EXPEDITION PROGRAM ANTARCTICA
(ANT – Land 2012/2013)

STATIONS AND FLIGHT MISSIONS

NEUMAYER STATION III

KOHNEN STATION

Flight Missions

DALLMANN LABORATORY

Other Activities

Coordination

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November 2012

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CONTENTS

1. NEUMAYER STATION III 3

1.1 Summary 3

1.2 Operation of observatories 4

1.2.1 Meteorological observatory 4

1.2.2 Operational weather forecast service for DROMLAN 4

1.2.3 Geophysical observatory 5

1.2.4 Air chemistry observatory 7

1.2.5 Marine acoustic observatory PALAOA 8

1.3 Scientific projects 9

1.3.1 Neutron-Monitor and Muon-Telescope 9

1.3.2 PASATA – PASsive Acoustic Tracking of Antarctic marine mammals 10

1.3.3 Sea Ice Mass Balance influenced by Ice Shelves (SIMBIS) 11

1.3.4 Consequences of longterm-Confinement and Hypobaric HypOxia on Immunity in the Antarctic Environment at NEUMAYER STATION III (CHO2ICE@NMIII) 13

1.4 National and international visits 15

1.4.1 National inspection BMBF 15

1.4.2 International Inspection 15

1.5 Scientific projects during wintering 16

1.5.1 Human physiology at NEUMAYER STATION III 16

2. KOHNEN STATION 18

2.1. Summary 18

2.2 Scientific Projects 18

2.2.1 Coldest Firn and Associated Projects (CoFi & CoFiAP) 18

2.2.2 LIMPICS ANT 2011/12 - Linking micro-physical properties to macro features in ice sheets with geophysical techniques ANTARCTICA 2011/12 21

3. AWI FLIGHT MISSIONS AND DROMLAN 22

3.1 Dronning Maud Land Air Network (DROMLAN) 22

3.2 DROMLAN operations for AWI 23

3.3 Logistics flight missions of POLAR 6 24

3.4 Scientific surveys with POLAR 6 24

3.4.1 DOMECair 25

3.4.2 DoCo East Antarctic 25

3.4.3 GEA 26

3.4.4 RECISL 26

3.4.5 WEGAS 26

4. KING GEORGE ISLAND 28

4.1 Summary 28

4.2 DALLMANN LABORATORY 28

4.3 Planned scientific projects 28

4.3.1 Sources and reaction pathways of soluble Fe from the Western Antarctic Peninsula to the Southern Ocean 28

4.3.2 Glacier mass balance measurements on King George Island 29

4.3.3 Research on Antarctic storm-petrels *Oceanites oceanicus* and *Fregetta tropica* 29

5. OTHER ACTIVITIES 30

5.1 AWI activities at other stations and locations 30

5.1.1 Population ecology of skuas 30

6. LOGISTICS, SCHEDULES, PARTICIPANTS 31

6.1 DROMLAN flight schedules 31

6.2 Travel schedule for participants, DML 32

6.3 Travel schedule for participants, KGI 38

6.4 Participants 39

7. PARTICIPATING INSTITUTIONS 42

7.1 Institute/Company Address 42

7.2 DROMLAN – Partners 45

7.3 DROMSHIP – Partners 46

1. NEUMAYER STATION III

1.1 Summary

The season ANT-Land 2012/2013 is scheduled for the period from 14 November 2012 until 27 February 2013.
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 21st of December 2012, to supply the majority of cargo and fuel for NEUMAYER STATION III and aircraft operations, furthermore for SA AGULHAS II 18th of December 2012 for supply of additional fuel and beginning of February 2013 for loading cargo returning to Germany

NEUMAYER STATION III has successfully run its wintering period.
The main logistic objectives of the season 2012/2013 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 two scientific projects take place during the summer season.
Medical studies of the Berlin Centre for Space Medicine (ZWMB) 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.

LIMPICS field party (4 scientists) performing reflection seismic measurements will take place in the vicinity of KOHNEN STATION during the season 2012/2013.

