Jens Daniel **Müller**

Postdoctoral Researcher

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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 CO_2 in seawater. Since 2020, I'm working as a PostDoc with Nicolas Gruber at ETH Zurich. We use global ship-based observations to reconstruct the accumulation of CO_2 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 pCO_2 measurements from a voluntary observing ship and several months spent 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, accepted, AGU Advances, 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 CO_2-induced acidification, Limnology and Oceanography, https://doi.org/10.1002/lno.10349, 2016.

Postdoctoral employment

Postdoctoral researcher — *Zurich, Switzerland*

ETH Zurich — *07/2020 - present*

- Environmental Physics | Prof. Dr. Nicolas Gruber

Postdoctoral researcher — *Warnemünde, Germany*

Leibniz-Institute for Baltic Sea Research Warnemünde (IOW) — *07/2018 – 06/2020*

- Trace gas biogeochemistry | Prof. Dr. Gregor Rehder

Visiting scientist — *Hamburg, Germany*

Max Planck Institute for Meteorology (MPI-M) — *07/2019 – 06/2020*

- Observations, Analysis and Synthesis | Dr. Peter Landschützer

Education

PhD Chemical Oceanography — *Warnemünde, Germany*

Leibniz-Institute for Baltic Sea Research Warnemünde (IOW) — *07/2014 – 06/2018*

- 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)

MSc Biological Oceanography — *Kiel, Germany*

GEOMAR Helmholtz Centre for Ocean Research Kiel — *09 / 2010 – 08 / 2012*

- Grade: 1.2 (ECTS grade, A Excellent)

BSc Chemistry — *Marburg, Germany*

Phillips-University Marburg — *09 / 2008 – 08 / 2009*

- Grade: 1.7 (ECTS grade B "Very good")

Experiences

Scientific Employee — *Kiel, Germany*

GEOMAR Helmholtz Centre for Ocean Research Kiel — *10 / 2013 – 03 / 2014*

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

Research Assistant — *Kiel, Germany*

GEOMAR Helmholtz Centre for Ocean Research Kiel — *05 – 08 / 2010*

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

Certified Scientific Diver & Divemaster — *Global*

200+ logged dives, dive mission leader, Nitrox-diver — *2011 - present*

- 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)

Research cruises — *Baltic Sea*

10 expeditions, 6 months at sea — *2011 - 2020*

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

Sailor — *Global*

Boat driver, safety and radio certificates — *2010 - present*

- 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)

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 pCO_2 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 pCO_2 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 CO_2 Reference Network, SOCONET and Associated Marine Boundary Layer CO_2 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 O _2 , CO _2 , 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 pCO_2 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 CO_2-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

DeVries, T. et al.: Magnitude, trends, and variability of the global ocean carbon sink from 1985-2018, in review, Global Biogeochemical Cycles, 2023.

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

Perez, F. F. et al.: An assessment of CO_2 storage and sea-air fluxes for the Atlantic Ocean and Mediterranean Sea between 1985 and 2018, in review, Global Biogeochemical Cycles, 2023.

Resplandy, L. et al.: A Synthesis of Global Coastal Ocean Greenhouse Gas Fluxes, in review, Global Biogeochemical Cycles, 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 RECCAP2 and Recommendations for Future Studies, Preprints, https://doi.org/10.22541/essoar.168394734.41886821/v1, 2023.

Yasunaka, S. et al.: An assessment of CO_2 uptake in the Arctic Ocean from 1985 to 2018, in review, Global Biogeochemical Cycles, 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*