GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel

GEOMAR Helmholtz Centre for Ocean Research Kiel is a foundation under public law jointly financed by the Federal Republic of Germany (90%) and the State of Schleswig-Holstein (10%). It is one of the internationally leading institutions in the field of marine research.

Through our research and our commitment to the transfer of knowledge and technology, we contribute significantly to the preservation of the function and protection of the ocean for future generations.

The *Ocean Dynamics* research unit at GEOMAR uses theory and numerical ocean models to advance our understanding of the physical processes of the ocean and climate system. Key areas of research include i) the global significance of oceanic eddies, turbulence, and upwelling; ii) the interplay of various physical processes and their role in ocean mixing; iii) scale interactions between ocean and atmosphere; and iv) the fundamental role of the oceans and their circulation in the climate system. These key areas are embedded in GEOMAR's Research Division 1 *Ocean Circulation and Climate Dynamics* which requires close collaboration with the measuring and climate modeling groups at GEOMAR, as well as further interdisciplinary collaborations.

The research unit Ocean Dynamics of the Research Division 1 Ocean Circulation and Climate Dynamics offers a position for a

Doctoral researcher (m/f/d) in Marine Data Science in the project "*Physically informed pattern mining and deep learning to study fine scale ocean processes*"

starting as soon as possible, presumably on 01. January 2026.

The position offers the opportunity to pursue a doctoral degree as a member of the graduate school "Helmholtz School for Marine Data Science" (MarDATA). MarDATA is dedicated to training a new generation of "marine data scientists" by integrating expertise from computer science and mathematics into the field of ocean sciences. The school's interdisciplinary focus spans supercomputing, modeling, (bio)informatics, robotics, statistics, and big data methodologies. Doctoral researchers benefit from a structured training program that promotes cross-disciplinary collaboration and provides in-depth scientific insight as well as a systematic approach to marine data science. For more information, visit: https://www.mardata.de/.

Job Description

The doctoral researcher will work in close collaboration between the *Ocean Dynamics* group (Prof. Stephan Juricke and Prof. Arne Biastoch) at GEOMAR and the *Data Science* group of Prof. Matthias Renz at the Faculty of Engineering at Kiel University. The goal is to contribute to a better understanding of oceanic processes on scales of a few kilometers using new computer science methods, particularly machine learning. This involves the analysis of very complex spatiotemporal phenomena, especially so-called submesoscale processes. These include eddies and fronts and play a crucial role in the mixing of water masses and their interaction with the atmosphere. The analysis will be based on data from high-resolution global ocean simulations with a particular focus on the Agulhas region off the southern tip of Africa. More specifically, the data used is from the NEMO ocean model and is generated in connection with the ERC project WHIRLS (https://www.whirls.eu). The doctoral researcher will work on new data mining methods to identify regions and processes of particular interest within these very large data sets. Furthermore, new deep learning algorithms (e.g., graph neural network

(GNN) architectures) will be developed to explain the identified small-scale processes as accurately and efficiently as possible and to ultimately develop a surrogate model for simulations. This enables the representation of such processes even at significantly lower and less computationally time-intensive resolutions of the global ocean model. The doctoral researcher will thus not only be directly integrated into a larger, interdisciplinary, and team-oriented research unit at GEOMAR, but will also be co-supervised through the Institute of Computer Science at Kiel University. The doctoral researcher will also be closely integrated into the international network of the WHIRLS project.

Your Tasks

- (Further) Development of an algorithm for identifying spatiotemporal patterns of submesoscale processes in model data.
- Evaluation, contextual interpretation, and clustering of the identified processes.
- Development of a method (a so-called parameterization) for representing the identified patterns in the form of a physically informed surrogate model based on large-scale ocean variables.
- Integration and evaluation of the parameterization in a global ocean model.
- Publication of scientific results from computer science (data science) and oceanography in the international literature and presentations at international conferences.

Qualification

Required:

- (Master's) university degree in computer science, data science, applied mathematics, or in physics, oceanography, or a related field with qualifications/experience in data science
- Experience in programming (e.g., FORTRAN, Python) and data evaluation and analysis
- Very good written and spoken English skills

If the required degree is not completed at the time of application, the degree certificate must be handed in before the start date of the contract and the application must contain plausible evidence that the degree can be finished before that date.

Desirable:

- Teamwork skills, open-mindedness, scientific creativity, and determination
- Experience in machine learning or artificial intelligence, for example, pattern recognition or neural networks
- Experience in analyzing large data sets
- Previous knowledge of climate or ocean modeling or working with climate data
- Previous knowledge of ocean dynamics, theoretical oceanography, or fluid dynamics

At a workplace, directly on the Kiel Fjord with many leisure and recreational opportunities, we offer you:

- Good conditions for work-life balance: We offer, among other things, the possibility of mobile working and individual working time arrangements, vacation courses for the children of our employees, and good support in finding a place in a daycare center at the Kiel site
- Support services for professional and personal life situations
- An exciting work environment with the opportunity to provide important impetus for the

development of sustainable solutions
- Exciting topics in an international environment
- Work in the field of marine and climate research, a forward-looking area with social significance
- 30 vacation days + additional time off at Christmas Eve and New Year's Eve
- Company pension plan and capital-forming benefits

The position is available for a funding period of 3 years. The salary depends on qualification and could be up to the class 13 TVöD-Bund of the German tariff for public employees. This is a full-time position. The position cannot be split. The fixed-term contract shall comply with Section 2 Paragraph 1 of The Act of Academic Fixed-Term Contract (German WissZeitVG).

GEOMAR Helmholtz Centre for Ocean Research Kiel seeks to increase the proportion of female scientists and explicitly encourages qualified female academics to apply. GEOMAR is an equal opportunity employer and encourages scientists with disabilities to apply. Qualified disabled applicants will receive preference in the application process.

Please send your application for this post **not later than 19. October 2025** under the following link:

Online application

As soon as the selection procedure has finished, all your application data will be removed according to data protection regulation.

For further information regarding the position and research unit please contact Prof. Dr. Stephan Juricke (Tel.: 0431 600-4003, E-Mail: sjuricke@geomar.de).

We will answer all your questions if you send us an e-mail to bewerbung@geomar.de. In doing so, please refer to the keyword “**MarDATA-WHIRLS**”.

For further information on GEOMAR Helmholtz Centre for Ocean Research Kiel or the Helmholtz Association, please visit www.geomar.de or www.helmholtz.de.

GEOMAR is committed to an objective and non-discriminatory personnel selection. Our job advertisements address all people. We expressly renounce the submission of application photos.

Das GEOMAR trägt das TOTAL E-QUALITY Prädikat für das Engagement zur beruflichen Chancengleichheit von Frauen und Männern.