EXPEDITION PROGRAM ANTARCTICA

(ANT – Land 2013/2014)

STATIONS AND FLIGHT MISSIONS

NEUMAYER STATION III

KOHNEN STATION

Flight Missions

DALLMANN LABORATORY

Other Activities

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November 2013

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1. NEUMAYER STATION III

1.1 Summary

The season ANT-Land 2013/2014 is scheduled for the period from 14 November 2013 until 25 February 2014.
Most of personnel will be flown into the Antarctic and back via the air link from Cape Town within the frame of Dronning Maud Land Air Network (DROMLAN). Ship calls are scheduled for RV POLARSTERN 29th of December 2013, to supply the majority of cargo, furthermore for SA AGULHAS II 10th of December 2013 for supply of Kohnen Station and fuel for NEUMAYER STATION III and aircraft operations. Begin of February 2014 second call for loading cargo returning to Germany.
Port call of Ernest Shackleton will be around 18th of December taking over 2 Pistenbully vehicles and one sledge for a joint German-British scientific Project on Filchner Shelf Ice.

NEUMAYER STATION III has successfully run its wintering period.
The main logistic objectives of the season 2013/2014 on the Ekström Ice Shelf will be the technical operation of NEUMAYER STATION III. Logistics will focus on two periods of lifting of the station. Furthermore a construction team will be onsite for maintenance of the station facilities.
In the vicinity of NEUMAYER STATION III one scientific project takes place during the summer season.
Medical studies of the Berlin Centre for Space Medicine (ZWMB) and University of Munich (LMU) will be continued and extended by the station staff during the winter period.

In parallel station facilities will be used to support the traverse to KOHNEN STATION, furthermore to operate the Basler BT-67 aircraft POLAR 6. The regular weather forecast service (AWI/DWD) will be provided to all aircraft operations within the Dronning Maud Land region, in particular as a contribution to DROMLAN.

EKSEIS field party (6 scientists) performing reflection seismic measurements will take place on the Ekstroem Schelf Ice during the season 2013/2014.

KOHNEN STATION will be visited (7 technicians) for maintenance work such as lifting up the station. The station will be reached by aircraft. A traverse, to KOHNEN STATION including supply goods will start from NEUMAYER STATION III after port call of SA AGULHAS II. Furthermore the station acts as base for scientific field work of CoFiMet and for the COFI project.

In total 59 scientists, engineers, technicians and visitors will be working or temporarily staying at NEUMAYER STATION III.

- Maintenance works (4)

- Logistic operations (3)
- Flight Missions Polar 6 (6)
- Operation of scientific observatories (5)
- AWI scientific projects – field parties (8)
- AWI wintering staff (18)
- DWD weather forecast service (2)
- Maintenance of KOHNEN STATION (11)
- Public relations (0)
- National and international visits (2)

1.2 Operation of observatories

1.2.1 Meteorological Observatory

Holger Schmitthüsen (AWI), Lisa Behrens(AWI), Elena Stautzebach (AWI)

The meteorological observatory program at Neumayer III is planned to be ongoing. It includes:

- 3-hourly routine synoptic observations,
- daily upper-air soundings,
- weekly ozone soundings,
- continuous surface radiation and mast measurements,
- satellite picture reception (HRPT)
- monitoring of automatic weather stations

The meteorological observatory provides the necessary support for the forecast service for DROMLAN, aircraft missions and field parties. The meteorological observatory acts as the DROMLAN weather forecast centre.

During the summer season 2013 / 2014 the following activities are planned:

- Repair and maintenance of all other equipment of the meteorological observatory as necessary.
- Training of the winterers.
- Lifting of the meteorological field facilities.
- Support of the observatory with expendable goods, spare parts and new equipment.
- Disposal of the observatory of old or defective equipment.
- The scientific aim is a quantification of mesoscalic gradients.

1.2.2 Operational weather forecast service for DROMLAN

Max Miller (DWD), Harald Rentsch (DWD)

Since 2002/03 the meteorological observatory of the German Antarctic station Neumayer offers a detailed and individual weather forecast service for all activities in Dronning Maud Land. This service

is performed in close cooperation between the Alfred-Wegener-Institute for Polar and Marine Research (AWI) and the German Weather Service (DWD).
During the summer season 2013/2014 up to 5000 forecasts will be performed for field parties, ships, stations and especially aircrafts. It is obvious, that this service will increase the safeness of the ambiguous projects in the Dronning Maud Land. Furthermore, it will help to reduce weather induced idle times of expensive flight operations to a minimum.

1.2.3 Geophysical observatory

Tanja Fromm (AWI), Thedda Hänssler (AWI), Georg Spiekermann (AWI), Johannes Lohse (AWI), Daniel Armbruster (AWI),

Period:	December 2013 – February 2014
Project:	Service works at remote seismographic stations
	Service works Geophysical Observatory
Scientific leader:	Tanja Fromm (AWI)
Area:	NEUMAYER STATION III, Dronning Maud Land (DML)

Scientific activities reports

Seismology

The primary objective of the seismological observatory at Neumayer-III is to complement the worldwide network of seismographic monitoring stations in the southern hemisphere. This contribution is of special importance as this network is rather wide meshed in Antarctica. Local seismographic networks of changing size and shape have been operated at Neumayer stations since the very beginning. In its current design it comprises the seismic station VNA1 in the geophysics observatory and the two remote seismic broadband stations VNA2 and VNA3 on the Ice Rises Halvfar Ryggen and Søråsen. Still unique in Antarctica is the small aperture detection array with 15 vertical seismometers placed on three concentric rings with a total diameter of almost 2 km at station VNA2. This array is a powerful tool for monitoring seismic activities in a local to regional distance range. In addition to this local seismographic network at Neumayer-III we are operating some other seismographic broadband stations which complement our local network. These stations are designed to run autonomously. Because of difficulties to provide continuous 12V DC power at these very remote sites there is the risk of substantial recording gaps during winter when solar energy is not available. However, we are trying to minimize or to eliminate these gaps in the near future by a more sophisticated power supply. The additional remote stations are located at the Swedish summer camp SVEA, at Weigel Nunatak close to the traverse track to Kohnen Station and at Kohnen Station itself. We apply for the permission of another year of operating this broadband station at Novolazarevskaya where continuous mains power from is provided.

One of the main tasks in austral season 2012/13 is still to solve the power problems during winter at the array site at station VNA2 on Halvfar Ryggen. We will check and eventually repair the 2 installed Twister T-300 windturbines. Additionally we will install a third windturbine to improve redundancy in case of failure of any other windturbine. For this the seismic container at the array will be towed to Neumayer Station because mounting the heavy post for the new turbine and improving the electric power supply is much easier as at the array site. At the array site the seismometer cables in the 15 pipes wherein the vertical array seismometers are installed must be prolongated to ensure access to the preamplifier units also in future years.

Remote station VNA3 on Søråsen ice rise should be serviced in 2012/2013 during the same service trip to station VNA2. Here we probably have only to dig out the electronics and battery boxes and the seismometer and to reinstall them again (annual snow accumulation here is approx. 3 meters).

The autonomous seismographic station at Weigel Nunatak will be serviced by members of the traverse team going up to Kohnen Station. It should be prepared for another year of operation.

At Kohnen Station the seismographic station had been moved from the former clean air chemistry container inside the science trench at the ice core drilling site. Deep inside the science trench temperatures do not drop that low during winter compared to a site outside the trench and close to the surface. Power supply will come from a wind generator and 2 solar panels mounted on a mast directly above the science trench. Recording boxes and seismometer will be deployed extremely thermally insulated and "cold hardened' to survive -45 C. We also installed another battery heating system.

The seismic station at Svea can only be serviced if Polar-6 is available for transport. The current recording situation is unknown. Eventually the equipment has to be exchanged completely or even removed until an envisaged modernisation of Svea's electrical power suppy and construction of a new seismometer vault will be finished in 2014/2015 summer season.

We applied for the permission to operate the seismic station at Novolazarevskaya for another year.

No service works should be necessary at the South African base Sanae-IV. The responsibility for the seismographic station there is now at CTBTO.

In 2013 we have been operating 3 more temporary seismic station on 2 crossing profiles over a destinct magnetic anomaly which is supposed to be caused by an ol volcano. Depending on the situation of available and operative recording systems we think about to carry on these passive seismic experiment with stations at different locations on other profiles.

At the base some more software work has to be done due to the installation of new Antelope release 5.3. The new wintering geophysicists will be further trained on this system during the summer campaign.

Geomagnetism

The new Geomagnetic Observatory at Neumayer-III was built during January and February 2009. It comprises a rather new 3-component flux gate sensor with a high dynamic range and a new Overhauser proton-magnetometer for recording total intensity. With this instrumentation high quality

geomagnetic field data can be sampled at a rate of 1 second. Calibrated recordings from March 2009 to April 2011 had been already transmitted to the World Data Center. We are applying to become a member of Intermagnet, an international geomagnetic cooperation.

To fulfil the requirements of Intermagnet we installed a second 3-component fluxgate system. This second system will also raise the redundancy. It is a Danish FGE magnetometer from DTU, Copenhagen. This new instrument had been installed outside the insulated container but still inside the geomagnetic observatory, mounted on top of a frozen in pillar (polypropylen sewage pipe) and covered by a polystyrol casing. Orientation of the sensor is parallel to magnetic North, so the second horizontal component will directly measure the declination. On a second frozen in pillar a refurnished Catl Zeiss 020A theodolite is mounted for manual determination of declination and inclination. Because these pillars are founded directly in the ice no small deflections from horizontal orientation should occur anymore by walking around. This was observed inside the insulated containment because its floor proved not being stiff enough against minor bending. Thus DI-measurements showed always some small errors resulting from transient deflections from the horizontal. For this reason baseline values for calibrating the fluxgate data showed a higher scatter than expected.

Participants

Name	First Name	Organization	Position/profession	Nationality
Fromm	Tanja	AWI	Geophysicist	Germany
Haenssler	Thedda	AWI	Geophysicist, winter 2013	Germany
Spiekermann	Georg	AWI	Geophysicist, winter 2013	Germany
Lohse	Johannes	AWI	Geophysicist, winter 2014	Germany
Armbruster	Daniel	AWI	Geophysicist, winter 2014	Germany

1.2.4 Air chemistry observatory

Rolf Weller (AWI), Kerstin Schmidt (AWI), Julia Regnery (AWI)

Period: January 2014 – February 2014
Cape Town: 10 January 2014
Cape Town: 20 February 2014

Area of activity: Neumayer Station 70°40.37'S, 08°12.26'W

Scientific activities report:

The main task of the Neumayer air chemistry observatory is to provide continuous, year-round as well as long-term data records for important gaseous and particulate trace components of the troposphere. Furthermore, the measuring program is also concerned with some aspects of the chemistry of snow and firn as well as the stratosphere and upper troposphere. The Neumayer air chemistry observatory

is one of only very few comparable clean air laboratories operated in Antarctica with an extensive scientific program, partly established since 1982. Since 1997 the air chemistry observatory is part of the GAW (Global Atmosphere Watch; http://www.empa.ch/gaw/gawsis) global station network. A main aspect of studying tropospheric chemistry in Antarctica is the need to interpret records of trace compounds found in firn and ice cores. Such records can be used to derive informations about climate, composition and chemistry of the paleo-atmosphere, provided atmospheric chemistry, the natural atmospheric nitrogen, sulfur and carbon cycling in the present and the physico-chemical processes of air to snow transfer are well characterised. On site, one of the nine over-winterer, usually an air-chemist or meteorologist is responsible for the observatory.

Apart from the routine measuring program, a broken nephelometer from the Finnish Meteorological Institute (FMI) will be re-installed after overhaul during the forthcoming summer campaign (2013/2014). Finally, there will be the usual maintenance operation at the Air Chemistry Observatory as well as training of the new air chemistry winterer.

1.2.5 PALAOA - the Perennial Acoustic Observatory in the Antarctic Ocean

Lars Kindermann (AWI), Rene Fontes (AWI), Dirk Zimmermann (AWI)

Period:	November 2013 – February 2014
Project:	Service works PALAOA
Scientific leader:	Lars Kindermann (AWI)
Area:	Neumayer-III

Since December 2005 the autonomous hydroacoustic observatory 20 km north of Neumayer III continuously records the underwater soundscape of the southern ocean. Close to the edge of the Ekström ice shelf a hydrophone array had been deployed into the water below the 100 m thick ice. Main purpose is the observation of marine mammals which produce underwater vocalisations; some of them are audible within a range of hundreds of kilometres. There is hardly a single minute during the year without the sound of some animals. Weddell, Ross, crabeater and leopard seals together with blue, fin, humpback, sperm, killer and probably Antarctic minke whales are present in the recordings. Additionally, a CTD collects oceanographic data from under the shelf ice and a GPS monitors the movement of the glacier itself.

