



Jens Daniel Müller

POSTDOCTORAL RESEARCHER

ETH Zurich | Department of Environmental Systems Science

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Ocean biogeochemist with a favour for carbon & observations seasoned with data science

About

I'm a biogeochemist studying the ocean carbon cycle through measurements of CO₂ in seawater. Since 2020, I work as a PostDoc with Nicolas Gruber at ETH Zurich. We use global ship-based observations to reconstruct the accumulation of CO₂ in the global ocean, and how this drives acidification in the ocean interior. This work profits from the experience gained during my PhD, specifically the development of pH analytics, the analysis of autonomous pCO₂ measurements from a voluntary observing ship and several months spend at sea. As a coordinator of RECCAP2 - the second cycle of the REgional Carbon Cycle Assessment and Processes project - I'm working with an international board of around 100 scientists covering a broad view on the ocean carbon sink through models and surface flux estimates.

Key publications

Gruber, N. et al.: Trends and variability in the ocean carbon sink, Nature Reviews Earth & Environment, <https://doi.org/10.1038/s43017-022-00381-x>, 2023.

Müller, J. D. et al.: Decadal Trends in the Oceanic Storage of Anthropogenic Carbon from 1994 to 2014, Preprints, <https://doi.org/10.22541/essoar.167525217.76035050/v1>, 2023.

Müller, J. D. and Rehder, G.: Metrology of pH Measurements in Brackish Waters—Part 2: Experimental Characterization of Purified meta-Cresol Purple for Spectrophotometric pH_T Measurements, Frontiers in Marine Science, <https://doi.org/10.3389/fmars.2018.00177>, 2018.

Schneider, B. and Müller, J. D.: Biogeochemical Transformations in the Baltic Sea, Springer International Publishing, Cham, <https://doi.org/10.1007/978-3-319-61699-5>, 2018.

Müller, J. D. et al.: Long-term alkalinity trends in the Baltic Sea and their implications for CO₂-induced acidification, Limnology and Oceanography, <https://doi.org/10.1002/lno.10349>, 2016.

Postdoctoral employment

Postdoctoral researcher

ETH ZÜRICH

• Environmental Physics | Prof. Dr. Nicolas Gruber

Zurich, Switzerland

07/2020 - present

Postdoctoral researcher

LEIBNIZ-INSTITUTE FOR BALTIC SEA RESEARCH WARNEMÜNDE (IOW)

• Trace gas biogeochemistry | Prof. Dr. Gregor Rehder

Warnemünde, Germany

07/2018 - 06/2020

Visiting scientist

MAX PLANCK INSTITUTE FOR METEOROLOGY (MPI-M)

• Observations, Analysis and Synthesis | Dr. Peter Landschützer

Hamburg, Germany

07/2019 - 06/2020

Education

PhD Chemical Oceanography

LEIBNIZ-INSTITUTE FOR BALTIC SEA RESEARCH WARNEMÜNDE (IOW)

- Ocean Acidification in the Baltic Sea: Involved Processes, Metrology of pH in Brackish Waters, and Calcification under Fluctuating Conditions
- Grade: With honors (Summa cum laude)

Warnemünde, Germany

07/2014 - 06/2018

MSc Biological Oceanography

GEOMAR HELMHOLTZ CENTRE FOR OCEAN RESEARCH KIEL

- Grade: 1.2 (ECTS grade, A Excellent)

Kiel, Germany

09 / 2010 – 08 / 2012

BSc Chemistry

PHILLIPS-UNIVERSITY MARBURG

- Grade: 1.7 (ECTS grade B “Very good”)

Marburg, Germany

09 / 2008 – 08 / 2009

Experiences

Scientific Employee

GEOMAR HELMHOLTZ CENTRE FOR OCEAN RESEARCH KIEL

- Benthic Ecology | Prof. Dr. M. Wahl
- Marine Biogeochemistry | Prof. Dr. U. Riebesell

Kiel, Germany

10 / 2013 – 03 / 2014

Research Assistant

GEOMAR HELMHOLTZ CENTRE FOR OCEAN RESEARCH KIEL

- Evolutionary Ecology of Marine Fishes | Prof. Dr. T. Reusch

Kiel, Germany

05 – 08 / 2010

Certified Scientific Diver & Divemaster

200+ LOGGED DIVES, DIVE MISSION LEADER, NITROX-DIVER

- Off-shore mesocosm experiment, Gran Canaria, Spain (2 months)
- Huinay Scientific Field Station, Patagonia, Chile (3 months)
- Divemaster at Al Dive dive centre, Loubiere, Dominica (3 months)

