CURRICULUM VITAE

KIEFER O. FORSCH

Postdoctoral Scholar and CCMI Research Fellow
Department of Earth Sciences, University of Southern California
forsch@usc.edu | +1 (734) 277-3913 | Google Scholar | ORCID 0000-0003-1076-164X

EMPLOYMENT

Growing Oceans, an initiative of AltaSea — Los Angeles, CA / Tonga
Research Director — *present*

Research on nitrogen fixation, hydrothermal vents, and ecosystem productivity. Leads interdisciplinary field-program planning. Coordinates station design, equipment, personnel, and integration of hydrography, trace metals, nutrient biogeochemistry, particle export, metagenomics, metaproteomics, and experiments. Works with sovereign Pacific Island hosts and local collaborators to co-design research in Tonga.

Department of Earth Sciences, University of Southern California — Los Angeles, CA
Postdoctoral Scholar and CCMI Research Fellow; advisor: Seth John — *2024-present*

Research on micronutrient chemical speciation and isotope geochemistry, including chelating-resin methods for kinetic speciation.

Scripps Institution of Oceanography and J. Craig Venter Institute — La Jolla, CA
Postdoctoral Scholar and Principal Investigator; advisors: Sarah Aarons and Christopher Dupont — *2021-2024*

Led an NSF-funded program on isotopic and microbial controls on the iron bioavailability of glaciogenic particles.

Rutgers Inorganic Analytical Facility, Rutgers University — New Brunswick, NJ
Research Associate and Laboratory Technician; mentor: Robert Sherrell — *2012-2014*

Plasma-source mass spectrometry, trace-element analysis, laboratory operations, sample preparation, and instrument support.

EDUCATION

University of California San Diego, Scripps Institution of Oceanography — La Jolla, CA
PhD, Oceanography; Studies in Marine Chemistry — *2014-2021*

Dissertation: Iron sources, sinks, and cycling in productive coastal seas. Advisor: Katherine A. Barbeau.

University of California San Diego, Scripps Institution of Oceanography — La Jolla, CA
MS, Oceanography — *2016*

Oberlin College — Oberlin, OH
BA, Chemistry — *2008-2012*

John F. Oberlin Scholar and NSF S-STEM Scholar in Computation and Modeling.

PUBLICATIONS

*Mentees: * indicates a student mentored by Forsch. Co-first authors are identified in individual citations.*

Published

11. **Forsch KO**, Ruacho A, and Aarons SM. 2025. Tidewater cycle drives alpine glacial sediment plume geochemistry. Nature Communications 16: 9211. https://doi.org/10.1038/s41467-025-64731-1.

10. Gangrade S, Franks PJS, **Forsch KO**, and Barbeau KA. 2025. Salinity is diagnostic of maximum potential chlorophyll and phytoplankton community structure in an Eastern Boundary Upwelling System. Limnology and Oceanography Letters. https://doi.org/10.1002/lol2.70059.

9. Stow PR, **Forsch KO**, Thomsen E, Naka H, Haygood MG, Barbeau KA, and Butler A. 2025. Stereospecific control of microbial growth by a combinatoric suite of chiral siderophores. Proceedings of the National Academy of Sciences 122(10): e2423730122. https://doi.org/10.1073/pnas.2423730122.

8. Sedlak JA, Vishnoi M, **Forsch KO**, Bhadha P, Aarons SM, and Grassian VH. 2024. Probing interactions at the organic-inorganic interface of biomass burning aerosol: Reactivity of organic tracer species with different iron oxide mineral phases. ACS Earth and Space Chemistry. https://doi.org/10.1021/acsearthspacechem.4c00212.

7. Manck LE, Coale TH, Stephens BM, **Forsch KO**, Aluwihare LI, Dupont CL, Allen AE, and Barbeau KA. 2024. Iron limitation of heterotrophic bacteria in the California Current System tracks relative availability of organic carbon and iron. ISME Journal, wrae061. https://doi.org/10.1093/ismejo/wrae061.

