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

EXPEDITION PROGRAMME PS95.1 and PS95.2

Polarstern

PS95.1

Bremerhaven - Las Palmas

29 October 2015 - 10 November 2015

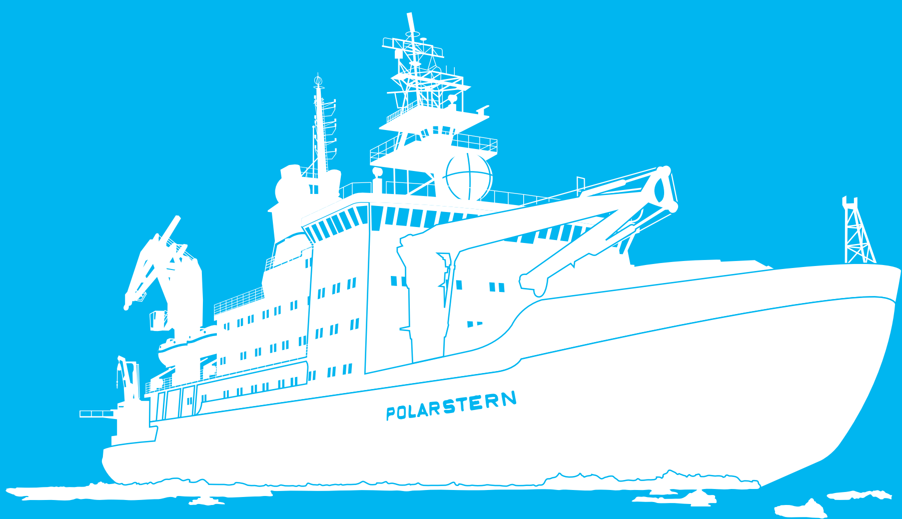
Coordinator:	Rainer Knust
Chief Scientist:	Rainer Knust

PS95.2

Las Palmas - Cape Town

10 November 2015 - 02 December 2015

Coordinator:	Rainer Knust
Chief Scientist:	Karin Lochte



Bremerhaven, Oktober 2015

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Contents

1. ÜBERBLICK UND FAHRTVERLAUF

R. Knust (AWI), K. Lochte (AWI)

Die Transitfahrt von Bremerhaven über Las Palmas nach Kapstadt (Südafrika) startet am 29.10.2015 und ist in zwei Abschnitte geteilt: Bremerhaven - Las Palmas (PS95.1, Fahrtleitung R. Knust) und Las Palmas - Kapstadt (PS95.2, Fahrtleitung K. Lochte). Beide Abschnitte stehen ganz im Zeichnen der studentischen Ausbildung. Eine internationale Gruppe von 34 Studierenden aus 21 Ländern werden während einer "schwimmenden Sommerschule" in Techniken der Ozeanographie und der marinen Biologie geschult. Dabei sollen sie Methoden der Probennahme, der Aufarbeitung der Proben und den Umgang mit erhobenen Daten lernen. Die "schwimmende Sommerschule" ist ein gemeinsames Projekt zwischen dem Alfred-Wegener-Institut, POGO Zentrum für Exzellenz und dem irischen Programm SMART (Strategic Marine Alliance for Research & Training). Die Sommerschule wird durch die Stiftung Mercator und der Nippon Foundation / POGO Centre of Excellence finanziert.

Eine weitere Aufgabe während der Transitfahrt werden chemische und physikalische Messungen zum Energie- und Material-Austausch zwischen Ozean und Atmosphäre bis in Tiefen von etwa 500 m sein.

Während der Überfahrt bis Las Palmas werden diverse hydroakustische Messgeräte getestet und kalibriert werden. Des Weiteren werden Arbeiten an der Satelliten-Standleitung durchgeführt und getestet. Im Seegebiet bei den kapverdischen Inseln wird das Multifrequenzgerät EK60 für den Einsatz in der nächsten Antarktis-Saison kalibriert.

Am 02.12.2015 wird *Polarstern* in Kapstadt einlaufen. Dort endet die 95. Expedition.

SUMMARY AND ITINERARY

R. Knust (AWI), K. Lochte (AWI)

The transit cruise from Bremerhaven via Las Palmas to Cape Town (South Africa) will begin on 29.10.2015 and is split into two cruise legs: Bremerhaven to Las Palmas (PS95.1, Chief Scientist R. Knust) and Las Palmas to Cape Town (PS95.2, Chief Scientist K. Lochte). Both legs are dedicated to the training of students. During a “floating summer school” an international group of 34 students will be trained in basic techniques of oceanography and marine biology on a North-South transect from Bremerhaven to Cape Town (North South Atlantic Training; NoSoAT). The participants will learn how to take samples, how to process them and deal with the accompanying data. The main water masses between the North Sea and Cape Town will be characterized in terms of their hydrographic and biological features down to a depth of approx. 500 m. The floating summer school is a joint project between the Alfred Wegener Institute, the POGO Centre of Excellence and the Irish Strategic Marine Alliance for Research & Training (SMART) program. It is funded by the “Stiftung Mercator” and the Nippon Foundation / POGO Centre of Excellence.

A further focus during the transit cruise will be physical and chemical measurements for energy and material exchange between ocean and atmosphere (OCEANET).

During the transit cruise from Bremerhaven to Las Palmas hydro acoustic measuring units are tested and calibrated. In the maritime area around the Cape Verde Islands the multi-frequency unit EK60 is calibrated to be ready for operation during the upcoming Antarctic season.

Polarstern is scheduled to arrive in Cape Town on 02.12.2015 and thus end the expedition PS95.

