



Dalton Shane Hardisty
Assistant Professor

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Current Position: *Endowed Assistant Professor of Global Change Processes, Director of Paleooceanography Lab, Michigan State University.* We reconstruct the biogeochemical evolution of Earth's atmosphere and oceans over geologic timescales through comparative studies of a.) ancient ocean geochemistry archived in sedimentary rocks and b.) experimental and field observational constraints on the mechanisms driving spatiotemporal biogeochemical variability in the ocean today.

EDUCATION

B.S. Environmental Science, Mathematics minor, Indiana University, 2005-2009
M.S. Geology, Indiana University, 2009-2011 (Advisor: Dr. Lisa Pratt)
Ph.D. Geology, University of California Riverside, CA, 2011-2016 (Advisor: Dr. Tim Lyons)
Postdoctoral Scholar, Woods Hole Oceanographic Institution 2016-2018 (Advisor: Dr. Sune Nielsen)

NON-ACADEMIC RESEARCH POSITIONS AND INTERNSHIPS

2013-2014 Geochemist, IODP Expedition 347, Baltic Sea (3 months)
2011 Geochemistry Lab and Field Assistant, Indiana Geological Survey (summer), USA
2010 Geochemistry Laboratory Technician, Indiana University (summer), USA
2007-2009 Hydrogeology Field Assistant, Indiana Geological Survey, USA
2007 Mining Reclamation Intern, Peabody Energy, Indiana, USA

TEACHING EXPERIENCE

2019- Instructor, Michigan State University, *Oceanography*
2019- Instructor, Michigan State University, *Environmental Geochemistry*
2015-2016 Senior Thesis Advisor, University of California Riverside
2016 Teaching Assistant, University of California Riverside, *Earth's Climate Through Time*
2012 Teaching Assistant, University of California Riverside, *Oceanography*
2010-2011 Senior Thesis Advisor, Indiana University
2010-2011 Teaching Assistant, Indiana University, *Environmental Geology*
2010 Teaching Assistant, Indiana University, *Earth Science: Materials and Processes*

SELECTED ACADEMIC HONORS AND PRE-MSU FUNDING

2016-2018 Ocean Exploration Institute Project Funding, WHOI
2016-2018 Doherty Postdoctoral Scholar, Woods Hole Oceanographic Institute
2016 NASA Postdoctoral Program Fellowship, NASA Astrobiology Program (I declined)
2015-2016 Dissertation Year Fellowship, University of California Riverside
2015 SETI Institute student travel grant – Astrobiology Science Conference
2014-2016 NSF Geobiology and Low-Temperature Geochemistry
2014-2015 Schlanger Ocean Drilling Fellowship, U.S. Science Support Program
2014 IODP Post-Expedition Award
2014 NASA Astrobiology Early Career Collaboration Award
2009 IU B.S. Environmental Science Senior Award
2009 IU graduation with distinction
2006 Peabody Energy Fellowship
2005 Linton High School 4-year perfect attendance award



PEER REVIEW CONTRIBRUTIONS

(2021-present) *Guest Associate Editor for Frontiers in Marine Science, Special Topic: The marine iodine cycle: past, present and future.*

Ad Hoc Reviews:

Acta Oceanologica Sinica (1); American Journal of Science (1); Biogeochemical Cycles (1); Biogeochemistry (1); Cambridge Elements (1); Canadian Journal of Earth Sciences (1); Chemical Geology (1); Earth and Planetary Science Letters (6); Geobiology (2); Geochemistry, Geophysics, Geosystems (3); Geochimica et Cosmochimica Acta (9); Geology (3); Global Biogeochemical Cycles (2); Journal of Earth Science (1); Nature Geoscience (3); Paleoceanography (1); Paleoceanography, Palaeoclimatology, Palaeoecology (1); Precambrian Research (3); Science (2)