6. Huang L, Tissot F, Ibanez-Mejia M, **Forsch KO**, et al. 2024. High-precision zirconium isotope analysis of Pacific seawater reveals large mass-dependent fractionations in the ocean. Geochimica et Cosmochimica Acta. https://doi.org/10.1016/j.gca.2023.11.018.

5. Lampe RH, Coale TH, **Forsch KO**, et al. 2023. Short-term acidification promotes diverse iron acquisition and conservation mechanisms in upwelling-associated phytoplankton. Nature Communications 14: 7215. https://doi.org/10.1038/s41467-023-42949-1.

4. **Forsch KO**, Fulton KC, Weiss MM*, Krause JW, Stukel MR, and Barbeau KA. 2023. Iron limitation and biogeochemical effects in southern California Current coastal upwelling filaments. Journal of Geophysical Research: Oceans 128: e2023JC019961. https://doi.org/10.1029/2023JC019961.

3. **Forsch KO**, Hahn-Woernle L, Sherrell RM, Roccanova J, Bu K, Burdige D, Vernet M, and Barbeau KA. 2021. Seasonal dispersal of fjord meltwaters as an important source of iron and manganese to coastal Antarctic phytoplankton. Biogeosciences 18: 6349-6372. https://doi.org/10.5194/bg-18-6349-2021.

2. Pan BJ, Vernet M, Manck L, **Forsch K**, Ekern L, Mascioni M, Barbeau KA, Almandoz GO, and Orona AJ. 2020. Environmental drivers of phytoplankton taxonomic composition in an Antarctic fjord. Progress in Oceanography 183: 102295. https://doi.org/10.1016/j.pocean.2020.102295.

1. Sherrell RM, Lagerström M, **Forsch KO**, Stammerjohn SE, and Yager PL. 2015. Dynamics of dissolved iron and other bioactive trace metals (Mn, Ni, Cu, Zn) in the Amundsen Sea Polynya, Antarctica. Elementa 3: 71. https://doi.org/10.12952/journal.elementa.000071.

Under review

2. . **Forsch KO**, Barbeau KA, Stukel M, Chabert P, Appelgate A. Inorganic nutrient transport and limitation in the California Current Ecosystem. BioScience.

1. Steck V, Lampe RH, Bhakta S, Marrufo KC, Adams JC, Sachdev E, **Forsch KO**, Barbeau KA, Allen AE, and Diaz JM. Atypical phosphatases drive dissolved organic phosphorus utilization by phosphorus-stressed phytoplankton in the California Current Ecosystem. ISME Journal.

In preparation

3. **Forsch KO** and Yang SC, et al. A hidden reservoir of isotopically distinct dissolved copper in the Pacific Ocean. Co-first authors.

2. **Forsch KO** and John S. New application of chelating resin beads to probe cadmium and lead kinetic speciation in seawater.

1. Steck V, **Forsch KO**, Barbeau KA, and Diaz J. A novel role for manganese in phytoplankton phosphorus nutrition in the ocean. Co-first authors.

Conference abstract

1. **Forsch KO**, Collins K, Kaufman B, Hawley M, John S. 2026. Development of an In Situ Autonomous Column (ISAC). American Geophysical Union Meeting, United States.

