

DR. KATHERINE E. GRANT

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RESEARCH INTERESTS

I am a geochemist and biogeochemist who focuses on the weathering of the critical zone. I am interested in understanding organic carbon preservation through time by combining novel isotopic techniques to disentangle the competing roles of carbon degradation/oxidation, mineral-carbon interactions, and environmental controls on organic carbon persistence through recent and past geologic timescales to inform global change.

EDUCATION

- 2019** **PhD in Geological Sciences: Geochemistry/Isotope Geochemistry**
Dissertation: Carbon Cycling in Hawaiian Soils: The role of soil mineral weathering on the age, energetics, and persistence of soil organic carbon
Advisor: Louis Derry
Cornell University – Ithaca, NY
(August 19, 2019)
- 2013** **Master of Science in Environmental Engineering**
Thesis: Effect of nitrogen on lead release in an iron and manganese rich aquifer in Kutupalong Refugee Camp, Bangladesh
Advisor: Andrew Quicksall
Southern Methodist University – Dallas, TX
- 2011** **Bachelor of Science in Chemistry**
University of Notre Dame – Notre Dame, IN

RESEARCH EXPERIENCE

- 2021- 2022** Guest Scientist at Woods Hole Oceanographic Institution – National Ocean Sciences Accelerator Mass Spectrometry (NOSAMS)
- 2021-Present** Post-Doctoral Researcher – Lawrence Livermore National Laboratory
Center for Accelerator Mass Spectrometry (CAMS-Natural Carbon Group)
Part of the Department of Energy: LDRD-ER funded Blackbox Radiocarbon Project
- 2019-2021** Post-Doctoral Research Associate – Durham University, UK
Supervisor: Dr. Robert Hilton
Part of the ERC funded ROC-CO2 project

Collaborations with Dr. Steven Petsch at UMASS-Amherst and Dr. Valier Galy at WHOI

- 2013-2019** Graduate Research Assistant – Cornell University
Advisor: Dr. Louis Derry
Committee: Dr. Valier Galy, Dr. Johannes Lehmann, and Dr. Carmen E. Martinez
Department of Earth and Atmospheric Sciences
Collaborations with Dr. Valier Galy at WHOI, Dr. Timothy Eglinton at ETH Zurich, Dr. Oliver Chadwick at UCSB, and Dr. Fredric Moynier at IPGP
Conducted 3 separate field work trips to Hawaii (2 weeks each)
- 2011-2013** Graduate Research Assistant – Southern Methodist University
Advisor: Dr. Andrew Quicksall
Department of Civil and Environmental Engineering
Conducted field work in Uganda (4 weeks) and Bangladesh (3 weeks)
- 2009-2011** Undergraduate Researcher – University of Notre Dame
Advisor: Dr. Patricia Maurice
Conducted an independent research project synthesizing and characterizing ferrihydrite.

PUBLICATIONS

- Grant, K.E.,** Hilton, R.G., Dellinger, M., Dickson, A, Ogrič, M., Horan, K., Petsch, S. Validating the rhenium proxy of rock organic carbon oxidation using weathering profiles. (*In prep.*)
- Grant, K.E,** Derry, L.A., Moynier, F., Ti isotope fractionation across an intensely weathered climate gradient (*In prep.*)
- Grant, K.,** Repasch, M., Finstad, K., Broek, T., McFarlane, K. (2022) Divergence of compound class persistence in a California grassland soil. Radiocarbon Proceedings– (*In prep.*)
- Grant, K.E.,** Galy, V.V., Haghipour, N., Eglinton, T.I., Derry, L.A. Energetics of tropical soil organic carbon show increasing vulnerability during climate change (*submission to EPSL October 2022*)
8. **Grant, K.E.,** Hilton, R.G., Galy V.V. Global patterns of radiocarbon depletion in deep soil linked to the presence of rock-derived organic carbon. (*In Review, Geochemical Perspective Letters*)
7. Ogrič, M., Dellinger, M., **Grant, K.E.,** Galy, V.V., Gu, X., Susan L. Brantley, S.L., Hilton. R.G. Low rates of rock organic carbon oxidation and anthropogenic cycling of rhenium in a slowly denuding landscape. (*In Revision at Earth Surface Processes and Landforms*)
6. **Grant, K.E.,** Galy, V.V., Haghipour, N., Eglinton, T.I., Derry, L.A. (2022) Persistence of old soil carbon under changing climate: the role of mineral-carbon interactions. *Chemical Geology* 587, 120629. <https://doi.org/10.1016/j.chemgeo.2021.120629>
5. Inagaki, T.M., Possinger, A.R., **Grant, K.E.,** Schweizer, S.A., Mueller, C.W., Derry, L.A., Lehmann, J. and Kögel-Knabner, I. (2020) Subsoil organo-mineral associations under contrasting climate conditions. *Geochimica et Cosmochimica Acta.* 270, 244-263