FUNDING PANELS

NSF-OCE review panel (2021); Maryland Sea Grant external review (2021); National Environmental Research Council external review (2019-2020); American Chemical Society external review 2019; National Science Foundation external reviewer (2018-2020); Executive Secretary for NASA Exobiology proposal review panels 2012 and 2014

DEPARTMENTAL SERVICE

2020- EES Graduate Affairs Committee, Oversight Chair
2019- EES ORCBS liaison/Safety training coordinator
2020 EES Department Chair Selection Committee
2018-2020 EES Faculty liaison to Geology Club

MAJOR GRANT SUPPORT

Funded Grants to Michigan State University (4)					
Title	Agency	Total	MSU Total	Dates	Role / Details
<i>Collaborative Research: Manganese Cycling and Coupling Across Redox Boundaries within Stratified Basins of the Baltic</i>	NSF-OCE-Chemical Oceanography	\$1,079,651	\$234,763	12/19-11/22	PI at MSU ; PI: Hansel; co-PIs: Oldham, Wankel
<i>Magic Planet</i>	MSU HUB	\$10,000	(internal)	11/19-11/20	co-PI ; PI: Schrenk; co-PI: Libarkin
<i>Collaborative Research: Experimental constraints on the rates and mechanisms of iodine redox transformations in seawater</i>	NSF-OCE-Chemical Oceanography	\$496,792	\$330,152	9/18-8/21	PI ; co-PI: Nielsen

CONFERENCE SESSIONS

Goldschmidt, 2019, co-convenor: Modern and Ancient Ocean Anoxia and Organic Carbon Burial: implications for the future

Goldschmidt, 2016, co-convenor: The Evolution of Bioessential Trace Elements in Paleomarine Environments

American Geophysical Union, 2015, co-convenor: New Insights on Geochemical Cycles toward Redox Proxy Development and Application to the Ancient Ocean and Atmosphere



Goldschmidt, 2015, co-convenor: Precambrian Redox Evolution

INVITED LECTURES

Yale University (2021); University of Michigan (2021); Oklahoma State University (2021); University of Tennessee (2020); University of Southern California (2019); Lamont-Doherty Earth Observatory (2019); Western Michigan University (2019); Central Michigan University (2018); Woods Hole Oceanographic Institution (2017); University of Massachusetts, Dartmouth (2017); Michigan State University (2017); University of Southern California (2016); Syracuse University (2015)

COMMUNITY SERVICE AND OUTREACH

2021 Guest speaker at MSU Broad Museum Focus Tour exhibition dialogue
2019 Outreach volunteer at annual MSU Darwin Day event
2018 Outreach organizer at NSF-sponsored R/V Atlantis open house in San Diego

PROFESSIONAL MEMBERSHIPS

Geological Society of America (GSA), American Geophysical Union (AGU), American Chemical Society (ACS), Geochemical Society

MENTORING

Current Graduate Students and Postdocs (Michigan State University)

- Keyi Cheng, PhD student; (August 2019-present)
- Alexi Schnur, PhD student; (August 2019-present)
- Janet Burke, NSF Ocean Sciences Postdoctoral Fellow; (March 2020-present)

PEER-REVIEWED PUBLICATIONS (updated November 2021)

Table 1. Comparison of citation metrics between Scopus and Google Scholar. The hyperlinks for both will take you directly to the sources for the stats from the respective citation trackers.