Scientific Background

After several incidents of mass standings of whales after the use of (military) sonar during the last decades, the effects of anthropogenic noise to marine mammals are under worldwide investigation now. However, there are many open questions left; no agreement has been reached about even the order of magnitude of potentially dangerous sound levels which are still to be regulated internationally. Tenth of thousands of ships, oil exploration and increasing marine construction work have increased

the background noise level of the worlds oceans significantly during the last century and the long term effects to the broader marine life remain unclear. To balance the interests of shipping and other marine industries and the navies with the requirements for natural conservation international agreements will have to be reached based on hard scientific data. This unique observatory in the Antarctic ocean enables us to access the natural soundscape and its inhabitants in one of the last areas of the world which is mostly unaffected by human activities yet, providing important baseline data how the rest of the oceans may have sounded like in the times of sailing vessels. On the other hand, for a few days of each year the location is regularly visited by research vessels like Polarstern. This provides a repeated controlled exposure experiment, as we can directly monitor the reactions of the animals to this situation. The multi year long term data set collected so far is used in international collaborations to address several important questions within this context.

Field Work

The electronic recording equipment is hosted in a small container on a sledge at the "north pier". The observatory is operating autonomously and is powered by batteries which are charged mainly by solar and wind energy. A radio link connects the experiment to the AWI network, enabling remote operation from Bremerhaven and live data access. Necessary maintenance is performed on demand by the electronics officer of the Neumayer base. The Ekström ice shelf moves about 150 meters per year northwards and in the long term the same amount of ice breaks off. When PALAOA was constructed in 2005 at a distance of 1500 meters from the edge we expected a safe lifespan of 5 years. As the under ice instruments still deliver valuable data but are in no way accessible anymore we will try to extend the operation time of the current PALAOA setup as long as possible because redeploying new instruments would require a major logistic and financial effort. Due to a very large iceberg colliding with the "north pier" in 2010 and a major calving event in 2011 the distance from the container to the edge has shrunk to less then 500 meters now. Therefore the observatory has been relocated about 300 m to the south east and the pole-mounted cable tracks connecting the hydrophones will have been extended accordingly by the construction team. For season 2013/2014 no special field work is planned except routine maintenance.

1.3 Scientific projects

1.3.1 Neutron-Monitor and Muon-Telescope

Michael Walter (DESY), Harm Moraal University Potchiefstrom, South Africa)

Installation and data acquisition of a combined neutron monitor and muon telescope at the Neumayer station

Project summary

Installation of a mobile, lightweight Neutron Monitor which is easy-to-operate at the NEUMAYER STATION III. It would give new results for calibrating the long-term observations measured at the nearby Sanae, and for studying solar cosmic-ray events in greater detail.
In polar region the asymptotic cone of acceptance is very sensitive to the location and the geomagnetic activity. Thus the view cone at Neumayer is sufficiently different form that at Sanae allowing investigating in detail the onset phase of a Ground Level Event.
The installation of a muon telescope at the Neumayer station would allow comparing both measurement results for cross calibrations and would give a higher confidence of the results.

State of the art and relevant publications
Galactic cosmic rays are high-energy charged particles, mainly protons, doubly ionized helium, and other fully ionized nuclei originating in the galaxy and bombarding the Earth from all directions. They are a direct sample of material from far beyond he solar system. Measurements by various particle detectors have shown that the intensity varies on different timescales, caused by the Sun's activity and geomagnetic variation. The role of Interplanetary Coronal Mass Ejections (ICMEs) in causing Forbush decreases, and Corotating Interaction Regions causing recurrent decreases in the GCR intensity observed at Earth, has been well established since the last twenty years. However, these interplanetary disturbances cause space weather effects, which warrant a more detailed study. Most of the research on GCR intensity variations is based on the analysis of ground-based neutron monitors and muon telescopes. Their measurements as explained in what follows depend on the geomagnetic position, and the processes in the Earth's atmosphere.
Beside the modulation of cosmic rays in the heliosphere there are two possible lines of defence: while the atmosphere shields life against cosmic radiation uniformly, the Earth magnetosphere acts as a rigidity filter. Before the primary particles can enter the atmosphere they are subject to the deviations in the magnetic field in the vicinity of the Earth, and as a consequence the intensity of charged particles on top of the atmosphere is reduced with respect to interplanetary space.

1.3.2 SPOT – Single Penguin Observation and Tracking

Daniel P. Zitterbart (AWI), S. Richter, W. Schneider, B. Fabry (Uni Erlangen)

This project aims to understand the reorganization process in penguin huddles and the implications for social thermoregulation.
The Emperor penguin (Aptenodytes forsteri) is the only species that breeds during the austral winter. They endure temperatures below -35° C and winds up to 50 m/s. From their arrival at the colony until the eggs hatch, the males, who solely incubate the eggs, fast for about 4 months. To conserve energy and to survive, the penguins form huddles. It is crucial that the huddle structure is continuously reorganized so that time spent at the huddle periphery is limited. Penguins in a huddle are packed so tightly, however, that individual movements become impossible, reminiscent of a jamming transition in

compacted colloids. We recently discovered that penguins overcome jamming by moving periodically in large, coordinated clusters.
The dynamics of huddling has previously been studied by analyzing the temperature and light intensity pattern recorded with sensors attached to individual penguins.
However, for ethical and economic reasons, this approach can only be applied to a small number of individuals within the huddle. We therefore use a non-invasive approach by analyzing high resolution video footage.
In 2012/2013 we installed a remote-operated penguin observatory at Atka Bay Emperor Penguin Colony including hard- and software for fast image acquisition and real-time processing. The observatory is capable of detecting the whole huddle, as well as tracking the movements of thousands of individual penguins throughout the winter. An accurate count of animals within the colony and the size of individual animals will also be recorded, and together our data will help to estimate how the increasing environmental strain such as ongoing climate changes, thinning sea ice and reduced krill availability, is affecting Emperor penguins.
After one year of operations we will replace several cameras with new models which perform better in low light, and do maintenance and relocation of the observatory according to the lessons learned during winter 2013.

1.3.3 Long term measurement of the cosmic radiation component on different geological positions.

Long term test of in-house developed gamma dose rate probes under extreme conditions

Roger Luff (Bundesamt für Strahlenschutz)

The German Federal Office for Radiation Protection (BfS) is the competent institution in Germany to protect man and the environment against ionising radiation. BfS runs a nation wide ambient dose rate monitoring network since over 30 years. It comprises of about 1800 stationary gamma dose rate probes. The network technology is kept at state-of-the-art level through continuous development on soft- and hardware as well as on detector technology. This includes long-time test series under various environmental conditions, international data and technology exchange.

The ambient dose rate level is influenced by a number of natural phenomena. The main sources are precipitation of radon progeny products by rain and snow, attenuation of terrestrial radiation by snow cover and modulation of the cosmic component. In addition, artefacts from the detector system can occur which are modulated by environmental parameters like e.g. temperature. The sensitivity of the detector and the interpretation of the data is highly related to an understanding of all these effects.

The probe to be installed at the Neumayer-Station is the standard BfS probe equipped with 2 Geiger-Müller tubes for high and low count rates. It measures automatically and continuously the

environmental gamma dose rate in a wide range from some µSv/h up to 5 Sv/h. In general, it registers the radiation in a reference height of about 1 m above the ground to get the terrestrial as well as the cosmic component of the gamma radiation. Moreover the probe measures the temperature and the air pressure in the probe housing for quality insurance, error detection and to estimate the cosmic component. The Linux based microprocessor-controlled data logger stores the measurements of the probe, forms mean values and other statistical values of them and transfers the data via the AWI-network to the measuring and service centre in Germany. In case of electrical power outage the system runs up to three days on battery.

The research project at the Neumayer-Station is designed as a long term measurement series that consists of two different aspects as outlined below.

Project topic and goals

The research project at the Neumayer-Station is designed as a long term measurement series that consists of two different aspects as outlined below.

Global monitoring of cosmic radiation component
The cosmic radiation originating from the sun and from outer space is subject to a complex process of interaction with the earth's magnetic field and atmosphere. Most of this radiation is attenuated and only a small fraction reaches the earth's surface as ionizing radiation. At ground level, it contributes to the total measured local ambient dose rate between 15%-90%. It is modulated by atmospheric pressure, the solar cycle and, occasionally, by solar flare events. Dose rate probes of similar response to cosmic radiation at different latitudes will help to understand the characteristics of the temporal variability of cosmic radiation and to better separate these effects from other environmental parameters. In case of current solar flare events the data will help to assess the impact on the dose rate monitoring network. To compare the data according to the German (PTB) reference standard, in a further step, a second reference probe (Reuter-Stokes (high pressure ionisation chamber) or Automess (plastic-szintillator) may be installed next for shorter time intervals.

1.3.4 EKSEIS — Ekströmisen's englacial and subglacial seismic structure

Olaf Eisen (AWI)

The flow of the Antarctic ice sheet is controlled by processes occurring at its surface, at its base, and by the spatial variation of temperature-dependent rheological properties within the ice. The internal structure of the ice sheet represents an integrated memory of the interaction of these processes and properties, knowledge of which has key implications for unravelling its history and predicting its future behaviour. Likewise, the depth of the water column below an ice shelf is important to determine

ocean-ice shelf interaction. Subbottom sedimentary structure are a memor of past grounding line advances.

The projects aims at obtaining seismic data to deduce the following information:

- bathymetry below Ekströmisen
- englacial stratigraphy of Ekströmisen across its grounding line
- sub-ocean and subglacial stratigraphy underneath the Ekström ice shelf and upstream of its grounding line
- sedimentary and basement stratigraphy across the strong magnetic anomaly south of Halvfarryggen
- distribution of the crystal orientation fabric (COF), internal stratigraphy and related acoustic properties in and below the ice sheet at Halvfarryggen, Dronning Maud Land, Antarctica.

The project will employ AWI's intermediate-weight seismic vibrator "EnviroVib", explosive seismics in combination with air-pressure drilling (RAM) and low-frequency ground-penetrating radar (GPR). Accompanied by already available airborne profiles and complementing seismic data from 1994, 1997, 2010 and 2011, the data will allow to map ice and sub-ice properties. These provide the base for interpretation of past ice dynamic of Ekströmisen and Halvfarryggen, such as grounding-line changes, interaction of sub-glacial geology with the ice sheet and geological interpretation of bedrock history.

Seismische Messungen auf dem Halvfarryggen und Ekströmisen

Die Bewegung des antarktischen Eisschildes wird durch Prozesse an seiner Ober- und Unterseite, sowie durch die räumliche Variation der rheologischen Eigenschaften im Eis kontrolliert. Die interne Struktur des Eisschildes stellt ein integriertes Gedächtnis der Wechselwirkung dieser Prozesse und Eigenschaften dar, deren Kenntnis für die Entschlüsselung seiner Geschichte und der Vorhersage seines zukünftigen Verhaltens eine Schlüsselfunktion besitzt. Ebenso ist die Geomorphologie subglazialer Sedimente ein Archiv für die vergangene Bewegung des Eises. Die physikalischen Eigenschaften an der Unterseite sind maßgeblich als Randbedingung für die Eisdynamik von Bedeutung. Die Expedition hat die Detektion der makroskaligen Architektur der subglazialen Sedimentmorphologie und der Mächtigkeit der Wassersäule zum Ziel. Des Weiteren sollen die integralen Eigenschaften der Eisbedeckung (Anisotropie und räumliche Variation der seismischen Ausbreitungsgeschwindigkeit) bestimmt werden. Dazu werden reflex-ionsseismische und Radar-Verfahren angewandt, um die physikalischen Eigenschaften des Eises bzw. Beschaffenheit der Sedimente abzuleiten. Diese Messungen finden auf einem Profil auf dem Ekströmisen, der Übergangszone zum Schelfeis und im gegründe-ten Einzugsgebiet des Ekströmisen statt. Zudem werden seismische Messungen über einer magnetischen Anomalie ca. 100 km südlich den Halvfarryggens durchgeführt. Basierend auf den Erfahrungen aus früheren Expedition kommen zwei verschiedene Quellen zur Anregung von seismischen Wellen zum Einsatz: herkömmliche Sprengseismik sowie Vibroseismik. Der Großteil der Profile wird mit Vibroseismik (10-300 Hz) vermessen. Sprengseismik dient zur Ergänzung auf ausgewählten Abschnitten. Als Empfangseinheit

dient ein Schnee-Streamer. Komplementär zur Seismik werden an einigen Profilen oberflächennahe Bodenradarmessungen durchgeführt.

1.3.5 Consequences of longterm-Confinement and Hypobaric HypOxia on Immunity in the Antarctic Environment at NEUMAYER STATION III (CHO2ICE@NMIII)

Alexander Chouker (University of Munich) Hanns-Christian Gunga (University of Berlin, Charité) et al.

The recently published research reports indicate that health and the immune system are affected under conditions of confinement in the pole regions. Beside the consequences of confinement, altered day night cycles and severe physical challenges on stress-dependent immune-modulation may add to alter immunity (e.g. also through hypobaric hypoxia).

Objectives

In the unique environment of the NEUMAYER STATION III, stress- dependent immune-modulation can be investigated and compared to conditions at the Concordia (3200m) where hypoxia is an additional stressor as shown in the context of the recently completed European study CHOICE (Consequences of long term-Confinement & Hypobaric HypOxia on Immunity in the antarCtic Environment), allowing for the first time to investigate the effects of hypobaric hypoxia and confinement on the immune system in a standardized fashion.

