Ze-Wen Koh

Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology
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RESEARCH INTERESTS

I study the formation and evolution of planetary surfaces. Currently, my work focuses on the interactions between climatic forcing and landscape evolution on Earth, early Mars, and Titan. By leveraging remote sensing data analysis, numerical modelling, fieldwork, and theory, I aim to bridge the gap between climate predictions and surface observations for planetary hydroclimates.

EDUCATION

Massachusetts Institute of Technology (MIT) **Cambridge, MA**
Doctor of Philosophy (Ph.D), Planetary Science *2023 – present*
- Dissertation title: *Climate-landscape interactions of ocean worlds*
- Advisor: Dr. Gaia Stucky de Quay

Cornell University **Ithaca, NY**
Bachelor of Arts (B.A.), Physics and Computer Science *2019 – 2023*
- Graduated *summa cum laude*

AWARDS & HONORS

School of Science Community Service Fellowship | *MIT* 2026
Grayce B. Kerr Fellowship | *MIT* 2024, 2025
Ida M. Green Summer Fellowship | *MIT* 2023
SETI Forward Award | *SETI Institute* 2022
John Mather Nobel Scholarship | *NASA Goddard Space Flight Center* 2022
Cranson and Edna B. Shelley Prize for Undergraduate Research | *Cornell University* 2022
Phi Beta Kappa Honor Society | *Cornell University* 2022
Roger and Mary Lou West Fellowship in Astronomy | *Cornell University* 2021
Dean's List | *Cornell University* 2019, 2020, 2021

RESEARCH EXPERIENCE

Massachusetts Institute of Technology (MIT) **Cambridge, MA**
Department of Earth, Atmospheric, and Planetary Sciences *2023 – present*
- Graduate student advised by Dr. Gaia Stucky de Quay
- Ph.D Thesis: *Climate-landscape interactions of ocean worlds*

NASA Goddard Space Flight Center/Catholic University of America **Washington, DC**
Planetary Magnetospheres Lab *2022 – 2023*
- CRESST II intern advised by Dr. Gang Kai Poh
- Research description: MAVEN measurements of Kelvin-Helmholtz vortices at Mars

Cornell University **Ithaca, NY**
Department of Astronomy *2021 – 2022*
- Undergraduate student advised by Dr. Jonathan Lunine and Dr. Francis Nimmo
- Research description: detecting Europa's seafloor topography from Europa Clipper gravity experiments

Cornell University **Ithaca, NY**
Department of Astronomy *2020 – 2021*

- Undergraduate student advised by Dr. Phil Nicholson
- Research description: bending wave profiles in Saturn's rings derived from Cassini stellar occultations

GRANTS & PROJECT FUNDING

Solar System Science Grant (NASA) **2026 – 2029**

- Role: Graduate student (proposal written by Koh)
- Project title: *Deciphering Early Mars Climate Conditions using Valley Network Erosion*
- PI: Gaia Stucky de Quay (MIT)

PUBLICATIONS

1. Wu, Y., [...] **Koh, Z.,**, Stucky de Quay, G., Martian gullies: young and dynamic landforms (*submitted, est. 2026*).
2. He, C., **Koh, Z.,** Turowski, J. M., Wordsworth, R., Stucky de Quay, G., Persistent water cycles after Martian floods (*in review, est. 2026*).
3. **Koh, Z.**, Poh, G., Fowler, C.M., Hanley, K.G., Ma, X., Gruesbeck, J. R., Kuruppuaratchi, D. C. P., Sun, W., DiBraccio, G. A., Espley, J. R., (2025). Global Occurrence of Kelvin-Helmholtz Vortices at Mars. *Geophysical Research Letters*, 52, e2025GL117836. DOI: 10.1029/2025GL117836
4. **Koh, Z.**, Nimmo, F., Lunine, J.I., Mazarico, E., Dombard, A.J. (2022). Assessing the Detectability of Europa's Seafloor Topography from Europa Clipper's Gravity Data. *The Planetary Science Journal*, 3 (8), DOI: 10.3847/PSJ/ac82aa

