ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

EXPEDITION PROGRAMME
PS147/1 and PS147/2

Polarstern

PS147/1 and PS147/2
Stanley – Mindelo – Bremerhaven
13 March 2025 – 14 April 2025

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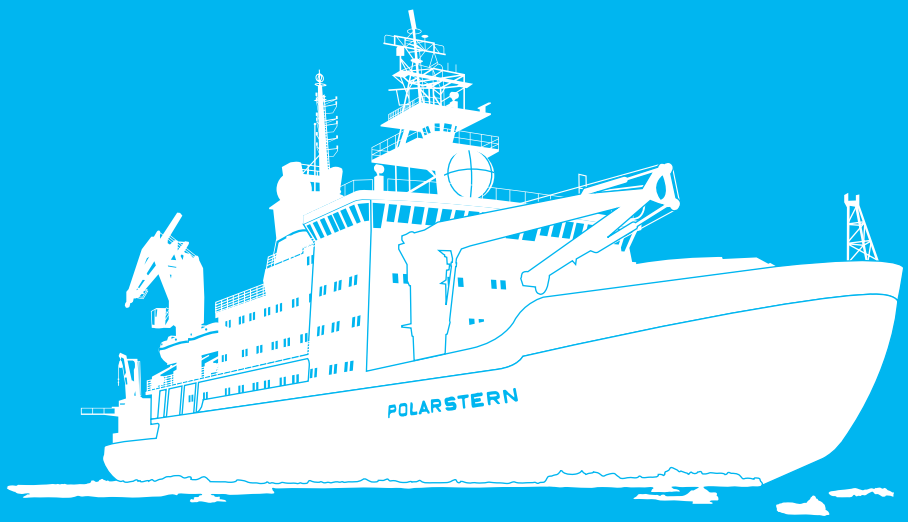

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The papers contained in the Expedition Programme *Polarstern* do not necessarily reflect the opinion of the AWI.

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PS147/1
PS147/2

13 March 2025 – 14 April 2025

Stanley – Mindelo – Bremerhaven

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1. ÜBERBLICK UND EXPEDITIONSVERLAUF

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Der Fahrtabschnitt PS147 ist der letzte Abschnitt der antarktischen Forschungssaison 2024/25 und dient der Überführung des Schiffes in seinen Heimathafen Bremerhaven. Die Expedition PS147 startet in Stanley am 13.03.2025 und endet am 14.04.2025 in Bremerhaven (Abb. 1). Am 01.04.2025 wird ein Zwischenstopp in Mindelo stattfinden, der die Fahrt in die Abschnitte PS147/1 und PS147/2 gliedert. Auf dem ersten Abschnitt liegt der Fokus auf dem Bergen einer Verankerung, die als Teil des Europäischen Projektes TRIATLAS ausgesetzt wurde und die zur Verbesserung der Daten über die südatlantische meridionale Umwälzzirkulation (SAMOC) beitragen wird. Des Weiteren werden atmosphärische, bathymetrische und meteorologische *en route* Messungen durchgeführt, welche ebenfalls auf dem zweiten Abschnitt fortgeführt werden. Ab Mindelo liegt der Schwerpunkt auf einer akademischen Ausbildungsfahrt („Floating University“) für westafrikanische M.Sc. Studierende, bei welcher zusätzlich auch tägliche Stationsarbeiten durchgeführt werden. Die Ausbildung auf diesem Abschnitt ist Teil des vom Bundesministerium für Bildung und Forschung (BMBF) finanzierten WASCAL Programms (West African Science Service Centre on Climate Change and Adapted Land-Use).

Auf der gesamten Reise (Abschnitte 1 und 2) werden folgende *en route* Messungen und Tätigkeiten durchgeführt:

- Mit den schiffsinternen hydroakustischen Systemen wird auf der gesamten Strecke ein Streifen Meeresbodentopographie bathymetrisch vermessen. Die Gesamt-Fahrtzeit von vier Wochen enthält einige Stunden Stationszeit für die Kalibration der Echolotsysteme mittels Wasserschallsonde und CTD Messungen.
- Mit dem PAMOS-Prototyp werden kontinuierlich Luftproben genommen, um die Verteilung von Aerosolen und Spurengasen, insbesondere von Ruß, in verschiedenen Klimazonen zu bestimmen.
- Weiterhin werden Radiosondenstarts durchgeführt, um die Struktur und Variabilität der intertropischen Konvergenzzone (ITCZ) zu untersuchen. Damit soll die Qualität der atmosphärischen Daten verbessert und das Verständnis der saisonalen und räumlichen Veränderungen in der ITCZ vertieft werden.
- Biogeochemische Messungen im Oberflächenozean mittels im Durchfluss betriebener Sensorik (u.a. CO2 Partialdruck und gelöster Sauerstoff).

Ab Mindelo beginnen tägliche Stationsarbeiten mit dem bordeigenen CTD Kranzwasserschöpfer sowie einem Multischließnetz. Es werden außerdem die beiden Zeitserienstationen CVOO nördlich von Cabo Verde („Cabo Verde Ocean Observatory“) sowie ESTOC nördlich von Gran Canaria („European Station of Time-Series in the Ocean of the Canary Islands“) beprobt, um Langzeit-Datenerhebungen fortzuführen. Darüber hinaus finden mehrere Auslegungen von Argo Tiefendriftern im Rahmen des internationalen Argo Programms statt.