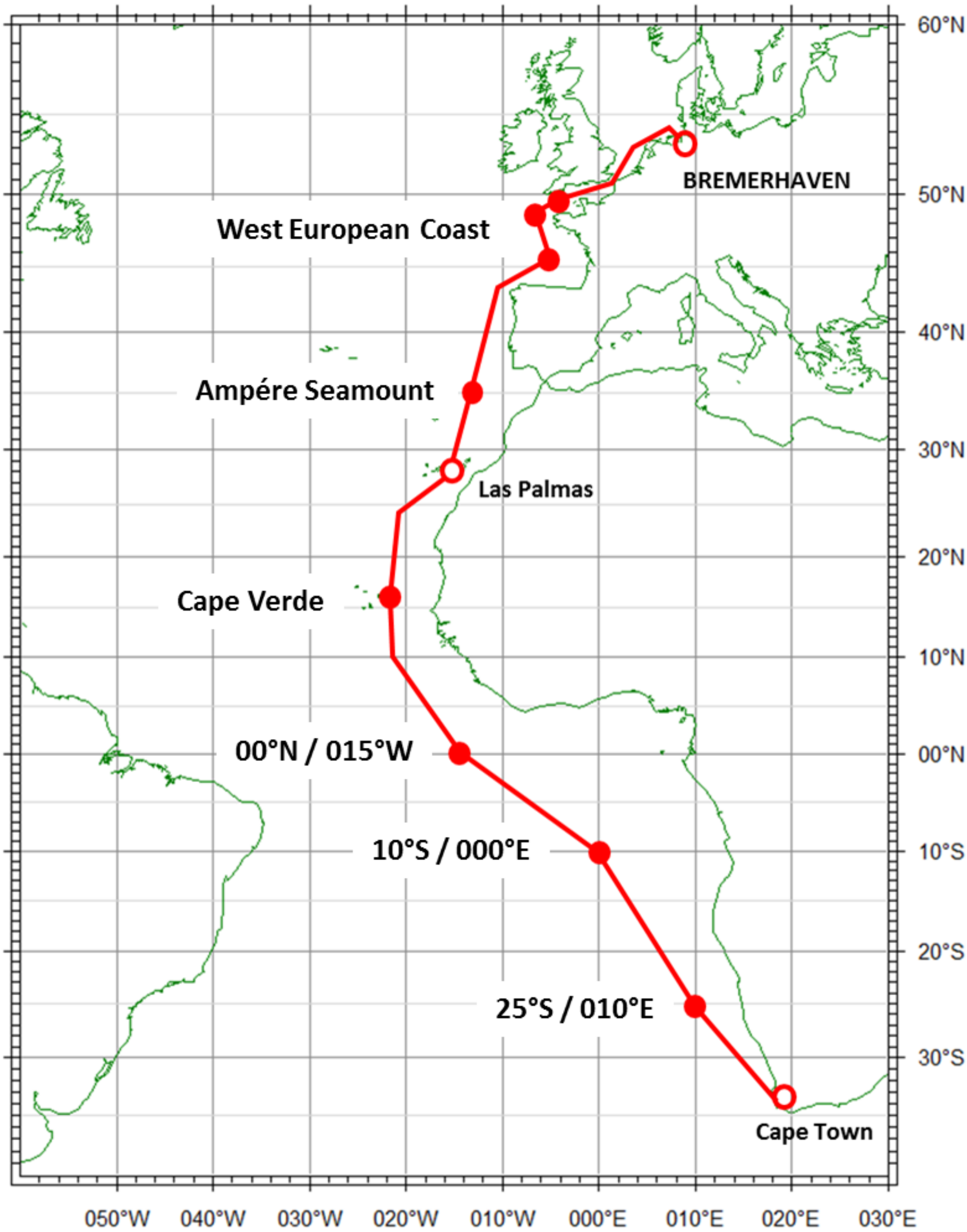

Abb. 1: Der generelle Kurs für PS95
Offene Kreise = Häfen
Gefüllte Kreise = Stationen

Fig. 1: The general course plot PS95
Open circles = ports
Closed circles = stations

2. NORTH SOUTH ATLANTIC TRAINING (NOSOAT) – FLOATING SUMMERSCHOOL

M. Boersma (AWI), M. Ginzburg (AWI), C. Hanfland (AWI), B. Heim (AWI), T. Keck (FUB), R. Knust (AWI), A. Kraberg (AWI), K. Lochte (AWI), P. McGrane (MIG), K. Wiltshire (AWI)

Objectives

Aim of the floating summer school is to chart and characterize different water bodies according to productivity along a North-South Atlantic Transect, as part of training exercise for capacity building in oceanography. An international group of 34 students (mostly graduate level and doctoral candidates) will be trained in basic oceanographic principles including sea-going methods and sampling associated with these. The cruise track will cross coastal, shelf and open Atlantic Ocean waters. Specifically, participants will learn how to sample and analyse for phytoplankton and zooplankton, to connect oceanographic "Ground Truth" information to Remote information, how to investigate differences in productivity and trophic interactions on board via incubation experiments.

Intended study objectives of the floating summer school include:

- Differentiation of different water masses via temperature, salinity, turbidity etc.
- Localization of thermocline
- Detection of salinity gradients, turbidity
- Species distribution; comparison with fluorescence distribution
- Incubation experiments under different light regimes
- Incubation experiments under influence of grazers
- Comparison of ground-truth data with remote sensing

Work at sea

The maps of the planned stations are shown in Fig. 2 to 4.

After embarkation, students will present their research projects (Master or PhD) in short talks. They will be provided background literature for the cruise. All participants need to pick a topic to be followed in discussion groups that will take place regularly during the cruise. Topics comprise physical and chemical oceanography, phytoplankton zooplankton, remote sensing and incubation experiments. Station work will take place on the Western European Shelf, the Western European Slope and the Western European basin (Gulf of Biskaye), around the Ampere Sea Mount, next to Cape Verde, and three more stations in the South Atlantic.

Deployed instruments comprise eXpendable Bathy/Thermographs (XBTs), CTD rosette casts, the Continuous Plankton Recorder, Multinet, Bongonets and surface radiance.

XBTs will be dropped from the (sailing) ship to measure temperature as they fall through the water. Deployment of XBTs will complement the oceanographic data collected during station work by CTD casts.

CTD Rosette Sampling

Investigations of the hydrographic regime will include 8 CTD casts measuring temperature, salinity and depth coupled with additional sensors to provide information on fluorescence, turbidity, oxygen etc. Water samples from depth will be recovered via Niskin bottles in a rosette frame and analysed for quantitative determination of chlorophyll a concentrations.

XBT Deployments

Physical environmental data will be enhanced by regular deployment of Expendable Bathythermographs (XBTs) to measure the thermal structure of the upper 1.8 km of the water column. XBT probes are 'fired' when the vessel is underway at a speed of approximately 6 knots. In order to resolve fine scale shelf features such as fronts and mesoscale eddies XBT probes are generally deployed at a distance of ~25 km. For larger scale ocean processes, distances between deployments are in the order of ~150 km. An example of temperature profiles from XBT data taken on the annual Trans-Atlantic Survey on board the RV Celtic Explorer are shown in Fig. 1. The position and number of XBT stations for the NoSoAT survey is dependent on a number of factors and station positions will be en route.

Thermosalinograph DAS Measurements & Sampling

In addition, underway sub-surface (ca. 3 m) temperature, salinity and fluorescence data will be collected using the vessels thermosalinograph unit and underway data acquisition system (DAS). Sub-surface underway quantitative samples for chlorophyll and coccolithophores could also be collected using the vessels flow-through system.

Data Analysis

Simple T/S (CTD) and scatter plots (XBT) will be worked up along the transect to give students a good understanding of differing water mass characteristics and data handling. Section plots will be worked up using open software such as Ocean Data Viewer (ODV) http://odv.awi.de which will be integrated with related data sets (phytoplankton, zooplankton, MODIS SST remote sensing data) to determine different water masses and biogeographic and provinces. Comparison with previous trans-meridional data sets will also be undertaken e.g. http://www.pangaea.de/search?ie=UTF-8&env=All&count=10&q=XBT+Polarstern.