Source	h-index	i10-index	Total documents	Total citations
Scopus	17	N/A	31	1113
Google Scholar	19	23	31	1324

2021

- [31] **Hardisty, D.S.**, Riedinger, N., Planavsky, N.J., Asael, D., Bates, S.M., & Lyons, T.W., 2021, Holocene spatiotemporal redox variations in the Southern Baltic Sea. *Frontiers in Earth Science* 9, 344.
- [30] Dodd, M.S., Zhang, Z., Li, C., Algeo, T.J., Lyons, T.W., **Hardisty, D.S.**, Loyd, S.J., Meyer, D.L., Gill, B.C., Shi, W., & Wang, W., 2021, Development of carbonate-associated phosphate (CAP) as a proxy for reconstructing ancient ocean phosphate levels. *Geochimica et Cosmochimica Acta* 301, 48-69.
- [29] Wang, C., Reinhard, C.T., Rybacki, K.S., **Hardisty, D.S.**, Ossa Ossa F., Wang, X., Hofmann, A., Asael, D., Robbins, J.R., Zhang, L., Planavsky, N.J., 2021, Chromium isotope systematics and the diagenesis of marine carbonates. *Earth and Planetary Science Letters* 562, 116824.
- [28] **Hardisty, D.S.**, Horner, T.J., Evans, N., Moriyasu, R., Babbin, A.R., Wankel, S.D., Nielsen, S.G., 2021, Limited iodate reduction in shipboard seawater incubations from the Eastern Tropical North Pacific oxygen deficient zone. *Earth and Planetary Science Letters* 554, 116676.



2020

- [27] **Hardisty, D.S.**, Horner, T.J., Wankel, S.D., Blusztajn, J., & Nielsen, S. G., 2020, Experimental observations of marine iodide oxidation using a novel sparge-interface MC-ICP-MS technique. *Chemical Geology* 532, 119360.
- [26] Volz, J.B., Riedinger, N., **Hardisty, D.S.**, & Kassten, S., 2020, Data report: solid-phase major and minor elements and iron and sulfur species in sediments of the Anholt Basin, Baltic Sea, collected during IODP Expedition 347. *Proceedings of the Integrated Ocean Drilling Program*.
- [25] Fan, H., Nielsen, S.G., Owens, J.O., Auro, M., Shu, Y., **Hardisty, D.S.**, Horner, T.J., Bowman, C.N., Young, S.A., & Wen, H., 2020, Constraining oceanic oxygenation during the Shuram excursion in South China using thallium isotopes. *Geobiology* 18, 348-365.
- [24] Dellinger, M., **Hardisty, D.S.**, Planavsky, N.J., Gill, B.C., Calderon-Asael, B., Asael, D., Croissant, T., Swart, P. K., & West, A.J., 2020, The effects of diagenesis on lithium isotope ratios of shallow marine carbonates. *American Journal of Science* 320, 150-184.
- [23] Moriyasu, R., Evans, Z.C., Bolster, K.M., **Hardisty, D.S.**, & Moffett, J.W, 2020, The distribution and redox speciation of iodine in the Eastern Tropical North Pacific Ocean. *Global Biogeochemical Cycles* 34, e2019GB006302.

2019

- [22] Zhang, F., Romaniello, S.J., Xiao, S., Lenton, T.M., **Hardisty, D.S.**, Daines, S.J., Li, C., Melezhik, V., Cheng, M., Pokrovsky B., Shi, W., & Anbar, A.D., 2019, Global marine redox changes drove the rise and fall of the Ediacara biota. *Geobiology* 17, 594-610.
- [21] Hancock, L.G., **Hardisty, D.S.**, Behl, R.J., & Lyons, T.W., 2019, A multi-basin redox reconstruction for the Miocene Monterey Formation, California, USA. *Palaeogeography, Palaeoclimatology, and Palaeoecology* 520, 114-127.
- [20] Liu, X.M., **Hardisty, D.S.**, Lyons, T.W., & Swart, P.K., 2019, Evaluating the integrity of the cerium paleoredox tracer during variable diagenesis on the Great Bahama Bank. *Geochimica et Cosmochimica Acta* 248, 25-42.