Global

2011 - present

Research cruises

10 EXPEDITIONS, 6 MONTHS AT SEA

- RVs Elisabeth Mann Borgese, Aranda, Alkor & Litorina
- VOS Finnmaid
- SVs HRIMFARE & Littorina

Baltic Sea

2011 - 2020

Sailor

BOAT DRIVER, SAFETY AND RADIO CERTIFICATES

- Member of the Academic Sailing Association in Kiel (ASViK e.V.)
- Several sailing campaigns including two ocean crossings
- Owner of SV Tina V (2019 - 2022)

Global

2010 - present

Publications

PEER REVIEWED

Gruber, N. et al.: Trends and variability in the ocean carbon sink, Nature Reviews Earth & Environment, <https://doi.org/10.1038/s43017-022-00381-x>, 2023.

Dai, M. et al.: Carbon Fluxes in the Coastal Ocean: Synthesis, Boundary Processes, and Future Trends, Annual Review of Earth and Planetary Sciences, <https://doi.org/10.1146/annurev-earth-032320-090746>, 2022.

Lauvset, S. K. et al.: GLODAPv2.2022: The latest version of the global interior ocean biogeochemical data product, Earth System Science Data, <https://doi.org/10.5194/essd-14-5543-2022>, 2022.

Poulter, B. et al.: Inventorying Earth's Land and Ocean Greenhouse Gases, Eos, <https://doi.org/10.1029/2022eo179084>, 2022.

Honkanen, M. et al.: The diurnal cycle of pCO₂ in the coastal region of the Baltic Sea, Ocean Science, <https://doi.org/10.5194/os-17-1657-2021>, 2021.

Jacobs, E. et al.: Upwelling-induced trace gas dynamics in the Baltic Sea inferred from 8 years of autonomous measurements on a ship of opportunity, Biogeosciences, <https://doi.org/10.5194/bg-18-2679-2021>, 2021.

Müller, J. D. et al.: Cyanobacteria net community production in the Baltic Sea as inferred from profiling pCO₂ measurements, Biogeosciences, <https://doi.org/10.5194/bg-18-4889-2021>, 2021.

Sanders, T. et al.: Decoupling salinity and carbonate chemistry: Low calcium ion concentration rather than salinity limits calcification in Baltic Sea mussels, Biogeosciences, <https://doi.org/10.5194/bg-18-2573-2021>, 2021.

Wanninkhof, R. et al.: A Surface Ocean CO₂ Reference Network, SOCONET and Associated Marine Boundary Layer CO₂ Measurements, *Frontiers in Marine Science*, 2019.

Müller, J. D. and Rehder, G.: Metrology of pH Measurements in Brackish Waters—Part 2: Experimental Characterization of Purified meta-Cresol Purple for Spectrophotometric pH_T Measurements, *Frontiers in Marine Science*, <https://doi.org/10.3389/fmars.2018.00177>, 2018.

Müller, J. D. et al.: Metrology for pH Measurements in Brackish Waters—Part 1: Extending Electrochemical pH_T Measurements of TRIS Buffers to Salinities 5–20, *Frontiers in Marine Science*, <https://doi.org/10.3389/fmars.2018.00176>, 2018a.

Müller, J. D. et al.: Spectrophotometric pH measurements in the presence of dissolved organic matter and hydrogen sulfide: Perturbations of spec pH measurements, *Limnology and Oceanography: Methods*, <https://doi.org/10.1002/lom3.10227>, 2018b.

Staudinger, C. et al.: A versatile optode system for oxygen, carbon dioxide, and pH measurements in seawater with integrated battery and logger: A versatile optode system for O₂, CO₂, and pH, *Limnology and Oceanography: Methods*, <https://doi.org/10.1002/lom3.10260>, 2018.

Wahl, M. et al.: Macroalgae may mitigate ocean acidification effects on mussel calcification by increasing pH and its fluctuations: Biogenic fluctuations mitigate OA effects, *Limnology and Oceanography*, <https://doi.org/10.1002/lno.10608>, 2018.

Fritzsche, E. et al.: Highly sensitive poisoning-resistant optical carbon dioxide sensors for environmental monitoring, *Analytical Methods*, <https://doi.org/10.1039/C6AY02949C>, 2017.

Saderne, V. et al.: Intense pCO₂ and [O₂] Oscillations in a Mussel-Seagrass Habitat: Implications for Calcification., *Biogeosciences Discussions*, <https://doi.org/10.5194/bg-2017-351>, 2017.

Müller, J. D. et al.: Long-term alkalinity trends in the Baltic Sea and their implications for CO₂-induced acidification, *Limnology and Oceanography*, <https://doi.org/10.1002/lno.10349>, 2016.