Deployment of octocopter

As a side project, a newly designed and build octocopter will be tested during station time on this cruise. The octocopter is intended to validate existing lab data with data taken in the field (temperature patterns as a proxy of Langmuir circulations).

The octocopter will be deployed along a gradient of latitudes. Mission planning for each flight needs to take into account all the experience gained during the previous flights. Students will learn about mission planning, data handling and processing.

Plankton work

The plankton work will concentrate on the shifts in resident phytoplankton and zooplankton communities caused by different hydrographic regimes.

Students will be given a chance to have an introduction to plankton sampling and microscopic techniques. Depending on skills and interests, students will receive training in phytoplankton identification, taxonomy and cultivation techniques. The phytoplankton topic will be closely interlinked with related modules on physical measurements, chlorophyll determination remote sensing and experimental topics. To provide quick updates of the changing communities throughout the voyage, together with the students, it is planned to initiate a plankton blog with images and short bio-summaries of the species and communities identified at each station.

At each station, phytoplankton samples will be taken from the Niskin sampler for quantitative assessments and from 20/80 µm nets if possible. Counting will be done on board. It is planned to set up semi-quantitative list of taxa for each station. Each taxon in the list will be documented by representative images (including brightfield, Nomarski and epifluorescence assessments (samples for epifluorescence will be stained with DAPI and calcofluor aka brightener 28). These data will be entered into the planktonnet database in a special collection set up for P95. Diatom resting stages present in any of the net samples will be collected and cultured in artificial medium to try to induce hatching into the vegetative stage. Cyst-theca (dinoflagellates) and resting stage – vegetative stage (diatoms) will be documented if possible.

Additionally, integrated net samples for immediate microscopic assessments will be taken.

In addition, sampling for DNA/RNA analysis will take place by CTD /Rosette sampling in the Chlorophyll- Maximum. Water will be filtered through PC-filters and the latter stored at -80°C. Genetic analyses will be carried out in the home laboratory.

Exercises in remote sensing will comprise optical *in-situ* measurements as well as optical and thermal satellite products.

The Continuous Plankton Recorder (CPR) will be pulled on appropriate parts of the cruise track between Bremerhaven to Cape Town (http://www.sahfos.ac.uk/ for more information on the instrument). This device is usually deployed from ships of opportunity, and continuously collects samples onto a silk from a depth of around 6-10 m). Normally the silks are collected on board and sent to Plymouth for further analysis, but we will try to analyse them en-route.

For this, we will:

- collect the silks from the spools, and cut them in such a way that we will have a 10 nm sample every 100 miles. This means that we will collect samples from divisions 2-3, 12-13, 22-23, etc. As this does not completely agree with the divisions on the silk, we will have to compute the exact spot sampled from the data of the ship combined with the actually travelled distance of the silks. Before cutting the samples will be scanned and the (colour) greenness of every division will be assessed and noted. Then the long stretches (4-11, 14-21) will be carefully packed in lint, and stored for later analysis.
- The short pieces will then be analysed for the occurrence of
  - plastics: Plastic particles will be collected and stored for further analysis
  - zooplankton: From the zooplankton fraction 20-30 copepods will be collected, stored in Eppendorf tubes and frozen. These samples will later be used for stable isotope analysis of the copepods in order to infer their trophic position.
- Measurements of the greenness will be compared to the other measurements of algal densities.
- Using the water intake system of the ship we will collect water from roughly the same stations as the ones used for the zooplankton, filter 1-4 L of water, and collect filter in Eppendorf tubes and freeze for further analysis of the stable isotope signal. The idea being to investigate whether the trophic position of copepods changes with latitude.

The work on board will include filtering of the samples were appropriate, analysis of the zooplankton samples, plus selection of animals for stable isotope analysis. Comparing of different measurements of algal densities

Dilution experiments

At the eight stations we will carry out dilution experiments to assess the grazing impact of microzooplankton and mesozooplankton on the phytoplankton community. In short, we will investigate the grazing impact of microzooplankton by diluting the original community, and thus changing the probability of encounter between predators and prey. Furthermore, we will have one treatment where we add copepod grazers to assess the grating impact of copepods (hopefully in near natural densities, probably in higher ones).

Communication & Ocean Literacy Outreach

A pilot Ocean Literacy programme is proposed that will produce on-board webcasts and live linkups with student teachers of primary school children in Newfoundland and possibly Ireland / Germany. Similar in concept to the NOAA Explorers programme this proof-of-concept approach would test the logistical and technical feasibility of live broadcasting from different time zones across the oceans and could feed into future research vessel-based outreach programmes.

On-board, students will be part of creative working groups set up to showcase the NoSoAT through a range of media fora including blogging, vlogging, video production and photography across a range of innovative social media. The technical feasibility of a live video link is currently being examined.

In addition to involvement by NoSoAT partners other confirmed interested partners include:

- Ocean Learning Partnership, Newfoundland
- Titanic Belfast, Northern Ireland
- SmartOcean, Ireland

Data management

All data collected during the expedition will be stored in the PANGAEA data repository at the AWI. Plankton data will be entered into the planktonnet database in a special collection set up for P95.

3. AUTONOMOUS MEASUREMENT PLATFORMS FOR ENERGY AND MATERIAL EXCHANGE BETWEEN OCEAN AND ATMOSPHERE (OCEANET): ATMOSPHERE

R. Engelmann (TROPOS), M. Merkel (TROPOS), L. Poulain (TROPOS), P. Herenz (TROPOS), A. Welti (TROPOS), S. Bohlmann (TROPOS), D. Merk (TROPOS)

not on board: A. Macke (TROPO), A. Wiedensohler (TROPOS), F. Stratmann (TROPOS), H. Deneke (TROPOS), H. Herrmann (TROPOS)

Objectives

a) Radiation & microwave remote sensing

The net radiation budget at the surface is the driving force for most physical processes in the climate system. It is mainly determined by the complex spatial distribution of humidity, temperature and condensates in the atmosphere. The project aims at observing both the radiation budget and the state of the cloudy atmosphere as accurately as possible to provide realistic atmosphere-radiation relationships for use in climate models and in remote sensing. While similar experiments have been performed from land stations, only few data from measurements over ocean areas exist.