Diese Expedition wird vom Bundesministerium für Bildung und Forschung (BMBF) im Rahmen des WASCAL-Programms (Förderkennzeichen 01LG2302A) gefördert und ist darüber hinaus Teil der Programmorientierten Förderung (PoF IV) des Helmholtz-Forschungsprogramms "Erde im Wandel – Zukunft sichern“, zu dessen Zielen die Themen 2 (Ozeane und Kyrosphäre im Klimawandel) mit Unterthema 2.1 und Thema 6 (Meeres- und polares Leben) mit Unterthema 6.3 beitragen.

SUMMARY AND ITINERARY

Expedition PS147 is the last leg of the 2024/25 Antarctic research season and will bring back the ship to its home port of Bremerhaven. Expedition PS147 starts in Stanley on 13.03.2025 and ends in Bremerhaven on 14.04.2025 (Fig. 1). On 01.04.2025 there will be a stopover in Mindelo, which will divide the voyage into legs PS147/1 and PS147/2. On the first leg, the focus is on the recovery of a mooring that was deployed as part of the European TRIATLAS project and will contribute to the improvement of data on the South Atlantic Meridional Overturning Circulation (SAMOC). Furthermore, atmospheric, bathymetric and meteorological *en route* measurements will be carried out, which will also be continued on the second leg. From Mindelo, the focus is on an academic training cruise ("Floating University") for West African M.Sc. students, during which daily station work will be carried out. The training on this leg takes place as part of the WASCAL Programme (West African Science Service Centre on Climate Change and Adapted Land-Use) funded by the German Federal Ministry of Education and Research (BMBF).

Throughout the voyage (leg 1 and 2), the following *en route* measurements and activities will be carried out:

- With the ship-mounted hydroacoustic systems, a swath of seabed topography will be bathymetrically surveyed along the ship's track. A few hours of station time will be spent on calibrating the echosounding systems by sound velocity profiler and CTD casts.
- The PAMOS prototype is used to continuously take air samples in order to determine the distribution of aerosols and trace gases, in particular black carbon, in different climate zones.
- Furthermore, radiosonde launches are carried out to investigate the structure and variability of the intertropical convergence zone (ITCZ). This should improve the quality of the atmospheric data and deepen our understanding of the seasonal and spatial changes in the ITCZ.
- Biogeochemical measurements in the surface ocean using flow-through sensors (e.g., CO2 partial pressure and dissolved oxygen).

Daily station work will begin from Mindelo onwards with the on-board CTD rosette water sampler and a multinet. The two time series stations CVOO north of Cabo Verde ("Cabo Verde Ocean Observatory") and ESTOC north of Gran Canaria ("European Station of Time-Series in the Ocean of the Canary Islands") will also be sampled to continue long-term data collection. In addition, several deployments of Argo Floats will take place as part of the international Argo programme.

This expedition is supported by the German Federal Ministry of Education and Research (BMBF) via the WASCAL Programme (Grant No. 01LG2302A) and is also part of the programme-orientated Funding (PoF IV) of the Helmholtz Research Programme "Changing Earth – Sustaining our Future" to whose goals Topics 2 (Ocean and Cyrosphere in Climate Change) with Subtopic 2.1 and Topic 6 (Marine and Polar Life) with Subtopic 6.3 contribute.

