Kevin M. **Gaastra**

Professional Experience

JPL Postdoctoral Fellow *Oct. 2023 - Present*

Jet Propulsion Laboratory *Pasadena, CA*

Postdoctoral Fellow *Jul. 2023 - Sep. 2023*

University of Houston *Houston, TX*

Postdoctoral Fellow *Jan. 2023 - Jun. 2023*

William Marsh Rice University *Houston, TX*

Education

William Marsh Rice University *Houston, Texas*

Ph.D. Earth Science *Aug. 2017 - Dec. 2022*

- Thesis: Hotspot Motion during the Cenozoic and True Polar Wander across the Cretaceous-Paleogene Boundary
- Advisor: Prof. Richard Gordon
- GPA: 3.9

University of California Berkeley *Berkeley, California*

B.A. in Geophysics and B.A. in Geology *Aug. 2012 - Aug. 2016*

- Advisor: Prof. Swanson-Hysell
- GPA: 3.6

Peer-Reviewed Publications

(*) indicates a mentored student

8. **Gaastra, K. M.**, *Mifflin, G. M., & Gordon, R. G. (In Revision). Neotectonic Rates of Hotspot Motion. *Journal of Geophysical Research, Solid Earth*.
7. Siedman, L., Gordon, R. G., Woodworth, D. T., & **Gaastra, K. M.** (In Revision). True Polar Wander, the Hawaiian-Emperor Bend, Paleolatitude of Ellesmere Island, and Climate Change. *Nature Communications*.
6. **Gaastra, K. M.**, Argus, D. F., Landerer, F. W., Wiese, D. N., & Ellmer, M. (2025). Elastic displacement of the solid Earth and GRACE/GRACE–FO response to variations in global lake and reservoir storage. Journal of Geophysical Research: Solid Earth, 130(11), e2025JB031750.
5. Yang, H., Tikoo, S. M., Carvallo, C., Bilardello, D., Solheid, P., **Gaastra, K. M.**, ..., & Widdowson M. (2024). Preliminary characterization of submarine basalt magnetic mineralogy using amplitude-dependence of magnetic susceptibility. *Geochemistry, Geophysics, Geosystems*.
4. Thoram, S., Sager, W. W., **Gaastra, K. M.**, Tikoo, S. M., Carvallo, C., Avery, A., ... & Widdowson, M. (2023). Nature and origin of magnetic lineations within Valdivia Bank: Ocean plateau formation by complex seafloor spreading. Geophysical Research Letters, 50(13), e2023GL103415.
3. **Gaastra, K. M.**, Gordon, R. G., & Woodworth, D. (2021). Quantification of Pacific Plate Hotspot Tracks Since 80 Ma and the Relative Timing of Eocene Plate Tectonic Events. *Tectonics*.
2. Sprain, C. J., Swanson-Hysell, N. L., Fairchild, L. M., & **Gaastra, K. M.** (2018). A field like today's? The strength of the geomagnetic field 1.1 billion years ago. *Geophysical Journal International*, 213(3), 1969-1983.
1. Tauxe, L., Shaar, R., Jonestrask, L., Swanson-Hysell, N. L., Minnett, R., Koppers, A. A. P., ... **Gaastra, K. M.**, & Fairchild, L. (2016). PmagPy: Software package for paleomagnetic data analysis and a bridge to the Magnetics Information Consortium (MagIC) Database. *Geochemistry, Geophysics, Geosystems*, 17(6), 2450-2463.

Manuscripts in Preparation

7. **Gaastra, K. M.**, Argus, D. F., Landerer, F. W., Peidou, A., Wiese, D. N. (In Preparation). Changes in Subsurface Water in Canada 1992-2025 Estimated from GRACE and GNSS Station Displacements. *Water Resources Research*.
6. **Gaastra, K. M.**, Argus, D. F., Landerer, F. W. (In Preparation). Effects of Seasonal Snow Water on GRACE/GRACE-FO Terrestrial Water Storage and GNSS Station Displacement. *Earth System Science Data*.
5. **Gaastra, K. M.**, Sager, W., Harsha, T., Carvallo, C. A., Sonia, T. M. (In Preparation). Southward Drift of the Tristan-Gough Hotspot Revealed by the Paleolatitude of IODP Site U1578. *Nature Geoscience*.

