

Scientific Resume Prof. Dr. Arne Biastoch

Objective: Physical oceanographer with a strong interest in using numerical models and data science tools to research the fine-scale structure and large-scale ocean circulation, and its impact on global climate and climate change. I collaborate on a number of interdisciplinary questions, from oceanic biogeochemistry to ecosystem connectivity of marine organisms.

Employment History and Research Experience

Since December 2018: Professor for Ocean Dynamics (W3) at Kiel University (Christian-Albrechts-Universität zu Kiel, CAU) and GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany

2001 to 2018: Scientist (permanent position) at GEOMAR¹

- Researching **submesoscale and mesoscale dynamics** and its impact on the large-scale circulation in the greater **Agulhas Current system** (coordinator in ERC Synergy Grant WHIRLS, 2024–2030, but also P. I. and coordinator in earlier DFG, SCOR, BMBF and EU projects)
- Studying the Atlantic Ocean circulation variability, with emphasis on northern and southern influences on the **Atlantic Meridional Overturning Circulation** (P. I. in EU and BMBF projects)
- Simulating ocean and climate dynamics using **global ocean/sea-ice models**, with focus on (sub)mesoscale, based on the NEMO code (European modelling initiative DRAKKAR) and development of the Flexible Ocean and Climate Infrastructure (FOCI) at GEOMAR
- Applying modelled currents to study the **dispersal and Lagrangian connectivity** of drifting organisms (e.g., glass eels, larvae) and particles (MH370) (interdisciplinary collaborations)
- Implementing **technology transfer** (ship routing in the S-H project RASMUS) and risk management (marine heatwaves and sea level extremes in the DAM project METAscales)
- Coordinating **information & data science** in the Helmholtz School for Marine Data Science (MarDATA, as speaker, 2019–2024)
- **Leading** as head of the research unit Ocean Dynamics (OD), as chair of the GEOMAR Scientific Council (2014–2017), and as deputy in the Helmholtz Program-oriented funding, Topic-2 Ocean and Cryosphere in Climate
- Serving the **international science community**, e.g., as member of the CLIVAR Ocean Model Development Panel (OMDP) or as German correspondent for the International Association for the Physical Sciences of the Oceans (IAPSO) (2020–2022)
- **Teaching and advising** BSc, MSc, PhD students, member of exam and other university boards
- Performing **outreach** (e.g., public talks, radio and TV broadcasts)

¹ including its predecessors IFM-GEOMAR (2004-2011) and Institute for Marine Sciences (before 2004)

1999 to 2001: Postgraduate researcher, Scripps Institution of Oceanography, La Jolla, U.S.A.

- Researched the physics of exchange over the Greenland Scotland Ridge and the circulation in the subpolar North Atlantic; studied the effectiveness of observing networks (ARGO) using high resolution regional and global models, organized the weekly Physical Oceanography Research Division seminar series

January 1999: Guest scientist, University of Cape Town, South Africa

- Installed Agulhas region model on a local computer and trained South African Ph.D. student; completed Agulhas analyses and wrote paper in collaboration with local scientists

1998 to 1999: Research assistant, Institute for Marine Sciences Kiel, Dept. Theoretical Oceanography

- Designed a model of the North Sea and Baltic Sea; studied the salt balance of the Gulf Stream in a regional model

1994 to 1998: Doctoral candidate, Institute for Marine Sciences Kiel, Dept. Theoretical Oceanography

- Designed an ocean general circulation model and researched the dynamics of the Agulhas Current system; discovered the mesoscale variability in the Mozambique Channel; programmed open boundary conditions for general use in the GFDL Modular Ocean Model (MOM2 and MOM3); collected ocean data (CTD, drifter) in the Irminger Sea (RV Poseidon) and Baltic Sea (RV Alkor); taught undergraduate students (exercises, talks)

1991 to 1992: Student job, Institute for Marine Sciences Kiel, Dept. Marine Physics

- Rewrote program of water mass formation analysis for global use, first publication (Speer, Isemer, and Biastoch, 1995, *J. Phys. Oceanogr.*, **25**, 2444–2457); collected ocean data (CTD, moorings) in the South Atlantic (RV Meteor)

University

2018: Appointment to a professorship (W3) in Ocean Dynamics at Kiel University (Christian-Albrechts-Universität zu Kiel, CAU)

2017: Appointment to a professorship in Hydrospheric Geophysics at University of Helsinki, Finland (declined)

2013: Appointment to a professorship in the South African Research Chair Initiative (SARChI) at University of Cape Town, South Africa (declined)

2013: Adjunct (“außerplanmäßiger”) Professor, Kiel University

2008/2009: Habilitation and *venia legendi* in Physical Oceanography, Kiel University

- Thesis: “The Agulhas Leakage: Role of Mesoscale Processes and Impact on the Atlantic Meridional Overturning Circulation”

2000: WOCE Young Investigator Workshop, Boulder, U.S.A.