RESEARCH GRANTS AND FELLOWSHIPS

Agency and program	*Project or fellowship*	*Amount*	*Role*	*Dates*
National Science Foundation, Ocean Sciences	Isotopic and microbial investigations of the iron bioavailability of glaciogenic particles	$297,994	Fellow, PI	2021-2024
National Science Foundation, Graduate Research Fellowship	Graduate research in marine chemistry and geochemistry	$138,000	Fellow	2015
Scripps Institution of Oceanography, Earth Section Small Grants Fund	Postdoctoral research support	$4,959	Recipient	2022
National Science Foundation, S-STEM	Scholarship in Computation and Modeling	$30,000	Scholar	2011

HONORS AND AWARDS

2019 **Scripps Institution of Oceanography Department Travel Award**
$1,500

2018 **Scripps Institution of Oceanography Department Travel Award**
$1,500

2018 **Edna Bailey Sussman Trust Special Merit Award**
$7,500

2017 **Outstanding Peer Mentor Award, Scripps Institution of Oceanography**

2017 **Antarctic Service Medal**

2011 **NSF REU Chemistry Leadership Group Travel Award**

2011 **All-NCAC Second Team Accolades, Men's Varsity Soccer, Oberlin College**

2011 **Robert M. Miller Scholarship, Oberlin College**

2008-2012 **John F. Oberlin Scholarship, Oberlin College**

RESEARCH EXPERIENCE

2024-present **Micronutrient chemical speciation and isotope geochemistry**
Simons Collaboration on Ocean Processes and Ecology. Develops chelating-resin approaches that mimic biological competition for trace metals and applies non-traditional stable isotopes to dissolved metal pools. Current work examines kinetic speciation of dissolved trace metals.

Current **Research Director, Growing Oceans**
Leads development of scientific objectives and operational plans for an international research initiative examining nitrogen fixation, nutrient amendments, phytoplankton growth, and carbon drawdown in oligotrophic South Pacific waters. Integrates hydrographic observations, trace-metal and nutrient chemistry, particle export, biological communities, metagenomics, metaproteomics, and experimental perturbations into coordinated field programs in Tonga.

2023 **California Current Ecosystem Long Term Ecological Research Program, Phase IV**
Investigated persistent iron limitation, phytoplankton community structure, nutrient utilization, and particle export in coastal upwelling waters.

2021-2024 **NSF postdoctoral research in isotope geochemistry and geobiology**
Tested how glacial setting, sediment mineralogy, and chemical lability regulate the delivery and microbial bioavailability of particulate Fe and Mn. Combined field sampling in Alaskan fjords with mineral dissolution, siderophore, microbial-growth, and isotope experiments. Faculty mentors: Sarah Aarons and Christopher Dupont.

2017-2021 **California Current Ecosystem Long Term Ecological Research Program, Phase III**
Characterized Fe limitation and biogeochemical change during offshore advection of productive coastal upwelling filaments. Connected trace-metal availability with macronutrient drawdown, diatom stoichiometry, community structure, and carbon and silica export.

2015-2017 **FjordEco Program**
Characterized seasonal glacial sources of dissolved and particulate Fe and Mn in Andvord Bay, West Antarctic Peninsula, and their exchange with productive coastal waters. Mentor: Maria Vernet.

2014 **GEOTRACES Eastern Pacific Zonal Transect**
Analyzed particulate trace metals and dissolved-particulate exchange during long-range transport. Mentors: Robert Sherrell and Jessica Fitzsimmons.

2013 **NOAA Great Lakes Environmental Research Laboratory**
CILER summer research fellowship in fisheries ecology. Mentors: Hongyan Zhang, Doran Mason, Ed Rutherford, and Lori Ivan.

2011 **Scripps Institution of Oceanography NSF SURF-REU**
Analytical biogeochemistry research. Mentors: Lihini Aluwihare and Jenan Kharbush.

2011 **Woods Hole Oceanographic Institution**
Internship in microbial oceanography and mercury biogeochemistry. Mentors: Tracy Mincer and Carl Lamborg.

2010 **Universidade de São Paulo NSF international REU**
Research in bioinorganic chemistry. Mentor: Ana Maria da Costa Ferreira.

2010 **University of Michigan**
Internship in inorganic chemistry. Mentor: Vincent Pecoraro.