4. **Gaastra, K. M.**, Gordon, R. G., Woodworth, D. T. (In Preparation). Skewness Analysis of C27r in the Pacific: True Polar Wander near the Cretaceous-Tertiary Boundary. *Geophysical Research Letters*.

3. **Gaastra, K. M.**, Woodworth, D. T. (In Preparation). Automatic Segmenting of Geophysical Trackline Data Provides High-Resolution Pacific-Rivera Plate Motion. *Geophysical Research Letters*.

2. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.** (In Preparation). True Polar Wander Inferred from Pacific Apparent Polar Wander During Magnetic Anomaly C24r. *Journal of Geophysical Research, Solid Earth*.

1. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.** (In Preparation). A True Polar Stillstand During the Formation of the Hawaiian Seamount Chain: Skewness Analysis of Marine Magnetic Anomaly C21n. *Geophysical Research Letters*.

Volume Chapters

(*) INDICATES A MENTORED STUDENT

7. Sager, W. W., Hoernle, K., Höfig, T. W., and **Expedition 391 Scientists** (2022). Expedition 391 Preliminary Report: Walvis Ridge Hotspot. *Proceedings of the IODP*

6. Sager, W. W. and **Expedition 391 Scientists** (2023). Expedition 391 Summary. *Proceedings of the IODP*

5. Sager, W. W. and **Expedition 391 Scientists** (2023). Expedition 391 Methods. *Proceedings of the IODP*

4. Sager, W. W. and **Expedition 391 Scientists** (2023). Site U1575 Summary. *Proceedings of the IODP*

3. Sager, W. W. and **Expedition 391 Scientists** (2023). Site U1576 Summary. *Proceedings of the IODP*

2. Sager, W. W. and **Expedition 391 Scientists** (2023). Site U1577 Summary. *Proceedings of the IODP*

1. Sager, W. W. and **Expedition 391 Scientists** (2023). Site U1578 Summary. *Proceedings of the IODP*

Conference Abstracts and Presentations

24. **Gaastra, K. M.**, Argus, D., Landerer, F., Ellmer, M. (2024). Elastic Displacement of the Solid Earth and GRACE/GRACE-FO response to variations in Global Lake and Reservoir Storage (G11A-07). *AGU Fall Meeting*.

23. **Gaastra, K. M.**, Argus, D., Landerer, F., Ellmer, M. (2024). Elastic Displacement of the Solid Earth and GRACE/GRACE-FO response to variations in Global Lake and Reservoir Storage (No. GSTM2024-31). *Copernicus Meetings*.

22. **Gaastra, K. M.**, Argus, D., Landerer, F., Ellmer, M. (2024). Elastic Displacement of the Solid Earth and Grace-Fo Response to Variations in Global Lake and Reservoir Storage (Abstracts 56, 404407). *Geological Society of America*.

21. **Gaastra, K. M.**, Thoram, S., Sager, W., Carvallo, C., Tikoo, S., Yang, H., and IODP Expedition 391 Scientists (2023, December). Paleolatitude of the Tristan/Gough Hotspot: Implications for Paleocene True Polar Wander and Hotspot Motion. *In AGU Fall Meeting Abstracts*.

20. **Gaastra, K. M.** and Gordon, R. G. (2022, December). The Magnitude of Neotectonic Hotspot Motion: Towards Better Absolute Reference Frames. *In AGU Fall Meeting Abstracts*.

19. *Ritchey, E., **Gaastra, K. M.**, Gordon, R. G. (2022, December). A New Paleomagnetic Pole from Skewness of Pacific Plate Magnetic Anomalies 30n-31n and IMplications for Maastrichtian Paleogeography. *In AGU Fall Meeting Abstracts*.

18. **Gaastra, K. M.**, Gordon, R. G., Woodworth, D. T. (2021, December). New Age for the Eocene Bends in Pacific Hotspot Tracks: Implications for Relative Timing of Global Eocene Tectonic and Paleoclimatic Events. *In AGU Fall Meeting Abstracts* (Vol. 2021, pp. GP31A-08).

17. **Gaastra, K. M.**, *Mifflin, G. M., Gordon, R. G. (2021, December). Rates of Neotectonic Lateral Hotspot Motion Determined From Monte Carlo Inversion. *In AGU Fall Meeting Abstracts* (Vol. 2021, DI25B-0041).

