

Frank J. Pavia (he/him)

CONTACT INFORMATION

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RESEARCH INTERESTS

I seek to understand the physical mechanisms that control Earth's chemistry, climate, and evolution. My current research is focused on: 1) Trace element input and removal processes in the modern ocean; 2) Carbon cycling and climate change both now and in the geologic past; 3) Deducing the physical mechanisms driving isotope fractionation and developing new chemical proxies to study Earth's history.

EMPLOYMENT

California Institute of Technology

Foster and Coco Stanback Postdoctoral Fellow, Dec. 2019-Present

EDUCATION

Columbia University, New York, NY

Ph.D., Earth and Environmental Sciences, October 2019

Thesis: Biogeochemical Studies of the South Pacific Ocean Using Thorium and Protactinium Isotopes

Advisor: Robert F. Anderson

Columbia University, New York, NY

M.A., Earth and Environmental Sciences, May 2016

Columbia University, New York, NY

B.A. (*cum laude*), Earth Science and Chemistry (Dept. Honors)

HONORS AND AWARDS

Caltech Foster and Coco Stanback Postdoctoral Fellowship, 2019
ASLO Student Travel Grant, 2018
Goldschmidt Student Travel Grant, 2017
Department of Defense NDSEG Fellowship, 2015 (Declined)
NSF Graduate Research Fellowship, 2015
DEES Young Investigator Award, 2013
Alaska Geological Society Scholarship, 2013

PUBLICATIONS

[16] Hayes, C.T. et al. (27 co-authors including **F.J. Pavia**). The Composition and Flux of Seafloor Sediments in the Global Ocean. *In Review, Global Biogeochemical Cycles*.

[15] Lee, J.M., P.J. Lam, S.M. Vivancos, **F.J. Pavia**, R.F. Anderson, Y. Lu, H. Cheng, P. Zhang, R.L. Edwards, Y. Xiang, S.M. Webb. Changing chemistry of particulate manganese in the near- and far-field hydrothermal plumes from 15°S East Pacific Rise and its influence on metal scavenging. *In Review, Geochimica et Cosmochimica Acta*.

[14] Pinedo-Gonzalez, P., R.F. Anderson, S.M. Vivancos, **F.J. Pavia**, M.Q. Fleisher. A new method to extract ^{232}Th , ^{230}Th , and ^{231}Pa from seawater using a bulk-extraction technique with Nobias PA-1 chelating resin. *Accepted, Talanta*.