1998: Doctoral degree in Physical Oceanography, Kiel University

- Thesis (in German): “Circulation and Dynamics of the Agulhas Region According to a Numerical Model”, advisor: W. Krauß, cum laude

1995: NATO ASI Workshop Decadal Climate Variability, Les Houches, France

1994: Diploma in Oceanography, Kiel University

- Thesis (in German): “The Influence of Atmospheric Fresh Water Fluxes and the Large-scale Density Field on the Circulation in the North Atlantic”, advisor: W. Krauß, mark “sehr gut”

1988 to 1994: Study of Physical Oceanography, Kiel University

Awards

2023: Award of the ERC Synergy Grant WHIRLS

2010: Golden Spike Award for High-Performance Computing at HPC Center Stuttgart

2009: IFM-GEOMAR publication price

Functions, Committees and Memberships

Member of the Scientific Advisory Board of the Leibniz Institute for Baltic Sea Research (IOW), (from 05/2025)

Coordinating PI of the ERC Synergy Project WHIRLS (since 2024)

Member of the Scientific Steering Committee of the German Climate Computing Center (DKRZ) (since 2022)

Co-lead of Topic-2 of the Helmholtz Program-oriented funding (POF-IV) (since 2021)

Head of the research unit Ocean Dynamics (since 2020)

Member of BSc and MSc exam boards (since 2019), and of the MNF faculty convent (2020–2024)

Member of the CLIVAR Ocean Model Development Panel (OMDP) (2020–2022)

Speaker of the Helmholtz School for Marine Data Science (MarDATA) (2019–2024)

German correspondent for the “International Association for the Physical Sciences of the Oceans” (IAPSO) and delegate in the National Committee for the “International Union of Geodesy and Geophysics” (IUGG) (2017–2023)

Member of the Scientific Advisory Committee of the International Laboratory for High-resolution Earth Prediction (iHESP), U.S.A. (2019–2021)

Chair of the GEOMAR Scientific Council, member of the Consultatory Board of Directors (2014–2017)

Co-chair of SCOR Working Group No. 136 “Climatic Importance of the Greater Agulhas System” (2010–2012)

Member of the American Geophysical Union (AGU, since 1995)

Scientific Output

As of today, more than 150 manuscripts in international peer-reviewed journals and books were published (among 13 contributions to *Nature* journals). My current Web of Science based h-index is 49. My five most important publications were:

- Biastoch, A., C. W. Böning, F. U. Schwarzkopf, and J. R. E. Lutjeharms, 2009: Increase in Agulhas leakage due to poleward shift in the southern hemisphere westerlies, *Nature*, **462**, doi: 10.1038/nature08519, 495–498.
- Böning, C. W., E. Behrens, A. Biastoch, K. Getzlaff, and J. L. Bamber, 2016: Emerging impact of Greenland meltwater on deepwater formation in the North Atlantic Ocean, *Nat. Geosci.*, **9**, 523–527, doi: 10.1038/ngeo2740.
- Schubert*, R., A. Gula, and A. Biastoch, 2021: Submesoscale Impacts on Agulhas Leakage and Agulhas Cyclone Formation, *Nat. Commun. Earth Environ.*, **2**, 197, <https://doi.org/10.1038/s43247-021-00271-y>.
- Biastoch, A., F. U. Schwarzkopf, K. Getzlaff, S. Rühs*, T. Martin, M. Scheinert, T. Schulzki*, P. Handmann*, R. Hummels, and C. W. Böning, 2021, Regional Imprints of Changes in the Atlantic Meridional Overturning Circulation in the Eddy-rich Ocean Model VIKING20X, *Ocean. Sci.*, **17**, 1177–1211, <https://doi.org/10.5194/os-17-1177-2021>.
- Rühs*, S., C. Schmidt*, F. U. Schwarzkopf, T. G. Schulzki*, R. Schubert*, D. Le Bars, and A. Biastoch, 2022: Robust estimates for the Decadal Evolution of Agulhas Leakage from the 1960s to the 2010s, *Nature Commun. Earth. Environ.* **3**, 318, <https://doi.org/10.1038/s43247-022-00643-y>.