16. Gordon, R. G., **Gaastra, K. M.**, Wang, C. (2021, December). Whither the Mantle Wind? *In AGU Fall Meeting Abstracts* (Vol. 2021).

15. Gordon, R. G., Woodworth, D. T., **Gaastra, K. M.** (2021, December). Placing the Paleo-Pacific Plate in Paleolatitude and Paleo-Declination. *In AGU Fall Meeting Abstracts* (Vol. 2021).

14. Woodworth, D. T., **Gaastra, K. M.** (2021, December). Automatic Segmentation of Geophysical Trackline Data Applied to Pacific-Rivera Motion. *In AGU Fall Meeting Abstracts* (Vol. 2021).

13. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.** (2021, December). Challenges to Establishing a Global Paleolatitude Framework: Paleomagnetic Inconsistencies in the Plate Circuit Through Antarctica. *In AGU Fall Meeting Abstracts* (Vol. 2021).

12. **Gaastra, K. M.**, Gordon, R. G. (2021, April). Relative Timing of the Eocene Global Reorganization of Plate Motions: New Results for Pacific Plate Hotspot Tracks. *In EGU General Assembly Conference Abstracts* (pp. EGU21-13574).

11. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.** (2021, April). Skewness Pole from Magnetic Anomaly C21n Implies Rapid Early Eocene True Polar Wander. *In EGU General Assembly Conference Abstracts* (pp. EGU21-13644).

10. Gaastra, K., Gordon, R. G. (2020, December). Bends in Pacific Hotspot Tracks and Eocene Global Climate Change: Are they Coeval?. *In AGU Fall Meeting Abstracts* (Vol. 2020, pp. DI014-07).
9. **Gaastra, K. M.**, Gordon, R. G., Woodworth, D. T. (2019, December). The Stability of the Earth Relative to its Spin Axis Across the K-Pg Boundary Tested by Skewness Analysis of Marine Magnetic Anomaly C27r. *In AGU Fall Meeting Abstracts* (Vol. 2019, pp. GP53A-0665).
8. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.**, Staro, A. (2019, December). Linking True Polar Wander, the Origin of the Hawaiian-Emperor Bend, the Paleolatitude of Ellesmere Island, and Cenozoic Climate Change. *In AGU Fall Meeting Abstracts* (Vol. 2019, pp. U21B-02).
7. Woodworth, D. T., Gordon, R. G., **Gaastra, K. M.** (2019, December). True Polar Wander and the Paleocene-Eocene Latitude of Ellesmere Island. *In AGU Fall Meeting Abstracts* (Vol. 2019, pp. GP53A-0666).
6. Gordon, R., Woodworth, D., Gaastra, K., Seidman, L. (2019, January). True Polar Wander and the Origin of the Hawaiian-Emperor Bend: New Evidence. *In Geophysical Research Abstracts* (Vol. 21).
5. **Gaastra, K. M.**, Gordon, R. G. (2018, December). Apparent Polar Wander of Pacific and Indo-Atlantic Hotspots During Cretaceous Time: Implications for Motion Between Hotspots and True Polar Wander. *In AGU Fall Meeting Abstracts* (Vol. 2018, pp. GP31A-0708).
4. Staro, A., **Gaastra, K. M.**, Zheng, L., Gordon, R. G. (2018, December). Skewness analysis of Pacific Plate Magnetic Anomalies 22r-22n-21r and possible implications for the formation of the Hawaiian-Emperor Bend, True Polar Wander, and Cenozoic Global Climate change. *In AGU Fall Meeting Abstracts* (Vol. 2018, pp. GP31A-0710).
3. **Gaastra, K. M.**, Gordon, R. G. (2017, December). Late Tertiary Motion of the Hawaiian Hot Spot Relative to the Spin Axis and Implications for True Polar Wander. *In AGU Fall Meeting Abstracts* (Vol. 2017, pp. GP51A-0780).
2. Sprain, C. J., Swanson-Hysell, N., Fairchild, L. M., **Gaastra, K. M.** (2016, December). The strength of the Mesoproterozoic geomagnetic field: new absolute paleointensity estimates from 1.1 billion-year-old Midcontinent Rift volcanics. *In AGU Fall Meeting Abstracts* (Vol. 2016, pp. DI13A-2347).
1. Fairchild, L. M., Swanson-Hysell, N., Ramezani, J., Sprain, C. J., **Gaastra, K. M.**, Bowring, S. A. (2015, December). When Did Midcontinent Rift Volcanism End and Where Was Laurentia at that Time?. *In AGU Fall Meeting Abstracts* (Vol. 2015, pp. GP31A-1364).