4. **Grant, K.E.**, Galy, V.V., Chadwick, O.A., Derry, L.A. (2019) Thermal oxidation of carbon in organic matter rich volcanic soils: insights into SOC age differentiation and mineral stabilization. *Biogeochemistry* 144, 291–304
3. Hemingway, J.D., Rothman, D.H., **Grant, K.E.**, Rosengard, S.Z., Eglinton, T.I., Derry, L.A. and Galy, V.V. (2019) Mineral protection regulates the global preservation of natural organic carbon. *Nature* 570, 228-231
2. Hemingway, J., Galy, V., Gagnon, A., **Grant, K.**, Rosengard, S., Soulet, G., Zigah, P., McNichol, A. (2017). Assessing the Blank Carbon Contribution, Isotope Mass Balance, and Kinetic Isotope Fractionation of the Ramped Pyrolysis/Oxidation Instrument at NOSAMS. *Radiocarbon*, 59(1), 179-193. doi:10.1017/RDC.2017.3
1. Barton, L. E.; **Grant, K. E.**; Kosel, T.; Quicksall, A. N.; Maurice, P. A. (2011) Size-Dependent Pb Sorption to Nanohematite in the Presence and Absence of a Microbial Siderophore. *Environmental Science & Technology* 45 (8), 3231-3237.

SEMINARS AND CONFERENCE PRESENTATIONS

- Grant, K.**, Galy, V., Hilton, R. (2022). The Presence and Fate of Rock Organic Carbon in the Critical Zone. AGU Abstract 157974 – Fall meeting Chicago 2022. *Invited*
- Grant, K.**, Repasch, M., Finstad, K., Broek, T., McFarlane, K. (2022); Soil Carbon Compound Class Persistence Across a Climate Gradient in California Grassland Soils. AGU Abstract– Fall meeting Chicago 2022
- Grant, K.**, Repasch, M., Finstad, K., Broek, T., McFarlane, K. (2022) Divergence of compound class persistence in a California grassland soil. Radiocarbon Meeting Abstract – September 10-16, ETH-Zurich
- Grant, K.**, Dellinger, M., Norwell, G., Petsch, S., Galy, V., Hilton, R. (2022) Using rhenium, $\delta^{187}\text{Re}$, and $\text{RPO-}^{14}\text{C}$ to trace the fate of rock organic carbon in the Critical Zone. Goldschmidt Hawaii 2022- Oral Presentation
- Grant, K.**, Carbon Cycling: the role of soil mineral weathering on the age, energetics, and persistence of soil organic carbon. October 21, 2021. Virtual Seminar at NOSAMS Advisory Committee Meeting, Woods Hole Oceanographic institution - *Invited*
- Grant, K.**, Carbon Cycling: the role of soil mineral weathering on the age, energetics, and persistence of soil organic carbon. May 19, 2021. Virtual Seminar at ETH-Zurich, Laboratory of Ion Beam Physics (ETH-LIP) – *Invited*
- Hilton, R., Dellinger, M., K Grant, K., Nowell, G., The rhenium isotopic composition of rivers: The first measurements of ^{187}Re and their implications for tracking oxidative weathering processes. AGU Fall Meeting Abstracts 2021, EP11B-07
- Grant, K.**, Dellinger, M., Norwell, G., Petsch, S., Hilton, R.; (2021) Using rhenium and $\delta^{187}\text{Re}$ to trace the fate of rock organic carbon in the Critical Zone. Virtual Goldschmidt Meeting 2021, Accepted
- Derry, LA, **Grant KE**, Deng, Z. F Moynier, F. Refractory element and Ti isotope constraints on parent material variability and elemental mobility in the Critical Zone. Goldschmidt2021 Virtual 4-9 July, 2021
- Grant, K.**, Carbon Cycling: the role of soil mineral weathering on the age, energetics, and persistence of soil organic carbon. October 9, 2020. Virtual Seminar at LLNL Center for Accelerator Mass Spectrometry (CAMS) – *Invited*