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 RV POLARSTERN. Furthermore the station acts as base for scientific field work within the frame of LIMPICS and for the COFI project.

In total 71 scientists, engineers, technicians and visitors will be working or temporarily staying at NEUMAYER STATION III.

- Maintenance works (4)
- Logistic operations (6)
- Operation of scientific observatories (5)

- AWI scientific projects – field parties (10)
- AWI wintering staff (18)
- DWD weather forecast service (2)
- Maintenance of KOHNEN STATION (11)
- Public relations (0)
- Inspection group (11)
- National and international visits (4)

1.2 Operation of observatories

1.2.1 Meteorological Observatory

König-Langlo (AWI), Lisa Behrens(AWI), Thomas Schmidt (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 2012 / 2013 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), Michael Knobelsdorf (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 2012/2013 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

Antje Schlömer (AWI), Meike Kühnel (AWI), Stefan Christmann (AWI), Thedda Hänssler (AWI), Georg Spiekermann (AWI)

Period:	December 2012 – February 2013
Project:	Service works at remote seismographic stations
	Service works Geophysical Observatory
Scientific leader:	Antje Schlömer (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 will be to solve the power problems during winter at the array site at station VNA2 on Halvfar Ryggen.

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. If everything worked without major failures it will only be necessary to change the CF cards for data retrieval. This can be accomplished within one day.
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.
At the base some more software work has to be done due to the installation of new Antelope release 5.1.

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.

Another objective in this context is the calibration of the second theodolite-gyro system. For determination of geographic North we use a Wild GAK-1 gyro which can be mounted on top of the theodolites. We have to determine the small misalignment between the gyro axis and the telescope axis to calibrate the gyro readings. This should also be carried out again for the first theodolite-gyro system.

Infrasound array I27DE

The entire geophysics team will support the annual service works at the infrasound array I27DE. The work to be done is mainly to dig out all 8 wind noise reducing porous hoses and their couplings which are laid out radially at each of the 9 single array stations. Also the boxes with the sensor and the recording and communication electronics have to be reinstalled at a higher level and therefore assistance is needed.

Participants

Name	First Name	Organization	Position/profession	Nationality
Schloemer*	Antje	AWI	Geophysicist	Germany
Haenssler	Thedda	AWI	Geophysicist, winter 2013	Germany
Spiekermann	Georg	AWI	Geophysicist, winter 2013	Germany
Christmann	Stefan	AWI	Geophysicist, winter 2012	Germany
Kuehnel	Meike	AWI	Geophysicist, winter 2012	Germany

1.2.4 Air chemistry observatory

Rolf Weller (AWI), Kathrin Höppner (AWI), Julia Regnery (AWI)

Period:	January 2013 – February 2013 Cape Town: 10 January 2013 Cape Town: 24 February 2013
Area of activity:	Neumayer Station 70°40.37'S, 08°12.26'W

Scientific activities report:

During the forthcoming summer campaign our activities at Neumayer III station will focus on the implementation of measurements of the mesopause temperature in the frame of the Network for Detection of Mesospheric Change (NDMC, http://wdc.dlr.de/ndmc/index.php) The measurements will be performed by GRIPS = GRound-based Infrared P-branch Spectrometer to determine long term trends of temperature in the mesosphere (influence of sun activity) and to investigate atmospheric waves. The project is run in close cooperation with DLR.

Finally, there will be the usual maintenance operation at the Air Chemistry Observatory as well as training of the new air chemistry over-winterer Julia Regnery.

1.2.5 Relocation of PALAOA - the Perennial Acoustic Observatory in the Antarctic Ocean

Lars Kindermann (AWI), Rene Fontes (AWI), Georg Spiekermann (AWI), Lars Lehnert (AWI), Stefan Christmann (AWI)

Period:	November 2012 – February 2013
Project:	Service works and relocation of 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.

<u>Scientific Background</u>

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 it will be relocated about 300 m to the south east and the pole-mounted cable tracks connecting the hydrophones will have to be extended accordingly by the construction team.

