

Dustin T. Harper, Ph.D.
Postdoctoral Researcher | University of Utah
(he/him)

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Education

- Ph.D.** University of California Santa Cruz | Earth Sciences
Thesis: *The coupling of climate and carbon cycle over the late Paleocene–early Eocene on long and short timescales*
Dec. 2018
Advisor: James Zachos
- M.S.** Scripps Inst. of Oceanography at UC San Diego | Earth Sciences
Thesis: *Benthic foraminifera as paleoceanographic proxies: Core-top element/calcium ratios and stable isotope data*
Sept. 2012
Advisor: Miriam Kastner
- B. S.** University of California San Diego | Earth Sciences/Geology
Dec. 2010

Professional Appointments

- **Post-Doctoral Researcher** | University of Utah
Feb. 2022 – present
- **Post-Doctoral Researcher** | University of Kansas
Feb. 2019 – Jan. 2022
- **Sedimentologist** | International Ocean Discovery Program Exp 396
Aug. 2021 – Oct. 2021
- **Teaching Assistant & Grad Researcher** | UC Santa Cruz
Sept. 2012 – Dec. 2018
- **Stratigraphic Correlator** | International Ocean Discovery Program Exp 371
June 2017 – Sept. 2017
- **Instructor of Record** | UC Santa Cruz
Apr. 2017 – June 2017
- **Post-Grad Intern** | Shell International Exploration and Production
June 2014 – Sept. 2014
- **Lab Assistant III** | Scripps Institution of Oceanography
Sept. 2009 – Sept. 2010

Teaching and Mentor Experience

- **Lab Mentor.** *SPATIAL Short Course* (<https://itce.utah.edu/spatial.html>).
Univ. of Utah, 2022, 2023, 2024
- **Guest Lecturer.** *Oceans* (GEO 3800).
Univ. of Utah, 2022
- **Guest Lecturer.** *Stable Isotope Geochemistry* (GEOL 591).
Univ. of Kansas, 2019, 2020
- **Undergraduate Thesis Mentor.** Oliver Azevedo (2018), Simin Jin (visiting 2018), Demir Worthington (2018), Reid Clark (2018) & Wayne Strojie (2017).
UC Santa Cruz, 2017 – 2018
- **Visiting Grad Researcher Advisor.** Guided visiting international researchers through analytical methods which resulted in three journal articles: Marlow Cramwinckel (2018), Max Vahlenkamp (2016), Cindy Schrader (2016) and James Barnett (2015).
UC Santa Cruz, 2015 – 2018
- **Teaching Assistant.** *Evolution of the Earth and Atmosphere* (4x), *Sedimentology and Stratigraphy* (3x), *Elements of Field Geology* (2x), and *Geology of the National Parks* (once).
UC Santa Cruz, 2012 – 2018
- **Instructor of Record.** *Elements of Field Geology* (EART-109). Introduced students to geologic field techniques via lecture, lab and field trip material. Instructed outcrop to regional-scale geologic mapping and interpretation.
UC Santa Cruz, 2017