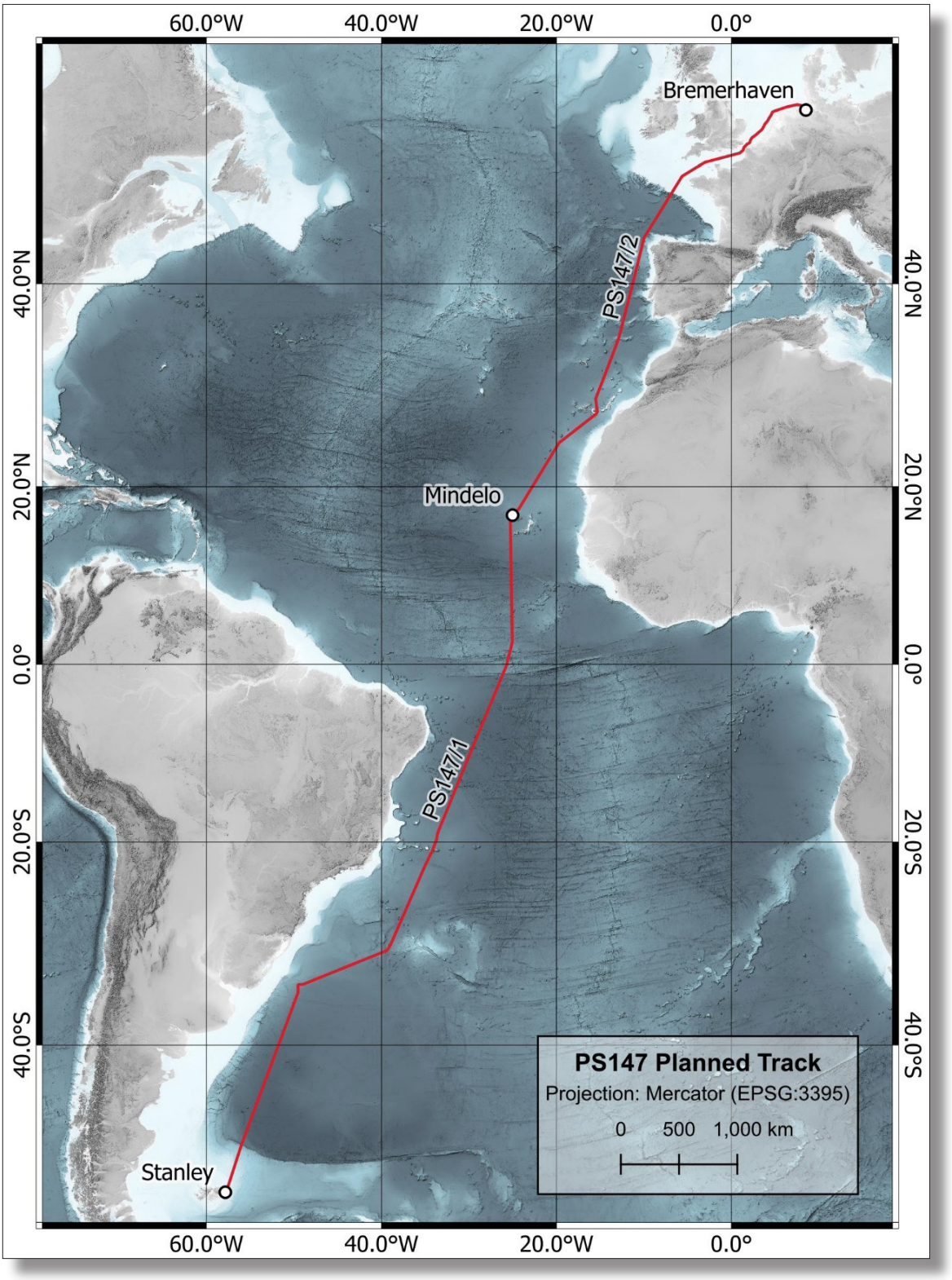

Abb. 1: Geplante Route der Fahrtabschnitte PS147/1 und PS147/2. Weiße Punkte markieren die Hafenanläufe während dieser Reise.

Fig. 1: Planned route of expeditions PS147/1 and PS147/2. White markers indicate port calls during the cruise.

2. CONTINUOUS AIR MONITORING AND PROFILES OF THE ITCZ

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Grant-No. AWI_PS147_00

Objectives

The air monitoring box PAMOS (Portable Atmospheric Measurement Box On Sea) is developed within the innovation platform SOOP (Shaping an Ocean Of Possibilities for science-industry collaboration). The PAMOS is designed for continuous and automatic air monitoring on commercial ships to improve the data coverage over the oceans. On the PS147 campaign, we test and improve the hardware and software of two PAMOS prototypes in the different climate zones crossed by the *Polarstern*. We will also do parallel measurements to assess the stability of the instruments. Furthermore, we will do reference aerosol measurements without an air dryer to estimate losses from the dryer. We will compare the weather station data to the ship integrated instruments to check the data quality.

The transit from Stanley to Bremerhaven will give us interesting insights into the aerosol and trace gas distribution over the Atlantic. It will be especially interesting to see the black carbon distribution with respect to the frequently used shipping routes.

We will do radiosonde profiles in the Intertropical Convergence Zone (ITCZ) to investigate the inner structure of the ITCZ in spring (Windmiller and Stevens 2024). This will comletement measurement during SO284, MSM114/2, and M203 where similar profiles were taken. We will investigate how the structure changes in different seasons and at different latitudes and improve the statistics for ITCZ studies.

Work at sea

The two PAMOS boxes are supposed to run automatically. One will be installed on the observation deck, the other in the so called “Krähennest”. However, since they are prototypes, we expect them to need some maintenance. We will also perform humidity and temperature measurements inside the cabinets and test different settings of the dryer to learn what works best for the different climate zones. We will furthermore do short period tests with reference instruments not permanently installed on the ship. By observing the automatization during the cruise, we will be able to improve the software and immediately test it.

Radiosondes will be launched every day. Additionally, we will launch radiosondes every three hours within the moist tropics.

Preliminary (expected) results

We want to find out about the aerosol distribution across the Atlantic. We expect to find significantly increased values within the common shipping routes compared to outside. Here, we also expect higher trace gas concentrations.For the instruments in the PAMOS, we expect

less accuracy than of the ones permanently installed on the *Polarstern*. We will be able to give a more precise estimate of the data quality after the campaign, also with respect to the losses from the air dryer.

In the radiosonde profile, we hope to find the structure of the ITCZ described in (Windmiller and Stevens 2024) with a northern and a southern edge and the doldrums in between. However, the ITCZ shows a large variability and the structure changes within days. Thus, we might observe a different structure of the ITCZ which would be interesting as well. In any case, this will be a valuable addition to the existing profiles and improve the statistics and data basis for studying the Atlantic ITCZ. The radiosoundings within the moist tropics will be processed with the python packages pysonde (Schulz et al. 2024) and shipspy (Köhler 2024).

Data management

Environmental data will be archived, published and disseminated according to international standards by the World Data Center PANGAEA Data Publisher for Earth & Environmental Science (https://www.pangaea.de) within two years after the end of the expedition at the latest. By default, the CC-BY license will be applied.

This expedition is supported by the Helmholtz Research Programme “Changing Earth – Sustaining our Future” Topic 2, Subtopic 1.