- [13] **Pavia, F.J.**, R.F. Anderson, P. Pinedo-Gonzalez, M.Q. Fleisher, M.A. Brzezinski, R.S. Robinson. Isopycnal Transport and Scavenging of ^{231}Pa and ^{230}Th in the Pacific Southern Ocean. *Accepted with minor revisions, Global Biogeochemical Cycles*.
- [12] **Pavia, F.J.**, R.F. Anderson, G.W. Winckler, M.Q. Fleisher. (2020) Atmospheric Dust Inputs, Iron Cycling, and Biogeochemical Connections in the South Pacific Ocean from Thorium Isotopes. *Global Biogeochemical Cycles*, *34*, e2020GB006562. <https://doi.org/10.1029/2020GB006562>.
- [11] Costa, K.M., C.T. Hayes, R.F. Anderson, **F.J. Pavia**, and 30 others (2020). ^{230}Th -normalization: New insights on an essential tool for quantifying sedimentary fluxes in the modern and Quaternary ocean. *Paleoceanography and Paleoclimatology*, *35*, e2019PA003820. <https://doi.org/10.1029/2019PA003820>.
- [10] Middleton, J.E., S. Mukhopadhyay, K.M. Costa, **F.J. Pavia**, G. Winckler, J.F. McManus, M. D’Almeida, C.H. Langmuir, P.J. Huybers (2020). The spatial footprint of hydrothermal scavenging on $^{230}\text{Th}_{xs}$ -derived mass accumulation rates. *Geochimica et Cosmochimica Acta*, *272*, 218-234. <https://doi.org/10.1016/j.gca.2020.01.007>.
- [9] Jacobel, A.W., R.F. Anderson, S.L. Jaccard, J.F. McManus, **F.J. Pavia**, G. Winckler (2020). Deep Pacific Storage of Respired Carbon during the Last Ice Age: Perspectives from bottom water oxygen reconstructions. *Quaternary Science Reviews*, *230*, 106065. <https://doi.org/10.1016/j.quascirev.2019.106065>.
- [8] Seltzer, A.M., **F.J. Pavia**, J. Ng, J.P. Severinghaus (2019). Heavy Noble Gas Isotopes as New Constraints on the Ventilation of the Deep Ocean. *Geophysical Research Letters*, *46*, 8926-8932. <https://doi.org/10.1029/2019GL084089>.
- [7] **Pavia, F.J.**, R.F. Anderson, P.J. Lam, B.B. Cael, S.M. Vivancos, M.Q. Fleisher, Y. Lu, H. Cheng, P. Zhang, R.L. Edwards (2019). Shallow Particulate Organic Carbon Regeneration in the South Pacific Ocean. *Proceedings of the National Academy of Sciences*, *42*, 9753-9758. <https://doi.org/10.1073/pnas.1901863116>. (GEOTRACES IPO Highlight). (OCB Highlight)
- [6] Jacobel, A.W., R.F. Anderson, G. Winckler, K.M. Costa, J. Gottschalk, J.L. Middleton, **F.J. Pavia**, E.M. Shoenfelt, Y. Zhou (2019). No evidence for equatorial Pacific dust fertilization. *Nature Geoscience*, *12*, 154-155. <https://doi.org/10.1038/s41561-019-0304-z>
- [5] Lund, D.C., **F.J. Pavia**, E.I. Seeley, S. McCart, P.A. Rafter, K.A. Farley, P.D. Asimow, R.F. Anderson (2019). Hydrothermal Scavenging of ^{230}Th on the Southern East Pacific Rise During the Last Deglaciation. *Earth and Planetary Science Letters*, *510*, 64-72. <https://doi.org/10.1016/j.epsl.2018.12.037>
- [4] **Pavia, F.J.**, R.F. Anderson, E. Black, L. Kipp, S.M. Vivancos, M.Q. Fleisher, M.A. Charette, V. Sanial, W. Moore, M. Hult, Y. Lu, H. Cheng, P. Zhang, R.L. Edwards (2019). Timescales of Hydrothermal Scavenging in the South Pacific Ocean from ^{234}Th , ^{230}Th , and ^{228}Th . *Earth and Planetary Science Letters*, *506*, 146-156. <https://doi.org/10.1016/j.epsl.2018.10.038>. (GEOTRACES IPO Highlight)
- [3] Hayes, C.T., E.E. Black, R.F. Anderson, M. Baskaran, K.O. Buesseler, M.A. Charette, H. Cheng, J.K. Cochran, R.L. Edwards, P. Fitzgerald, P.J. Lam, Y. Lu, S.O. Morris, D.C. Ohnemus, **F.J. Pavia**, G. Stewart, Y. Tang (2018). Flux of Particulate Elements in the North Atlantic Ocean Constrained by Multiple Radionuclides. *Global Biogeochemical Cycles*, *32*, 1738-1758. <https://doi.org/10.1029/2018GB005994>. (OCB Highlight) (EOS Highlight)
- [2] Schlitzer, R. et al. (including **F. J. Pavia**) (2018). The GEOTRACES Intermediate Data

Product 2017. *Chemical Geology*, 493, 210-223. <https://doi.org/10.1016/j.chemgeo.2018.05.040>

[1] **Pavia, F.J.**, R.F. Anderson, S.M. Vivancos, M.Q. Fleisher, P.J. Lam, Y. Lu, H. Cheng, P. Zhang, R.L. Edwards (2018). Intense Hydrothermal Scavenging of ^{230}Th and ^{231}Pa in the Deep Southeast Pacific. *Marine Chemistry*, 201, 212-228. <https://doi.org/10.1016/j.marchem.2017.08.003>

MANUSCRIPTS IN PREPARATION **F.J. Pavia**, S. Wang*, R.F. Anderson, R.W. Murray. Trace Metal Indicators of Abyssal Ventilation During the Last Deglaciation. *to be submitted, full manuscript draft available upon request.*

* *Indicates Undergraduate Advisee*

BOOK CHAPTERS (PEER-REVIEWED) [1] Bell, J.E., **F.J. Pavia** (2021). Time Bomb: Pessimistic Approaches to Climate Change Studies. In *Timescales* (eds B. Wigginn, C. Fornoff, P.E. Kim). University of Minnesota Press, Minneapolis.

FUNDING National Science Foundation - Chemical Oceanography. Collaborative Research: U.S. GEOTRACES GP17-OCE and GP17-ANT: ^{230}Th , ^{232}Th , and ^{231}Pa tracers of trace element supply and removal (submitted August 2020). \$162,511 to Caltech.

Pavia, F.J. Heavy Noble Gas Isotopes in the Ocean as a Tracer of Air-Sea Disequilibrium. Geological Society of America Student Research Grant (Outstanding Mention), 2018. \$1,518.

Pavia, F.J., R.F. Anderson. Glacial-Interglacial Deepwater Oxygen Variations in the Pacific Southern Ocean. LDEO Climate Center, 2017, \$10,000.