A multichannel microwave radiometer will be applied to continuously retrieve temperature and humidity profiles as well as cloud liquid water path over the ocean. Time series of these profiles will resolve small scale atmospheric structures as well as the effects of the mean state of the atmosphere and its variability on the co-located measurements of the down-welling shortwave and longwave radiation. The atmospheric profiles will be compared to and combined with METEOSAT SEVIRI products for a characterization of atmospheric state and radiative fluxes. Atmospheric aerosol optical thickness will be measured by means of hand held sun photometer and a multi-spectral solar radiometer, which also enables the determination of spectrally resolved aerosol and cloud radiative effects. Most instruments are integrated in the container-based atmosphere observatory.

b) Lidar measurements

Since more than 15 years TROPOS has developed and operated advanced lidar systems in order to study optical and microphysical aerosol properties in the troposphere. The system PollyXT, a semi-autonomous multi wavelength polarization Raman lidar will be operated inside a container, together with the radiation and microwave sensing equipment. The lidar is able to measure independently profiles of particle backscatter at three wavelengths and extinction at two wavelengths, which allows identifying particle type, size, and concentration. Additionally particle depolarisation is measured in order to discriminate between spherical and non-spherical particles, e.g. biomass-burning smoke vs. mineral dust or water clouds vs. ice clouds. The lidar is equipped with a measurement channel for atmospheric water-vapour, too. The data are used to characterize long-range transport of aerosol and identify pollution. The determined height-resolved aerosol extinction completes the radiation measurements. In this way, the radiative influence of single lofted aerosol or cloud layers can be calculated with radiation-transport models.

For the PS95 cruise the lidar will be equipped with a dual-wavelength near-range channel in order to observe the aerosol in the shallow marine boundary layer as well at 355 and 532 nm.

c) Aerosol in-situ measurements

The portfolio of the Aerosol Group at TROPOS includes the *in-situ* characterization of atmospheric aerosols in urban as well as remote background atmospheres, the characterization of regional and urban air quality, the examination of hygroscopic particle properties, the measurement and simulation of *in-situ* aerosol optical properties, the investigation of atmospheric transport processes, and the development of new and improved instruments for physical aerosol characterization. On board *Polarstern* all measurements will be conducted inside a temperature-controlled container laboratory, and focus on the particle characterization using high-end scientific instruments in order to study:

- Physical aerosol properties using an Aerodynamic Sizer (APS) and Scanning Mobility Particle Sizer (SMPS) for particle number size distributions from 10 nm to 10 µm, and a Volatility and Humidifying Tandem Differential Mobility Particle Sizer (VH-TDMPS) for the hygroscopic growth of the particles
- Optical properties using a nephelometer and an absorption photometer to measure the particle light scattering and absorption coefficients, respectively; and
- Particle chemical composition using a High Resolution Time of Flight Aerosol Mass Spectrometer (HR-ToF-AMS) for the non-refractory PM1
- Cloud Condensation Nuclei (CCN) number size distribution and particle number size distribution to determine the particle hygroscopicity using a DMT CCN counter-100 and a Scanning Mobility Particle Sizer (SMPS)
- Ice Nucleating Particle (INP) number concentration using a DMT Spectrometer for Ice Nuclei (SPIN)
-

Additionally to the on-line instrumentations, a Digitel PM1 sampler will be installed on the roof of the aerosol container and will perform daily (from midnight to midnight) filter sample of the PM1 aerosol particles. The filters will be later analyzed at the institute by a state-of-the-art analytical instrumentations to provide a precise identification of the organic chemical species.

Work at sea

Upon departure from Bremerhaven both container-based atmosphere observatories will be installed at the deck of *Polarstern*. Most measurements will be performed underway and continuously. The following individual instruments are combined:

- Multichannel microwave radiometer HATRPO. The instrument requires a calibration with liquid nitrogen at the port of Bremerhaven
- Whole sky imager for cloud structure measurements
- Multi wavelength polarization Raman lidar PollyXT
- Hand-held sun photometer (Microtops) for aerosol and cloud optical thickness
- Standard meteorological data logging
- Multispectral shadow-band radiometer
- *In-situ* aerosol measurements
- Measurement of cloud- and ice-nuclei concentration

Expected results

- 2d structure of the clear sky atmosphere and corresponding net radiation budget.
- Horizontal structure of the cloud water path and its effect on the down welling shortwave and longwave radiation
- Vertical structure of temperature and humidity as well as its variability for validation of satellite products
- Vertical profiles of tropospheric aerosols and their effect on radiation
- Near-surface aerosol size distributions and their physical and chemical compositions

Data management

All data collected during the expedition will be stored in the PANGAEA data repository at the AWI under the keyword "OCEANET-ATMOSPHERE".

4. CALIBRATION OF THE SCIENTIFIC MULTI-FREQUENCY ECHOSOUNDER SIMRAD EK60/80 AND TESTING OF NEWLY INSTALLED WIDEBAND-TRANSCEIVER

S. Krägefsky (AWI)

Objectives

Scientific hydro-acoustic survey of abundance of marine zooplankton and nekton with the multi-frequency echo-sounder (Simrad EK60) of FS *Polarstern* requires a regular calibration of the echo-sounder with standard calibration spheres. The calibration spheres have to be placed and moved in a controlled manner within sound beam below the ship. Due to the ships construction and dimensions of FS *Polarstern* such calibration is a demanding and time-consuming task. A system for supporting calibration of the Simrad EK60 was developed, allowing for a relatively fast and semi-automatic calibration of the Simrad EK60 or similar echo-sounders while facilitating the calibration process. The calibration unit consists of a deck unit and synchronized, electronically controlled underwater winches. Aim of the calibration exercise is to gain a proper calibration, giving priority to the recently replaced 38 kHz transducer. Additionally, the calibration exercise serves testing of the newly installed Wideband-Transceivers (WBTs). These transceivers allow for measurements over a wide sound frequency band, improving, among others, the ability for species identification of backscattering organisms.

Work at sea

After installing the deck unit and underwater winch-system, a calibration sphere will be lowered underneath the ship attached to the end of the ropes of the underwater winches. The calibration sphere will be moved through the sound beams of the single transducers in a controlled manner by means of the underwater winch-system. Calibration results will be documented and applied. The calibration is scheduled in the sea area around the Cape Verde Islands (Fig. 4).

Multi-frequency Echo-sounder data will be collected during the cruise with different hardware and software settings. Analysis of the collected data will address the improved measuring capabilities given by the new Wideband-Transceivers.

Expected results

Calibration of the multi-frequency echo-sounder (Simrad EK60/80) of FS *Polarstern* and testing of the new Wideband-Transceivers.

5. CALIBRATION OF THE MULTIBEAM ECHO SOUNDER ATLAS HYDROSWEEP DS3

R. Krocker (AWI), J. Ewert (TELEDYNE)

Objectives

During ship yard time in May 2015 five of six transducer elements had been replaced by new ones. As consequence the system needs to be recalibrated to find adjusted parameters for roll, pitch and yaw.