In all publications based on this expedition, the **Grant No. AWI_PS147_00** will be quoted and the following publication will be cited:

Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (2017) Polar Research and Supply Vessel POLARSTERN Operated by the Alfred-Wegener-Institute. Journal of large-scale research facilities, 3, A119. http://dx.doi.org/10.17815/jlsrf-3-163.

References

Windmiller JM, Stevens B (2024) The inner life of the Atlantic Intertropical Convergence Zone. Quarterly Journal of the Royal Meteorological Society 150:523–543. https://doi.org/10.1002/qj.4610

Schulz H, Stolla K, Köhler L, et al (2024) pysonde: Postprocessing of Atmospheric Soundings. https://doi.org/10.5281/zenodo.10023462

Köhler L (2024) shipspy. https://github.com/shipspy-development/shipspy

3. BATHYMETRIC UNDERWAY MEASUREMENTS

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Grant-No. AWI_PS147_01

Objectives

High-resolution bathymetry is a key dataset required to understand many marine processes, and is particularly important when interpreting scientific data in a spatial context. Bathymetry contains valuable information on geomorphological features at various spatial scales, from isolated, individual features like knolls or seamounts, to those across large spatial expanses like sand waves or contourites. The spatial nature of bathymetric data means that it also provides context to the broader environment being studied. Further, bathymetry can enhance our knowledge of geological processes such as erosion, sediment transport or even tectonics. In addition to the multibeam swath bathymetry, high-resolution sub-bottom profiler transects reveal insights on subsurface sediment composition and characteristics.

Although global maps give the impression that seafloor topography has been fully mapped, most of the world's ocean floor remains unmapped by hydroacoustic systems. In regions lacking such hydroacoustic measurements, bathymetry is modelled from satellite altimetry which is characterized by relatively low spatial and temporal resolutions, when compared with hydroacoustic data. Bathymetry derived from satellite altimetry thus lacks the resolution necessary to resolve small- to meso-scale geomorphological features (e.g. sediment waves, glacial features and small seamounts). Ship-borne multibeam data provide bathymetric information in a resolution sufficient to resolve those features. The collection of underway data during PS147/1 and PS147/2 will contribute to the bathymetry data archive at AWI, which, in turn, contributes to global bathymetric datasets such as GEBCO (General Bathymetric Chart of the Ocean).

Work at sea

Bathymetric data will be recorded with the hull-mounted multibeam echosounder Teledyne Reson Hydrosweep DS3. The main task of the bathymetry group is to run hydroacoustic systems during transit. The raw bathymetric data will be corrected for sound velocity changes in the water column, and will be further processed and cleaned for erroneous soundings and artefacts.

Sound velocity profiles will be collected with a CTD (Conductivity Temperature Depth) or an SVP (Sound Velocity Probe) whenever possible.

Preliminary (expected) results

The expected results are high-resolution seabed maps along the cruise track.

Data management

Environmental data will be archived, published and disseminated according to international standards by the World Data Center PANGAEA Data Publisher for Earth & Environmental Science (https://www.pangaea.de) within two years after the end of the cruise at the latest. By default, the CC-BY license will be applied. Furthermore, bathymetric data will be provided to the Nippon Foundation – GEBCO Seabed 2030 Project.

This expedition is supported by the Helmholtz Research Programme “Changing Earth – Sustaining our Future” Topic 2, Subtopic 3 Sea Level Change.

The data will be obtained as part of the Project BATHY-LTO.

In all publications based on this expedition, the **Grant No. AWI_PS147_01** will be quoted and the following publication will be cited:

Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (2017) Polar Research and Supply Vessel POLARSTERN Operated by the Alfred-Wegener-Institute. Journal of large-scale research facilities, 3, A119. http://dx.doi.org/10.17815/jlsrf-3-163.

4. SOUTH ATLANTIC MERIDIONAL OVERTURNING CIRCULATION

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Grant-No. AWI_PS147_02

Objectives

In the frame of the “South Atlantic Meridional Overturning Circulation” (SAMOC) project, which involves institutions from Argentina, Germany, Brazil, the United States of America, France, and South Africa (Chidichimo et al. 2023) a subsurface mooring was installed during an Argentine research cruise with *RV Austral* in December 2022. This mooring was funded by the European project TRIATLAS. The SAMOC project aims to measure the meridional transport of mass and heat across the South Atlantic Ocean using various oceanographic observations along a line located approximately at 34.5°S. It is part of the Atlantic-wide AMOC observing system consisting among others of the OSNAP array in the subpolar North Atlantic and the RAPID array in the subtropical North Atlantic. The newly installed mooring is aimed to strengthen the South Atlantic observing system and enhances knowledge of currents and ecosystems in a data-sparse region of the global ocean. The objective during the cruise is to recover this mooring and contribute data to improve the AMOC estimates in the South Atlantic.

Work at sea

The subsurface mooring as part of the SAMOC project is located at 34°30.04’S, 49°30,00’W. The mooring consists of two releases, 14 MicroCats, a Longranger 75kHz ADCP, 6 additional point current meters and floatations providing the necessary buoyancy. The main work during PS147/1 is the recovery of this deep-sea mooring. No new moored equipment will be installed.