- Grant, K.,** Galy, V., Hilton, R.; (2020). The fate of rock organic carbon in the Critical Zone. Goldschmidt Meeting 2020, Hawaii, Accepted – COVID-19
- Grant, K.,** Carbon Cycling: the role of soil mineral weathering on the age, energetics, and persistence of soil organic carbon. June 4, 2019. Earth and Atmospheric Sciences, Cornell University – *Defence Seminar*.
- Grant, K.,** Galy, V., Haghipour, N., Eglinton, T., Derry, L.; (2019). Insights into SOC Stabilization Using Bulk Radiocarbon, Thermal Oxidation, and Lipid Biomarker Analysis. Soil Science Society of America International Meeting, 2019, San Diego, CA. Oral Presentation
- Grant, K.,** Galy, V., Haghipour, N., Eglinton, T., Derry, L.; (2018). Multi-Level Radiocarbon Analysis of Hawaiian SOC. Goldschmidt Meeting, 2018, Boston, MA, USA. Oral Presentation
- Grant, K.,** Galy, V., Haghipour, N., Eglinton, T., Derry, L.; (2017). Iron loss promotes SOC turnover on a Hawaiian soil gradient. Goldschmidt 2017 Meeting, Paris, France
- Grant, K.,** Galy, V., Derry L.; (2016), Thermal reactivity of SOC linked to iron oxide content: Pyrolysis-AMS study of mineral-associated SOC on Kohala Volcano, Hawaii, Abstract B41D-0460 presented at 2016 Fall Meeting, AGU, San Francisco, Calif., 12-16 Dec.
- Grant, K E;** Galy, V; Derry L A; (2014), Pyrolysis-AMS Study of Age Structure of SOC in Volcanic Soils on Kohala Volcano, Hawaii, Abstract B13N-0072 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec.
- Grant, K. E.;** Aleto, D. M.; Dietrich, L. S.; Quicksall, A. N., Effects of varied NO_2^- and NO_3^- concentrations on Pb release from Fe and Mn rich soils in the Kutupalong Refugee Camp, Bangladesh. *Abstracts of Papers of the American Chemical Society* 2014, 247.

AWARDS

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| 2019 | Meyer Bender '29 and Stephen Bender '58 Memorial Scholarship Award |
| 2016 | Bryan Isacks Excellence in Teaching Award |
| 2013 | SMU Research Day Poster Award |

GRANTS AND FELLOWSHIPS

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| 2019 | Cornell Conference Travel Grant |
| 2018 | Kaufman Travel Fund |
| 2017 | Cornell Research Travel Grant |
| 2017 | Cross Scale Biogeochemistry (CSBC) Small Grant |
| 2016 | Kaufman Travel Fund |
| 2016 | Cross Scale Biogeochemistry and Climate NSF-IGERT International Travel Grant |
| 2016-2017 | Cross Scale Biogeochemistry and Climate NSF-IGERT Traineeship |
| 2016 | EAS Bloom Scholarship Fund |
| 2016 | Cross Scale Biogeochemistry (CSBC) Small Grant |
| 2015 | Geological Society of America Graduate Student Research Grant |
| 2015 | Cross Scale Biogeochemistry (CSBC) Small Grant |
| 2014 | National Ocean Sciences Mass Spectrometry (NOSAMS) Graduate Student Internship |
| 2014 | Cross Scale Biogeochemistry (CSBC) Small Grant |
| 2013-2014 | Cornell University Fellowship |