Work at sea

The calibration measurement will be performed in a flat area northwest of Ampere Seamount (Fig.3). At this location previous calibration measurements have been executed and data are available for comparison. Profile length amounts to 10 nautical miles between startpoint 35.6°N, 13.24°W and endpoint 35.44°N, 13.3°W. Ships speed will be 10 knots. This and a parallel profile for yaw calibration will be sailed at least 8 times for calibration and confirmation. So the complete task will take abour half a day.

Expected results

Adjusted parameters for roll, pitch and yaw will be applied in swath sounder firmware ATLAS Hydromap Control and in visualisation software package Hypack/Hysweep and post processing software CARIS HIPS. They will also be applicable in post-processing to adjust surveys that have been executed since transducer change in May 2015 until this calibration survey.

6. CALIBRATION OF THE WAVE RADAR WAMOS II, APPLYING WAVE BUOY

R. Krocker (AWI), S. El Naggar (SELNA, not on board)

Objectives

Some parameters of wave radar system WAMOS II from company OceanWaves/Rutter rely on the intensity of radar signal. Due to aging of the radars magnetron the system needs to be calibrated periodically. The calibration will be performed comparing WAMOS wave parameters with *in-situ* measurements of wave buoy.

Work at sea

The measurements of wave buoy will be executed during sailing period of profiles for Hydrosweep calibration. As the profiles will be sailed alternating in opposite direction, systematic effects can be determined and removed.

Expected results

Measured data of wave buoy and from WAMOS will be delivered to OceanWaves after the cruise. OceanWaves will calculate the parameter adjustments and will send them to meteorological service on board who will apply them into the system.

7. INVESTIGATION OF HEAVE COMPENSATION

R. Krocker (AWI), C. Gebhardt (AWI), S. Albrecht (FIELAX), J. Ewert (TELEDYNE), S. El Naggar (SELNA, not on board)

Objectives

Data of sediment echo sound Parasound from Teledyne ATLAS show slight wobble of nearly one meter. An uncompleted heave compensation is assumed to be reason for this artefact, but there are other reasons possible, as well. To determine the reason, a second motion sensor (IXBLUE PHINS) will be installed in previous ship yard time to make comparison measurements with the main motion sensor MINS-2 from Raytheon Anschütz. The second sensor will alternatively be installed directly next to the MINS and directly above the Parasound transducer in box keel.

Work at sea

Roll, pitch, heave and heading data of both sensors will be measured in parallel with a special data logger. Additionally, the data of motion sensor MINS converted by MINS interface will be logged. Furthermore, the data stream of MINS interface collected and delivered by ship data management system (DShip) will be logged.

Online analysis and comparison of these datasets by scientific staff will be executed in the first part of the cruise until Las Palmas de Gran Canaria. During the second part of the cruise data collection will be executed without scientific supervision and analysis.

If both systems are installed directly next to each other, all datasets should coincide without any corrections. If the second motion sensor is installed above the Parasound transducer, its data must be corrected by lever arms.

In a second step the application of motion data inside ATLAS software PARASTORE will be investigated. The installation of the additional motion sensor will be arranged, that you can switch between both motion sensors.

Expected results

Motion data of both sensors will be available for correlation analysis. The reason for wobbling artefacts in PARASOUND data could be located in MINS, MINS interface, or applied corrections, e.g. lever arm correction. If no error can be found in these data, the wobbling seems to be generated by PARASTORE.

8. MAPS OF PLANNED STATIONS

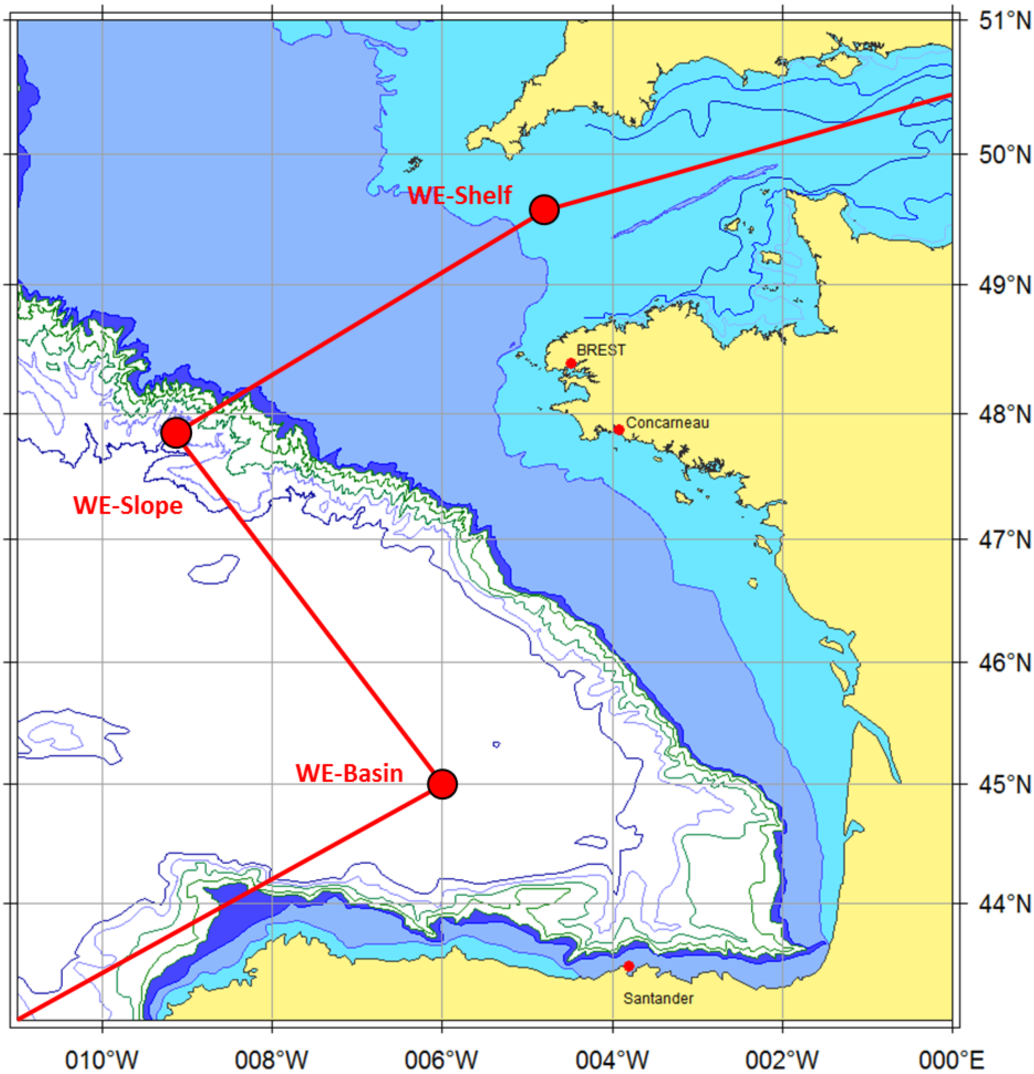

Fig. 2: Planned stations on the West European coast:
WE-Shelf= Shelf area with a water depth of approx. 200m or shallower.
WE-Slope= West European slope with a water depth between 800 – 1500
WE-Basin= West European basin with a water depth > 3,000m