Methodology

This study will get advantage of the experience of on-going and future Antarctic, space-related studies as well as in clinical setting to understand the interaction of stress & immunity on a multinational collaborative scale, using a battery of parameters from blood, saliva, urine as well as new innovative tools.

Conclusions

CHOICE@NMIII project in conjunction with the investigation on CONCORDIA- Station will increase knowledge on the physiological adaptation of humans´ health and immunity during long-term confinement without or with hypobaric hypoxia. Because both confinement stress and various oxygen tensions are major variables affecting any cells´ function and hereby impacting health and immunity, the Antarctic missions are of high significance for the future expeditions as well as for Space application, as both appear to be of comparable nature.

State of the art and relevant publications

The vulnerability of totally confined subjects is a concern which needs to be considered when planning health care and health monitoring during long-term space flights, manned lunar exploration and potential future “extraterrestrial” settlement. Medical statistics of Antarctic wintering-over teams in the last 50 years show that up to 3 medical consultations per subject occur mostly for surgical, internal medicine (~60%) or dermatological reasons (7-17%) [H. OHNO, Japanese Report on Antarctic Medical Program and Research, 2004], reflecting health consequences of confinement in the

Antarctic. There is a need to understand these alterations of health under extreme living conditions that might result from confinement-associated neuroendocrine, stress-associated modulation of immunity due to the complex environmental challenges alike those that can be mirrored on earth by confinement of a wintering group in Antarctica.

State of the art and preliminary work including publications

Currently two publication for the Concordia mission are in preparation. Abstract and oral presentation at the “Life in Space for life on Earth Symposim” 2012 in Aberdeen. “Consequences of longterm Confinement and Hypobaric Hypoxia on Immunity in the Antarctic-Concordia Environment (CHOICE)”: A hypoxia controlled field study to prepare for manned exploration class mission M Feuerecker, BE Crucian, AP Salam, D Schmitt; RP Stowe, M Moreels, SK Mehta, C Strewe, A. Martignoni, R Quintens, I. Kaufmann, G Schelling, HC Gunga, S Baatout, M Thiel, DL Pierson, CF Sams and A Choukèr

Abstract and poster presentation at the „Human in Space“ Kongress, Houston, 2011: Early adaption in the Antarctic environment at Dome C: consequences on stress –sensitive innate immune functions. M. Feuerecker, F. Muckenthaler, U. Thieme, B. Crucian, A. Salam, A. Rybka, I. Kaufmann, C. Sams, G. Schelling, M. Thiel, A. Choukèr.Abstract and poster presentation at the „Human in Space“ Congress, Houston, Februar 2011: Characterization of an in-vitro-DTH test to monitor cellular immunity - applications for patient care and space flight. M. Feuerecker, W. Mayer, M. Gruber, I. Kaufmann, F. Muckenthaler, R. Draenert, M. Hörl, S. Matzel, G. Schelling J.R. Bogner, B. Crucian, M. Rykova, M. Thiel, B. Morukov, C. Sams, A. Choukèr

Abstract und oral presentation at the 49.Jahrestagung der Deutschen Gesellschaft für Luft-und Raumfahrtmedizin DGLRM. Sinsheim 08.-10. September 2011. From Hypo- to Hyperoxia: the role of Oxygen in Inflammation. A. Martignoni, I. Kaufmann, M. Thiel & A. Choukèr

Project topic and goals

The goals of the planned project can be summarized as follows:

- 1) Assessment and understanding of stress-associated immune changes that result from confinement living and/or under mild hypobaric hypoxia comparable to the living situation in future lunar habitats where air pressure and oxygen may be lowered for technical reasons.
- 2) Workout for the rationale for the development of adequate countermeasures to counterbalance the potential risk of confinement and hypoxia-induced immune and health changes
- Deliverables
- During wintering over, blood, saliva, and urine collection occurred before and after the mission as well as during the isolation period. The immune tests included e.g. peripheral leucocyte distribution, innate and adaptive immunocyte functions when challenged with receptor

dependent or independent agents as well as the Herpes virus replications as a marker of immune dysfunction. Complementary stress questionnaires will be assessed.

1.4 National and international visits and inspections

1.4.1 International Visits

In the frame of CCAMLR Dr. V. Bizikov of Russian Federal Institute of Fisheries and Oceanography joins RV Polarstern on leg ANT XXIX/9 and will visit Neumayer Station III to use flight connection to Cape Town.

1.4.2 International Inspection

No information.

1.5 Scientific projects during wintering

1.5.1 Human Physiology at Neumayer Station III – Campaign 2014

Alexander Stahn, Mathias Steinach, Hanns Christian Gunga (ZWMB Berlin, Charite), Eberhard Kohlberg (AWI), participants wintering team 2014 (AWI)

For more than five years the Alfred Wegener Institute for Polar and Marine Research (AWI) has now been closely cooperating with the Center for Space Medicine Berlin (ZWMB). The aim of this partnership is the field based investigation of changes in human physiology under extreme environmental conditions such as altered circadian rhythms, isolation, confinement and cold. These studies are of very remarkable character, because they do not correspond to an artificial laboratory situation, but imply the chance to monitor human performance under real life conditions. In particular, this project is of importance to space medicine because overwintering in the Antarctic has various analogies to a long-term space travel such as isolation, confinement and extreme environmental conditions and the derived knowledge from this research could have important implications for space medicine, space physiology and living and travelling in extreme environments. Furthermore, some of this research could also have significant impact for basic research under terrestrial conditions and even the clinical setting and as new mechanisms underlying the regulation of the human body could be detected.

During the overwintering campaign 2014 the following experiments are planned:

- Circadian Rhythm (ZIRKA),
- Metabolic Rate (MR),
- SenseWear (SW),

- Body Composition (BIA),
- Autonomous Nervous System (ANS),
- Biomarkers (BM), and
- Cognitive Function (CF).

SW, BIA, ANS, and BM have made a long-standing contribution to the understanding of changes in body composition, energy balance, and regulation of the cardiovascular and hormonal system during overwintering in the Antarctic. Except for BM, requiring a small venous blood sample, all of these experiments are non-invasive, require minimal to moderate time, and are easy to operate. These experiments have been successfully completed and are presently being analysed. Previous campaigns have shown diametrically adverse effects of overwintering on body composition in men and women. In addition, Vitamin D as an example of the experiment BM, affecting the remodelling of bone, neuromuscular function and inflammation, have been shown to be decreased to detrimental levels since 2010. In addition, both body composition and vitamin D seem to be significantly affected by the dark phase during the Antarctic winter. Similar results have been previously shown for other biomarkers (e.g. erythropoietin) during the campaign 2009. While the decrease in vitamin D could have been expected due to its light-sensitive synthesis, the degradation far exceeded of what would have been expected. Given the field-physiologic character of these studies, however, it remains to be determined whether these results can be replicated in other overwintering crews. It is therefore of crucial importance to continue all of these experiments. Furthermore, given the increasing role of hormones and proteins in the understanding of body composition and cell proliferation, differentiation and apoptosis, it is intended to promote the means to increase the number of biomarkers being investigated during overwintering at NEUMAYER STATION III.

Since 2011 the test battery was complemented by the experiments ZIRKA, MR and CF. ZIRKA promises to provide innovative and leading insights into the understanding of circadian rhythm. The experiment employs a hardware that allows a non-invasive core body temperature measurement for 36 h, allowing the characterization of the circadian timing system. The hardware has been now refurbished to meet the specific needs at NEUMAYER STATION III. The recording system is now smaller, connection cables are more robust, the recording device is less energy-consuming, the data download has been improved, and the device is smaller, lighter, more robust and much easier to operate. In addition, a special bag has been manufactured increase crew compliance. The knowledge of this experiment is expected not only to provide significant knowledge on the impact of isolation, confinement and altered day/night cycle on the circadian timing system, but also has significant practical implications by helping to improve physical exercise, rest- and work shifts as well as fostering adequate workplace illumination in the sense of occupational healthcare in future overwintering missions. In addition, these measurements will be of crucial importance for the ISS-project circadian rhythm and can serve as “reference data” during isolation under terrestrial conditions. Presently,

Concordia Station has also asked to use the technology for replacing rather invasive techniques for long-term temperature profiling.

The wintering 2011 was also complemented by two additional projects: MR and CF. Both projects will be continued. MR is intended to provide an excellent addition to the experiment SW as MR provides a measure of resting metabolic rate based on spirometry and gas analysis. Thus, the MR will be used to validate some of the data generated by SW-device (other indices provided by SW are presently also validated in another validation study being conducted in the laboratory).

CF aims at monitoring cognitive function during overwintering at NEUMAYER STATION III. Research from polar stations such as McMurdo station has shown that cognitive performance can be substantially affected during overwintering. For the first, a computer-based test battery has also now been employed that has been validated for tracking cognitive performance under extreme environmental conditions. Since cognitive function will excellently complement ZIRKA as well as BM and BIA – there seem to be close associations between circadian rhythm, cognitive performance, body composition, metabolic rate and even physical activity, it is clearly intended to carry out the experiments ZIRKA, SW, MR, BIA, BM and CF in 2014. It is specifically the respective influences of each of these experiments and their synergistic impact that will powerfully contribute to the understanding of human physiology in extreme environments as well as the clinical setting.

In addition to changes in hardware and software, a detailed, comprehensive documentation of each single experiment is used to implement successfully the entire project. Furthermore, all crew members were invited to the ZWMB for baseline testing in body composition and BM as well as to introduce all of the experiments and provide a better understanding of the background and objectives of the project.

Finally, some of the experiments will also be carried out at the South African National Antarctic Expedition (SANAE) base. This is the success of the collaborative efforts between the South African National Antarctic Programme (SANAP), the South African Dept. of Environmental Affairs, Stellenbosch University, the Alfred Wegener Institute for Polar and Marine Research (AWI), and the Center for Space Medicine Berlin at the Charité University Medicine Berlin. This partnership will not only enhance the number of subjects being monitored in the Antarctic, but also allow promote comparisons between different environmental conditions in the Antarctic (e.g. NEUMAYER STATION III at sea level vs. SANAE at 846 m above sea level) as well as between different nations, cultures, and teams. Given the real-world character and exciting research opportunities, the cooperation with SANAE and NEUMAYER STATION III will continue and extend to take a central research focus at the ZWMB of the University of Berlin.

2. KOHNEN STATION

2.1. Summary

Station leader Andreas Frenzel

The season ANT-Land 2013/2014 is scheduled for the period from 23 November 2013 until 29 January 2014.
Most of personnel will be flown into the Antarctic and back via the air link from Cape Town within the frame of Dronning Maud Land Air Network (DROMLAN). KOHNEN STATION will be operated for logistics and maintenance work such as lifting up the station, furthermore for hosting scientific projects (see below). The station also serves as base for the scientific flight missions of POLAR 6.

2.2 Scientific Projects

2.2.1 Coldest Firn and Associated Projects (CoFi & CoFiAP)

Sepp Kipfstuhl (AWI) et al.

CoFi and CoFiAP investigate the evolution of the snow pack, the firnification and the air entrapment on the Antarctic Plateau, the relationship between impurities and microstructure, how the seasonal climatic and environmental signals develop under the depositional conditions at Kohnen and and how the radiation properties (e.g. albedo) of the snow are linked to the microstructure of the snow. We intend to drill shallow ice cores at Kohnen for firn gas sampling (~120 m), on the ice divide 100-200 km east of Kohnen (CoFi1: 200 m), in the closer vicinity of Dome Fuji (CoFi5/6) and at the S81 Recisl fuel camp. At Kohnen Station the temperature of the shallow boreholes (B34-52) will be logged in the beginning. Snow samples for isotopes and impurities will be taken during the entire field season. In collaboration with G.Birnbaum (CoFi-Met) the link between radiation and microstructural properties of the snow surface are studied. The ice cores drilled at CoFi2 and CoFi4 during the last season have to moved to Kohnen/Neumayer. Up to 10 people will work at Kohnen from about 25.11.2013-10.02.2014. As special support requested are a Pistenbulli and an ALCI plane to move the drill team to the drill site and bring back the ice cores.

Project topic and goals

Project topic is the effect of snow deposition on the formation of the seasonal signals in the firn and the microstructural properties of the snow from the surface to the firn-ice transition. A special topic this season is the link between the specific surface area (SSA) and albedo of surface snow. At Kohnen one goal is a comprehensive snow sampling program performed at various locations (5 or more; daily samples; top 1 m; entire season) to find out how the summer signals form and develop over the summer season. A second goal is to drill a shallow core (up to 120 m depth) for firn gas sampling (2 weeks) to better understand gas transport and diffusion in firn and to log the temperature of all shallow boreholes (B34, B37, B40 to B52) to reconstruct the most recent temperature evolution independent from the isotopes in the ice. The main CoFi goal is to continue drilling two 200 m cores on the ice divide in the vicinity of Dome Fuji to get the coldest firn from the highest elevations at potential drill

sites for the IPICS “Oldest Ice Core” planned to be drilled within the next 5-100 years. Another 200 m core is planned at the S81 fuel depot camp, where the elevation is only 2000-2500 mNN, to use the infrastructure existing next season.