Schulz, J. et al.: Aquatische Optische Technologien in Deutschland, *Marine Science Reports - Meereswissenschaftliche Berichte*, <https://doi.org/10.12754/msr-2015-97>, 2015.

Wahl, M. et al.: A mesocosm concept for the simulation of near-natural shallow underwater climates: The Kiel Outdoor Benthocosms (KOB): Mesocosms with natural fluctuations and delta treatments, *Limnology and Oceanography: Methods*, <https://doi.org/10.1002/lom3.10055>, 2015.

IN REVIEW

Müller, J. D. et al.: Decadal Trends in the Oceanic Storage of Anthropogenic Carbon from 1994 to 2014, *Preprints*, <https://doi.org/10.22541/essoar.167525217.76035050/v1>, 2023.

Resplandy, L. et al.: A Synthesis of Global Coastal Ocean Greenhouse Gas Fluxes, *Preprints*, <https://doi.org/10.22541/essoar.168182303.39621839/v1>, 2023.

Rodgers, K. et al.: Seasonal variability of the surface ocean carbon cycle: A synthesis, *Preprints*, <https://doi.org/10.22541/essoar.168167394.47800179/v1>, 2023.

Terhaar, J. et al.: Assessment of Global Ocean Biogeochemistry Models for Ocean Carbon Sink Estimates in REC-CAP2 and Recommendations for Future Studies, *Preprints*, <https://doi.org/10.22541/essoar.168394734.41886821/v1>, 2023.

Yasunaka, S. et al.: An assessment of CO₂ uptake in the Arctic Ocean from 1985 to 2018, *Preprints*, <https://doi.org/10.22541/essoar.168476524.42265823/v1>, 2023.

BOOKS

Schneider, B. and Müller, J. D.: *Biogeochemical Transformations in the Baltic Sea*, Springer International Publishing, Cham, <https://doi.org/10.1007/978-3-319-61699-5>, 2018.

THESIS

Müller, J. D.: *Ocean acidification in the Baltic Sea : Involved processes, metrology of pH in brackish waters, and calcification under fluctuating conditions*, Dissertation, Universität Rostock, https://doi.org/10.18453/rosdok_id00002303, 2018.

DATASETS

Müller, J. D.: RECCAP2-ocean data collection, <https://doi.org/10.5281/zenodo.7990823>, 2023.

SELECTED CONFERENCE PRESENTATIONS

Teaching experience

Global Biogeochemical Cycles and Climate (with Nicolas Gruber & Meike Vogt)

ETH Zurich

TUTORIALS:

SS 2022 & SS 2023

- Seawater chemistry
- Circulation of the ocean and atmosphere
- Ocean carbon cycle
- Terrestrial carbon cycle

Analytical and Environmental Chemistry I (with Gregor Rehder)

University of Rostock

LECTURES:

SS 2019

- Dissolved Gases
- Water

Analytical Chemistry IV: Environmental Chemistry (with Gregor Rehder)

University of Rostock

LECTURES:

WS 2018/19

- Dissolved Gases
- Current topic: Baltic Sea Biogeochemistry

Funding

SPECTROPHABS

BSH

SPECTROPHOTOMETRIC PH-MEASUREMENTS FOR MONITORING OF MARINE ACIDIFICATION IN THE BALTIC SEA

2019-2022

- co-applicant

Early-Career Grant

National Geographic Society

FINANCIAL AND OUTREACH SUPPORT FOR BLOOMSAIL EXPEDITION

2018

Academic Scholarships

German Academic Scholarship
Foundation

MULTIPLE FUNDINGS GRANTED INDEPENDENTLY

2010 - 2018

- PhD scholarship (ideational)
- Full student scholarship
- Field work grant, Patagonia, Chile
- Advanced English course, Bath, England
- Summer academy, San Giovanni, Italy

Honors and Awards

Briese Award

Shipping company Briese

OUTSTANDING PHD THESIS IN MARINE RESEARCH

2019

Dissertation award

German Water Chemical Society

OUTSTANDING PHD THESIS IN WATER CHEMISTRY, SPONSORED BY WALTER-KÖLLE FOUNDATION

2019

Dissertation award

Baltic Sea Research Foundation

OUTSTANDING PHD THESIS IN BALTIC SEA SCIENCE

2019

Best poster award

Baltic Sea Science Congress

FOR PRESENTATION BY NEWCOMERS

2017

Book-price

Bertha-von-Suttner Gymnasium

FOR EXTRAORDINARY ACHIEVEMENTS DURING THE ABITUR

2005