Publications

23. Dustin Harper, A. Lam, D. Penman, J. Frieling, N. Varela, S. Chatterjee. *The Value of Scientific Ocean Drilling for Early Career Researchers*. Correspondence accepted for publication in Nature Geoscience.
22. Carlos Alvarez Zarikian, S. Yager, M. Christopoulou, N. Varela, V. Clementi, and D. Harper, **2024**. *Data Report: X-ray fluorescence scanning of Site U1574, Vøring Plateau, IODP Expedition 396*. <https://doi.org/10.14379/iodp.proc.396.201.2024> Proceedings of the International Ocean Discovery Program.
21. Bärbel Hönisch, C. Witkowski, D. Penman, D. Harper, M. Henehan, P. Polissar, **2024**. *Paleo-atmospheric CO₂ reconstructions from deep-ocean sediments*. <https://doi.org/10.22498/pages.32.2.84>. PAGES magazine.
20. Dustin Harper, B. Hönisch, G. Bowen, R. Zeebe, L. Haynes, D. Penman, and J. Zachos, **2024**. *Long- and short-term coupling of sea surface temperature and atmospheric CO₂ during the late Paleocene and early Eocene*. <https://doi.org/10.1073/pnas.2318779121>. Proceedings of the National Academy of Science.
19. Ashley Morris, S. Lambart, M. Stearns, J. Bowman, M. Jones, G. Mohn, G. Andrews, J. Millet, C. Tegner, S. Chatterjee, J. Frieling, P. Guo, D. Jolley, E. Cunningham, C. Berndt, S. Planke, C. Alvarez Zarikian, P. Betlem, H. Brinkhuis, M. Christopoulou, E. Ferrè, I. Filina, D. Harper, J. Longman, R. Scherer, N. Varela, W. Xu, S. Yager, A. Agarwal, and V. Clementi, **2024**. *Evidence for Low-Pressure Crustal Anatexis During the Northeast Atlantic Break-up*. <https://doi.org/10.1029/2023GC011413>. Geochemistry, Geophysics, Geosystems.
18. Madeleine Vickers, M. Jones, J. Longman, C. Ullman, M. Vickers, J. Frieling, D. Harper, V. Clementi, S. Planke, and the IODP Expedition 396 Science Party, **2024**. *Paleocene-Eocene age glendonites from the Norwegian Margin – Indicators of cold snaps in the hothouse?* <https://doi.org/10.5194/cp-20-1-2024>. Climate of the Past.
17. CenCO2PIP Consortium, **2023**. *Towards a Cenozoic history of atmospheric CO₂*, <https://doi.org/10.1126/science.adi5177>. Science.
16. Christian Berndt, S. Planke, C.A. Zarikian, J. Frieling, J. Millett, M. Jones, H. Brinkhuis, S. Bünz, H. Svensen, J. Longman, R. Scherer, J. Karstens, B. Manton, R. Huismans, J. Faleide, A. Agarwal, G. Andrews, P. Betlem, J. Bhattacharya, S. Chatterjee, M. Christopoulou, V. Clementi, E. Ferré, I. Filina, P. Guo, D. Harper, S. Lambart, G. Mohn, R. Nakaoka, C. Tegner, N. Varela, M. Wang, W. Xu, and S. Yager, **2023**. *Shallow-marine hydrothermal venting linked to Paleocene Eocene Thermal Maximum*, <https://doi.org/10.1038/s41561-023-01246-8>. Nature Geoscience.
15. Joji Uchikawa, D. Penman, D. Harper, J. Farmer, J. Zachos, N. Planavsky, and R. Zeebe, **2023**. *Sulfate and phosphate oxyanions alter B/Ca and $\delta^{11}\text{B}$ in inorganic calcite at constant pH: Crystallographic controls over normal kinetic effects*, <https://doi.org/10.1016/j.gca.2022.12.018>. Geochimica et Cosmochimica Acta.
14. Wanda Stratford, R. Sutherland, G. Dickens, P. Blum, J. Collot, M. Gurnis, S. Saito, C. Agnini, L. Alegret, G. Asatryan, A. Bordenave, J. Bhattacharya, L. Change, M. Cramwinckel, E. Dallonave, M. Drake, S. Etienne, M. Giorgioni, D. Harper, H. Huang, A. Keller, A. Lam, H. Li, H. Matsui, H. Morgans, C. Newsam, Y. Park, K. Pascher, S. Pekar, D. Penman, T. Westerhold, and X. Zhou, **2022**. *Timing of Eocene compressional plate failure during subduction initiation, northern Zealandia, southwestern Pacific*, <https://doi.org/10.1093/gji/ggac016>. Geophysical Journal International.
13. Rupert Sutherland, Z. Dos Santos, C. Agnini, L. Alegret, A. Lam, T. Westerhold, M. Drake, D. Harper, E. Dallonave, C. Newsam, M. Cramwinckel, G. Dickens, J. Collot, S. Etienne, A. Bordenave, W. Stratford, X. Zhou, H. Li, G. Asatryan, **2022**. *Neogene mass accumulation rate of carbonate sediment in the Tasman Sea, southwest Pacific*, <https://doi.org/10.1029/2021PA004294>. Paleoceanography and Paleoclimatology.
12. Dustin Harper, M. Suarez, J. Uglesich, H. You, D. Li, P. Dodson, **2021**. *Aptian-Albian clumped isotopes from northwest China: Cool temperatures, variable atmospheric pCO₂ and regional shifts in the hydrologic cycle*, <https://doi.org/10.5194/cp-2020-152>. Climate of the Past.
11. Laia Alegret, D. Harper, C. Agnini, C. Newsam, T. Westerhold, M. Cramwinckel, E. Dallonave, G. Dickens, R. Sutherland, **2021**. *Biotic Response to Early Eocene Warming Events: Integrated Record from Offshore Zealandia, North Tasman Sea*, <https://doi.org/10.1029/2020PA004179>. Paleoceanography and Paleoclimatology.
10. Gabriella Kitch, A. Jacobson, D. Harper, M. Hurtgen, B. Sageman, J. Zachos, **2021**. *Calcium isotope composition of *Morozovella velascoensis* over the late Paleocene-early Eocene*, <https://doi.org/10.1029/2020PA003932>. Geology.
9. Marlow Cramwinckel, H. Coxall, K. Śliwińska, M. Polling, D. Harper, P. Bijl, H. Brinkhuis, J. Eldrett, A. Houben, F. Peterse, S. Schouten, G.J. Reichart, J. Zachos, A. Sluijs, **2020**. *A warm, stratified, and restricted Labrador Sea across the middle Eocene and its Climatic Optimum*, <https://doi.org/10.1029/2020PA003932>. Paleoceanography and Paleoclimatology.