2018

- [19] Lu, W., Ridgwell, A., Thomas, E., **Hardisty, D.S.**, Luo, G., Algeo, T.J., Saltzman, M.R., Gill, B.C., Shen, Y., Ling, H.F., Edwards, C.T., Whalen, M.T., Zhou, X., Gutchess, K.M., Jin, L., Rickaby, R.E.M., Jenkyns, H.C., Lyons, T.W., Lenton, T.M., Kump, L.R., & Lu, Z., 2018, Late inception of a resiliently oxygenated upper ocean. *Science* 361, 174–177.
- [18] **Hardisty, D.S.**, Lyons, T.W., Riedinger, N., Isson, T.T., Owens, J.D., Aller, R.C., Rye, D.M., Planavsky, N.J., Reinhard, C.T., Gill, B.C., Masterson, A.L., & Johnston, D., 2018, An evaluation of sedimentary molybdenum and iron as proxies for pore fluid paleoredox conditions. *American Journal of Science* 318(5), 527-556.
- [17] Raiswell, R., **Hardisty, D.S.**, Lyons, T.W., Canfield, D.E., Owens, J.D., Planavsky, N.J., Poulton, S.W. & Reinhard, C.T., 2018, The iron paleoredox proxies: A guide to the pitfalls, problems and proper practice. *American Journal of Science* 318(5), 491-526.
- [16] Chen, X., Romaniello, S.J., Herrmann, A.D., **Hardisty, D.S.**, Gill, B.C. & Anbar, A.D., 2018, Diagenetic effects on uranium isotope fractionation in carbonate sediments from the Bahamas. *Geochimica et Cosmochimica Acta* 237, 294-311.
- [15] Planavsky, N.J., Slack, J.F., Cannon, W.F., O'Connell, B., Isson, T.T., Asael, D., Jackson, J.C., **Hardisty, D.S.**, Lyons, T.W. & Bekker, A., 2018, Evidence for episodic oxygenation in a weakly redox-buffered deep mid-Proterozoic ocean. *Chemical Geology* 483, 581-594.



2017

- [14] **Hardisty, D.S.**, Lu, Z., Planavsky, N.J., Kah, L.C., Bekker, A., Knoll, A.H., Zhou, X., Osburn, M.R., Loyd, S.J., Jiang, G., Gill, B.C., Diamond, C.W., & Lyons, T.W., 2017, Perspectives on Proterozoic surface ocean redox from iodine contents in ancient and recent carbonate. *Earth and Planetary Science Letters* 463, 159-170.
- [13] Li, C., **Hardisty, D.S.**, Luo, G., Huang, J., Algeo, T.J., Cheng, M., Shi, W., An, Z., Tong, J., Xie, S., Jiao, N., & Lyons, T.W., 2017, Uncovering the spatial heterogeneity of Ediacaran carbon cycling. *Geobiology* DOI: 10.1111/gbi.12222
- [12] Owens, J.D., Lyons, T.W., **Hardisty, D.S.**, Lowery, C., Lu, Z., & Jenkyns, H.C., 2017, Patterns of local and global redox variability during the Cenomanian–Turonian Boundary Event (OAE2) recorded in carbonates and shales from central Italy. *Sedimentology* 63, 168-185.
- [11] Konhauser, K.O., Planavsky, N.J., **Hardisty, D.S.**, Robbins, L.J., Warchola, T.J., Haugaard, R., Lalonde, S.V., Partin, C.A., Oonk, P.B.H., Tsikos, H. and Lyons, T.W., 2017. Iron formations: A global record of Neoproterozoic to Palaeoproterozoic environmental history. *Earth-Science Reviews*, 172, 140-177.
- [10] Zhou, X., Jenkyns, H.C., Lu, W., **Hardisty, D.S.**, Owens, J.D., Lyons, T.W., & Lu, Z., 2017, Records of organically bound iodine during the Cenomanian–Turonian OAE 2: implications for bottom-water conditions and iodine cycling. *Chemical Geology* 457, 95–106.
- [9] Lu, W., Wörndle, S., Halverson, G.P., Zhou, X., Bekker, A., Rainbird, R.H., **Hardisty, D.S.**, Lyons, T.W., Lu, Z., 2017, Iodine proxy evidence for increased ocean oxygenation during the Bitter Springs Anomaly. *Geochim. Perspect. Lett.* 5, 53-57
- [8] Zhang, S., Henehan, M.J., Hull, P.M., Reid, P., **Hardisty, D.S.**, Hood, A., & Planavsky, N.J., 2017, Investigating controls on boron isotope ratios in shallow marine carbonates. *Earth and Planetary Science Letters* 458, 380-393.

