., Earth & Planetary Sciences** *2021*

Washington University in St. Louis, MO, USA

*Dissertation:* Iron and Manganese Oxidation by Oxyhalogen Species: Implications for  
Paleoenvironmental Reconstruction on Mars. [*Thesis Advisor: Prof. Jeffrey G. Catalano*]

**B.Sc. (Honors) & M.Sc., Applied Geology** *2015*

Indian Institute of Technology (IIT) Kharagpur, WB, India

*Dissertation:* Quantification of Net Erosion and Uplift Experienced by the Barmer Basin,  
Rajasthan using Sonic Log. [*Thesis Advisors: Prof. Anindya Sarkar and Steven Schulz*]

## OTHER PROFESSIONAL EXPERIENCE

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- Lecturer (part time), Institute for STEM Education, Stony Brook University, NY *2022-23*
- Research Associate, IIT & Indian Space Research Association (ISRO) *2015-16*
- Geology Intern, Cairn India Limited (CIL), Barmer Oil Fields, Rajasthan, India *2014-15*
- Geology Intern, Hindustan Copper Limited, Malanjkhand Mines, MP, India *2013*

## RESEARCH GRANTS & FELLOWSHIPS

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- Faculty Travel Grant, UTSA Office of Research *2024*
- Full Conference Fellowship, Blumberg Astrobiology Workshop  
*Oxygen in Planetary Biospheres* | Green Bank, WV *2023*
- Future Investigators in NASA Earth and Space Science and Technology (**FINESST**)  
*'Chlorate as an Fe and Mn Oxidant on the Martian Surface'* | \$135,000 *2019-21*
- Student Travel Grant, NASA Mars Program Office  
9<sup>th</sup> International Conference on Mars, Pasadena, CA *2019*
- Student Travel Grant, NASA Mars Program Office

- 4<sup>th</sup> International Conference on Early Mars, Flagstaff, AZ 2017
- INSPIRE Scholarship for Higher Education, Government of India  
Undergraduate Funding for 5 Years 2010-15
- Academic Excellence Scholarship, State Bank of India  
For Outstanding Academic Performance at IIT 2010-15

## AWARDS & HONORS

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- Letter of Appreciation, **Best Graduate Paper**, Washington University, MO 2021
- **Career Development Award**, Lunar & Planetary Institute, The Woodlands, TX 2019
- **Outstanding Teaching Assistantship**, Washington University, St. Louis, MO 2018
- **People's Choice Award, 3 Minute Thesis**, Washington University, St. Louis, MO 2018
- **Best Student Award**, Department of Geology & Geophysics, IIT Kharagpur, India 2015
- **Best Master's Thesis**, Department of Geology & Geophysics, IIT Kharagpur, India 2015

## PUBLICATIONS

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### Refereed Journal Articles [\* = Undergraduate Student]

1. Knight, A.L., **Mitra, K.**, and Catalano, J.G., 2024, Transformation of Precursor Iron(III) Minerals in Diagenetic Fluids: Potential Origin of Gray Hematite at Vera Rubin Ridge. *Accepted: Journal of Geophysical Research: Planets.*
2. **Mitra, K.**, Catalano, J. G., \*Bahl, Y., & Hurowitz, J.A., 2023, Iron Sulfide Weathering by Oxyhalogen Species: Implications for Iron Sulfate and Iron (Oxyhydr)oxides Formation on Mars. *Earth & Planetary Science Letters*, 624, doi.org/10.1016/j.epsl.2023.118464.
3. **Mitra, K.**, \*Moreland, E.L., Ledingham, G.L., and Catalano, J.G., 2023. Formation of manganese oxides on early Mars due to active halogen cycling. *Nature Geoscience*. 16, pp. 133-139, doi.org/10.1038/s41561-022-01094-y
4. **Mitra, K.**, \*Moreland, E.L., Knight, A.L. and Catalano, J.G., 2022. Rates and products of iron oxidation by chlorate at low temperatures (0 to 25° C) and implications for Mars geochemistry. *ACS Earth and Space Chemistry*, 6(2), pp. 250-260. doi.org/10.1021/acsearthspacechem.1c00379  
Included in “*Hochella Honorary*” special issue.
5. **Mitra, K.**, \*Moreland, E.L., and Catalano, J.G., 2020. Capacity of chlorate to oxidize ferrous iron: Implications for iron oxide formation on Mars. *Minerals*, 10(9). Included in special issue on “*Expanding Views of Clays, Oxides, and Evaporites on Aquaplanets in the Solar System*” as **Feature Paper**. doi.org/10.3390/min10090729