8. Timothy Bralower, J. Cosmidis, P. Heaney, L. Kump, J. Morgan, D. Harper, S. Lyons, K. Freeman, K. Grice, J. Wendler, J. Zachos, N. Artimieva, S. Chen, S. Gulick, C. House, H. Jones, C. Lowery, C. Nims, B. Schaefer, E. Thomas, V. Vajda, **2020**. *Global microbial blooms during the immediate aftermath of the Cretaceous–Paleogene boundary impact*, <https://doi.org/10.1016/j.epsl.2020.116476>. Earth Planet. Sci Lett.
7. James Barnet, D. Harper, L. LeVay, K. Edgar, M. Henehan, T. Babila, C. Ullmann, M. Leng, D. Kroon, J. Zachos, K. Littler, **2020**. *Coupled evolution of temperature and carbonate chemistry during the Paleocene–Eocene; new trace element records from the low latitude Indian Ocean*, <https://doi.org/10.1016/j.epsl.2020.116414>. Earth Planet. Sci Lett.
6. Rupert Sutherland, G. Dickens, P. Blum, C. Agnini, L. Alegret, J. Bhattacharya, A. Bordenave, L. Chang, J. Collot, M. Cramwinckel, E. Dallanave, M. Drake, S. Etienne, G. Martino, M. Gurnis, D. Harper, H. Huang, A. Keller, A. Lam, H. Li, H. Matsui, C. Newsam, Y. Park, K. Pascher, S. Pekar, D. Penman, S. Satio, W. Stratford, T. Westerhold, X. Zhou, **2020**. *Continental scale of geographic change across Zealandia during subduction zone initiation*, <https://doi.org/10.1130/G47008.1>. Geology.
5. Dustin Harper, B. Hönisch, R. Zeebe, G. Shaffer, L. Haynes, E. Thomas, J. Zachos, **2020**. *The magnitude of surface ocean acidification and carbon release during Eocene Thermal Maximum 2 (ETM-2) and the Paleocene–Eocene Thermal Maximum (PETM)*, <https://doi.org/10.1029/2019PA003699>. Paleoceanography and Paleoclimatology.
4. Rupert Sutherland, G. Dickens, P. Blum, C. Agnini, L. Alegret, J. Bhattacharya, A. Bordenave, L. Chang, J. Collot, M. Cramwinckel, E. Dallanave, M. Drake, S. Etienne, G. Martino, M. Gurnis, D. Harper, H. Huang, A. Keller, A. Lam, H. Li, H. Matsui, C. Newsam, Y. Park, K. Pascher, S. Pekar, D. Penman, S. Saito, W. Stratford, T. Westerhold, X. Zhou, **2018**. *International Ocean Discovery Program Expedition 371 Preliminary Report: Tasman frontier subduction initiation and Paleogene climate*, <https://doi.org/10.14379/iodp.pr.371.2018>. Integrated Ocean Drilling Program: Preliminary Reports.
3. Maximillian Vahlenkamp, I. Niezgodzki, D. De Vleeschouwer, T. Bickert, D. Harper, S.K. Turner, G. Lohmann, P. Sexton, J. Zachos, H. Pälike, **2018**. *Astronomically paced changes in deep-water circulation in the Western North Atlantic during the Middle Eocene*, <https://doi.org/10.1016/j.epsl.2017.12.016>. Earth Planet. Sci Lett.
2. Dustin Harper, R. Zeebe, B. Hönisch, C.D. Schrader, L.J. Lourens, J. Zachos, **2018**. *Subtropical sea surface warming and increased salinity during Eocene Thermal Maximum 2*, <https://doi.org/10.1130/G39658.1>. Geology.
1. Joji Uchikawa, D. Harper, D. Penman, J. Zachos, R. Zeebe, **2017**. *Influence of solution chemistry on the boron content in inorganic calcite grown in artificial seawater*, <https://doi.org/10.1016/j.gca.2017.09.016>. Geochimica et Cosmochimica Acta.