2016

- [7] **Hardisty, D.S.**, Riedinger, N., Planavsky, N.J., Asael, D., Andrén, T., Jørgensen, B.B., & Lyons, T.W., 2016, A Holocene history of dynamic water column redox conditions in the Landsort Deep, Baltic Sea (IODP Expedition 347). *American Journal of Science* 216, 713–745
- [6] Robbins, L.J., Lalonde, S.V., Planavsky, N.J., Partin, C.A., Reinhard, C.T., Kendall, B., Scott, C., **Hardisty, D.S.**, Gill, B.C., Alessi, D.S., Dupont, C.L., Saito, M.A., Poulton, S.W., Bekker, A., Lyons, T.W., & Konhauser, K.O., 2016, Trace elements at the intersection of marine biological and geochemical evolution. *Earth-Science Reviews*.

2015

- [5] Zhou, X., Jenkyns, H.C., Owens, J.D., Junium, C.K., Zheng, X., Sageman, B.B., **Hardisty, D.S.**, Lyons, T.W., Ridgeway, A., & Lu, Z., 2015, Upper ocean oxygenation dynamics from I/Ca ratios during the Cenomanian-Turonian OAE 2. *Paleoceanography* 30, 510-526.
- [4] Li, C., Planavsky, N.J., Love, G.D., Reinhard, C.T., **Hardisty, D.S.**, Feng, L., Bates, S.M., & Lyons, T.W., 2015, Marine redox conditions in the middle Proterozoic ocean and isotopic constraints on authigenic carbonate formation: Insights from the Chuanlinggou Formation, Yanshan Basin, North China. *Geochimica et Cosmochimica Acta* 150, 90-105.
- [3] **IODP Expedition 347 Science Party**, 2015, IODP Expedition 347 Report, In Andrén, T., Jørgensen, B.B., Cotterill, C., Green, S., and the Expedition 347 Scientists, Proc. IODP, 347: College Station, TX (Integrated Ocean Drilling Program).

2014



[2] **Hardisty, D.S.**, Lu, Z., Planavsky, N.J., Bekker, A., Philippot, P., Zhou, X., & Lyons, T.W., 2014, An iodine record of Paleoproterozoic surface ocean oxygenation. *Geology* 42, 619-622.

2013

[1] **Hardisty, D.S.**, Olyphant, G.A., Bell, J.B., Johnson, A.P., & Pratt, L.M., 2013, Acidophilic sulfur disproportionation. *Geochimica et Cosmochimica Acta* 113, 136-151.