Pavia, F.J., G. Winckler, R.F. Anderson, S.M. Vivancos. Helium Isotopes in the South Pacific: Tracking Hydrothermal Activity and Deep Ocean Circulation. LDEO Climate Center, 2015, \$10,000.

Pavia, F.J., G. Winckler, J.E. Nichols. Leaf wax *n*-alkane concentrations and stable isotope composition in dust - A new dust proxy for the South Pacific. LDEO Climate Center, 2013, \$10,000.

TEACHING EXPERIENCE

Teaching Assistantships

Columbia University Earth and Environmental Sciences

- EESC3101 Geochemistry for a Habitable Planet **Fall 2017**
Professor Terry Plank
- EESC4926 Intro to Chemical Oceanography **Spring 2017**
Professor Robert Anderson
- EESC4330 Intro to Terrestrial Paleoclimate **Fall 2016**
Professors Wallace Broecker and Joerg Schaefer
- EESC3101 Geochemistry for a Habitable Planet **Fall 2015**
Professor Terry Plank

Guest lectures (at least 1) in each course listed above.

Columbia Graduate School of Business

- B8718/B8535 The Management and Economics of Professional Sports **Spring 2013, 2014**
Professors Casey Ichniowski and Sunil Gulati

PEDAGOGICAL ACTIVITIES

- Certificate of Interest in University Teaching, Caltech. *In Progress*
- Syllabus from Scratch Workshop, Center for Teaching and Learning. December 2017
- Innovative Teaching Summer Institute Workshop, Center for Teaching and Learning. June 2016

- Convener of working group on Pedagogy in Environmental Humanities, September 2015-May 2016. \$2000 grant from Columbia Center for Science and Society.

MENTORING

- Shouyi Wang, Columbia Senior Thesis, 2017-2018. (Currently Ph.D. Student at MIT/WHOI)

OUTREACH
ACTIVITIES

- Caltech RISE Program Tutor, January 2020-Present
- Intrepid Kids Week Exhibit, February 2019
- Organizer of Ocean Chemistry Exhibit at Lamont-Doherty Open House, October 2016-2019
- Lamont High School Intern Mentor, Summers 2015-2018
- Day in the Life of the Hudson, October 2014 & 2016
- Columbia Cool Jobs Panel for Prospective Scientists, October 2014
- Science Research Symposium, DEES Undergraduate Representative, April 2014
- Lamont-Doherty Career Day, March 2013
- Lamont-Doherty Open House Volunteer, October 2012
- Science on the Hudson River volunteer, July 2012

INVITED
PRESENTATIONS

- Caltech Geoclub Seminar, October 2020
- University of Southern California Paleoenvironmental Seminar, April 2020.
- Scripps Marine Chemistry and Geochemistry Seminar, April 2019.
- Lamont-Doherty Geochemistry Seminar, November 2018.
- WHOI Marine Chemistry and Geochemistry Seminar, November 2018.
- MIT EAPS Seminar, November 2018.
- UCONN Avery Point Marine Sciences Seminar, October 2018.
- UC Berkeley Isotope Geochemistry Seminar, May 2018.
- Lamont-Doherty Earth Observatory Summer Intern Lecture, July 2016.

CONFERENCE
PRESENTATIONS
(PRESENTING
AUTHOR ONLY)

F.J. Pavia, Z. Baumann, C.H. Lamborg. The LGM to Present Mercury Cycle. Comer Climate Conference, 2020. Talk

F.J. Pavia, R.F. Anderson, G. Winckler, M.Q. Fleisher. Atmospheric Dust Inputs, Iron Cycling, and Biogeochemical Connections in the South Pacific Gyre. Ocean Sciences Meeting, 2020. Talk

M.Q. Fleisher, **F.J. Pavia**, R.F. Anderson, S.M. Vivancos, G. Winckler, J.T. Abell. Near-Bottom ^{230}Th and ^{231}Pa Scavenging and Anomalous ^{230}Th Burial Rates in the South Pacific. Ocean Sciences Meeting, 2020. Poster

F.J. Pavia, J.T. Abell, G. Winckler, R.F. Anderson. Reconstruction of Modern Dust Deposition in the South Pacific from Water Column and Sedimentary Methods. AGU Fall Meeting, 2019. Poster

F.J. Pavia, S. Wang, R.F. Anderson, R.W. Murray. Trace Metal Indicators of Abyssal Ventilation During the Last Deglaciation. Comer Climate Conference, 2019. Talk

Pavia, F.J., R.F. Anderson, M.Q. Fleisher, G. Winckler. Supply and Removal of Trace Elements in the South Pacific Gyre from Long-Lived Thorium and Protactinium Isotopes. Chemical Oceanography Gordon Conference, 2019. Poster