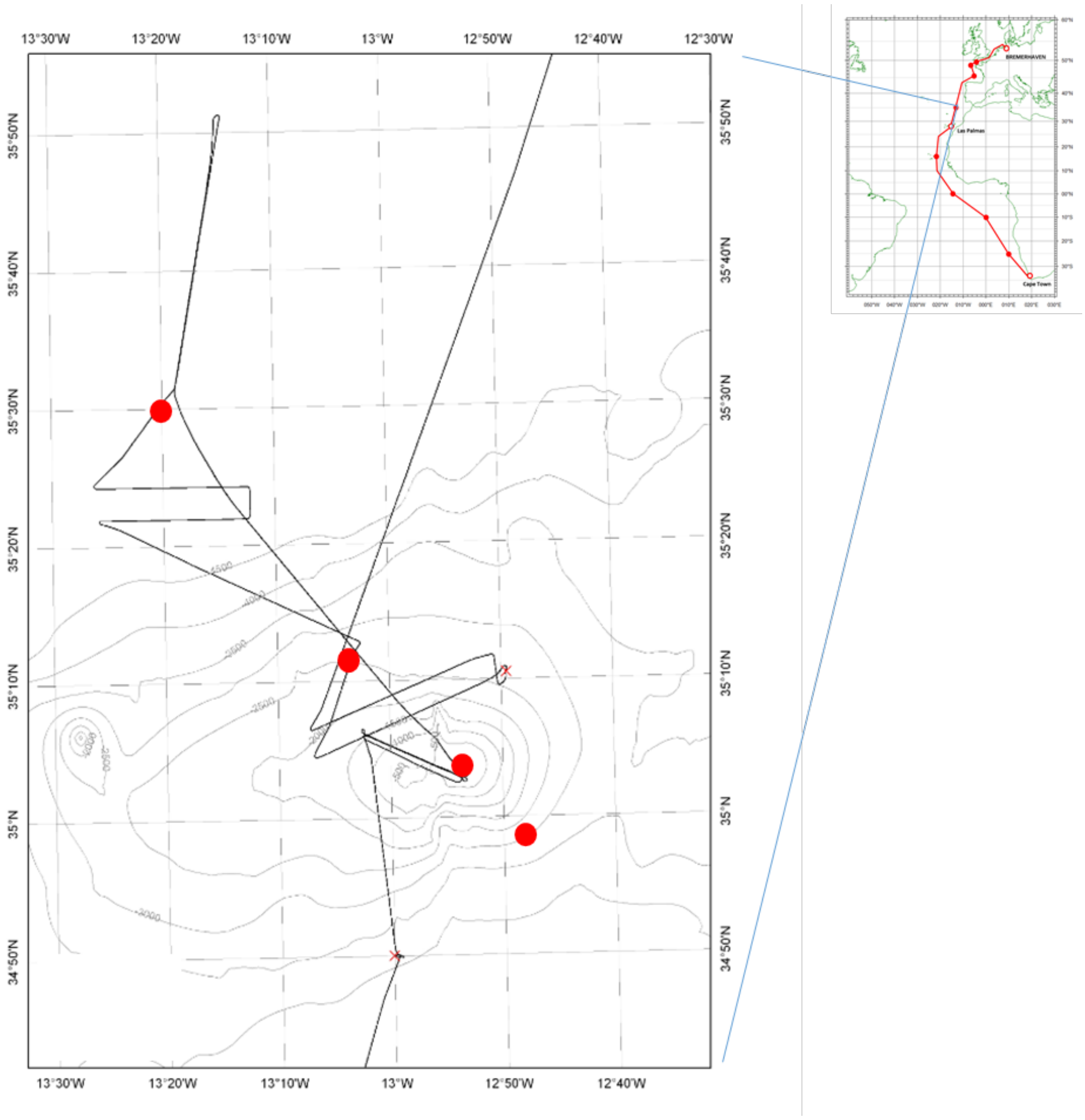

Fig. 3: Stations at the Ampére Seamount

Red dots = Plankton sampling at different location (Transekt from deeper water to the mountain and "behind" the mountain).

Black line = Course plot of Polarstern in 2014 for Posidonia calibration

48 h Station Calibration of hydro acoustic devices (Multi beam DSIII, Parasound)