2.2.2 Coldest Firn – Meteorology

CoFi-Met (in situ ground based measurements)

Dr. Gerit Birnbaum (AWI), Tim Carlsen (Leipzig Institute for Meteorology (LIM), University of Leipzig)

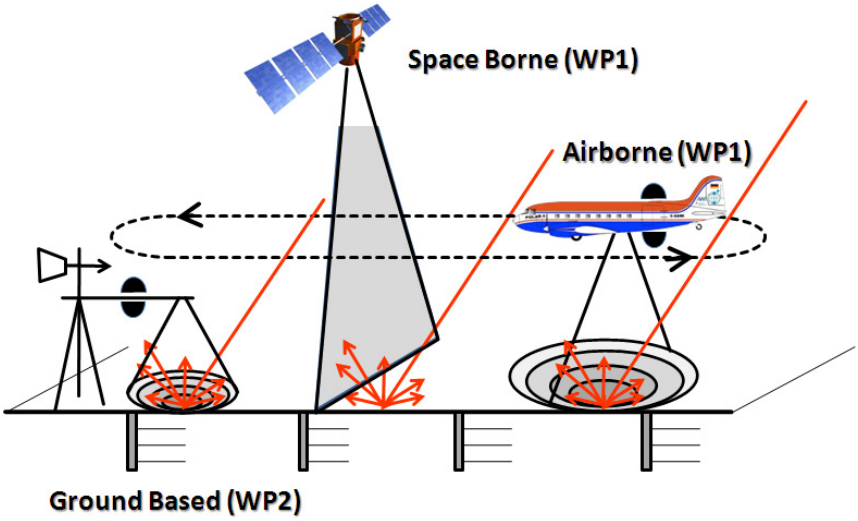
Project partners:

Leipzig Institute for Meteorology (Prof. Manfred Wendisch, Dr. André Ehrlich, Tim Carlsen)

AWI (Dr. Gerit Birnbaum, Dr. Sepp Kipfstuhl, Dr. Gert König-Langlo, Dr. Andreas Herber, Dr. Christof Lüpkes)

We will investigate, benchmark and improve the current knowledge on radiative properties of snow in the Antarctic by using broadband, spectral and multi-spectral measurements of surface reflectivity. Additionally radiative transfer simulations in combination with prognostic snow models will be applied to study the temporal evolution of snow radiative properties depending on the aging of the snow. These data and simulations will help to quantify how surface albedo and consequently the energy budget of the Antarctic ice sheet depend on microphysical and macroscopic snow properties and on the state of the atmosphere.

To obtain a full view of the surface properties, ground based measurements at Kohnen Station and airborne measurements over Dronning Maud Land will be coupled as illustrated in Figure 1. As none of these two methods for its own can combine high spatial and temporal coverage of the Antarctic surface, only a combination of the methods will allow obtaining reliable data. Identical radiometric calibration of both instrument sets and detailed airborne sampling of the ground site will, however, allow linking both data sets.



Satellite Data (WP1)	
Surface albedo	Retrieval

Airborne Data (WP1)	
Surface albedo	In situ
Surface BRDF	In situ
Surface roughness	Retrieval
Grain size	Retrieval

Ground Based Data (WP2)	
Surface albedo	In situ
Surface BRDF	In situ
Grain size profile	In situ
Surface roughness	In situ
Meteorology	In situ

Figure 1: Illustration of measurement strategy including ground based (work package WP2), airborne (WP1) and space borne (WP1) measurements of optical and microphysical surface characteristics. (Illustration by A. Ehrlich)

By use of measurement data and radiative transfer and snow model simulations, the main objective is to quantify the relations of snow microphysical and macroscopic properties to snow albedo and the bidirectional reflectance distribution function (BRDF) and to implement these into models to improve simulations of the radiation balance for snow surfaces in Antarctica.

Measurements of snow microphysical properties, namely of the specific surface area and the density of snow, will be performed by our partners in the framework of the project “Coldest Firn”.

The meteorological observation programme at Kohnen will consist of the following elements:

1) We will continuously operate upward- and downward-looking pyranometers and pyrgeometers. Data will allow deriving time series of the broadband surface albedo and of the surface radiation balance. Simultaneously, the compact radiation measurement system (CORAS) will be operated at the same location to derive a time series of spectral surface albedo in the wavelength range between 350-2100 nm.
2) The continuous operation of an automatic weather station (AWS) will provide time series of surface pressure, temperature, relative humidity, wind speed and direction. Turbulent surface fluxes of momentum will be calculated based on ultra-sonic anemometer measurements. The vertical profile of temperature in the snow and firn will be measured by sensors placed between the surface and 10 m depth with the highest sensor density in the uppermost 50 cm.

3) Surface structures like small ripples and dunes have a non-negligible impact on the surface albedo. To estimate the quantitative influence of these effects, we will install two digital cameras and use photogrammetric methods to estimate the dimensions of macroscopic roughness structures.
4) To estimate snow BRDF, a downward-looking digital camera with a 180° field of view fish-eye lens will be operated.
5) Hourly, synoptic observations on cloud cover and types and significant weather conditions (e.g., precipitation, drifting or blowing snow) will be performed. Accumulation will be estimated from data of a sensor, which continuously measures the distance to the surface. A comprehensive analysis of accumulation events is vital for the interpretation of temporal changes in specific surface area and hence, in surface albedo and BRDF.
6) Although the content of dust and black carbon in the snow at Kohnen is expected to be negligible low, we will take snow samples from shallow snow pits (50 cm deep) five times during the 2-month measurement period to check this assumption.
7) The operation of a sun-photometer will allow retrieving aerosol optical thickness.
8) Radio soundings will be performed four times a day at 00, 06, 12 and 18 UTC to derive vertical profiles of pressure, temperature, relative humidity as well as wind speed and direction. Those profiles are important input parameters for simulations of the radiative transfer in the atmosphere and an important basis for the analysis of precipitation events. Furthermore, the radio soundings will be used to validate so-called reanalysis data sets provided by weather centres like the European Center for Medium Range Weather Forecast (ECMWF). Since the number of manned and automatic weather stations is very limited in the inner part of Antarctica, meteorological forecasts and reanalyses often differ considerably from reality.

3. AWI FLIGHT MISSIONS AND DROMLAN

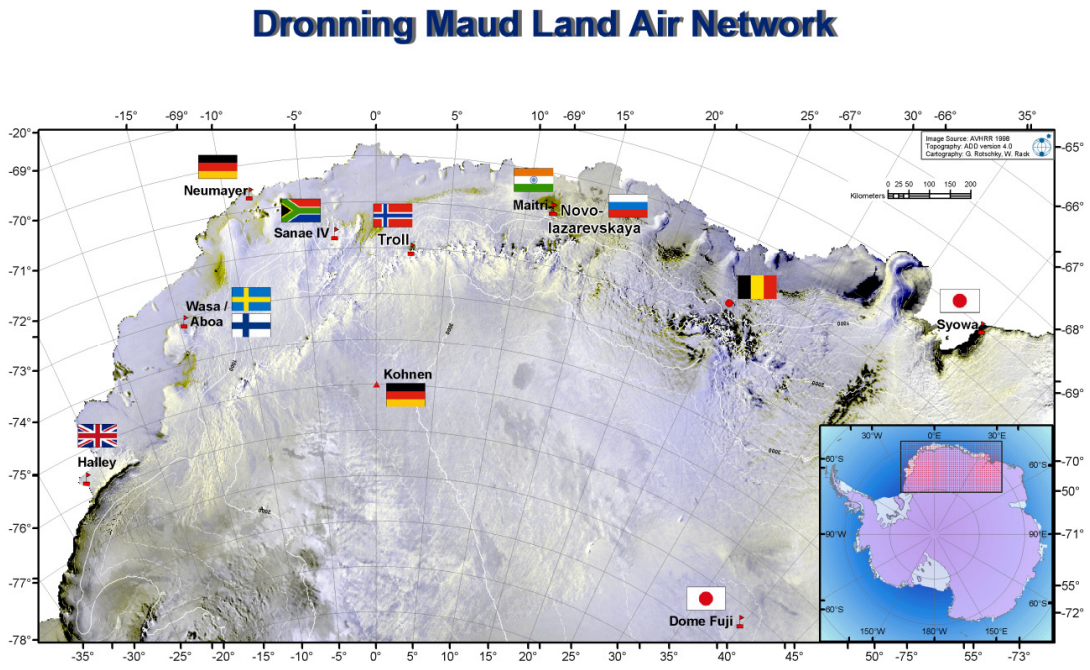
3.1 Dronning Maud Land Air Network (DROMLAN)

The aim of DROMLAN is to provide an intercontinental air-link from Cape Town to destinations within Dronning Maud Land (DML) to any member country of COMNAP and SCAR in science related activities, including logistics. This regularly operated air-link improves the accessibility and extends the time period for summer season activities. DROMLAN has been established as an international project by Belgium, Finland, Germany, India, Japan, Norway, Russia, South Africa, Sweden, The Netherlands, and UK.

Each summer season runways are prepared at NOVO Airbase close to the Russian station NOVOLAZAREVSKAYA and at the Norwegian station TROLL for landing of heavy aircraft. The runway at NOVO Airbase consists of compacted snow and is elevated about 500 m a.s.l. Because of surface melting this runway cannot be used for intercontinental flights from mid December until mid January.

The runway at TROLL STATION consists of blue ice at an elevation of about 1300 m a.s.l. Because of higher altitude this runway is operational for greater aircraft during the whole summer period. NOVO Airbase is operated by Antarctic Logistics Centre International (ALCI, Cape Town) in charge of the Russian Antarctic expedition (RAE).

Figure 2-1: Overview map of Dronning Maud Land Air Network.



The Norwegian Antarctic Research Expedition (NARE) maintains the runway at TROLL. The weather forecast for intercontinental and internal flight operations is organized at NEUMAYER STATION III (AWI, DWD). This service covers the region between HALLEY and SYOWA for all intercontinental and internal flights in the scope of DROMLAN.

Since the establishment of DROMLAN, the Antarctic Logistics Centre International (ALCI) as the logistic operator of the Russian Antarctic Expedition (RAE) organises and performs intercontinental flights with cargo aircraft Iljushin (IL-76TD) between Cape Town and NOVO Airbase every summer season. Internal feeder flights are performed with ski-equipped aircraft Basler (BT-67). The map shows destinations within Dronning Maud Land. DROMLAN members coordinate the feeder flights with ALCI and provide necessary services, fuel and facilities at their stations.

The number of flight missions depends on logistic and scientific requirements of the national programs. Every season DROMLAN generally aims to perform 9-10 intercontinental flights with connecting flights to various destinations.

In season 2013/2014, for DROMLAN altogether 9 intercontinental flights are scheduled with IL-76TD, between 12 Nov. 2013 and 25 Feb 2014.
The IL-76TD flights running via Novo Airbase and Troll are arranged by ALCI.
At TROLL runway flight management is arranged by NPI. Pre-flight assistance in Cape Town will be provided by ALCI for all DROMLAN intercontinental flights.
This season scientists, technicians and other personnel from 11 DROMLAN members are going to join the intercontinental flights. In total - including support personnel, pilots and others for NOVO Airbase - 287 persons will fly into Antarctica and 240 persons back. About 42 tons of cargo have to be carried in and about 19 tons out.

Table 2.2: DROMLAN intercontinental flight activities and AWI share.

DROMLAN intercontinental transport			**AWI share**	
Aircraft – number of flights	Persons in / out	Cargo (ton) in / out	Persons in / out	Cargo (ton) in / out
IL-76TD – 9 flights	287 / 240	42 / 19	62/ 63	12,9/ 9,0

The three BT-67 POLAR 6 (C-GHGF), MIA (C-GEAJ) as well as a chartered Twin Otter (KBAL) will carry out the feeder flights in Dronning Maud Land. ALCI coordinates and performs feeder flights according to the requirements for DROMLAN as well as for RAE activities at the Russian stations PROGRESS and VOSTOK.

3.2 DROMLAN operations for AWI

Altogether 62 scientists and technicians with about 13 tons of cargo will be carried from Cape Town to NEUMAYER STATION III, and 63 persons with about 9,0 tons of cargo back to Cape Town.

The following aircraft will perform logistic tasks of AWI personnel and cargo:
Iljushin (IL-76-TD) operated by ALCI for DROMLAN
Basler (BT-67) operated by ALCI (MIA) for feeder flights in the scope of DROMLAN and 1 (POLAR 6, AWI) for scientific and logistic tasks
Twin Otter chartered from KBAL
The detailed flight schedules are shown in chapter 5.