Submitted Manuscripts

- [in revision]** Jack Longman, V. Clementi, J. Frieling, M. Jones, S. Chatterjee, S. Planke, C. Berndt, C. A. Zarikian, P. Betlem, H. Brinkhuis, M. Christopoulou, I. Filina, D. Harper, S. Lambart, J. Millett, G. Mohn, R. Scherer, N. Varela, W. Xu, S. Yager, and the IODP Expedition 396 Scientific Party. *Major impact of marine silicate diagenesis in the Norwegian Sea on Early Eocene climate*, Manuscript in revision for Palaeogeography, Palaeoclimatology, Palaeoecology.
- [in review]** Chels Howard, D. Penman, J. Zhu, D. Harper, D. Newell, and R. Norris. *Tropical Atlantic temperature and hydrologic change during the Paleocene–Eocene Thermal Maximum*, Manuscript in revision for Paleoceanography and Palaeoclimatology.
- [in review]** Joji Uchikawa, S. Karancz, M. Wolthers, L. Pacho, D. Harper, D. Penman, L. de Nooijer, G. Reichart, and R. Zeebe. *Changes in calcium ion concentration as the common driver for Na, K, S, B incorporation during inorganic calcite precipitation in artificial seawater?* Manuscript in review for Geochimica et Cosmochimica Acta.
- [in review]** Joost Frieling, M. Jones, I. Fendley, T. Mather, W. Xu, C. A. Zarikian, D. Harper, and the IODP Expedition 396 Scientific Party. *Constraints on volcanic and thermogenic carbon emissions during the Paleocene–Eocene Thermal Maximum*, Manuscript Submitted to Proceedings of the National Academy of Science.

Invited Talks

- Northern Illinois University Department of Earth, Atmosphere, and Environment Colloquium, 2024. **Bayesian Approaches to Carbon Cycle Proxy Systems**.
- Deep-time Digital Earth International Workshop (Hangzhou) for Paleo-CO₂ Reconstruction, 2024. **Bayesian Paleo-Environment Reconstructor (BPER): An R package for reconstructing paleo-CO₂ and more**.

- Pre-Goldschmidt Boron Isotope User Group Meeting, 2023. *Forward Bayesian hierarchical modeling of the boron proxy system with a new community accessible R package.*
- Utah State University Department of Geosciences Seminar, 2022. *Forward modeling proxies of atmospheric CO₂: Paleocene-Eocene foraminifera-based applications.*
- PAGES (Past Global Changes) Boron Isotope CO₂ Workshop at Bergen Norway, 2022. *$\delta^{11}\text{B}$ -based records reveal coupling of late Paleocene and early Eocene climate and atmospheric paleo-CO₂.*
- PAGES (Past Global Changes) Boron Isotope CO₂ Workshop at Bergen Norway, 2022. *Forward modeling the boron proxy system.*
- University of Kansas Department of Geology Colloquium, 2019. *Deep ocean records of Eocene Thermal Maximum 2: Coupling of climate and the carbon cycle.*