6. **Mitra, K.** and Catalano, J.G., 2019. Chlorate as a potential oxidant on Mars: Rates and products of dissolved Fe (II) oxidation. *Journal of Geophysical Research: Planets*, 124(11), pp. 2893-2916. doi.org/10.1029/2019JE006133  
\*Featured Article as **Editor's Highlight** in American Geophysical Union's magazine *Eos* — 'Why Is the Red Planet Red? Chlorate May Oxidize Mars' Surface'.
7. **Mitra, K.**, Mitra, S., Gupta, S., Bhattacharya, S., Chauhan, P. and Jain, N., 2018. Modelling basalt weathering at elevated CO<sub>2</sub> concentrations: Implications for terminal to post-magmatic rifting in the Deccan Traps, Kachchh, India. *Geological Society, London, Special Publications*, 463(1), pp. 227-241.  
\*Highlighted in *Large Igneous Provinces Commission LIP of the Month*
8. Mitra, S., **Mitra, K.**, Gupta, S., Bhattacharya, S., Chauhan, P. and Jain, N., 2017. Alteration and submergence of basalts in Kachchh, Gujarat, India: Implications for the role of the Deccan Traps in the India–Seychelles break-up. *Geological Society, London, Special Publications*, 445(1), pp. 47-67.
9. Verma, S., Mukherjee, A., Mahanta, C., Choudhury, R. and **Mitra, K.**, 2016. Influence of geology on groundwater–sediment interactions in arsenic enriched tectono-morphic aquifers of the Himalayan Brahmaputra River basin. *Journal of Hydrology*, 540, pp. 176-195.

#### Tertiary Literature (Refereed)

**Mitra, K.**, 2022. Weathering, B. Cudnik (ed.), *Encyclopedia of Lunar Science*, Springer Nature Switzerland AG 2022. [https://doi.org/10.1007/978-3-319-05546-6\\_148-1](https://doi.org/10.1007/978-3-319-05546-6_148-1).

#### Under Review

1. **Mitra, K.**, \*Bahl, Y., Hernandez-Robles, A., Stevanovic, A., & Hurowitz, J.A., 2023, Magnetite Survivability in Presence of Oxyhalogen Brines on Mars. *Under review at Geophysical Research Letters*.

#### CONFERENCE PROCEEDINGS: TALKS [Selected]

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1. **Mitra, K.**, 2023, Formation of manganese oxides on early Mars due to active halogen cycling and not oxygen on early Mars. In *Oxygen in Planetary Biospheres* at Green Bank Observatory, West Virginia.
2. **Mitra, K.**, Catalano, J.G., Krawczynski, M., and Hurowitz, J.A., 2022, Heterogeneous oxidation of ferrous minerals by chlorate and bromate: Effect of oxyhalogen brines on Mars. In *Goldschmidt Conference 2022*. Abstract# 11570.
3. **Mitra, K.**, Moreland, E.L., Ledingham, G.J., Arvidson, R.E. and Catalano, J.G., 2020, Manganese oxide formation by oxyhalogens: Faster alternatives to oxygen as Mn oxidants on Mars. In *AGU Fall Meeting 2020*. Abstract ID# P041-03

4. **Mitra, K.** and Catalano, J.G., 2019, Stoichiometric efficiency of Fe(II) oxidation and Fe(III) oxide production by chlorate on Mars: An experimental approach. In *9<sup>th</sup> International Conference on Mars*. LPI Contribution# 2089.
5. **Mitra, K.** and Catalano, J.G., 2019, Rates and products of Fe(II) oxidation by chlorate: A potential oxidant on Mars. In *LPSC (Vol. 50)*, LPI Contribution# 2132.
6. **Mitra, K.** and Catalano, J.G., 2018, Oxychlorine species as an oxidant on past and present Mars: New oxidation pathways for dissolved Fe(II) on the Martian surface. In *LPSC (Vol. 49)*. LPI Contribution# 2083.