3.3 Logistic flight missions of POLAR 6

Logistic flights (approximately 20 flight hours):
Logistic flights are planned for the support of the maintenance of the external observatories of the NEUMAYER STATION III, exchange of flight personnel and transport of perishable provisions to KOHNEN STATION

3.4 Scientific surveys with POLAR 6

Airborne Geophysics with POLAR 6 in Antarctica: projects AMASIM, CoFi Met/Structure, DoCo, RecFil, RECISL, SAF, SWIT, VELMA, and WEGAS East

(Steinhage, Birnbaum, Eagles, Ricker, Binder, Gehrmann, Konrad (AWI); Carlson (U Leipzig); Behnisch, Fischer, Herrmann (Fielax))

In 2013/14 AWI's research aircraft POLAR 6, a Basler BT-67 on skis, will carry out survey flights for nine different scientific projects and logistic flights for DROMLAN, the maintenance of the remote observatories of the Neumayer Station, and moving ice cores of the CoFi project from Kohnen to Neumayer. In total are approximately 462 flight hours planned within a period of 135 days from beginning of October 2013 until end of February 2014 including the ferry to and from Antarctica.

In total five scientists, six engineers, and five crew are participating in the nine different projects. Supported by the several station and traverse teams. The scientific equipment and personnel for the planned missions will be flown in from Punta Arenas, Chile, by BAS to Rothera, respectively from Cape Town, South Africa, by DROMLAN. A preliminary schedule of the season is given in table aero.tab1.

Aero. table 1: Preliminary schedule of POLAR 6.

Begin	End	Project
12/Oct	25/Oct	Ferry to Rothera
26/Oct	13/Nov	VELMA & AMASIM, **Rothera**
14/Nov	18/Nov	Ferry Rothera – Novo, 2 days at **Halley** (SAF)
19/Nov	11/Dec	WEGAS offshore, **Davis**
12/Dec	17/Dec	DoCo, **Novo, Progress**
18/Dec	01/Jan	CoFi-Met/Structure, **Kohnen**
02Jan	04/Jan	CoFi Log (ice cores to **Neumayer**)
05Jan	31/Jan	RECISL, **FD81** (incl. re-configuration)
01/Feb	06/Feb	SWIT, & RecFil, **Halley**
07/Feb	09/Feb	De-installation, **Novo**

12/Feb	22/Feb	Ferry to Calgary

The instrumentation of POLAR 6 varies for the nine missions:
AMASIM, VELMA: Ice thickness radar, accumulation radar, ASIRAS, laser scanner, laser altimeter, nadir video and photo camera, IR thermometer, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
CoFi Met/Structure: Snow radar, accumulation radar, laser scanner, laser altimeter, pyrgeo- and pyranometer, albedometer, IR thermometer, zenith video, nadir photo camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
DoCo: Ice thickness radar, accumulation radar, laser scanner, laser altimeter, nadir video and photo camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
RECISL: Ice thickness radar, accumulation radar, magnetics, laser scanner, laser altimeter, nadir video and photo camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
RecFil, SWIT: Ice thickness radar, accumulation radar, laser scanner, laser altimeter, nadir video and photo camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
SAF: Laser scanner, laser altimeter, nadir video and photo camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
WEGAS East: Gravity meter, magnetics, laser scanner, laser altimeter, nadir video, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure), AIMMS20 probe.
On ground GPS reference and magnetic base stations will be set up during the surveys near the skiway from which POLAR 6 will be operated.

AMASIM (15 flight hours) (PI Hendricks et al.)
Airborne measurements of sea ice physical parameters including surface elevation (freeboard) shall be conducted over Antarctic sea ice to enable the exploitation of existing satellite data (e.g. CryoSat-2 & SMOS, European Space Agency) for sea ice mass balance monitoring in the southern hemisphere. The retrieval of Antarctic ice thickness by means of satellite radar altimetry (CryoSat-2) is currently hampered by the thick and complex snow cover, which is typical for Antarctic sea ice. To meet the goals of the project, we want to investigate the impact of physical snow properties on radar signals and the buoyancy of sea ice floes with combined laser altimetry and ASIRAS data.
Results of similar validation campaigns in the Arctic cannot be applied to Antarctic sea ice because of fundamental differences in the physical properties of sea ice and its snow cover between both hemispheres. Therefore, the AMASIM project will provide a vital validation dataset for satellite Antarctic sea ice mass balance estimates.

CoFi Met (40 flight hours) (PI Birnbaum at al.)

Within the project, we will investigate, benchmark and improve the current knowledge on radiative properties of snow in the Antarctic by using broadband, spectral and multi-spectral measurements of surface reflectivity. To obtain a full view of the surface properties, airborne measurements in Dronning Maud Land and ground based measurements at Kohnen Station will be coupled. As none of these two methods for its own can combine high spatial and temporal coverage of the Antarctic surface, only a combination of the methods will allow obtaining reliable data. While airborne instruments cover large areas but not frequently in time, ground based measurements have a high temporal resolution but are limited to a single observation area. Identical radiometric calibration of both instrument sets and detailed airborne sampling of the ground site will, however, allow linking both data sets. Additionally, the measurements will be accompanied by analysis of satellite observations which will a) be used to put the ground based and airborne data into context to the entire Antarctic and b) be validated by the airborne data. In this regard, the project links the local measurements and the up scaling issues by using a hierarchy of measurements, i.e., making local measurements and linking through aircraft measurements to high spatial measurements from space.

By use of measurement data and radiative transfer and snow model simulations, the main objective is to quantify the relations of snow microphysical and macroscopic properties to snow albedo and the bidirectional reflectance distribution function (BRDF) and to implement these into models to improve simulations of the radiation balance for snow surfaces in Antarctica.

Airborne measurements on board of Polar 6 will mainly provide information on the spatial variability of surface albedo, directional reflectivity, surface roughness and specific surface area of snow. The spectral modular airborne radiation measurements system SMART-albedometer will be used to derive spectral surface albedo in the wavelength range between 0.3-2.1 µm. The spectral resolution of the SMART-Albedometer is 2-3 nm for the 0.3-1µm wavelength range and 9-16 nm for wavelength above 1 µm and allows resolving the spectral features of snow albedo related to specific surface area of snow. In combination with the SMART-albedometer a digital single-lens reflex camera measuring multi-spectral solar radiance will be used to derive surface directional reflectivity. Furthermore, broadband pyranometers and pyrgeometers, a radiation pyrometer, a laser altimeter, a laser scanner and basic meteorological sensors measuring air pressure, air and surface temperature, humidity, and wind will be operated on Polar 6.

Proposed flight patterns include flights from near-coastal areas to the plateau investigating potential gradients in surface albedo, event-oriented patterns, e.g., after the passage of a synoptic system that led to precipitation only in parts of the flight region, and cross- and square-shaped patterns close to Kohnen Station to couple ground based and airborne measurements and to check the representativeness of albedo and BRDF measured at Kohnen Station. Flight time and pattern will also be planned to allow for a thorough comparison of airborne data to products retrieved from space borne observations.

DoCo East Antarctica (30 flight hours) (PI Steinhage):
The project Dome Connections in East Antarctica (DoCo) aims for radar sections connecting deep ice core drill sites in East Antarctica mainly following the ice divides between them (Dome Fuji, Dome A region, Vostok, Dome C, Talos Dome, see also figure aero.fig1) supporting interpretation of the deep ice cores. The ice divides between Kohnen and Dome Fuji with POLAR 2 as well as between Talos Dome – Dome – Vostok – Dome A with POLAR 5 have been mapped in the past. The larger endurance of POLAR 5 and POLAR 6 compared to POLAR 2 and the possibility to refuel at the former AGAP-N camp allows now to complete the survey and map the ice divide between Dome A and Dome F. The profiles will allow for the first time an independent correlation of the cores by tracing internal layers, isochrones, along the ice divides between the deep ice core drill sites. This survey will be conducted within 4-5 days in December 2013. The map in aero.fig1 shows the planned profile and those already flown.

RecFil (15 flight hours) (PI Steinhage):
This project aims to map the internal structure of the Filchner Ice Shelf (FIS) and the ice front West of Berkner island as a pre-site survey for a major glaciological survey on the ice shelf including hot water drilling and phase sensitive radio-echo soundings (pRES).

RECISL (100 flight hours) (PI Humbert & Steinhage):
It is planned to carry out 8-10 survey flights for the RECISL project operating from Kohnen station. The aim is investigate ice thickness and basal properties of the Recovery Glacier and contribution ice streams. The profiles are orientated along and across to the ice streams aiming for cross sections and basal roughness in flow direction. The data are necessary for improving the understanding of the sub-glacial processes of ice streams.

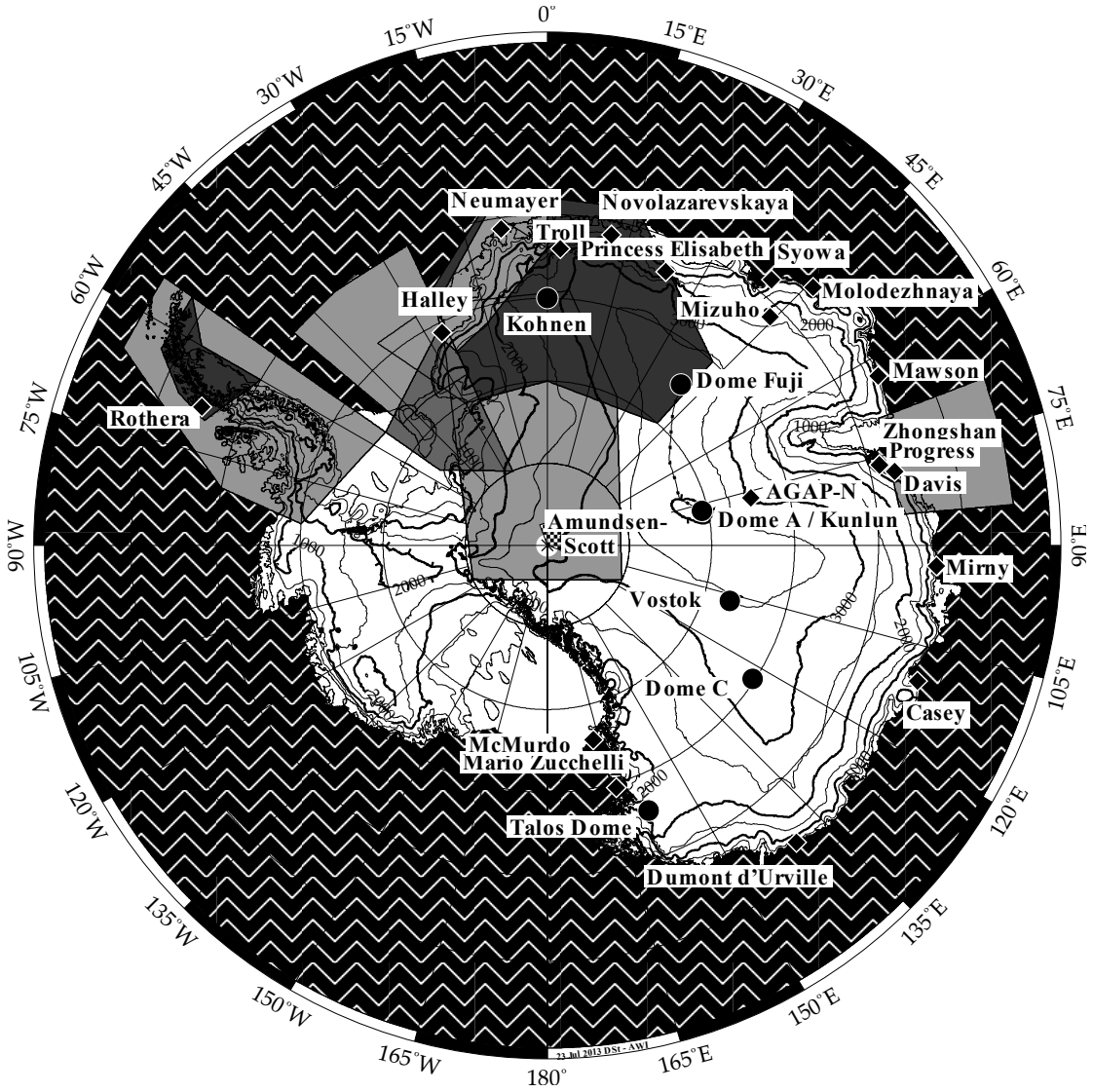
SAF (15 flight hours) (PI Bornemann & Plötz):
The project is closely related to RV *Polarstern* cruise ANT-XXIX/9 (20.12.2013 - 05.03.2014). These joint activities aim to investigate the Filchner Trough Area (Fig. aero.fig1, grey shaded region west of Halley) in a comprehensive approach. Here the outflow of ice shelf water of the Filchner Ronne Ice Shelf interacts with warm deep water of the Weddell gyre circulation. This interaction is supposed being the primary cause converting this area in a biological "hot spot" where upper and intermediate trophic level interactions maximise. Physical, biogeochemical and ecological studies in the target area shall characterize this "hot spot" in detail. This proposal concentrates on an aerial seal census survey based on photographic transects and parallel video footage over ice covered sea in order to get data on potential density gradients and density estimates for seals towards and within the area of the Filchner Trough.

SWIT (15 flight hours) (PI Kleiner & Humbert):
The intent of the project is to improve the knowledge about the geometry and the basal properties of the Stancomb-Wills-Glacier, Antarctica, by means of ice thickness radar. The information is essential for high-resolution flow dynamical modelling especially near the grounding zone, where the controlling processes take place on short length scales.