Pavia, F.J., P.J. Lam, J.K. Bishop, L.J. Gloege, R.F. Anderson. A global database of size-fractionated POC and PIC concentrations compared to satellite-based estimates. OCB Summer Workshop, 2019. Poster

Pavia, F.J., R.F. Anderson, P.J. Lam, B.B. Cael, S.M. Vivancos, M.Q. Fleisher, P. Zhang, Y. Lu, H. Cheng. Distinct POC regeneration regimes in the Peru OMZ compared to oxic waters of the eastern Tropical South Pacific, ASLO Aquatic Sciences Meeting, 2019. Talk

Pavia, F.J., R.F. Anderson, S. Wang. Abyssal Ventilation in the Pacific Sector of the Southern Ocean During the Last Ice Age, AGU Fall Meeting, 2018. Poster

Pavia, F.J., R.F. Anderson, P.J. Lam, M. Martin, R. Fine, S.M. Vivancos, M.Q. Fleisher, P. Zhang, Y. Lu, H. Cheng, R.L. Edwards. Vertical POC Flux Profiles and Oxygen Utilization Rates from Particulate ²³⁰Th-Normalization, Goldschmidt Conference, 2017. Talk

Pavia, F.J., R.F. Anderson, M.Q. Fleisher, S.M. Vivancos, Y. Lu, P. Zhang, H. Cheng, R.L. Edwards. Continuous, Rapid Scavenging of Thorium and Protactinium During Westward Advection of the East Pacific Rise Hydrothermal Plume, AGU Ocean Sciences Meeting, 2016. Talk

Pavia, F.J., J.E. Nichols, G. Winckler, P. De Deckker. Pairing Leaf-Wax Isotopes and Lithogenic Fluxes to Understand the Drivers of Dustiness in the South Pacific, AGU Fall Meeting, 2014. Poster

Pavia, F.J., G. Winckler, J.E. Nichols. The Sensitivity of *n*-alkanes in Marine Sediments to Changes in Dustiness: Further Developing the Use of Leaf Wax Biomarkers as a Dust Proxy. AGU Fall Meeting, 2013. Poster

Pavia, F.J., J.E. Nichols, D.M. Peteet. Reconstructing Paleoclimate and Carbon Storage of Alaskan Peatlands During the Holocene. AGU Fall Meeting, 2012. Poster

PROFESSIONAL
WORKSHOPS AND
CONVENED
SESSIONS

- Convener, AGU Fall Meeting: Systematics and Applications of Redox Proxies from Precambrian to Pleistocene, December 2019.
- Chemical Oceanography Gordon Research Seminar Discussion Leader, July 2019.
- Ocean Observing Initiative Early Career Chemistry Data Workshop, August 2018.
- Biogeochemical Argo Workshop, University of Washington, July 2018.
- Data Science Bootcamp, Collaboratory@Columbia, January 2018
- Anthropogenic Sublime: A critique (respondent and panelist). Center for Science and Society, Columbia University, New York. December, 2016. ([Video Link](#)).
- GEOTRACES-OCB synthesis workshop, Biogeochemical Cycling of Trace Elements within the Ocean. Lamont-Doherty Earth Observatory, Palisades, New York. August 2016.
- Pedagogy in Environmental Humanities Symposium (co-convener and panel discussion leader). Columbia University, New York. April, 2016.
- National Ocean Exploration Forum. National Aquarium, Baltimore, MD. November 2015.

PROFESSIONAL
SERVICE

- LDEO Mentoring Award Committee, 2017-2019
- Organizer, Weekly Geochemistry Seminar Series, LDEO, July 2017-July 2018
- Chairman, Chevron Student Initiative Fund, LDEO, Sept 2016-Sept 2018
- LDEO Colloquium Committee, June 2015-June 2017

REVIEW ACTIVITIES

- Peer Reviewer: *Geochemistry, Geophysics, Geosystems, Geophysical Research Letters, Frontiers in Marine Science, Frontiers in Earth Science, Biogeosciences, Paleoceanography*
- Panel Reviewer: NASA PSTAR, 2016

FIELD
EXPERIENCE

R/V Ka'imikai-O-Kanaloa (HOT-303) **June 2018**
Honolulu to Honolulu. 5 days.
Water sampling for noble gas isotopes.

R/V IB Nathaniel B. Palmer (NBP17-02) **January-March 2017**
McMurdo Station, Antarctica to Lyttleton, New Zealand. 42 days.
Water sampling and filtration, multicoring, gravity coring, piston coring.

UltraPac Expedition, R/V Sonne (SO245). **December 2015-January 2016**

Antofagasta, Chile to Wellington, New Zealand. 43 days.
Water sampling and filtration, *in situ* pump operation for
suspended particle sampling, box coring, gravity coring.

Lake and Marsh Sediment Coring, Black Rock Forest and Jamaica Bay

Sept-Oct 2012