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#### CONFERENCE PROCEEDINGS: POSTERS & SECONDARY AUTHOR *[Selected]*

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1. **Mitra, K.**, Ghosh, A., Hazra, A., Tinker, C., Ramachandran, A. V., and Bouchard, M. C., 2024, The Design of the Multi-Planet Surface Simulator (MPS2): An Experimental Facility for the Continuous Monitoring of Physical and Chemical Processes on Planetary Bodies. In *LPSC (Vol. 55)*, Abstract# 1675.
2. \*Bahl, Y., **Mitra, K.**, & Hurowitz, J.A., 2024, Formation of Non-Stoichiometric Magnetite in Aqueous Systems on Mars: Magnetite Survivability in Presence of Oxyhalogen Brines. In *LPSC (Vol. 55)*, Abstract# 1685.
3. Das, E., **Mitra, K.**, and Glotch, T.D., 2024, Geochemical Modeling of Martian Chloride Deposit Source Brines. In *LPSC (Vol. 55)*, Abstract# 2254.
4. **Mitra, K.**, 2023 The Interconnectedness of Redox Sensitive Elements & Halogens: Implications for Mars Surface Geochemistry. In First Texas Area Planetary Science Conference, San Antonio.
5. Das, E. Glotch, T.D., **Mitra, K.**, Edwards, C.S., Ye, C, and Milliken, R.E., 2023, Investigating the Age, Abundance and Origin of Chloride Salt-Bearing Deposits on Mars. In Ancient & Future Brines Conference.
6. **Mitra, K.**, Y. Bahl, V.B. Rivera Banuchi, Catalano, J.G., and Hurowitz, J.A., 2023, Experimental oxidation of pyrite, pyrrhotite, magnetite, & smectite by chlorate & bromate: Oxyhalogen species as active oxidant on Mars. In *LPSC (Vol. 54)*, Abs. ID# 1105
7. Das, E., Glotch, T.D., Edwards, C.S., Ye, C, Milliken, R.E. and **K. Mitra**, 2023, Investigating the Age, Abundance & Origin of Chloride Salt-Bearing Deposits on Mars. In *LPSC (Vol. 54)*.
8. Knight, A.L., Catalano, J.G., and **Mitra, K.**, 2022, Diagenetic alteration of iron (III) minerals to hematite and implications for the Vera Rubin Ridge, Mars. In *LPSC (Vol. 53)*, LPI Contribution# 2678 Abs. ID# 1919.
9. **Mitra, K.**, Moreland, E.L., Ledingham, G.J., Arvidson, R.E. and Catalano, J.G., 2020, Dissolved manganese oxidation by bromate and chlorate: An alternate hypothesis of manganese oxide formation on Mars., In *LPSC (Vol. 51)*, LPI Contri.# 2326 Abs. ID# 1068.

10. **Mitra, K.**, Moreland, E.L., and Catalano, J.G., 2020, Fe(II) oxidation and Fe(III) mineral production by chlorate at Mars-relevant temperatures: Reaction rates & mineral products. In *LPSC (Vol. 51)*, LPI Contribution# 2326 Abstract ID# 1069.
11. Knight, A, **Mitra, K.**, and Catalano, J.G., 2020, Transformation of iron(III) oxide minerals in Mars-relevant fluids: Implications for diagenetic hematite formation. In *LPSC (Vol. 51)*, LPI Contribution# 2326 Abstract ID# 1146.
12. \*Moreland, E.L., **Mitra, K.**, and Catalano, J.G., 2020, Stoichiometric efficiency of iron oxidation by chlorate on Mars., In *LPSC (Vol. 51)*, Abstract ID# 1033. [*\*mentee*]
13. Catalano, J.G., Chemtob, S.M., Nickerson, R.D., **Mitra, K.** and Kupper, R.J., 2019, Comparative Redox Geochemistry of Early Earth and Early Mars: Implications for Habitability. In AGU Fall Meeting 2019. AGU. Abstract#P14A-01.
14. **Mitra, K.** and Catalano, J.G., 2017, Iron oxidation by chlorate: Implications for akaganeite and jarosite formation on Mars. In *4<sup>th</sup> International Conference on Early Mars: Geologic, Hydrologic, & Climatic Evolution and the Implications for Life*. LPI Contribution# 2014.
15. Mitra, S., Gupta, S., **Mitra, K.** et al., 2017, Spectroscopic signature and geochemical constraints on jarosite formation at Kachchh: Implications for Mars. In *LPSC (Vol. 48)*. LPI Contribution# 1964.
16. Gupta, S., Mitra, S., **Mitra, K.\***, Bhattacharya, S., Banerjee, S., Chauhan, P., Jain, N. and Parthasarathy, G., 2016, The drying of Mars: An analog from Kachchh, western India. In *AGU Fall Meeting 2016*. Abstract ID# P21C-2131. (*\*co-presenter*)
17. **Mitra, K.**, Schultz, S., and Sarkar, A., 2015, Quantification of net erosion and uplift experienced by the Barmer basin, Rajasthan using sonic log. In *AGU Fall Meeting 2015*. Abstract ID# T23B-2949.