CONFERENCE PRESENTATIONS

**led by MSU student under Hardisty's supervision*

- A. *American Geophysical Union, 2021 (co-author): Insights from shipboard radiotracer experiments into the role of reactive oxygen species on iodine speciation transformations at the Bermuda Atlantic Time Series.
- B. Geological Society of America, 2021 (co-author): A new model-data comparison: promises and pitfalls of paleoredox proxies in carbonate rocks.
- C. *American Geophysical Union, 2021 (presenting author): How low can you go? Redox requirements for maintaining present but sustained low iodate in Proterozoic seas.
- D. *American Geophysical Union, 2021 (co-author): Marine iodine cycling in an Earth system model.
- E. *American Geophysical Union, 2021 (co-author): Foraminiferal I/Ca Reveals Regional Variation in Eastern Tropical Pacific Oxygen Deficient Zone Intensity Across the Miocene Climatic Optimum.
- F. *SACNS, 2021 (co-author): Integrating chemical oceanographic data on to Science on a Sphere to expand oceanographic outreach
- G. *UURAF, 2021 (co-author): Constraints on mid-Miocene seawater and sediment chemistry from foraminiferal tests of the eastern Pacific.
- H. *American Geophysical Union, 2020 (co-author): Updated iodine cycle constraints and parameters in the cGENIE model: implications for modern iodine redox transformation and paleo-redox reconstruction.
- I. *American Geophysical Union, 2020 (co-author): Experimental constraints on biotic and abiotic drivers of near surface-marine iodine redox transformations at the Bermuda Atlantic Time Series
- J. *UURAF, 2020 (co-author): Chemical composition of hydrothermal vent fluids at the EastPacific Rise 9°N and the impact on seawater elemental budgets.
- K. American Geophysical Union Ocean Sciences, 2020 (lead author): Constraints on marine OMZ iodine cycling and implications for paleoredox proxy applications
- L. American Geophysical Union, 2019 (co-author): Estimating pressure and temperature conditions of hydrothermal vent fluid formation: Recent observations at the East Pacific Rise 9°50'N
- M. American Geophysical Union, 2019 (co-author): Historical Fluxes of Toxic Trace Elements in the Salton Sea Basin
- N. Geological Society of America, 2018, Oral (lead author): A novel tracer method to provide principal constraints on seawater iodine redox chemistry
- O. Goldschmidt, 2017, Poster Presentation (lead author): A novel tracer method to provide principal constraints on seawater iodine redox chemistry.



- P. Goldschmidt, 2016, Oral Presentation (lead author): Spatiotemporal variations in the degree and frequency of Baltic Sea Holocene anoxia (IODP Expedition 347).
- Q. American Geophysical Union, 2015, Poster Presentation (lead author): Assessing potential diagenetic alterations to primary iodine-to-calcium ratios.
- R. Goldschmidt, 2015, Poster Presentation (lead author): A Holocene history of dynamic water column redox conditions in the Landsort Deep, Baltic Sea (IODP Expedition 347).
- S. Astrobiology Science Conference, 2015, Oral Presentation (lead author): An oxygen lean Mesoproterozoic surface ocean.
- T. Southern California Geobiology Symposium, 2015, Poster Presentation (lead author): A Holocene history of unstable, intermediate redox conditions in the Landsort Deep, Baltic Sea.
- U. Goldschmidt, 2014, Oral Presentation (lead author): An oceanic oxidation event coincident with the Shuram carbonate carbon isotope excursion.
- V. Southern California Geobiology Symposium, 2014, Oral Presentation (lead author): An oceanic oxidation event coincident with the Shuram carbonate carbon isotope excursion
- W. American Geophysical Union, 2013, Poster Presentation (lead author): Iodine-to-calcium ratios in carbonates suggest a primary origin for the Precambrian Shuram carbon isotope excursion.
- X. Goldschmidt, 2013, Poster Presentation (lead author): An Iodine Record of Paleoproterozoic Surface Ocean Oxygenation.
- Y. Southern California Geobiology Symposium, 2013, Oral Presentation (lead author): An Iodine Record of Paleoproterozoic Surface Ocean Oxygenation.
- Z. Goldschmidt, 2012, Oral Presentation (lead author): New insights from FOAM: iron and trace metal cycling in highly sulfidic pore waters beneath an oxic water column.
- AA. American Geophysical Union, 2011, Poster Presentation (lead author): Bacterial disproportionation of elemental sulfur inferred from a field study of stable isotope fractionations between elemental sulfur and pyrite.
- BB. American Society for Mining and Reclamation, 2010, Oral Presentation (lead author): Controls on pH and pyrite oxidation pathways across the phreatic surface of an abandoned coal waste deposit in southwest Indiana.