VELMA (25 flight hours) (PI Braun):
The project aims at improving mass flux estimates for Antarctic Peninsula glaciers, by combining data and analysis of the high-resolution national missions TerraSAR-X and TanDEM-X with airborne surveys in previously sparsely mapped areas. The satellite systems enable mapping of surface ice velocities and surface elevation (changes), however, inaccuracies arise from the variable penetration depth. The airborne data (laser scanning and ice thickness) will be used to quantify errors resulting from penetration depth of the X-band SAR data and to compute mass fluxes. CryoSat-2 data can also be validated with the data.

WEGAS East (100 flight hours) (PI Jokat):
For several decades it was well established that the separation India and Antarctica happened somehow in the early Cretaceous. Marine magnetic surveys reported to having identified Mesozoic spreading anomalies north of the Lützow Holm area close to the Gunnerus Ridge. An aeromagnetic survey conducted from the Japanese Antarctica Station Syowa proved this model wrong. No magnetic stripes were found. Instead of a separation some 130 Ma, it is now more likely to have occurred some 90 Ma. This has a dramatic consequences for the kinematic models and palaeo-topographic, faunal and flora interpretations. This project now aims to extend the existing survey off Enderby Land more towards the east. A corridor northwest of the Australian station Davis is chosen, where magnetic stripes might be existent based on few ship tracks in order to obtain data for testing present day hypothesis on the separation in this region.

Logistic flights and DROMLAN (approximately 30 flight hours):
Logistic flights are planned for the support of the maintenance of the external observatories of the Neumayer III Station, the support of the Coldest Firn project (CoFi), and within the DROMLAN project. The schedule for the feeder flights does not exist yet, as the planning for the flights between Cape Town and Novo airfield, respectively Troll Station has not been completed.



Aero. Fig. 1: Map showing the areas of investigation as dark grey regions, from west to east: AMASIM, VELMA, RecFil, SAF, SWIT, CoFi Met/Struture, RECISL, and WEGAS East. The main profile of DoCo is shown as thin line with points along the ice divide between Dome A and Dome Fuji. The ferry routes are not shown.

Acronyms:

AMASIM	**A**irborne **m**easurements for **A**ntarctic **s**ea **i**ce **m**onitoring
ASIRAS	**A**irborne **S**ynthetic Aperture Radar / **I**nterferometric **R**adar **A**ltimeter **S**ystem
CoFi Met/Structure	**Co**ldest **Fi**rn **Met**eorology / internal **structure**
DoCo (East Antarctica)	**Do**me **Co**nnection East Antarctica
DROMLAN	**Dro**nning **M**aud **L**and **A**ir **N**etwork
GPS	**G**lobal **P**ositioning **S**ystem

GRACE	**G**ravity **R**ecovery **a**nd **C**limate **E**xperiment
KBA	**K**enn **B**orek **A**ir Ltd
RecFil	**Rec**onnaissance **Fil**chner Ice Shelf
RECISL	**Rec**overy Glacier and Lakes, **i**ce thickness, bedrock topography and basa**l** properties
SAF	**S**eals **a**t **F**ilchner Trough
SMOS	**S**oil **M**oisture and **O**cean **S**alinity
SWIT	**S**tancomb-**W**ills **i**ce **t**ongue, ice thickness and basal properties
VELMA	**V**elocities, **el**evation and **m**ass budgets of **A**ntarctic Peninsula glaciers
VISA	**V**erdichtung und **I**nterpretation von **Sa**tellitendaten zur Bestimmung von Magnetfeld, Schwerefeld, Eismassenhaushalt und Krustenstruktur in der Antarktis unter Nutzung flugzeuggestützter und bodengebundener Messungen
WEGAS	**W**est-**E**ast **G**ondwana **A**malgamation and its **S**eparation

4. KING GEORGE ISLAND

4.1 Summary

The transport of personnel and cargo to King Georg Island (KGI) needs close coordination and assistance by various national programs and commercial operators. That includes aircraft and ship transportation. Transport is organised by Dirección National del Antártico (DNA) and performed by Argentinean aircraft and vessels.
Furthermore, main cargo from AWI will be transported by the support of MV Polar Pioneer, from Bremerhaven directly to Potter Cove.

4.2 Dallmann Laboratory

The DALLMANN LABORATORY at Base CARLINI (Argentina) will be opened at the beginning of November 2013. It is operated in cooperation with the Instituto Antártico Argentino (IAA). During the season 2013/14 German scientists (7 scientific groups) will work at the Potter Cove and the station area. The planned scientific activities of AWI are focussed on coastal biological projects, furthermore glaciological and sedimentological projects.
In order to perform all planned scientific works 3 tons of cargo have to be shipped by sea.
Begin of November MV Polar Pioneer is scheduled to call at King George Island deliver cargo and to drop the first scientists. Station will be closed end of March 2014.

4.3 Planned scientific projects

4.3.1 Elephant Seal Tagging Campaign 2014

H. Bornemann et al.(AWI)

Foraging ecology of southern elephant seal males and oceanography Part **III**

The proposed study is a follow-up of satellite telemetry deployments on adult male elephant seals tagged within ASPA 132 at Isla 25 de Mayo / King George Island in April 2000 (Part I) and 2010 (Part II). Males had either moved along the Bransfield Strait and around the tip of the Antarctic Peninsula and towards the South Orkneys or deep into the winter pack ice of the southern Weddell Sea to the area of the Filchner Trough. The latter finding of 2000 could not be reproduced in 2010, though seals travelled on comparably extended latitudinal gradients. We therefore propose a re-instrumentation of adult males in order to investigate whether males continue to travel to similar areas and towards the Filchner Trough in particular. This area is hypothesised being a biological hot spot. A synchronous research cruise with RV *Polarstern* and a flight campaign with the AWI aircraft *Polar 5* will investigate this area at the same time. This will include aerial seal surveys and *in situ* deployments of satellite transmitters on other seal species. We aim to match the transmitter deployments at Isla 25 de Mayo with these expeditions. In addition, data on post breeding foraging migrations are scarce. Only a few of the instruments deployed so far cover the short pelagic phase between breeding and moult, when fat reserves of the seals have been depleted and energy demands of the individuals are highest. It is hypothesized that the seals concentrate their foraging during this time on oceanic feeding hot spots, where productivity is high and feeding effort most efficient. This proposal aims to deploy CTD-combined satellite relayed dive loggers on adult male southern elephant seals at the end of their breeding period between November and December in order to test for the aforementioned hypothesis and to close the gap of knowledge concerning their diving activities and foraging areas during the post-breeding phase.

Main aims

The proposed study aims to

- instrument adult male southern elephant seals with CTD-combined ARGOS satellite-relayed dive loggers (CTD-SRDL) and Smart-Position-Only-Tags (SPOT - contributed by Prof Rogers, Australia) towards the end of the breeding season
- extend the number of post-breeding deployments
- retrieve the deployed instruments when the animals will have returned to Isla 25 de Mayo during their forthcoming moulting season
- analyze the data for the purpose of detections of foraging routes, foraging locations and dive depths in relation to oceanographic features along the migration paths of the seals

- compare the data of individuals foraging at different areas potentially identify oceanic areas of enhanced food availability
- extend the number of deployments or respectively enlarge the number of seals foraging in certain areas to query (in)stability of foraging areas over time,
- substantiate the pool of data to further investigate hydrographic impacts on foraging behaviour
- reconcile the satellite tracking data with results from the retrospective analyses of cumulative prey spectra of the seals due to detection of stable isotopes in whiskers or nails and blood as well as in situ investigations of stomach contents as proposed by the Argentinean field team
- archive the primary data via the open access library PANGAEA - Data Publisher for Earth & Environmental Science (www.pangaea.de)
- publish the analysed data in a peer reviewed scientific journal

4.3.2 Glacier surface mass and energy balance

Braun, Matthias (Uni Erlangen) Ulrike Falk (Uni Bonn)

Since 2010, the joint group of Univ. Bonn and Erlangen run a surface mass and energy balance program jointly with colleagues from IAA. The purpose of this field visit is to continue the running measurements. The activities include the operation of an automatic weather station as well as regular readings of mass balance stakes. Additionally, surface elevation profiles have been collected by differential GPS to determine elevation changes over time. The stay at Dallmann station is required to maintain the installed equipment on the glacier and to train the technician overwintering in Carlini station.

4.3.3 Population genetics of storm petrels Oceanites oceanicus and Fregetta tropica and response to climate change

Petra Quillfeldt et al. (Uni Giessen)

The circumpolar breeding range of Wilson's and Black-bellied Storm-petrels includes islands of the Scotia Archipelago, through the southern Indian Ocean to the Antipodes Islands (New Zealand), including subantarctic islands from Cape Horn (Chile) east to the Kerguelen Islands (Southern Indian Ocean), and also includes coastal Antarctica. Due to their small size and nocturnal life, they are still relatively little studied. The biology of the species has been studied between 1996 and 2000 at the Tres Hermanos, and this has been the first thorough investigation of these species after initial studies in 1940 and 1970. Following on from this previous work and a recent study by Dr. N. Coria and students, we would now suggest following up this work, especially in the framework of changes in the food availability due to climate change. We also propose to use newly available technology (miniature geolocation loggers) to follow migration directly. Further, we will collect samples for a planned study of the genetic structure of the population in the circumpolar context.

Scientific lines of the project:

1. Population genetics – genetic variability and population connectivity with populations at Kerguelen (Southern Indian Ocean) and other Antarctic sites
2. Migration ecology – using GLS loggers and stable isotope analysis
3. Historical migration ecology – using stable isotope analysis of museum and recently collected samples
4. Breeding biology and diet – comparison with data from 1996-2000

4.3.4 Response of bacterial communities at Carlini Base to a small oil-spil and the attempt to develop a bioremediation technique for Antarctic habitats.

In October 2009 a pipeline from the fuel depot of Carlini Base broke and diesel contaminated part of the terrain and reached even the Potter Cove. The Argentine microbiologists took the unique chance to investigate a natural hydrocarbon spill in an Antarctic area. The aim of this study was/is to find out: a) how such a fuel spill affects the Antarctic soil bacterial communities, b) if and how natural attenuation takes place in such a cold and nutrient limited habitat, c) which organisms are involved in biodegradation processes and how these can be stimulated and d) which could be the fate of the hydrocarbons in that area when a spill occurs. To answer this bundle of questions, samples of soil and sediment were taken since 2009 and analyzed for changes in pH, water content, nutrient content (C, N), and total hydrocarbon concentrations.

Further, the total and hydrocarbon-degrading bacterial counts were determined and changes in the diversity and structure of the bacterial communities are being studied. The microbiologists of the AWI have been part of this project for more than two years. We contributed especially with our molecular biological knowledge as well as with our experiences concerning oil degrading bacteria and developing concepts of bioremediation/bioaugmentation. Together we found strong indications for a natural attenuation process in the soil of Carlini Base. Therefore, we will continue these studies. As on top of the soil the hydrocarbons seem to quickly disappear, we will now focus our sampling and investigations more on deeper soils, down up to the permafrost zone. Further, we want to set up *in situ*-experiments that will help to develop methodologies allowing Antarctic environments to be *in situ* bioremediated i.e. by inoculating with autochthonous hydrocarbon degraders and/or by the addition of nutrients.

4.3.5 The influence of climate, photobiont selection and biogeography on bacterial communities in the widespread Antarctic and Arctic lichen *Cetraria aculeate*

Christian Printzen

Lichens, symbioses between fungi and green algal or cyanobacterial photobionts, are prominent components of Antarctic and Arctic ecosystems. In addition to their photobionts, lichen mycobionts also associate with species-specific bacterial communities. Many symbiotic systems can adapt to environmental conditions by modifying their microbiomes. This has been shown for lichen photobionts, but the possible adaptative role of lichen microbiomes has not been studied adequately to date. The

fact that many lichens from polar regions also occur in much warmer biomes presents a unique chance to investigate the impact of environmental factors on the structure and composition of lichen microbiomes, thereby assessing their possible role in adaptation to polar conditions. Building on our previous studies of mycobiontphotobiont interactions in the model species *Cetraria aculeata* we want to characterize its microbiome in relation to environmental gradients and photobiont selection. We will sample populations along transects from both polar into temperate regions, perform transplantation experiments and use an environmental metagenomic approach to characterize the microbiomes of *C. aculeata*. This will allow us first insight into the possible role of bacteria for the adaptation of polar lichens and will yield baseline data for future studies on the functional role of bacteria within the lichen symbiosis.

4.3.6 Lipidomics in a changing environment: effect of temperature rise on fatty acid pathways in Antarctic harpacticoid copepods

This research stay will address the impact of global warming on the biochemical aspects of trophic interactions. More specifically, attention goes to the energy transfer between primary producers (e. g. phytoplankton, microphytobenthos) and first levels consumers (copepods, Crustacea) because of the highly variable transfer efficiency of energy and biomass at this plant-animal interface (Brett & Müller-Navarra, 1997; Micheli 1999).