## INVITED TALKS

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- The State University of New York, Brockport, NY 2024
  - Texas Tech University, Lubbock, TX 2024
  - City College Chicago, IL 2023
  - South Texas Gem & Mineral Society, Fall Meeting 2023
  - Current Topics in Geoscience, Special Lecture, Department of Earth & Planetary Sciences, The University of Texas at San Antonio, TX 2023
  - Department of Earth, Atmospheric & Planetary Sciences (EAPS) **Purdue University**, West Lafayette, IN 2023
  - Department of Earth & Planetary Sciences (EPS) **University of Texas at San Antonio**, San Antonio, TX 2023
  - Inaugural Lecture, Earth & Planetary Science Seminar Series **Institute of Innovation Research and Education for Earth and Space**, India 2023
  - *SBU Postdoctoral Highlight*, Office of Postdoctoral Affairs **Stony Brook University**, Stony Brook, NY 2022

- *Geology Open Night*, Department of Geoscience  
**Stony Brook University**, Stony Brook, NY 2022
- Geochemistry Seminar, School of Marine & Atmospheric Sciences  
**Stony Brook University**, Stony Brook, NY 2022
- Department of Civil and Environmental Engineering, and Earth Sciences  
**University of Notre Dame**, Notre Dame, IN 2021
- Earth, Environmental, and Planetary Sciences (EEPS)  
**Rice University**, Houston, TX 2020
- Mars Group Presentation, Astromaterials Research and Exploration Science  
**Johnson Space Center (JSC), NASA**, Houston, TX 2020

## STEM PEDAGOGY

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### The New York State Master Teacher Program (NYSMTP)

**Interviewer & Lecturer** | Institute for STEM Education (I-STEM)  
Stony Brook University, NY

*Fall 2022*

### Professional Development in Teaching & Pedagogy

2016-21

**'Practitioner'** | Second-Highest Professional Level Certification

Center for Integration of Research, Teaching & Learning (**CIRTL**) Network  
and **Center for Teaching & Learning**, Washington University in St. Louis

- Scholarship of Teaching & Learning (SoTL) | Seminar and Courses
- Research Project Design | The Importance of '*Partial Notes*' in Geoscience Courses
- Semester Long Teaching Philosophy Discussion | '*Small Teaching*' by James M. Lang
- Advanced Level Workshops | Active Learning, Pedagogical Scholarship, Team Based Learning, Teaching Students to Read and Critically Evaluate Scientific Literature, Responding Effectively to Student Writing, and Inclusive Teaching in STEM

## TEACHING EXPERIENCE

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### Teaching @ UTSA

3373/6973 Geochemistry (GEO)

*Fall 2023*

4953/6973 Chemistry of the Solar System (GEO & PHY)

*Spring 2024*

### Lecturer

- *The Quest for Life & Habitability* – New York State Master Teacher Program  
I-STEM, Stony Brook University, Stony Brook, NY 2023  
Available on YouTube: <https://www.youtube.com/@kmicalmindset6322>

### Guest Lecturer

- *Geochemistry of Solid Mars* - Short Course (GEO533)  
Stony Brook University, Stony Brook, NY 2022
- *Hydrology* (EPSc 428), Washington University, St. Louis, MO 2017
- *Earth & Environment* (EPSc 201), Washington University, St. Louis, MO 2017

## Teaching Assistant

- *Hydrology*, Washington University, St. Louis, MO 2017
  - Laboratory sessions, new assignment design, and guest lectures
- *Earth & Environment*, Washington University, St. Louis, MO 2017
  - Laboratory sessions, review classes and assignment, and guest lecture

## Online Web-based Lectures

- Lecturer | **AcadNest**- Online Educational Resource for High School 2021
  - **Chemistry Video Lectures** | Indian High School syllabi (ongoing)  
Central Board of Secondary Education (CBSE) and  
Indian Certificate of Secondary Education (ICSE)
  - Lectures and Assignments | Grade 8 to 12
- Geochemistry Video Lectures | **KMical Mindset** | YouTube 2018-present
  - Undergraduate and Graduate Level Courses

## STUDENTS MENTORED

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### Graduate Research Mentoring

- Adriana A. Padro (M.S.), UTSA [*Thesis Committee Member*] Aug., 2023-ongoing
- Eashan Das (Ph.D.), Stony Brook University Jan., 2023-ongoing