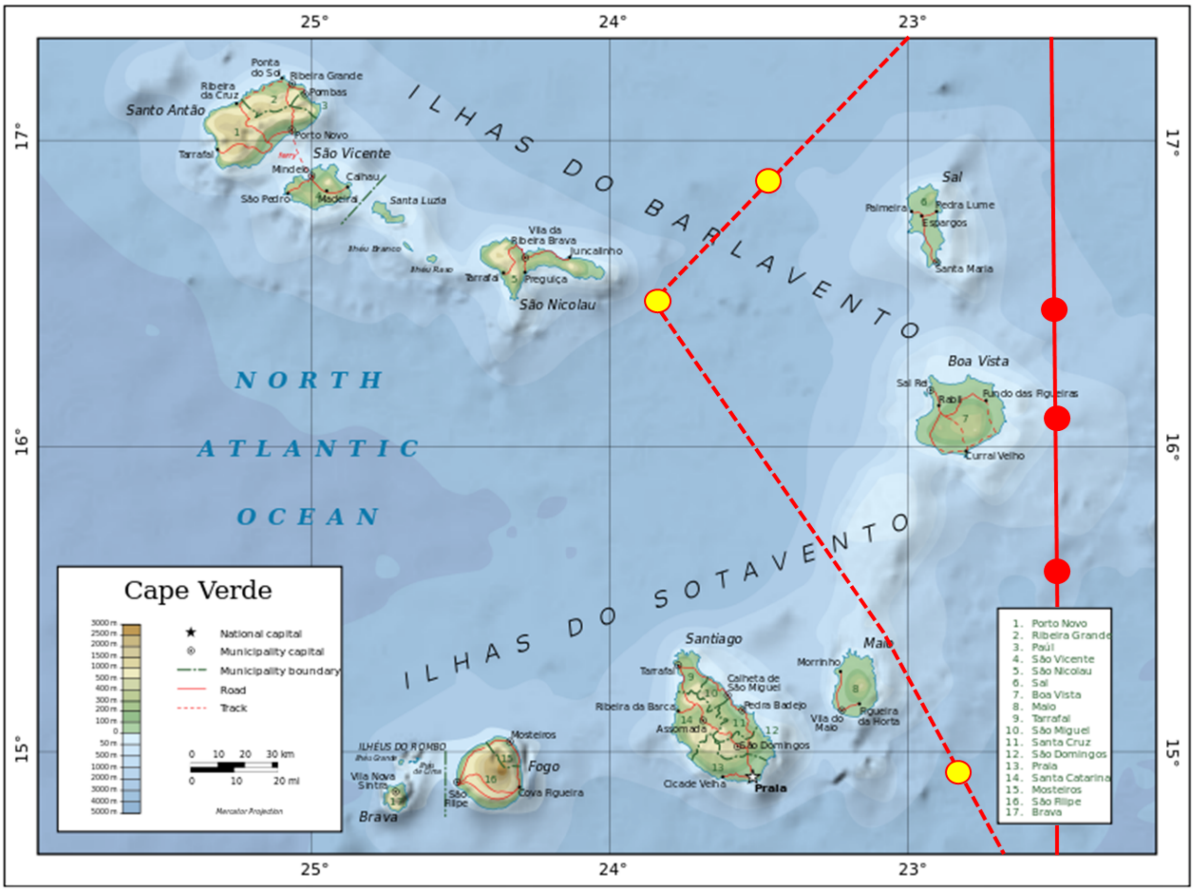

Fig. 4: Cape Verde
Two alternative sampling sites for plankton sampling and CTD measurements
And 24h Station to calibrate the hydro acoustic devices (EK60)

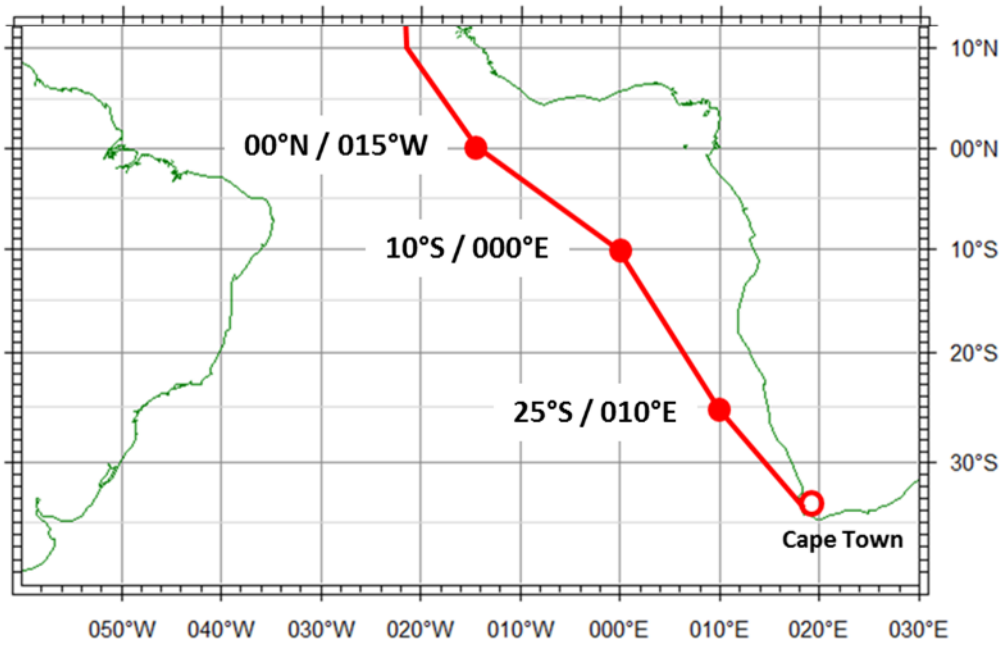

Fig. 5: Stations between Cape Verde and Cape Town

9. TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTIONS

	Address
AWI	Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung Postfach 120161 27515 Bremerhaven Germany
DWD	Deutscher Wetterdienst Geschäftsbereich Wettervorhersage Seeschifffahrtsberatung Bernhard-Nocht-Str. 76 20359 Hamburg Germany
FIELAX	FIELAX Gesellschaft für wissenschaftliche Datenverarbeitung mbH Schleusenstr. 14 27568 Bremerhaven Germany
FUB	FU Berlin Freie Universität Berlin Kaiserswerther Str. 16/18 14195 Berlin Germany
GMIT	Galway Mayo Institute of Technology Westport Road, Castlebar, Co. Mayo, Ireland
HCMR	Hellenic Center for Marine Research 46,7 km, 19013 Anavisso Greece
IHSM	Institute Halieutique et des Sciences Marines BP 141 - Route du Port Avenue De France Tuléar 601 Madagascar

	Address
IOW	Leibniz-Institut für Ostseeforschung Warnemünde Seestraße 15 18119 Rostock Germany
IST	Institute of Space Technology P.O. Box 2750 Islamabad 44000 Pakistan
IT Sligo	Institute of Technology Sligo Ash Ln Ballinode Co. Sligo Ireland
IUPA	Graduate Institute of fisheries and aquaculture Senegal
LAEISZ	Reederei F.Laeisz Zweigniederlassung Bremerhaven Bartelstraße 1 27570 Bremerhaven Germany
LMU	Ludwig-Maximilians-Universität München Geschwister-Scholl-Platz 1 80539 München Germany
MIG	Marine Institute Galway Rinville, Oranmore, Co. Galway Ireland
NUI	National University of Ireland Galway University Road Galway Ireland
QMUL	Queen Mary, University of London Mile End Rd London E1 4NS United Kingdom

	Address
SELNA	SELNA Beratungsbüro Forschungsschifffahrt Karkmeyer-Straße 3 28277 Bremen Germany
SYKE	Finnish environment institute (SYKE) Mechelininkatu 34a, Töölö, Helsinki P.O.Box 140, 00251 Helsinki Finland
TELEDYNE	Teledyne RESON GmbH Flughafenallee 28 28199 Bremen Germany
TROPOS	Leibniz-Institut für Troposphärenforschung e.V. (TROPOS) Permoserstraße 15 04318 Leipzig Germany
UALG	Universidade do Algarve Campus da Penha Estrada da Penha 8005-139 Faro Portugal
UBO	Université de Bretagne Occidentale 29 Avenue Georges Clemenceau 29200 Brest France
UCC	University College Cork Western Road Cork Ireland
UCT	University of Cape Town Private Bag X3 Rondebosch 7701 South Africa