PRESENTATIONS & TALKS

Conference Abstracts *(* = oral)*

1. **Koh, Z.**, Zhang, Y., Kang, W., Seasonal variations in sea circulation on Titan driven by flood and drought. *AGU Fall Meeting*, 2025. Abstract P33D-2674
2. Wang, T., [...] **Koh, Z.**, et al., Reconstructing the Lost Waters of Mars: Insights from Global Chaotic Terrains. *AGU Fall Meeting*, 2025. Abstract EP31D-1691
3. **Koh, Z.**, He, C., Goudge, T.A., Stucky de Quay, G., Lake-breaching Flood Volumes and Early Mars Hydrology. *AGU Fall Meeting*, 2024. Abstract EP53E-1545
4. **Koh, Z.**, He, C., Stucky de Quay, G., Global Flood Volumes of Mars' Open-Basin Paleolakes. *10th International Conference on Mars*, 2024. LPI Contributions No. 3007, p.3379
5. Abreu, M., Poh, G., **Koh, Z.**, Gruesbeck, J. R., DiBraccio, G. A., Espley, J. R., Investigating the Vanishing Martian Magnetic Pile-up Boundary in MAVEN Measurements: A Machine Learning Approach. *AGU Fall Meeting*, 2023. Abstract P03-04.
6. ***Koh, Z.**, Global MAVEN Distribution of Kelvin-Helmholtz Vortices from a Machine Learning and Statistical Approach. *AOGS 20th Annual Meeting*, 2023. Abstract D2-AM2
7. **Koh, Z.**, Poh, G., Fowler, C.M., Gruesbeck, J.R., DiBraccio, G.A., Espley, J.R., Identifying Kelvin-Helmholtz Vortices in MAVEN Observations with a Machine Learning and Statistical Analysis Framework. *AGU Fall Meeting*, 2022. Abstract SM32A-70
8. ***Koh, Z.**, Nicholson, P.D., Hedman, M.M., French, R.G., Measuring the Amplitudes of Bending Waves in Saturn's Rings. *54th Annual DPS Meeting*, 2022. Abstract 301.07
9. **Koh, Z.**, Nimmo, F., Lunine, J.I., Mazarico, E., Dombard, A.J., Assessing the Detectability of Europa's Seafloor Topography from Europa Clipper Gravity Data. *53rd LPSC*, 2022. Abstract 1276

Invited Talks

- **University of Cambridge** | Department of Earth Sciences Colloquium 2025
- **Imperial College London** | Department of Earth Sciences and Engineering Colloquium 2025
- **NASA Jet Propulsion Lab** | Europa Clipper Lecture Series 2023

TEACHING EXPERIENCE

Department of Earth, Atmospheric, and Planetary Sciences, MIT

- **Exploring Solar System Surfaces** | Guest Lecturer 2025
- **Intro to Geophysics & Planetary Science** | Teaching Assistant 2025

Department of Computer Science, Cornell University

- **Data Structures & Functional Programming** | Teaching Assistant 2021
- **Object-Oriented Programming & Data Structures** | Teaching Assistant 2020, 2021

MENTORING EXPERIENCE

Jack Gao **2026 – present**
Thomas Jefferson High School Research Practicum Program *MIT*
- Project title: "Mapping Martian Drainage Basins"

Yihong (Amy) Chen **2025 – 2026**
Undergraduate Research Opportunities Program (UROP) *MIT*
- Project title: "Effects of Precipitation on Hawaiian Fluvial Erosion"

RELEVANT SKILLS & COURSEWORK

Programming & software Python, Julia, Java, C, Fortran, MATLAB, GIS tools (ArcGIS, QGIS), Git, Linux shell scripting, GDAL, Generic Mapping Tools (GMT), Adobe Creative Suite (e.g., Illustrator)

Numerical modeling Fluvial erosion and flow routing models, drainage extraction, open-source landscape evolution models (e.g., Landlab), hydrological balancing and limnology, finite volume simulations, GPU-based computing

Fieldwork skills Fluvial geomorphic mapping, sampling, and grain size measurements (Baker River, NH, 2023) ⋄ Crustal structure, tectonics, fault motions; measurements with gravimeters, seismometers, and high-precision GPS (Catalina Island, CA, 2024) ⋄ Coastal geomorphology (Cape Cod, MA, 2024)

Select coursework Geomorphology, Coastal Geomorphology, Essentials of Field Geophysics, Principles of Remote Sensing, Fluid Dynamics of the Atmosphere and Ocean, Fluid Dynamics in Planetary Systems, Planetary Surface Processes

PROFESSIONAL ACTIVITIES

Service and Outreach

- **Let's Invest in K-12 (LINK-12)**, MIT EAPS | Classroom volunteer 2025 – present
- **Letters to a Pre-Scientist**, USA | Volunteer 2024 – present
- **Application Mentorship Program**, MIT EAPS | Leadership team, Mentor 2024 – present
- **MIT EAPS Student Advisory Committee (E-SAC)** | Publicity Chair 2024 – 2026
- **MIT EAPS Student Advisory Committee (E-SAC)** | Open House Chair 2023 – 2024
- **Cornell Malaysian Association** | Vice President 2021 – 2023

Open-Source Projects

- **PyMAVEN**: Access, processing, and plotting library for MAVEN magnetic field and plasma measurements