Select Conference Abstracts

- Dustin Harper, G. Bowen, D. Royer, X. Zhang, J. Da, J. Richey, D. Breecker, B. Hönisch, I. Montañez. *Reconstructing the carbon isotope composition of Phanerozoic atmospheric CO₂ using a Bayesian forward model.* Goldschmidt, 2024. Abstract 24155.
- Dustin Harper, G. Bowen, B. Hönisch, P. Polissar, Y. Zhang, X. Liu, J. Da, D. Breecker, I. Montañez. *Bayesian Paleo-Environment Reconstructor (BPER): A new R package for multi-proxy paleo-CO₂ reconstruction.* AGU, 2023. Abstract 1420112.
- Dustin Harper[†], P. Polissar, Y. Zhang, G. Bowen. *Forward modeling the alkenone paleo-CO₂ proxy: Combining traditional approaches in a Bayesian framework.* Goldschmidt, 2023. Abstract 18606.
- Dustin Harper, E. Anagnostou, B. Hönisch, G. Bowen. *Exploring approaches to extinct planktonic foraminifera $\delta^{11}\text{B}$ vital effects: Implications for Paleocene-Eocene Thermal Maximum and Eocene Thermal Maximum 2 pCO₂ reconstructions.* International Conference on Paleoceanography 14, 2022. Abstract A-546.
- Dustin Harper[†], B. Hönisch, G. Bowen, R. Zeebe, L. Haynes, J. Zachos. *δ^{11} -based records reveal close coupling of late Paleocene and early Eocene (59 to 53 Ma) climate and atmospheric paleo-CO₂,* 12th International Conference on Climate and Biotic Events of the Paleogene (CBEP) 2022. Abstract A-184.
- Dustin Harper, M. Suarez, H. You, D. Li, P. Dodson. *Aptian-Albian clumped isotopes from the Xiagou and Zhonggou Formations, northwest China: Cool summer temperatures and regional shifts in the hydrologic cycle,* AGU Fall Meeting 2019. Abstract PP13C-1471.
- James C. Zachos, D. Harper*, B. Hönisch, R. Zeebe, L. Haynes. *Long-term trends and orbital variability in late Paleocene and early Eocene (LPEE) climate, carbonate chemistry and planktic foraminiferal Mg/Ca,* AGU Fall Meeting 2019. Abstract PP31E-1683.
- Dustin Harper, B. Hönisch, R. Zeebe, L. Haynes, E. Thomas, J. Zachos. *Surface Ocean Acidification during Eocene Thermal Maximum 2 (ETM-2),* AGU Fall Meeting 2018. Abstract PP21D-1450.
- Dustin Harper, R. Zeebe, B. Hönisch, C. Schrader, L. Lourens, J. Zachos. *Sea Surface Warming and Increased Aridity at Mid-latitudes during Eocene Thermal Maximum 2,* AGU Fall Meeting 2017. Abstract PP23B-1317.
- Wayne Strojie**, D. Harper, J. Zachos. *Thermal evolution of the equatorial Pacific thermocline during Eocene Thermal Maximum 2 from foraminifera stable isotope and trace metal analysis,* AGU Fall Meeting 2017. Abstract PP23B-1316.
- Dustin Harper[†], R. Zeebe, B. Hönisch, J. Zachos. *The magnitude and phasing of variations in climate and ocean carbonate chemistry during Eocene Thermal Maximum 2: Insights into C cycle recovery,* AGU Fall Meeting 2016. Abstract PP53E-05.
- Dustin Harper, T. Westerhold, U Röhl, J. Zachos. *Paradox of the Paleocene Carbon Isotope Maxima (PCIM; ~57.8Ma): Abrupt $\delta^{13}\text{C}$ enrichment and global warming,* International Conference on Paleoceanography 2016. Abstract P-153.
- Dustin Harper, B. Hönisch, J. Zachos. *Paradox of the peak-PCIM (Paleocene Carbon Isotope Maxima; ~57.8Ma) and Abrupt Global Warming,* AGU Fall Meeting 2015. Abstract PP23B-2303.
- Dustin Harper, D. Penman, B. Hönisch, J. Zachos. *Trends in seawater Boron-based proxies during the Late Paleocene and Early Eocene associated with long-term warming,* AGU Fall Meeting 2014. Abstract PP51B-1121.

Dustin Harper, D. Penman, B. Hönisch, J. Zachos. *Investigating long- and short-term trends in seawater boron-based proxies during the Late Paleocene and Early Eocene*, Goldschmidt Conference 2014. Abstract 921.

Dustin Harper, D. Penman, B. Hönisch, J. Zachos. *Long- and short-term trends in seawater B/Ca and pH across the Paleocene-Eocene boundary*, AGU Fall Meeting 2013. Abstract PP23B-1970.