	Address
UCY	University of Cyprus University House "Anastasios G. Leventis" 1 Panepistimiou Avenue 2109 Aglantzia Nicosia Cyprus
UG	University of Ghana P.O. Box LG 25 Legon, Accra Ghana
UHB	Universität Bremen Bibliothekstraße 1 28359 Bremen Germany
UHH	Universität Hamburg Mittelweg 177 20148 Hamburg Germany
UoB	University of Bergen P.O.Box 7800 5020 Bergen Norway
UNIST	University of Split Livanjska 5 21000 Split Croatia
UNN	University of Nigeria Nsukka Enugu State Nigeria
UoH	University of Helsinki P.O. Box 3 (Fabianinkatu 33) 00014 University of Helsinki Finland
UoS	University of Salzburg Paris-Lodron-Universität Salzburg Kapitelgasse 4-6 5020 Salzburg Austria

	Address
UP	University of Plymouth Drake Circus Plymouth Devon PL4 8AA United Kingdom
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10. FAHRTTEILNEHMER / CRUISE PARTICIPANTS

No	Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession	Disziplin/ Discipline
	Bremerhaven - Cape Town				
1	Abdullah	Muhammad	IST	Student	Biology
2	Alujevi	Karla	UNIST	Student	Biology
3	Annasawmy	Pavanee	UCT	Student	Biology
4	Auch	Dominik	UHH	Student	Biology
5	Bintoudi	Eleni	HCMR	Student	Biology
6	Boersma	Maarten	AWI	Scientist	Biology
7	Bohlmann	Staphanie	TROPOS	Student	Physics
8	Cosgrove	Sarah	NUI	Student	Biology
9	Demetriou	Monica	UCY	Student	Biology
10	DIABY	Almamy	IUPA	Student	Biology
11	Eglite	Elvita	IOW	Student	Biology
12	Evans	Lowri	QMUL	Student	Biology
13	Ginzburg	Michael	AWI	Scientist	Biology
14	Gkaragkouni	Maria	UCC	Student	Biology
15	Gonzáles Pech	Racœl Augusto	LMU	Student	Biology
16	Grimmer	Friederike	UHB	Student	Biology
17	Hanfland	Claudia	AWI	Scientist	Geo-Science
18	Heim	Birgit	AWI	Scientist	Geo-Science
19	Herenz	Paul	TROPOS	PhD student	Physics
20	Hovi	Minna	UoH	Student	Biology
21	Jerney	Jacqueline	SYKE	Student	Biology
22	Kaiser	Patricia	UHB	Student	Biology
23	Kajee	Mohammed	UCT	Student	Biology
24	Kanhai	La Daana	GMIT	Student	Biology
25	Keck	Therese	FUB	Scientist	
26	Knust	Rainer	AWI	Scientist	Biology
27	Kraberg	Alexandra	AWI	Scientist	Biology
28	Le Gland	Guillaume	UBO	Student	Biology
29	Lynch	Seàn	NUI	Student	Biology
30	Mahu	Edem	UG	Student	Biology
31	Maxwell	Hugo	UiB	Student	Biology
32	Mc Gee	Donal	IT Sligo	Student	Biology
33	McGrane	Pauhla	MIG	Scientist	
34	Merkel	Maik	TROPOS	Scientist	Physics
35	Miller	Max	DWD	Meteorologist	Meteorology

No	Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession	Disziplin/ Discipline
36	Mishra	Amrit Kumar	UP	Student	Biology
37	Mohale	Ngwako Rabodiba Adam	UCT	Student	Biology
38	Murphy	Rosemary	UCC	Student	Biology
39	Navarro Campoy	Ana	UALG	Student	Biology
40	Oguguah	Ngozi	UNN	Student	Biology
41	Poulain	Laurent	TROPOS	Scientist	Physics
42	Rasoloarijao	Zo Tsihoarana	IHSM	Student	Biology
43	Scheuffele	Hanna	UHB	Student	Biology
44	Sonnabend	Hartmut	DWD	Technician	Meteorology
45	Ward	Andrew	UU	Student	Biology
46	Welti	Andre	TROPOS	Scientist	Physics
47	Wenta	Philipp	UoS	Student	Biology
48	Wilson	Annette Margaret	NUI	Student	Biology
49	Wilsthire	Karen	AWI	Scientist	Biology
50	Wright	Amy	UCT	Student	Biology
	Bremerhaven - Las Palmas				
1	Albrecht	Sebastian	FIELAX	Scientist	Electronics
2	Gebhardt	Catalina	AWI	Scientist	Geo Science
3	Krocker	Ralf	AWI	Engineer	Geo-Science
4	Liebe	Thomas	LAEISZ	Scientist	Geo-Science
	Las Palmas - Cape Town				
1	Engelmann	Ronny	TROPOS	Scientist	Physics
2	Krägefski	Sören	AWI	Scientist	Biology
3	Lochte	Karin	AWI	Scientist	Biology
4	Merk	Daniel	TROPOS	Student	Physics

11. SCHIFFSBESATZUNG / SHIP'S CREW

	Name	Rank
1.	Wunderlich, Thomas	Master
2.	Spielke, Steffen	1.Offc.
3.	Westphal, Henning	Ch. Eng.
4.	Langhinrichs, Moritz	2. Offc.
5.	Kentges, Felix	2.Offc.
6.	Fallei, Holger	2.Offc.
7.	Pohl, Klaus	Doctor
8.	Hofmann, Jörg	Comm.Offc.
9.	Schnürch, Helmut	2.Eng.
10.	Buch, Erik-Torsten	2.Eng.
11.	Rusch, Torben	2. Eng.
12.	Brehme, Andreas	Elec.Tech.
13.	Ganter, Armin	Electron.
14.	Dimmler, Werner	Electron.
15.	Winter, Andreas	Electron.
16.	Feiertag, Thomas	Electron
17.	Schröter, Rene	Boatsw.
18.	Neisner, Winfried	Carpenter
19.	Clasen, Nils	A.B.
20.	Burzan, Gerd-Ekkehard	A.B.
21.	Schröder, Norbert	A.B.
22.	Hartwig-Labahn, Andreas	A.B.
23.	Kretzschmar, Uwe	A.B.
24.	Müller, Steffen	A.B.
25.	Gladow, Lothar	A.B.
26.	Sedlak, Andreas	A.B.
27.	Beth, Detlef	Storek.
28.	Plehn, Markus	Mot-man
29.	Klein, Gert	Mot-man
30.	Krösche, Eckard	Mot-man
31.	Dinse, Horst	Mot-man
32.	Watzel, Bernhard	Mot-man
33.	Meißner, Jörg	Cook
34.	Tupy, Mario	Cooksmate
35.	Möller, Wolfgang	Cooksmate
36.	Wartenberg, Irina	1.Stwdess
37.	Schwitzky-Schwarz, Carmen	Stwdss/KS
38.	Hischke, Peggy	2.Steward

	Name	Rank
39.	Duka, Maribel	2.Stwdess
40.	Chen, Tingdong	2.Steward
41.	Hu, Guo Yong	2.Steward
42.	Chen, Quan Lun	2.Steward
43.	Ruan, Hui Guang	Laundrym.