LABORATORY AND ANALYTICAL EXPERTISE

- Trace-metal-clean collection of seawater and particles using GO-Flo bottles, trace-metal rosettes, surface pumps, in situ pumps, and particle interceptor traps.
- Plasma-source mass spectrometry, including quadrupole and sector-field ICP-MS, multi-collector isotope measurements, elemental purification, chemical leaches and digestion, and clean-laboratory sample preparation.
- Electrochemical analysis of trace-metal speciation, including voltammetric titrations of Fe-binding organic ligands and development of chelating-resin probes for kinetic speciation.
- Non-traditional stable isotope geochemistry, including Fe and Cu isotope systems in seawater, suspended particles, mineral dissolution experiments, and microbial biomass.
- Shipboard and laboratory experiments with natural phytoplankton and bacterial communities, mineral particles, siderophores, and controlled trace-metal additions.
- Integration of trace-metal chemistry with nutrient measurements, phytoplankton community composition, and particulate carbon and silica cycling.

FIELD EXPERIENCE

Total time at sea: 265 days. Roles include chief scientist, chief scientist trainee, scientist, trace-metal sampling specialist, and experimentalist across polar, upwelling, oligotrophic, and coastal systems.

2026 **PACSUN2603, F/V Pacific Sunrise, Kingdom of Tonga (5 days)**
Chief Scientist. Led a team of 8 scientists studying nitrogen fixation and submarine volcanic hydrothermal vents. Deployed in situ autonomous columns to study the effects of sinking particulate iron on seawater biogeochemistry.

2025 **SR2507, R/V Sproul, San Pedro Basin (4 days)**
Scientist. Conducted studies of resin-based chemical speciation in seawater.

2024-2025 **San Pedro Ocean Time-series, R/V Yellowfin, San Pedro Basin (3 days)**
Scientist. Deployed a new in situ trace-metal pump for collection of large volumes of trace-metal-clean seawater.

2024 **P2402 California Current Ecosystem LTER, R/V Roger Revelle (31 days)**
Scientist. Operated GO-Flo bottles and the trace-metal rosette; conducted shipboard and Lagrangian experiments testing iron limitation of natural phytoplankton communities; collected sinking particles with trace-metal particle interceptor traps.

2022 **Kenai Fjords campaign, Alaska (2 days)**
Chief Scientist. Led a four-person team conducting cross-fjord sampling transects at Aialik and Northwestern glaciers. Directed trace-metal-clean surface-pump collection of suspended particles and microbial samples and coordinated iceberg collection.

2021 **P2107 California Current Ecosystem LTER, R/V Roger Revelle (31 days)**
Scientist. Operated GO-Flo bottles and the trace-metal rosette and conducted shipboard and in situ Lagrangian experiments testing iron limitation of natural phytoplankton communities.

2020 **SR2007 California Current Ecosystem LTER Student Cruise, R/V Sally Ride (3 days)**
Scientist. Conducted trace-metal-clean sampling along CalCOFI Line 93 using GO-Flo bottles and surface pumps.

2019 **P1908 California Current Ecosystem LTER, R/V Atlantis (32 days)**
Scientist. Operated GO-Flo bottles and the trace-metal rosette and conducted shipboard and in situ Lagrangian experiments testing iron limitation of natural phytoplankton communities.

2018 **IN2018_V02 Subantarctic Biogeochemistry of Carbon and Iron, R/V Investigator (22 days)**
Scientist. Worked at the Southern Ocean Time Series site using a trace-metal rosette and McLane in situ pumps to collect trace-metal-clean seawater and particulate matter; conducted shipboard experiments with natural phytoplankton and bacterial communities.

2017 **RR1706 California Current Ecosystem LTER, R/V Roger Revelle (32 days)**
Scientist. Operated GO-Flo bottles and the trace-metal rosette; conducted shipboard and Lagrangian experiments; deployed bongo nets; and incubated zooplankton fecal pellets with natural bacterial populations.