Preliminary (expected) results

The mooring will provide full-depth velocity, temperature and salinity data for a period of more than two years and will be used to analyze intraseasonal to seasonal variability at the western end of the SAMOC array. It will provide important information to describe the circulation and water mass variability in a region typically only measured by bottom mounted CPIES. The combined analysis of bottom pressure and acoustic travel time measurement from the CPIES with the mooring data will improve the overall accuracy of the AMOC estimate at about 35°S. As the mooring is located in an energetic circulation, mooring data will be analyzed in comparison to satellite altimetry to better understand flow instability and the resulting mesoscale eddy field. Here, both, the variability of the warm-water path and the cold-water path of the AMOC are of particular importance.

Data management

Environmental data will be archived, published and disseminated according to international standards by the World Data Center PANGAEA Data Publisher for Earth & Environmental Science (https://www.pangaea.de) within two years after the end of the expedition at the latest. By default, the CC-BY license will be applied.

This expedition is supported by the Helmholtz Research Programme “Changing Earth – Sustaining our Future” Topic 2, Subtopic 1.

In all publications based on this expedition, the **Grant No. AWI_PS147_02** will be quoted and the following publication will be cited:

Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (2017) Polar Research and Supply Vessel POLARSTERN Operated by the Alfred-Wegener-Institute. Journal of large-scale research facilities, 3, A119. http://dx.doi.org/10.17815/jlsrf-3-163.

References

Chidichimo MP, Perez RC, Speich S, et al (2023) Energetic overturning flows, dynamic interocean exchanges, and ocean warming observed in the South Atlantic. Communications Earth & Environment 4:10. https://doi.org/10.1038/s43247-022-00644-x

5. WASCAL

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Not on board: Florian Schütte[1], Arne Körtzinger[1]

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Grant-No. AWI_PS147_03

Outline

Leg PS147/2 hosts the 3rd edition of the WASCAL Floating University Programme (GPF 24-1_035; WASCAL-III) which combines a research expedition with an academic curricular education cruise. This Floating University cruise is a continuation of the successful previous edition during PS135/2 and part of the curriculum of the international master programme “Climate Change and Marine Sciences”, which is currently implemented at the Atlantic Technical University of Cabo Verde (UTA) in the framework of the BMBF-funded WASCAL programme (“West African Science Service Centre on Climate Change and Adapted Land Use”). During the cruise, several modules of the curriculum will be taught theoretically as well as practically. In addition, scientists on board will be able to communicate their research to West African students and data will be collected for individual master thesis projects. Therefore, ongoing scientific research efforts off West Africa will be integrated into the work program (e.g., ecological and biogeochemical time-series observations). The students will benefit, not only through the teaching component delivered by the lecturing PIs, but even more through their immersion into real individual research projects as compared to the more “staged” experience of classical field work practicals.

Through the combination of teaching and research (“training-through-research”), the WASCAL Floating University during PS147/2 benefits academic education as well as for current research projects in the region.

The WASCAL Programme in Cabo Verde including this expedition are endorsed by IOC-UNESCO as a Decade Project hosted by the Decade ECOP Programme within the framework of the UN Decade of Ocean Research for Sustainable Development.

Objectives

Primary objective during this expedition is the academic education of Master’s degree students in the course “Climate Change and Marine Sciences” (MRP-CCMS) during an authentic research expedition. Therefore, theoretical lectures modules will be combined with practical training sessions about classical oceanographic field-sampling methods (e.g., gear deployment/recovery, analytical lab techniques, data reduction and visualization, etc.). Scientific data obtained during the cruise will be used instantaneously for teaching and training purposes but also for scientific exploitation.

The following lecture modules of the MRP-CCMS curriculum will be addressed on board: 1)

Ocean Observations 2), Hydroacoustics in fisheries and marine ecology and 3) Communication and scientific writing.

Beside teaching modules also research modules will be carried out in order to (i) contribute to current research efforts in the region and to global ocean observing programs, (ii) teach the students with state-of-the art oceanographic technologies and real scientific data, and (iii) collect scientific data for individual master thesis projects. Therefore, the following research modules are being an integral part of PS147/2:

Module 1: **Surface ocean biogeochemistry;** underway measurements of key surface properties (temperature, salinity, CO_2 partial pressure, O_2 partial pressure, chlorophyll, and turbidity) that allow to assess the saturation state for CO_2 and O_2 to deconvolute the observed disequilibrium into its physical and biological drivers and calculate air-sea CO_2 and O_2 fluxes. These observations will be carried out throughout the cruise. Permanently installed equipment on board of *Polarstern* will be used for this purpose.

Module 2: **Marine ecology & microbiology;** the cruise track covers different biomes and offers the opportunity to characterize the associated pelagic ecosystems as well as local communities. To facilitate integration of results, the main aim is to use methods that readily can be used to estimate zooplankton contribution to biomass, bulk metabolic rates and export flux. Variations in nekton and planktonic communities will be also investigated across the different regimes.

Module 3: **Time-series observations;** full-depth CTD hydrocasts including biogeochemical sampling at 2 different time-series sites (Cape Verde Ocean Observatory, CVOO, and European Station of Time-Series in the Ocean of the Canary Islands, ESTOC) will extend the long-term data sets of these sites. Conducted sampling will facilitate the assessment of changes in the Eastern Tropical North Atlantic (e.g., community structure, acidification, deoxygenation).