† = oral presentation

* = presenting author

** = student presentation

Select Popular Press Coverage

- KSL [Article](#), *U. researcher leads study into what microscopic fossilized shells say about climate change.*
- UNews [Article](#), *What microscopic fossilized shells tell us about ancient climate change.*
- The Guardian [Article](#), *Birth of North Atlantic Ocean 55M years ago caused rapid global warming.*
- UNews [Article](#), *Ancient volcanism drove ancient global warming that marked the end of the Paleocene.*
- National Geographic [Article](#), *'Lost continent' expedition provides clues to Earth's history.*
- New Zealand Herald [Article](#), *Scientific expedition reveals secrets of lost continent of Zealandia.*
- The Guardian [Article](#), *Zealandia drilling reveals secrets of sunken lost continent.*
- Newsweek [Article](#), *Zealandia: Scientists set to drill into long-lost continent to uncover its secrets.*
- NSF News [Release](#), *Scientists embark on expedition to submerged continent Zealandia.*

Grants and Awards

- International Ocean Discovery Program (IODP) salary and Post-Expedition Activity (PEA) grants (\$38,000), Expedition 396, 2021-2022.
- International Ocean Discovery Program (IODP) salary and Post-Expedition Activity (PEA) grants (\$28,000), Expedition 371, 2017-2018.
- Outstanding Teaching Assistant of the Year Award (faculty nominated), Earth and Planetary Sciences, University of California Santa Cruz, 2016–2017.
- Outstanding Teaching Assistant of the Year Award (undergraduate nominated), Earth and Planetary Sciences, University of California Santa Cruz, 2015–2016.
- NSF Urbino Summer School for Paleoclimatology Travel Scholarship, 2013.
- Martin Van Couvering Award. Pacific Section AAPG Meeting Travel Scholarship, 2013.

Service

- National Science Foundation (NSF) grant proposal review; Sedimentary Geology and Paleobiology (SGP) Program.
- Manuscript peer reviewer for academic journals *Paleoceanography & Paleoclimatology* (6x), *Climate of the Past* (3x), *Geology* (3x), *Global & Planetary Change* (2x), *Nature Geoscience* (2x), *Geoscientific Model Development* (1x), *Chemical Geology* (1x), *Paleogeography, Paleoclimatology, Paleoecology* (1x), *Geochimica et Cosmochimica Acta* (1x), *Geochemistry, Geophysics, Geosystems* (1x) and *Earth & Planetary Science Letters* (1x).
- University of Kansas, Geology Department, G-Hawk Research Symposium 2019, Volunteer Judge.

- International Ocean Discovery Program (IODP) Exp. 371 and 396, 2017 and 2021; education and outreach activities; participated regularly in ship to shore video links; programs reached >3000 teachers and elementary school to college-level students on four continents.
- High School Student Internship (HSSI) Program, University of California Santa Cruz, Summer 2013 and 2015, High School Intern Mentor.

Field Experience

- University of Utah, field expedition in collaboration with Utah State University to Range Creek Canyon, Turtle Canyon and Desolation Canyon, Summer 2023; mapped stratigraphy of lower Colton Fm., and some Flagstaff Fm. and North Horn Fm.; collected carbonate nodule samples for stable carbon isotope analysis aiming to locate and characterize early Eocene hyperthermal events in the region.
- International Ocean Discovery Program (IODP) Expedition 396, Norwegian Sea, Sedimentologist, Summer 2021; nine sites to be drilled over eight weeks to investigate regional Paleogene volcanism (North Atlantic Igneous Province) and associated long- and short-term climate change.
- University of Kansas, field expedition to Bentonite Hills, Spring 2019, Capitol Reef Nat'l Park, Utah; mapped stratigraphic section of Cedar Mountain Formation.
- International Ocean Discovery Program (IODP) Expedition 371, Tasman Sea, Stratigraphic Correlator, Summer 2017; six sites drilled over eight weeks to characterize Tonga-Kermadec subduction initiation and reconstruct Paleogene climate.
- University of California Santa Cruz, field expedition to El Adobe Ranch, New Idria, Panoche Hills, California, Spring 2016; generated large scale geologic map of deformation and distribution of Lodo Fm., Yokut Sandstone Fm., Kreyenhagen Shale Fm., and Quaternary deposits.
- University of California Santa Cruz, field expedition to Point Lobos State Preserve, Carmel, California, Spring 2016; generated large scale geologic map of deformation and distribution of Carmelo Sandstone Fm., Santa Lucia Granodiorite Fm., and Quaternary deposits.

Project Groups and Memberships

- SPATIAL: Spatio-Temporal Isotope Analytics Lab (<https://wateriso.utah.edu/spatial/>)
- CO₂PIP: CO₂ Proxy Integration Project (paleo-co2.org)
- DeepMIP: The Deep-Time Model Intercomparison Project (deepmip.org)
- American Geophysical Union ([agu.org](https://www.agu.org))
- Geological Society of America ([geosociety.org](https://www.geosociety.org))
- American Association for the Advancement of Science ([aaas.org](https://www.aas.org))