My ISI-based publication record are found at <https://www.webofscience.com/wos/author/record/B-5219-2014> and <https://www.geomar.de/abiastoch>.

Several (invited) talks and presentations were given at international conferences, workshops and institutes. These include a keynote presentation at the 10th International Conference on Southern Hemisphere Meteorology and Oceanography (ICSHMO12) in Nouméa, New Caledonia, a prestigious lecture on ocean and climate change at the College de France, Paris (2012), and invited talks at the Wolfgang H. Berger (2018) and Arnold Gordon (2020) symposiums, both at Scripps Institution of Oceanography, La Jolla, U.S.A. In 2023, I gave a keynote on Marine Data Science at the International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL).

Examples for conference contributions: As one of the leading conveners, an AGU Chapman Conference on “The Agulhas System and its Role in Changing Ocean Circulation, Climate, and Marine Ecosystems”, was proposed, organized and held in October 2012 in the Western Cape, South Africa.

* Supervised student or postdoc

A CLIVAR workshop on “Future Directions in High-resolution Ocean Modelling” (about 120 participants) was organized and held online in October 2020.

Review of scientific manuscripts for international journals (*Nature*, *Science*, topical journals) and research proposals (EU ERC, U.S. NOAA and NSF, U.K., Sweden, The Netherlands, South Africa, Switzerland).

Conception, application and realization of scientific projects (DFG, S-H, BMBF, EU). Coordination of framework projects (e.g., BMBF SPACES-CASISAC). The Helmholtz School for Marine Data Science (MarDATA, about 6M€ funding) was planned and led as a speaker (2019–2024). Contributions to proposals of large-scale research activities (collaborative research centers, clusters of excellence).

In 2023, the European Research Council (ERC) awarded the Synergy Proposal WHIRLS with a total budget of almost 12M€. WHIRLS consists of 4 partners (including me as the coordinating PI) and will research the submesoscale and mesoscale dynamics and its impact on the large-scale circulation and the marine biome in the greater Agulhas Current system (2024–2030).

Supervision and Teaching

Currently, supervision includes students, postdocs and permanent personnel (scientists and science support staff) of the research unit Ocean Dynamics.

Since 2009 (officially allowed by the German Habilitation), the following doctoral theses are/were successfully supervised at Kiel University:

- Leon Mock: Role of submesoscale for Agulhas leakage (graduation expected in 2027)
- Muhammad Naim Mohd Satar: Upwelling Dynamics Under Climate Change and Its Future Projection in Southern South China Sea (graduation expected in 2026)
- Yannick Wölker: Deciphering the AMOC with Neural Networks (graduation expected in 2025)
- Ilana Schiller-Weiss: The emergence of Greenland meltwater impacts: From boundary currents to the Atlantic Overturning Circulation (graduation in 2024)
- Tobias Schulzki: Regional to Interhemispheric Connectivity of the Atlantic Ocean Circulation (graduation in 2023)
- Rene Schubert: The impact of submesoscale flows on mesoscale Agulhas Dynamics (graduation in 2020)
- Siren Rühs: Lagrangian connectivity of the upper limb of the overturning circulation studied with high-resolution ocean models (graduation in 2018)
- Jonathan Durgadoo: Controls and impact of Agulhas leakage (graduation in 2013)


Further doctoral candidates are/were co-supervised. National and international doctoral and PhD theses were reviewed, PhD committees were served as an examiner (Germany, The Netherlands,

France, U.S.A.) or opponent (U.K.). Theses from the bachelor and master programs at the Kiel University are regularly supervised and reviewed.

Since 2002, lectures and exercises at Kiel University were taught, covering all aspects of Theoretical Physical Oceanography and Ocean General Circulation Modelling. These courses were part of the diploma, bachelor ("Physik des Erdsystems") and master ("Climate Physics") programs at Kiel University. Modules at international summer schools were designed and held.

Strategies for the fair and cooperative contact with students were developed through an individual coaching provided by Kiel University (2011–2012). Participation in a course on university didactic at Kiel University ("Hochschuldidaktik-Premium") in November 2017. I am a graduate of the Helmholtz Leadership Academy (2019–2020).

Kiel, January 2025

A handwritten signature in black ink, appearing to read 'Arne Bll'.