Fatty acids (FA) have been identified as key factors modulating the efficiency of energy transfer (Müller-Navarra et al 2004) and it is therefore of paramount importance to clarify hop temperature impacts consumers' assimilation and modification of dietary FA. Though the lipid metabolism of planktonic copepods (Calanoida) is already substantially unraveled, information for their benthic counterpart, belonging to the order Harpacticoida, is scarce. Yet, recent research indicated a high potential of harpacticoids to elongate and desaturate precursor Fas into Ω3 Fas de novo, it might be rewarding the explore the capacities of harpacticoids further. Moreover, it is crucial to understand these FA pathways in varying environmental conditions.

Therefore, Potter Cove is a perfect location to test the effect of different environmental conditions (temperature – salinity – food supply) on FA profiles of both primary producers and consumers. We aim to study potential changes in both planktonic (cooperation with Argentinian partners) and benthic communities (our expertise). Further, within the PhD research of Eva Werbrouck (2012-2016), the obtained results will be compared with the FA profiles of temperate and tropical copepod species.

4.3.7 Occurrence of potentially harmful dinoflagellates in the Antarctica

The approaching global warming and climate change will have an incalculable impact on life on earth. The Western Antarctic Peninsular with its surrounding Southern Ocean is currently one of the most threatened regions of the world in terms of changing environmental conditions. Unicellular phytoplankton is at the bottom of the food chain, where disturbed ecological dynamics subsequently will have a great effect on all levels of nutrition. Dinoflagellates have great importance functioning in

the polar regions. Yet the biogeographical distribution of known and emerging toxic species and the nature of their toxins remain poorly defined for the Argentine Continental Shelf. Even less is known regarding the driving factors influencing the population dynamics and toxin composition of the toxigenic species. The major aim is to unravel the interactions and feedbacks between biogeochemistry and plankton composition with regard to occurrence of harmful algae and their toxin composition. A second objective will be to determine the partitioning and metabolism of these toxins within the planktonic food web. The core activities will include field sampling expeditions along the Argentine coast for toxigenic organism and associated toxins, combined with detailed laboratory studies on selective grazing and high resolution analysis of toxin profiles from field plankton and cultured isolates.

5. OTHER ACTIVITIES

5.1 AWI activities at other stations and locations

5.1.1 Long term monitoring of Antarctic seabirds and seals on Fildes Peninsula, King George Island

Hans-Ulrich Peter et al. (Jena University)

From November 2013 to March 2014 there are two main research fields on Fildes Peninsula (Maxwell Bay, King George Island, South Shetland Islands):

Aim of this project is the continuation of the long term monitoring of fauna and flora of the Fildes Peninsula and Ardley Island with focus on birds and seals. Within this project the monitoring of breeding pair number and breeding success of penguins (Pygoscelis spec.) and Southern Giant Petrels (Macronectes giganteus) plays an important role. These species are sensitive indicators for climate change and human impact (see Peter et al. 2008).

A second part of the project is the continuation of the long-term study on the population ecology of both skua species and hybrid pairs.

6. LOGISTICS, SCHEDULES, PARTICIPANTS

6.1 DROMLAN flight schedules October 2013

Transport	Date	Flight No	Route	Pax in	Cargo in (kg)	Pax out	Cargo out (kg)
Personal- und Frachttransporte (Transport of personnel and cargo)							
DROMLAN flight - IL-76TD		D1	CT - Novo - CT	0	0	0	0
DROMLAN flight - IL-76TD		D2	CT - Novo/Troll - CT	10	3515	0	0
DROMLAN flight - IL-76TD		D3	CT - Novo - CT	9	2600	1	0
DROMLAN flight - IL-76TD		D4	CT - Novo - CT	7	4450	2	0
DROMLAN flight - IL-76TD		D5	CT - Novo - CT	5	800	0	0
DROMLAN flight - IL-76TD		D6	CT - Novo - CT	18	1000	6	0
DROMLAN flight - IL-76TD		D7	CT -Troll - CT	13	1486	5	600
DROMLAN flight - IL-76TD		D8	CT -Novo - CT	0	800	32	5225
DROMLAN flight - IL-76TD		D9	CT - Novo - CT	0	0	17	3500
			DROMLAN gesamt	62	14651	63	9325
Bereitstellung Polar 6 (Commissioning and decommissioning Polar 6)							
Polar 6 (BT-67)		P6		0		0	
Schiffstransporte (Ship transportation)							
RV Polarstern		PS	CT - Atka Bay - CT	0		0	
SA Agulhas		SAA	CT - Atka Bay/Penguin Bukta -	0		0	

		CT				
DROMSHIP	DROMSHIP		0		0	
Ernest Shackleton	BAS	CT - NM - Halley	0		0	
Transport gesamt (Transport total)			**62**	**14651**	**63**	**9325**

6.2 Travel schedule for participants, DML

surname	given name	responsibility	institution	profession	nation		in	out
Neumayer Station III: Saison								
Koordination Saison 2012/2013 (Coordination season 2012/2013)								
Kohlberg	Eberhard	coordinator logistics					D4	D9
						Total:	1	1
Flugwetterdienst (DROMLAN) (Flight weather forecast (DROMLAN))								
Miller	Max	DROMLAN weather forecast					D2	D6
Rentsch	Harald	DROMLAN weather forecast					D6	D9
						Total:	2	2
Koordination Technischer Betrieb (Coordination technical operation)								
		Technical Super Intendant	AWI-LOG	Engineer	Germany			

Heuck	Hinnerk	Technical Super Intendant	RFL	Engineer	Germany		D2	D9
						Total:	1	1
Sicherheitstechnische Prüfung (Safety-related inspection)								
Ortmann	Volker	Medical Super Intendant			Germany		D6	D7
Miller	Christine	Medical Super Intendant			Germany		D3	D4
						Total:	2	2
Arbeitsgruppe RFL Logistik/Technik/Service (Maintenance team RFL logistics/Service)								
Kooistra	Frerk	Technician	RFL	Technician	Germany		D2	D8
Eder	Pit	Technician	RFL	Technician	Germany		D2	D8
Mehl	Hans-Joachim	Technician	RFL	Technician	Germany		D2	D8
Reichwein	Petra	Housekeeping	RFL	Service	Germany		D2	D9
Findler	Patrick	Logistic	RFL	Service	Germany		D3	D7
						Total:	5	5
Wissenschaftlich-technischer Betrieb (WTB) (Scientific-technical operations)								
Riess	Felix	IT Engineer	RFL	Engineer	Germany		D6	D8
						Total:	1	1
Observatorien Betreuung (Scientific super intendant observatories)								
Weller	Rolf	Airchemistry observatory	AWI	Scientist	Germany		D7	D9
Schmidthüsen	Holger	Meteorological observatory	AWI	Scientist	Germany		D7	D9
Fromm	Tanja	Geophysical observatory	AWI	Scientist	Germany		D5	D9
Grasse	Torsten	I27DE - Infrasound Array	BGR	Engineer	Germany		D7	D9
Hoffmann	Mathias	I27DE - Infrasound Array	BGR	Engineer	Germany		D7	D9
						Total:	5	5
Wissenschaftliche Projekte (Station und Umfeld) ((Scientific projects at								

station and beyond)								
SIMBIS (Meereis)								
ANS, CHOICE (Medizin)								
		Physician NM III, Kohlberg						
Neutron Monitor, Muon Telescope								
kein Personal von DESY								
SPOT								
Fabry	Ben	SPOT	Uni Erlangen	scientist	Germany		D7	D8
Zitterbart	Daniel	SPOT	AWI	scientist	Germany		D7	D8
						Total:	2	2
PASATA								
						Total:	0	0
Übergeordnete Begutachtungen und Abnahmen (Superior evaluation and certification)								
		super intendent	RFL	Engineer	Germany			
						Total:	0	0
Neumayer-Station III: Überwinterung (Ablösung/Einweisung) (Winter staff exchange and briefing)								
Überwinterung 2012(Winter staff 2012)								
Fiedel	Babara	Station leader, physician	AWI-LOG	Physician	Germany		2013	D8
Spiekermann	Georg	Geophysics	AWI-LOG	Scientist	Germany		2013	D8
Hänssler	Thedda	Geophysics	AWI-LOG	Scientist	Germany		2013	D8
Regnery	Julia	Air chemistry	AWI-LOG	Scientist	Germany		2013	D8
Behrens	Lisa-Katharina	Meteorology	AWI-LOG	Scientist	Germany		2013	D8
Christian	Boris	Electrician	RFL	Engineer	Germany		2013	D8

Fontes	Rene-Pascal	IT, radio operator	RFL	Engineer	Germany		2013	D8
Janke	Michael	Cook	RFL	Cook	Germany		2013	D4
Treuger	Thomas	Station engineer	RFL	Engineer	Germany		2013	D3
						Total:	0	9
Überwinterung 2013 (Winter staff 2013)								
Bauer	Holger	Station leader, physician	AWI-LOG	Physician	Germany		D6	2014
Lohse	Johannes	Geophysics	AWI-LOG	Scientist	Germany		D6	2014
Armbruster	Daniel	Geophysics	AWI-LOG	Scientist	Germany		D6	2014
Schmid	Kerstin	Air chemistry	AWI-LOG	Scientist	Germany		D6	2014
Stautzebach	Elena	Meteorology	AWI-LOG	Scientist	Germany		D6	2014
Brungs	Lothar	Electrician	RFL	Engineer	Germany		D6	2014
Zimmermann	Dirk	IT, radio operator	RFL	Engineer	Germany		D6	2014
Geisel	Ralf	Cook	RFL	Cook	Germany		D6	2014
Bischoff	Markus	Station engineer	RFL	Engineer	Germany		D6	2014
						Total:	9	0
Neumayer-Station III gesamt (Neumayer Station total):							28	28

Surname	Given Name	Responsibility	Institution	Profession	Nation		in	out
NEUMAYER STATION III: Season								
Coordination season 2012/2013								
Kohlberg	Eberhard	Coordinator logistics					D5	D12
						Total:	1	1
Weather Forecast (DROMLAN)								
Miller	Max	DROMLAN weather forecast					D2	D8
Knobelsdorf	Michael	DROMLAN weather					D8	D12

		forecast						
						Total:	2	2
Coordination technical operation								
Matz	Thomas	Technical superintendent	AWI-LOG	Engineer	Germany		D8	D9
Heuck	Hinnerk	Technical superintendent	RFL	Engineer	Germany		D2	D12
						Total:	2	2
Safety-related inspection								
NN	NN (GL)						D8	D9
						Total:	1	1
Maintenance Team RFL Logistics/Service								
Kooistra	Frerk	Technician	RFL	Technician	Germany		D2	D10
Eder	Pit	Technician	RFL	Technician	Germany		D2	D10
Mehl	Hans-Joachim	Technician	RFL	Technician	Germany		D2	D10
Tillmann	Babara	Housekeeping	RFL	Service	Germany		D2	D12
						Total:	4	4
Scientific-technical operations								
Hofmann	Jörg	Super Intendant WTB	Fielax	Engineer	Germany		D6	D11
						Total:	1	1
Observatorien Betreuung (Scientific super intendant observatories)								
Weller	Rolf	Airchemistry observatory	AWI	Scientist	Germany		D8	D11
König-Langlo	Gert	Meteorological observatory	AWI	Scientist	Germany		D8	D11
Schlömer	Antje	Geophysical observatory	AWI	Scientist	Germany		D8	D11
Grasse	Torsten	I27DE - Infrasound Array	BGR	Engineer	Germany		D8	D11
Hoffmann	Mathias	I27DE - Infrasound Array	BGR	Engineer	Germany		D8	D11
						Total:	5	5
Scientific projects at station and beyond								

SIMBIS (sea ice)								
Hunkel	Priska						D2	D5
Hoppmann	Mario						D2	D8
Baltes	Uwe						D2	D5
Paul	Stephan						D2	D8
ANS, CHOICE (Medicine)								
Chouker	Alexander	Physician NM III, Kohlberg					D10	D11
Neutron Monitor, Muon Telescope								
kein Personal von DESY								
SPOT								
Fabry	Ben						D8	D11
Richter	Sebastian						PS	D11
Zitterbart	Daniel						PS	D11
						Total:	6	8
PASATA								
Van Opzeeland	Ilse						D2	PS
Thomisch	Karolin						D2	PS
						Total:	2	0
Superior evaluation and certification								
Denecke	Mirko	super intendent	RFL	Engineer	Germany		D8	D9
						Total:	1	1
Winter staff exchange and briefing								
Winter staff 2012								
Möbius	Christoph	Station leader, physician	AWI-LOG	Physician	Germany		2012	D10
Christmann	Stefan	Geophysics	AWI-LOG	Scientist	Germany		2012	D10
Kühnel	Meike	Geophysics	AWI-LOG	Scientist	Germany		2012	D10
Höppner	Kathrin	Air chemistry	AWI-LOG	Scientist	Germany		2012	D11