2017 **SR1703 R/V Sally Ride Test Cruise (3 days)**
Scientist. Conducted GO-Flo and trace-metal rosette deployments and shipboard incubation experiments offshore San Diego.

2016 **BH16-09 UNOLS Chief Scientist Training Program, R/V Blue Heron (4 days)**
Chief Scientist Trainee. Participated in a Great Lakes transit from Duluth, Minnesota, to Milwaukee, Wisconsin; conducted GO-Flo deployments and shipboard incubations of natural phytoplankton communities.

2016 **NBP16-03 FjordEco, ARIB Nathaniel B. Palmer, West Antarctic Peninsula (44 days)**
Scientist. Conducted CTD and GO-Flo deployments, small-boat operations for glacial ice collection, plankton-net tows, and shipboard incubation experiments in Andvord Bay.

2015 **LMG15-10 FjordEco, ARSV Laurence M. Gould, West Antarctic Peninsula (44 days)**
Scientist. Conducted CTD and GO-Flo deployments, small-boat operations for glacial collection, sea-ice coring, plankton-net tows, and shipboard incubation experiments in Andvord Bay.

2015 **California Current LTER Student Cruise, R/V Oceanus (5 days)**
Scientist. Operated surface pumps and conducted GO-Flo bottle deployments in the California Current, Channel Islands, Point Conception, and Santa Barbara Basin.

INVITED ACADEMIC SEMINARS

2026 **Scripps Institution of Oceanography, Polar Center Seminar**
La Jolla, CA

2024 **Scripps Institution of Oceanography, Marine Chemistry and Geochemistry Seminar**
La Jolla, CA

2023 **University of Southern California, Department of Earth Sciences**
Los Angeles, CA

2022 **University of Michigan, Earth and Environmental Sciences, Smith Lecture**
Ann Arbor, MI

2020 **Scripps Institution of Oceanography, Marine Chemistry and Geochemistry Seminar**
La Jolla, CA

CONTRIBUTED CONFERENCE PRESENTATIONS (first-author)

2026 **Ocean Sciences Meeting, United Kingdom**
Application of chelating resins as 'cell mimics' to study kinetic speciation of trace metals in seawater.

2025 **Association for the Sciences of Limnology and Oceanography Meeting, USA**
Persistent iron-limited water masses in the California Current Ecosystem.

2023 **Gordon Research Conference on Chemical Oceanography, USA**
Glacial setting controls on the delivery of bioactive trace metals to coastal southcentral Alaska.

2022 **LTER Network All Scientists' Meeting, USA**
Biogeochemical consequences of iron limitation during lateral advection of diatom populations.

2022 **Ocean Sciences Meeting, USA**
Labile iron-bearing particles transported offshore by coastal upwelling filaments in the California Current Ecosystem.

2020 **Ocean Sciences Meeting, USA**
Dispersal of trace elements by a glacial sediment plume.

2019 **Association for the Sciences of Limnology and Oceanography Meeting**
Iron limitation of a coastal upwelling filament in the southern California Current Ecosystem.

2018 **LTER Network All Scientists' Meeting, USA**
Iron limitation of a coastal upwelling filament in the southern California Current Ecosystem.

2018 **Ocean Sciences Meeting, USA**
Seasonal cryospheric iron sources to a productive Antarctic fjord, Andvord Bay, West Antarctic Peninsula.

2017 **Gordon Research Conference on Polar Marine Science, USA**
Cryospheric sources of iron to the coastal West Antarctic Peninsula.

2015 **Ocean Sciences Meeting, USA**
Long-range transport of hydrothermal iron facilitated by dissolved-particulate exchange.

2011 **American Chemical Society National Meeting, USA**
Investigation of syntheses and characterization of metal complexes with indolomine ligands.