Module 4: Communication & Scientific Writing; the data and results which will be obtained during this leg shall be communicated and presented in both a scientific as well as a popular scientific way, also by the students. By choosing appropriate communication methods, tools and guiding questions, the students will be able to train their communication skills in translating scientific information and knowledge for different target audience groups, and sharpen their process of scientific thought and discourse. Those exercises will be combined with general public outreach activities during the cruise, such as blog posts, short video clips, etc.

Work at sea

The following gears and general operational methods will be deployed for carrying out the research modules:

I. Station work:

CTD-rosette system (CTD-rosette): profiling physical properties and water sampling will be performed using the ship's own Seabird 911+ system equipped with 24 x 12 L Niskin bottles. The system will have a sensor configuration with additionally attached oxygen and fluorescence sensors.

Discrete water samples taken from the rosette will be analyzed for nutrients (NO_3^-, NO_2^-, PO_4^3, $Si(OH)_4$) as well as dissolved oxygen and carbon parameters (dissolved inorganic carbon (DIC), total alkalinity (TA)). Chlorophyll a (Chl a) concentration will be measured from filtered samples using a Turner fluorometer. Salinity and oxygen analysis will be used to calibrate the CTD sensors. Daily CTD depths profiling along the transit will be performed down to 1,200 m, time-series stations will be sampled with full-depths CTD profiles. Water samples will be

collected and FlowCam observations will be carried out to study latitudinal variations in Nekton and plankton communities.

Multinet: determining the biomass and vertical distribution of mesozooplankton along the latitudinal gradient. The used multinet is a Hydrobios Multinet Midi with a 0.25 m^2 mouth opening and five 150 µm mesh nets. The multinet will be deployed down to 1,000 m water depth. The standard depth strata will be 1,000 - 600 - 300 - 200 - 100 - 0 m. Multinet casts will be conducted in pairs (one at daytime, one at nighttime) at CVOO and ESTOC to allow the estimation of diurnal vertical migration.

II. Underway measurements:

Underway multiparameter measurement systems (GO *p*CO_2 and Ferry Box) and **thermosalinograph** for underway near-surface water sampling will be carried out to determine sea surface temperature, sea surface salinity as well as several biogeochemical parameters. Discrete samples for various parameters will be also collected from the underway seawater supply line.

Shipboard observations will include current velocity using the **Acoustic Doppler Current Profiler (ADCP)** mounted to the research vessel (150 kHz RDI Ocean Surveyor).

The scientific echo sounder (EK80) will record underway calibrated backscatter signals to determine and characterize, e.g., zooplankton and pelagic fish assemblages and distribution as well as to quantify selected groups.

III. Autonomous mobile platforms:

Along the route, 3 **Argo floats** will be deployed for the Federal Maritime and Hydrographic Agency (BSH) and 1 biogeochemical Argo float to support the international Argo programme.

Preliminary (expected) results

Obtained scientific data during PS147/2 will contribute to long-term biogeochemical, ecological and physical time-series sites off (North-) West Africa (CVOO and ESTOC). Site occupations with large international research vessels are rare and therefore very important for the extension of these data sets. In particular full-depth samplings at these sites can't be carried out with local research vessels. Collected data contribute to regional assessments of acidification, deoxygenation and potential shift in zooplankton community structure.

Surface ocean *p*CO_2 measurements along the transit route provide also valuable data for the Eastern Tropical North Atlantic which is a highly undersampled region for carbon dioxide. Carbon measurements on *Polarstern* have a very high accuracy (ICOS class 1 station) and therefore can be also used for validation of other, autonomous platforms such as biogeochemical Argo floats.

The training programme on board for the West African students provides a bi-directional exchange of knowledge during the expedition. The students will have learned to apply observational, multidisciplinary methods to produce scientific knowledge under authentic at-sea conditions. Involved scientists on board will also benefit from the student's experiences and challenges in their home countries in West Africa.

Data management

All data are stored shortly after the cruise in the Ocean Science Information System (OSIS-Kiel) which is hosted at GEOMAR. Data are accessible for all project participants and can be

used to share and edit common expedition information and to share ongoing research data as they become available. Consequently, quality-controlled data will be forwarded to the World Data Center PANGAEA to warrant long-term archival and access to the data. Zooplankton data will be further submitted to the international Ecotaxa database (http://ecotaxa.obs- vlfr.fr/) and recorded, continuous surface pCO_2 data will be submitted to the ICOS (Integrated Carbon Observing System) Carbon portal and to the Surface Ocean CO2 Atlas (www.socat.info) by the responsible ICOS PI at AWI.

This expedition is supported by the German Federal Ministry of Education and Research (BMBF) via the WASCAL Programme (Grant No. 01LG2302A) and contributes also to the Helmholtz Research Programme “Changing Earth – Sustaining our Future” Topic 2, Subtopic 2.1 and Topic 6, Subtopic 6.3.

In all publications based on this expedition, the **Grant No. AWI_PS147_03** will be quoted and the following publication will be cited:

Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (2017) Polar Research and Supply Vessel POLARSTERN Operated by the Alfred-Wegener-Institute. Journal of large-scale research facilities, 3, A119. http://dx.doi.org/10.17815/jlsrf-3-163.