Teaching

Classes

Teaching Assistant & Invited Lectures

- **ESCI 115** - Introduction to the Earth (Spring 2019, 2020): This introductory class gives prospective Earth Science undergraduates a solid basis in the many diverse fields that compose Earth and Environmental Science. As a TA it was my job to create, teach, and grade a lab weekly covering the skills required for basic study in the Earth Sciences from mineralogical identification techniques to seismic source triangulation.
- **ESCI 101** - The Earth (Spring 2021, 2022): This introductory course provides a broad overview of most of the fields in Earth and Environmental Science from the origin of the Earth to modern climate change, with the purpose of providing context for non-major undergraduates who may encounter Earth Science in the news or their own studies. As a TA I helped prepare exams, helped give review lectures prior to exams, and preformed all of the grading.
- **ESCI 114** - Discoveries in EEPS Seminar (Invited talks "Tectonics and Paleomagnetism" in Spring 2019, Fall & Spring 2020): This seminar provides an overview of the avenues of research available within the EEPS department (previously ESCI) in which talks are solicited from professors or a senior graduate student to explain the research done in their group in one or two lectures. The goal being to inform freshmen and sophomore undergraduates considering EEPS as a major about what research they may participate in.
- **ESCI 699** - Visual Design for Scientists (Invited talk "Map Projections: plotting geospatial data" in Fall 2019): This class was designed to help students learn from each other and the professor about methods of data representation to collectively improve presentation of results in academic journals.

Mentored Undergraduate Students

Rice University

- Gregory Mifflin (Summer 2019): Undergraduate Researcher
- Evan Ritchey (Summer 2022): REU Undergraduate Researcher

Tutoring

Student Learning Center

Aug. 2013 - Dec. 2014 *University of California Berkeley*

- Provided drop-in assistance on mechanics, E & M, optics, quantum, and relativity. In 2014 I also lead a weekly supplementary lecture on mechanics that followed the curriculum of the introductory course at UC Berkeley from kinematics to wave mechanics.

Service

PySkew Code *Rice Tectonics Group*

- Created an open-source library and GUI for the interactive analysis of magnetic trackline data from the NCEI data center *2017-Present*

PmagPy Code *EarthRef Organization*

- Contributed the majority of the code behind Demag GUI the graphical user interface for analyzing demagnetization data *2014-2017*
- Assisted in the modification and upkeep of the Thellier GUI for grapihcal analysis of paleointensity data
- Modified or created all of the scripts for converting magnetometer data files into MagIC format for analysis and contribution to the MagIC public database

Geounion - Vice President *Rice Earth Science Graduate Student Union*

- Helped plan, organize, and run department events *2018*

Reviewed for the following Journals

- Water Resources Research
- Geochemistry, Geophysics, Geosystems
- Geology

Funding

IODP 391 - Post-Cruise Research Funding *2022*
$18,000

IODP 391 - Participation Award *2021-2022*
$20,000

Honors & Awards

Awards

2021 **Torkid Rieber Award**, for Exemplary Academic Standing *Rice University*
2020 **Alison Henning Teaching Award**, for Excellence in Teaching *Rice University*

Invited Talks

2025 **Inter Commission Committee on Geodesy for Climate Research**, International Association of Geodesy
2025 **Mojave Water Agency Technical Advisory Board**, Mojave Water Agency
2025 **California State University Fullerton Colloquium**, CalState Fullerton Earth Science

Field Work

Walvis Ridge in the South Atlantic *IODP 391*

2 months *Dec. 2021-Feb. 2022*

- Drilled multiple cores along the Walvis Ridge to investigate the paleolatitudinal history of the Tristan hotspot and the dynamics of inter-hotspot and hotspot-mantle motion

Panum Crater, Benton Range, and Long Valley Caldera *EPS 118*

4 weeks *Jun. 2016 - Jul. 2016*

- Mapping and stratigraphy of select formations in the above regions as well as a full Caldera gravity survey and a local seismic refraction and dc resistivity survey

Saratoga Springs, Death Valley *EPS 115*

1 week *Mar. 2016*

- Time series analysis of the parasequences of the Beck Springs Formation