Schmidt	Thomas	Meteorology	AWI-LOG	Scientist	Germany		2012	D10
Behrendt	Chris	Station engineer	RFL	Engineer	Germany		2012	D10
v. Helms	Jens	Electrician	RFL	Engineer	Germany		2012	D10
Lehnert	Lars	IT, radio operator	RFL	Engineer	Germany		2012	D10
Peter	Dirk	Cook	RFL	Cook	Germany		2012	D10
						Total:	0	9
Winter staff 2013								
Fiedel	Babara	Station leader, physician	AWI-LOG	Physician	Germany		D6	2013
Spiekermann	Georg	Geophysics	AWI-LOG	Scientist	Germany		D6	2013
Hänssler	Thedda	Geophysics	AWI-LOG	Scientist	Germany		D6	2013
Regnery	Julia	Air chemistry	AWI-LOG	Scientist	Germany		D6	2013
Behrens	Lisa-Katharina	Meteorology	AWI-LOG	Scientist	Germany		D6	2013
Christian	Boris	Electrician	RFL	Engineer	Germany		D6	2013
Fontes	Rene-Pascal	IT, radio operator	RFL	Engineer	Germany		D6	2013
Jahnke	Michael	Cook	RFL	Cook	Germany		D6	2013
Treuger	Thomas	Station engineer	RFL	Engineer	Germany		D6	2013
						Total:	9	0
NEUMAYER STATION III total							34	34

Kohnen-Station / RECISL									
Technischer Betrieb und Versorgung/Fahrzeugwartung (Technical operations and supply)									
Schubert	Holger	Logistic team, technician	RFL	Technician	Germany	zuerst nach NM		D2	D9
Köhler	Jens	Logistic team, technician	RFL	Technician	Germany	zuerst nach NM		D2	D9
Peter	Dirk	Cook	RFL		Germany			D3	D9
Schomburg	Götz	Physician	RFL		Germany			D3	D9
Lenuck	Michael	Electrician	RFL		Germany			D3	D9
Schmid	Alexander	Technician Kässbohrer	Kässbohrer		Germany	zuerst nach NM		D2	D9
Trimborn	Klaus	Logistic team, technician	AWI	Technician	Germany			D3	D9
Zörer	Walter	Mountain Guide	AWI		Austria			D6	D8
Langenkämper	Torsten	Driver/Technician	AWI		Germany			D5	D9
Sibberns	Reinhard	Driver	AWI		Germany			D5	D7
Marquardt	Gereon	Cook	RFL		Germany			D5	D8
Stocker	Bruno	Driver	RFL		Germany			D5	D7
							Total:	12	12
Wissenschaftliche Projekte (Scientific projects)									
CoFiaP/CoFiMet									
Kipfstuhl	Sepp		AWI		Germany			D4	D8
Ritter	Francois				France			D4	D8

Frenzel	Andreas		AWI		Germany			D4	D8
Hilmarsson	Sverrir		AWI		Iceland	mit D7 nach NM f. EKSEIS		D4	D8
Orsi	Anais				France			D4	D8
Birnbaum	Gerit		AWI		Germany	zuerst nach NM		D2	D8
Schäfer	Michael	Doktorand v. Gerit	AWI		Germany			D4	D8
Miller	Heinz	Kohnen Station		scientist	Austria			D7	D8
Lemke	Peter	Visitor		scientist	Germany			D7	D8
							Total:	9	9
EKSEIS									
Eisen	Olaf	EKSEIS	AWI	scientist	Germany			D7	D8
Meyer	Christoph	EKSEIS	BAdW	scientist	Germany			D7	D8
Hilmarsson	Sverrir	technician	AWI		Iceland	ab D7			
Lambrecht	Anja	EKSEIS	BAdW	scientist	Germany			D7	D8
Blenkner	Rick	EKSEIS	AWI	technician	USA			D7	D8
Ehlers	Birte	EKSEIS	OSU	scientist	Italy			D7	D8
							Total:	5	5
Kohnen-Station gesamt (Kohnen Station total):								26	26
Wissenschaftliche Flugmissionen Polar 6 (Scientific flight missions Polar 6)									
CryoVExANT									
WEGAS/DoCo/RECISL									
Steinhage	Daniel	Scientific leader	AWI	Scientist	Germany			P6	D8

Eagles	Graeme	scientist	AWI	Scientist	Germany			D3	D6
Konrad	Christian	enigineer	AWI	engineer	Germany			D3	D6
Gehrmann	Martin	engineer	AWI	engineer	Germany			D6	D8
Ohme	Jens	enigineer	Fielax	Scientist	Germany			D3	D6
Gebler	Madlen	enigineer	Fielax	Scientist	Germany			D6	D8
							Total:	5	6
Polar 6 Besatzung (Polar 6 crew)									
Emberley	Dean		KBAL					P6	D6
Gilmour	John		KBAL					P6	D6
Harrison	Brian							D6	P6
Miller	Finlay							D6	P6
Hudon	Roger							P6	P6
							Total:	2	2
Flugmissionen gesamt (Flight missions total):								7	8
Wissenschaftliche Projekte im DML (Scientific projects in DML)									
							Total:	0	0
Projekte gesamt (Projects total):									
Nationale und internationale Besuche/Medien (National and international visits/Media):									
Besuch Neumayer-Station III und Kohnen-Station (Visit at Neumayer Station III and Kohnen Station)									

Giegold	Rolf	Art Project	AWI/Hanse Wiss.Kolleg	Artist				D6	D7
							Total:	1	1
							Total:	0	0
Besuche gesamt (Visits total):								1	1
DROMLAN interkontinental gesamt (DROMLAN intercontinental total):								62	63

6.3 Participants

surname	given name	institution	profession	nation
Armbruster	Daniel	AWI-LOG	Scientist	Germany
Bauer	Holger	AWI-LOG	Physician	Germany
Behrens	Lisa-Katharina	AWI-LOG	Scientist	Germany
Birnbaum	Gerit	AWI	Scientist	Germany
Bischoff	Markus	RFL	Engineer	Germany
Blenkner	Rick	AWI	technician	USA
Brungs	Lothar	RFL	Engineer	Germany
Christian	Boris	RFL	Engineer	Germany
Eagles	Graeme	AWI	Scientist	Germany
Eder	Pit	RFL	Technician	Germany
Ehlers	Birte	OSU	scientist	Italy
Eisen	Olaf	AWI	scientist	Germany
Emberley	Dean	KBAL	Pilot	
Fabry	Ben	Uni Erlangen	scientist	Germany
Fiedel	Babara	AWI-LOG	Physician	Germany
Findler	Patrick	RFL	Service	Germany
Fontes	Rene-Pascal	RFL	Engineer	Germany
Frenzel	Andreas	AWI	Scientist	Germany
Fromm	Tanja	AWI	Scientist	Germany
Gebler	Madlen	Fielax	Scientist	Germany
Gehrmann	Martin	AWI	engineer	Germany
Geisel	Ralf	RFL	Cook	Germany
Giegold	Rolf	AWI/Hanse Wiss.Kolleg	Artist	Germany
Gilmour	John	KBAL	Pilot	Canada
Grasse	Torsten	BGR	Engineer	Germany
Hänssler	Thedda	AWI-LOG	Scientist	Germany
Harrison	Brian		Pilot	Canada
Heuck	Hinnerk	RFL	Engineer	Germany
Hilmarsson	Sverrir	AWI	Engineer	Iceland
Hilmarsson	Sverrir	AWI	Engineer	Iceland
Hoffmann	Mathias	BGR	Engineer	Germany
Hudon	Roger		Engineer	Canada
Janke	Michael	RFL	Cook	Germany
Kipfstuhl	Sepp	AWI	Scientist	Germany
Kohlberg	Eberhard		Expedition Leader	Germany
Köhler	Jens	RFL	Technician	Germany
Konrad	Christian	AWI	engineer	Germany
Kooistra	Frerk	RFL	Technician	Germany
Lambrecht	Anja	BAdW	scientist	Germany
Langenkämper	Torsten	AWI	Technician	Germany
Lemke	Peter		scientist	Germany
Lenuck	Michael	RFL	Technician	Germany
Lohse	Johannes	AWI-LOG	Scientist	Germany
Marquardt	Gereon	RFL	Cook	Germany
Mehl	Hans-Joachim	RFL	Technician	Germany

Meyer	Christoph	BAdW	scientist	Germany
Miller	Max			
Miller	Christine			Germany
Miller	Heinz		scientist	Austria
Miller	Finlay			
Ohme	Jens	Fielax	Scientist	Germany
Orsi	Anais			France
Ortmann	Volker			Germany
Peter	Dirk	RFL		Germany
Regnery	Julia	AWI-LOG	Scientist	Germany
Reichwein	Petra	RFL	Service	Germany
Rentsch	Harald			
Riess	Felix	RFL	Engineer	Germany
Ritter	Francois			France
Schäfer	Michael	AWI		Germany
Schmid	Kerstin	AWI-LOG	Scientist	Germany
Schmid	Alexander	Kässbohrer		Germany
Schmidthüsen	Holger	AWI	Scientist	Germany
Schomburg	Götz	RFL		Germany
Schubert	Holger	RFL	Technician	Germany
Sibberns	Reinhard	AWI		Germany
Spiekermann	Georg	AWI-LOG	Scientist	Germany
Stautzebach	Elena	AWI-LOG	Scientist	Germany
Steinhage	Daniel	AWI	Scientist	Germany
Stocker	Bruno	RFL		Germany
Treuger	Thomas	RFL	Engineer	Germany
Trimborn	Klaus	AWI	Technician	Germany
Weller	Rolf	AWI	Scientist	Germany
Zimmermann	Dirk	RFL	Engineer	Germany
Zitterbart	Daniel	AWI	scientist	Germany
Zörer	Walter	AWI		Austria

7. PARTICIPATING INSTITUTIONS

7.1 Institute/Company Address

ALCI	Antarctic Logistics Centre Intl. (Pty.) Ltd. 97, Keerom Street Cape Town 8001 Republic of South Africa
AWI	Alfred Wegener Institute for Polar and Marine Research Postbox 12 02 61 27515 Bremerhaven Germany
BGR	Federal Institute for Geosciences and Natural Resources Stilleweg 2 30655 Hannover Germany
BMBF	Bundesministerium für Bildung und Forschung Heinemannstraße 2 53175 Bonn Germany
DEA	Department of Environmental Affairs Directorate: Antarctica and Islands P.O. Box 8172, Roggebaai 8012 Cape Town 9012 Republic of South Africa
DNA	Dirección National del Antártico Cerrito 1248 1010 Buenos Aires Argentina
DWD	Deutscher Wetterdienst Bernhard-Nocht Str. 76 20359 Hamburg Germany

FACH	Fuerza Aero de Chile, División Antártica Tarpaca No. 1129, 2°Piso Santiago de Chile Chile
IAA	Instituto Antártico Argentino Cerrito 1248 1010 Buenos Aires Argentina
INACH	Instituto Antarctico Chileno Plaza Munoz Gamero 1055 Punta Arenas Chile
Kässbohrer	Kässbohrer Geländefahrzeug AG Kässbohrerstr. 11 88471 Laupheim Germany
Kenn Borek Air Ltd.	Kenn Borek Air Ltd. 209 McTravish Rd NE Calgary, AB, CA, T2E 7G5 Canada
Laeisz	Reederei F. Laeisz GmbH Brückenstr. 25 27568 Bremerhaven Germany
RAE	Russian Antarctic Expedition 38, Bering St. 199397 St. Petersburg Russia
University of Berlin	Zentrum für Weltraummedizin (ZWMB), Charité Thielallee 71 14195 Berlin Germany
University of Bonn	Universität Bonn Walter-Flex-Str. 3 53113 Bonn Germany

University of Cologne	Institut für Geologie & Mineralogie Zülpicher Str. 49a 50674 Köln Germany
University of Giessen	AG Verhaltensökologie und Ökophysiologie der Tiere Heinrich-Buff-Ring 38 D-35392 Gießen Germany
University of Heidelberg	Universität Heidelberg Grabengasse 1 69117 Heidelberg Germany
University of Jena	AG Polar- und Ornithoökologie Institut für Ökologie Dornburger Str. 159 07743 Jena Germany
University of Munich	Institut für Anästhesie und Intensivmedizin Marchioninistr. 15 81377 München Germany

7.2 DROMLAN – Partners

AWI	Alfred Wegener Institute for Polar and Marine Research, Germany
AARI	Arctic and Antarctic Research Institute, Russian Antarctic Expedition, Russia
BAS	British Antarctic Survey, UK
BELARE	Belgian Antarctic Research Expedition, Belgium
FIMR	Finnish Institute of Marine Research, Finland
NCAOR	National Centre for Antarctic and Ocean Research, India
NIPR	National Institute of Polar Research, Japan
NPI	Norwegian Polar Institute, Norway
NWO	Netherlands Organisation for Scientific Research, The Netherlands
DEA	Department of Environmental Affairs, Directorate: Antarctica and Islands, South Africa
SPRS	Swedish Polar Research Secretariat, Sweden

7.3 DROMSHIP – Partners

AWI	Alfred Wegener Institute for Polar and Marine Research, Germany
BELARE	Belgian Antarctic Research Expedition, Belgium
FIMR	Finnish Institute of Marine Research, Finland
NPI	Norwegian Polar Institute, Norway
SPRS	Swedish Polar Research Secretariat, Sweden