APPENDIX

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTES

A.2 FAHRTTEILNEHMER:INNEN / CRUISE PARTICIPANTS

A.3 SCHIFFSBESATZUNG / SHIP‘S CREW

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTES

Affiliation	Address
On board	
CV.UTA	Universidade Técnica do Atlântico Institute of Engineering and Marine Sciences CP.163 – Campus de Ribeira de Julião Mindelo, São Vicente Cabo Verde
DE.AWI	Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung Postfach 120161 27515 Bremerhaven Germany
DE.CAU	Kiel University Christian-Albrechts-Platz 4 24118 Kiel Germany
DE.GEOMAR	GEOMAR Helmholtz Centre for Ocean Research Kiel Wischhofstr. 1-3 24148 Kiel Germany
DE.ECOP	ECOP-Germany, Austria, Switzerland (DACH) Coordination Unit National Node Germany https://www.ecopdecade.org/germany/
DE.IOW	Leibnitz Institute for Baltic Sea Research Warnemünde Seestraße 15 18119 Rostock-Warnemünde Germany
DE.JAG	Johannes-Althusius-Gymnasium Emden Früchteburger Weg 28 26721 Emden Germany
DE.TI	Institute of Sea Fisheries Herwigstraße 31 27572 Bremerhaven Germany
DE.UNI-Potsdam	University of Potsdam Am Neuen Palais 10 14469 Potsdam Germany
DK.SDU	University of Southern Denmark Campusvej 55 5230 Odense M Denmark

Affiliation	Address
NL.UU	Utrecht University Heidelberglaan 8 3584 CS Utrecht The Netherlands
SN.CRODT	Centre de Recherche OcÈanographique de Dakar Thiaroye (CRODT-ISRA) B.P. 2241, Rte des Hydrocarbures Dakar République du Sénégal

A.2 FAHRTTEILNEHMER:INNEN / CRUISE PARTICIPANTS

PS147/1 Stanley – Mindelo				
Name/ Last name	**Vorname/ First name**	**Institut/ Institute**	**Beruf/ Profession**	**Fachrichtung/ Discipline**
On board				
Köhler	Laura Elisabeth	DE.AWI	Scientist	Physics
Künzig	Sophia Hannah Celina	DE.UNI-Potsdam	Student	Geo Sciences
Müller	Mario	DE.GEOMAR	Engineer	Oceanography
Müller	Tim	DE.GEOMAR	Student	Data
Schulze Tenberge	Yvonne	DE.AWI	Scientist	Geophysics
Not on Board				
Brandt	Peter	DE.GEOMAR	Scientist	Oceanography
Dorschel	Boris	DE.AWI	Scientist	Geophysics
Dreutter	Simon	DE.AWI	Scientist	Geophysics

PS147/2 Mindelo – Bremerhaven				
Name/ Last name	**Vorname/ First name**	**Institut/ Institute**	**Beruf/ Profession**	**Fachrichtung/ Discipline**
On Board				
Ahounga	Akotè M'kawata	CV.UTA	Student	Marine Sciences
Almeida	Corrine	CV.UTA	Scientist	Biology
Antia	Avan	DE.CAU	Scientist	Biology
Baierlein	Paula	DE.GEOMAR	Student	Outreach
Beyer	Josefa	NL.UU	Student	Law of the Sea
Bittig	Henry	DE.IOW	Scientist	Chemistry
Coelho	Débora da Luz	CV.UTA	Student	Marine Sciences
Coulibaly	Drissa Alfousseyni	CV.UTA	Student	Marine Sciences
Dennis	Hannah Ukamaka	CV.UTA	Student	Marine Sciences
Dia	Nogaye	CV.UTA	Student	Marine Sciences
Diallo	Aly	CV.UTA	Student	Marine Sciences
Djogli	Khevine Robaverge Mahougnon	CV.UTA	Student	Marine Sciences

PS147/2 Mindelo – Bremerhaven				
Name/ Last name	**Vorname/ First name**	**Institut/ Institute**	**Beruf/ Profession**	**Fachrichtung/ Discipline**
On Board				
Fiedler	Björn	DE.GEOMAR	Scientist	Chemistry
Fock	Heino	DE.TI	Scientist	Biology
Gbla	Ayodele	CV.UTA	Student	Marine Sciences
Hahn	Tobias	DE.GEOMAR	Scientist	Chemistry
Javidpour	Jamileh	DK.SDU	Scientist	Biology
Kache	Sophie	DE.IOW	Scientist	Biology
Köhler	Laura	DE.AWI	Scientist	Physics
Kouadio	N'guessan Cesaire	CV.UTA	Student	Marine Sciences
Künzig	Sophia Hannah Celina	DE.UNI-Potsdam	Student	Geo Sciences
Lamah	Joachim	CV.UTA	Student	Marine Sciences
Mensah	Patience Adjei	CV.UTA	Student	Marine Sciences
Sarré	Abdoulaye	SN.CRODT	Scientist	Biology
Sawadogo	Somyida Dénis	CV.UTA	Student	Marine Sciences
Schulze Tenberge	Yvonne	DE.AWI	Scientist	Geophysics
Souley	Souleymane Maman Nouri	CV.UTA	Student	Marine Sciences
Tempel	Titus	DE.JAG	Pupil	Marine Sciences
Not on board				
Brandt	Peter	DE.GEOMAR	Scientist	Oceanography
Dorschel	Boris	DE.AWI	Scientist	Geophysics
Dreutter	Simon	DE.AWI	Scientist	Geophysics
Schütte	Florian	DE.GEOMAR	Scientist	Physics
Körtzinger	Arne	DE.GEOMAR	Scientist	Chemistry