TEACHING

University of California San Diego La Jolla, CA
Instructor of Record, SIO 90: Perspectives on Ocean Science *2020*

University of California San Diego La Jolla, CA
Teaching Assistant, SIO 40: Life and Climate; instructor: Katherine Barbeau *2019*

University of California San Diego La Jolla, CA
Teaching Assistant, SIO 102: Introduction to Geochemistry; instructor: Miriam Kastner *2019*

University of California San Diego Teaching and Learning Commons La Jolla, CA
Course certificate, Introduction to College Teaching *2019*

MENTORING

2023 **Gabriel Abdelnoor, University of Alaska Fairbanks**
NSF SURF-REU fellow, initiated Polar project focus through coordination with SIO Polar Center and the Alaska Native Science and Engineering Program.

2020-2021 **Marley Weiss**
California Current Ecosystem LTER REU fellow and technician; subsequently entered the Scripps Institution of Oceanography PhD program and received an NSF Graduate Research Fellowship.

2018 **Niv Anidjar**
California Current Ecosystem LTER REU fellow; subsequently entered the Scripps Institution of Oceanography PhD program (defended August 2026).

PROFESSIONAL LEADERSHIP AND SERVICE

2021-2023 **AGU LANDInG Postdoctoral Fellow, American Geophysical Union**
Professional leadership training centered on diversity, equity, inclusion, bias awareness, and cultural intelligence.

2017-2018 **Peer Mentor Leader, Scripps Institution of Oceanography**
Led a graduate student peer mentor-mentee program; received the Outstanding Peer Mentor Award.

2016-2017 **Graduate Student Association Representative, University of California San Diego**
Represented Scripps Institution of Oceanography graduate students and secured free recreational access for graduate students.

Peer review

- Ad hoc reviewer for Analytica Chimica Acta, Biogeosciences, Chemical Geology, Marine Chemistry, Nature Communications, Science Advances, The Cryosphere, Geophysical Research Letters, Limnology and Oceanography, L&O Letters
- Ad hoc proposal reviewer for the National Science Foundation Office of Polar Programs, and UK Research and Innovation (UKRI)

Professional affiliations

- American Geophysical Union, member, 2014-present.
- The Oceanography Society, member, 2014-present.
- Association for the Sciences of Limnology and Oceanography, member, 2018-present.

SCIENCE COMMUNICATION AND OUTREACH

2022-2024 **Oceanography Merit Badge revision, Scouts BSA**
Contributed scientific expertise to the national revision of oceanography education materials.

2022 **Launch Friday, Alaska Native Science and Engineering Program**
Research presentation and engagement activity.

2020 **From STEM to Stars, Scripps Institution of Oceanography**
Science communication and student engagement.

2016-2020 **Beach Science at Scripps Institution of Oceanography**
Public-facing marine science outreach.

2018 **SURF-REU Keynote Speaker, Scripps Institution of Oceanography**
Keynote address for undergraduate research fellows.

2018 **Scripps Student Symposium**
Student-led scientific community event.

2016 **Scripps Institution of Oceanography Block Party**
Public engagement and ocean-science outreach.

2013 **CILER Summer Fellowship Presentation, NOAA Great Lakes Environmental Research Laboratory**
Research communication to scientific and public audiences.

2011 **San Diego Undergraduate Research Symposium, University of California San Diego**
Undergraduate research presentation.

MEDIA COVERAGE

2025 **Scripps Institution of Oceanography:** Retreating Glaciers May Send Fewer Nutrients to the Ocean
https://scripps.ucsd.edu/news/retreating-glaciers-may-send-fewer-nutrients-ocean

2025 **EOS:** Glacier Runoff Becomes Less Nutritious as Glaciers Retreat
https://eos.org/articles/glacier-runoff-becomes-less-nutritious-as-glaciers-retreat

2025 **KDLL 91.9 FM Public Radio for the Central Kenai Peninsula:** Kenai Conversation: Glacier sediment study with two scientists
https://www.kdll.org/podcast/kenai-conversation/2026-02-11/kenai-conversation-glacier-sediment-study-with-two-scientists