2013 SMU Research Day Best Poster Award
2009/2010 Nanoelectronics Undergraduate Research Fellowship

ANALYTICAL TECHNIQUES

Thermo Element 2 (ICP-MS)	Ion Chromatography (Dionex)
Thermo Neptune Plus (MC-ICP-MS)	Radiocarbon lab procedures and vacuum lines
Spectroblue ICP-OES	Operator of Compact-AMS (1KV system)
Thermo Series II Quadrupole (ICP-MS)	Ramped Pyrolysis/Oxidation (RPO- ¹⁴ C)
Preparatory Gas Chromatography	BET surface area analysis
Inorganic geochemistry clean lab procedures	FTIR, UV-VIS, and XRD analysis

FIELDWORK TRIPS

2022 Hopland, CA – UC Hopland Research Reserve (multiple 1-day trips)
2021 Hopland, CA – UC Hopland Research Reserve (multiple 1-day trips)
2021 UC Angelo Coast Range Reserve (2 separate 1-week trips for soil sampling)
2021 UC Sedgwick Research Reserve (1-week trip for soil sampling)
2016 Kohala Mt, Hawaii (1 weeks April)
2015 Kohala Mt, Hawaii (2 weeks beginning of Jan)
2014 Kohala Mt, Hawaii (2 weeks beginning of Jan)
2011 Cox's Bazar, Bangladesh (1 month in Nov): Trip to two refugee camps with UNHCR for water sample collection
2011 Uganda – 1 month in August. Trip to nine different refugee settlements across Uganda for water sample collection

SHORT COURSES/WORKSHOPS

2022 Expanding the Critical Zone Research Network Workshop – Colorado School of Mines (*July 18-21*)
2022 Big Island Biogeochemistry Fieldtrip, Hawaii – Goldschmidt Conference Fieldtrip (co-leader) (*July 7-10*)
2018 Critical Zone Ecosystem Dynamics Summer Course – Ceresole Reale, Italy
2015 CUAHSI Short Course: The Role of Runoff and Erosion on Soil Carbon Stocks: From Soils to Landscapes – Purdue University, West Lafayette, IN Oct. 20-21
2014 Radiocarbon Short Course – Irvine, CA
2014 Cornell Biogeochemistry NSF-IGERT NCAR Climate Modeling Bootcamp – Boulder, CO

LEADERSHIP

2022-Present Cornell College of Engineering Graduate Studies Advisory Board Member
2018-2019 Snee Graduate Organization: Member at Large
2017-2019 Cornell Biogeochemistry, Environmental Science and Sustainability Co-President

2014-2019 Atkinson Research Fellow
2015-2016 Cornell GPSA Field Representative
2014-2015 Snee Graduate Organization: Treasurer

SOCIETY MEMBERSHIP

American Geophysical Union, Geochemical Society, Soil Science Society of America, Geological Society of America

TEACHING

2019 The Earth System (EAS 2250), NYS Cayuga Correctional Facility, Moravia, NY
Instructor – Taught as part of the Cornell Prison Education Program (CPEP)

2019 The Earth System (EAS 2250), NYS Auburn Correctional Facility, Auburn, NY
Co-Instructor – Taught as part of the Cornell Prison Education Program (CPEP)

2016 Climate and Global Warming (EAS 2680), Ithaca, NY
Teaching Assistant – Instructor: Dr. Arthur Degaetano

2015 Introduction to Biogeochemistry (EAS 3030), Ithaca, NY
Teaching Assistant – Instructor: Dr. Joe Yavitt

2014 Introduction to Biogeochemistry (EAS 3030), Ithaca, NY
Teaching Assistant – Instructor: Dr. Louis Derry and Dr. Joe Yavitt

2010 Chemistry in Service of the Community, Notre Dame, IN
Undergraduate Teaching Assistant – Instructor: Dr. Dennis Jacobs
Assisted in the scheduling and execution of lead risk assessments in the homes of community members.

2009 Organic I Teaching Lab, Notre Dame, IN
Undergraduate TA – Lab Coordinator: Dr. DeeAnne Goodenough-Lashua

MENTORSHIP

2022 – Christopher Larson (University of Pennsylvania): undergraduate student intern at LLNL in the Natural Carbon Group.

2022 – Dan Sullivan (University of Arizona): Graduate student intern at LLNL working on Rhenium isotopes in uranium ore concentrates