A.3 SCHIFFSBESATZUNG / SHIP‘S CREW PS147/1

No.	Position/ Rank	Nachname/ Last name	Vorname/ First name
1	Master (P)	Kentges	Felix
2	Chief Mate (P)	Langhinrichs	Jacob
3	Chief Mate Cargo (P)	Janik	Michael
4	2nd Mate (P)	Hering	Igor
5	2nd Mate (P)	Rathke	Wulf Jannik
6	Doctor	Gößmann-Lange	Petra
7	Chief Engineer (P)	Grafe	Jens
8	2nd Engineer (P)	Ehrke	Tom
9	2nd Engineer (P)	Brose	Thomas Christian Gerhard
10	2nd Engineer (P)	Bähler	Stefanie
11	Electrical Engineer (P)	Redmer	Jens
12	Electrical Engineer (P)	Zivanov	Stefan
13	Electrical Engineer (P)	Frank	Gerhard Ansgar Leon
14	Electrical Engineer (P)	Hüttebräucker	Olaf
15	Electrical Engineer (P)	Jäger	Vladimir
16	Electrical Engineer (P)	Pliet	Johannes
17	Bosun	Sedlak	Andreas
18	Carp.	Neisner	Winfried
19	FA/D	Klee	Philipp
20	FA/D	Burzan	Gerd-Ekkehard
21	FA/D	Fischer	Sascha
22	FA/D	Klähn	Anton
23	FA/D	Kryszkiewicz	Maciej Waldemar
24	FA/D	Cornelsen	Robert
25	FA/D	Bäcker	Andreas
26	FA/D	Röth	Benedikt
27	FA/D	Rhau	Lars-Peter
28	FA/D	Ackenhausen	Hendrik
29	Fitter/E	Preußner	Jörg

No.	Position/ Rank	Nachname/ Last name	Vorname/ First name
30	FA/M	Rolofs	Nils Christian Timo
31	FA/M	Hänert	Ove
32	FA/M	Klinger	Dana
33	FA/M	Plehn	Marco Markus
34	FA/M	Münzenberger	Börge
35	Cook	Hofmann	Werner
36	2./Cook	Hammelmann	Louisa
37	2./Cook	Dietrich	Emilia Felizitas Ilse Lieselotte
38	C/Stew.	Pieper	Daniel
39	Steward(ess) / Nurse	Schwantes	Andrea
40	2./Stew.	Brändli	Monika
41	2./Stew.	Dibenau	Torsten
42	2./Stew.	Möhle	Steffi
43	2./Stew.	Arendt	René
44	2./Stew.	Cheng	Qi
45	2./Stew.	Chen	Dansheng
46	Apprentice Ship Mechanic	Glawe	Jonathan Elias

A.3 SCHIFFSBESATZUNG / SHIP‘S CREW PS147/2

No.	Position/ Rank	Nachname/ Last name	Vorname/ First name
1	Master (P)	Kentges	Felix
2	Chief Mate (P)	Langhinrichs	Jacob
3	Chief Mate Cargo (P)	Janik	Michael
4	2nd Mate (P)	Hering	Igor
5	2nd Mate (P)	Rathke	Wulf Jannik
6	Doctor	Gößmann-Lange	Petra
7	Chief Engineer (P)	Grafe	Jens
8	2nd Engineer (P)	Ehrke	Tom
9	2nd Engineer (P)	Brose	Thomas Christian Gerhard
10	2nd Engineer (P)	Bähler	Stefanie
11	Electrical Engineer (P)	Redmer	Jens
12	Electrical Engineer (P)	Zivanov	Stefan
13	Electrical Engineer (P)	Frank	Gerhard Ansgar Leon
14	Electrical Engineer (P)	Hüttebräucker	Olaf
15	Electrical Engineer (P)	Jäger	Vladimir
16	Electrical Engineer (P)	Pliet	Johannes
17	Bosun	Sedlak	Andreas
18	Carp.	Neisner	Winfried
19	FA/D	Klee	Philipp
20	FA/D	Burzan	Gerd-Ekkehard
21	FA/D	Fischer	Sascha
22	FA/D	Klähn	Anton
23	FA/D	Kryszkiewicz	Maciej Waldemar
24	FA/D	Cornelsen	Robert
25	FA/D	Bäcker	Andreas
26	FA/D	Röth	Benedikt
27	FA/D	Rhau	Lars-Peter
28	FA/D	Ackenhausen	Hendrik
29	Fitter/E	Preußner	Jörg

No.	Position/ Rank	Nachname/ Last name	Vorname/ First name
30	FA/M	Rolofs	Nils Christian Timo
31	FA/M	Hänert	Ove
32	FA/M	Klinger	Dana
33	FA/M	Plehn	Marco Markus
34	FA/M	Münzenberger	Börge
35	Cook	Hofmann	Werner
36	2./Cook	Hammelmann	Louisa
37	2./Cook	Dietrich	Emilia Felizitas Ilse Lieselotte
38	C/Stew.	Pieper	Daniel
39	Steward(ess) / Nurse	Schwantes	Andrea
40	2./Stew.	Brändli	Monika
41	2./Stew.	Dibenau	Torsten
42	2./Stew.	Möhle	Steffi
43	2./Stew.	Arendt	René
44	2./Stew.	Cheng	Qi
45	2./Stew.	Chen	Dansheng
46	Apprentice Ship Mechanic	Glawe	Jonathan Elias