### Undergraduate Research Mentoring

- Lauren Malesky, UTSA Oct., 2023-ongoing
- Gavin Westover, UTSA Oct., 2023-ongoing
- Cammi Pape, UTSA Oct., 2023-Dec., 2023
- Elena Brancaleon, UTSA Oct., 2023-ongoing
- Amy Schoenenberger, UTSA Oct., 2023-ongoing
- Yatharth Bahl, Stony Brook University Oct., 2022  
Introductory Research in Geology (ongoing)
- Eleanor L. Moreland\*, Washington University 2019-20  
*\*Currently graduate student at Rice University*

### High-School Research Mentoring

- Jeffrey Desloge, High School Student, Washington University | 2 Months 2018  
Organized by the **STARS Program** by University of Missouri St. Louis (UMSL) 2018
- Ryan Roth, High School Student, Washington University | 6 Months 2017

### Non-Academic Mentoring

- Graduate Peer Mentor | 3 Years | Washington University 2019-21

## COMMUNITY INVOLVEMENT & SCIENCE OUTREACH ACTIVITIES

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- Subject Matter Expert (SME) at NASA Community College Network (NCCN)  
**SMD's Science Activation (SciAct) Program** 2023
- '*Lessons from Mars*' on Science Radio Show '*Changing Earth*'

- KURU 88.5 AMES Alternative, **Iowa State University**, Ames, IA 2022
- Planetary Science Presenter, *Meteorites & Asteroids*  
**Maker Faire Long Island**, Port Jefferson, NY 2022
- Speaker for Space Camp for Club Fibromatosis on ‘*Alien Oceans*’  
**St. Louis Science Center**, St. Louis, MO 2021
- **Reviewer**, Exhibit “*Mission Mars*”  
**St. Louis Science Center**, St. Louis, MO 2019-2021
- Writer & Contributor, *The Planetary Society* Blog ed. Emily Lakdawalla 2019-present
- Student Coordinator, *SciFest: 4<sup>th</sup> and 5<sup>th</sup> Annual Rock, Fossil, Quake*  
**St. Louis Science Center**, St. Louis, MO 2018 & 2019
- Student Volunteer, *Science Palooza*  
**Lunar and Planetary Institute**, The Woodlands, TX 2018
- Speaker, ‘*Martian Geology 101*’  
**St. Louis Science Center**, St. Louis, MO 2017

## COMMITTEES & SERVICES

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### STONY BROOK UNIVERSITY, USA

- Equity, Diversity, and Inclusion (EDI) Committee Member 2021-22 & 2022-present  
Department of Geosciences, Postdoc Representative (re-elected)
  - Establishing a **Peer Mentor Network** for Graduate and Undergraduate Students
  - Designing a cross-institutional support system for *Suffolk County Community College* geoscience students to encourage student transfers to the Department of Geosciences

### WASHINGTON UNIVERSITY IN ST. LOUIS, USA

- Earth & Planetary Sciences, Library Re-programming Working Group 2020-21
- Colloquium Committee Member, Department of Earth & Planetary Sciences 2020-21
- Brown Bag Coordinator, Department of Earth & Planetary Sciences 2019-20
- Peer Mentor Committee Member, The Liberman Graduate Center 2019-20
- Peer Mentor Coordinator, Department of Earth & Planetary Sciences 2018-19
- Grad Student Activity Coordinator, Department of Earth & Planetary Sciences 2017-18

### INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR, INDIA

- General Secretary, Earth Science Study Circle (ESSC) 2012-13 & 2013-14  
Department of Geology & Geophysics (re-elected)

## REVIEWER OF SCIENCE PROPOSALS

- The National Aeronautics & Space Administration (MIRO) [External Reviewer & Panelist] 2024
- The National Aeronautics & Space Administration (ROSES SSW) [External Reviewer] 2024
- The National Science Foundation, Graduate Research Fellowship Program (NSF GRFP) 2023
- United Kingdom Space Agency, 2022 Exploration Science Funding Proposals 2022



## **REVIEWER OF JOURNAL ARTICLES**

Journal of Geophysical Research Planets (AGU), Clays and Clay Minerals (Springer), Geochimica et Cosmochimica Acta (Elsevier), Nature Geoscience (Nature), American Mineralogist (MSA), Geoderma (Elsevier), National Science Review (Oxford U Press), Communications Earth & Environment (Nature), Journal of Earth System Science (Springer), Earth & Space Chemistry (American Chemical Society).

## **PROFESSIONAL ASSOCIATIONS**

The Geochemical Society, The American Association for the Advancement of Science (AAAS), The Planetary Society, American Geophysical Union (AGU), NASA Community College Network (as a Subject Matter Expert)