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 PASATA – PASsive Acoustic Tracking of Antarctic marine mammals

Ilse van Opzeeland (AWI, Karolin Thomisch (AWI)

Period: 14 November 2012 – 25 December 2012
Cape Town: 14 November 2012 (D2)
Punta Arenas: 07 January 2013 (return journey with Polarstern)

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

Scientific activities report:

Previous analyses of recordings made by the PerenniAL Acoustic Observatory in the Antarctic ocean (PALAOA) indicate species-specific seasonal peaks in vocal activity for all 4 Antarctic ice-breeding seal species (Ross seal, *Ommatophoca rossii*; Weddell seal, *Leptonychotes weddellii*; crabeater, *Lobodon carcinophaga*; leopard seal, *Hydrurga leptonyx*). Similar patterns in vocal activity have in other pinniped species been found to be associated with mating activity. For the Ross, leopard, and crabeater seals little is known on mating behaviour. Acoustic techniques such as hydrophone arrays (from which time-of-arrival differences of calls at hydrophone elements and subsequently the position of calling animals can be derived) enable study of the movement patterns of vocalizing individuals in their underwater habitat. This technique has successfully been used to track underwater movements of vocalizing individuals in other seal species in temperate and Arctic regions. This study will use acoustic localization techniques to investigate acoustic behaviour in relation to male reproductive strategies in Weddell, Ross, leopard and crabeater seals.
In addition to the hydrophone array, two underwater camera systems will be deployed as part of a pilot project to explore the possibilities of using underwater visual data for obtaining behavioural data on Weddell seals during the breeding season.

In addition to acoustic recorders, underwater cameras will be deployed near the Weddell seal colony near seal breathing holes. This camera set-up mainly serves as a pilot project to explore possibilities to visually observe underwater behaviour of Weddell seals at the breathing holes.

Participants:

Name	First Name	Institute	Profession	Nationality
Van Opzeeland	Ilse	AWI	Biologist (PI)	Dutch
Thomisch	Karolin	AWI	Biologist	German

1.3.3 Sea Ice Mass Balance influenced by Ice Shelves (SIMBIS)

M. Nicolaus (AWI), M. Hoppmann (AWI), S. Willmes (Uni Trier), S. Paul (Uni Trier), G. Heinemann (Uni Trier)

Objectives and background

The overall goal of this project is to improve our understanding of formation processes and properties of Antarctic sea ice and how these are influenced by snow cover and platelet ice, which are characteristic features of the sea ice close to ice-shelves. Platelet ice crystals form in the water column from super-cooled water masses that exit the ice shelf cavities or is at least modified through ice-shelf-ocean interaction.

Only two studies were performed on Atka Bay landfast sea ice: Kipfstuhl described the ice pump process and the resulting formation and accretion of platelet ice during his wintering in 1982/83 (Kipfstuhl, 1991). Günther performed the first (and only) biological study of sea ice in Atka Bay from June to December 1995 (Günther and Dieckmann, 2001), focusing on sea ice algae communities. More recent studies of platelet ice formation were performed in the Ross Sea by scientists of the US and NZ stations at McMurdo (Jeffries et al, 1993, Dempsey, 2010). These studies focused on the deposition of platelet ice under sea ice and the influence of brine rejection from the freezing process, the spatial variability based on ice-core analyses, and the development of a numerical description of (small-scale) platelet-ice processes. It has been found that the accretion of platelet ice under the landfast sea ice of McMurdo Sound can add up to more than 40% of the total sea ice mass.

In order to estimate the contribution of platelet ice to sea ice beyond this region, it is necessary to quantify the amount of platelet ice that is grown into sea ice (consolidated fraction) and the thickness of the sub ice platelet layer (ice-water mixture). This quantification is challenging, because the sub ice layer cannot yet be monitored or even mapped and the analyses of ice cores is a time-consuming and destructive method. By now, several international collaborators have set up fast-ice monitoring sites around the Antarctic coastline in the framework of the Antarctic Fast Ice Network (AFIN).

The proposed field campaign at NEUMAYER STATION III will allow for a detailed investigation of processes related to platelet ice and snow cover in the Atka Bay area and make a contribution to AFIN as well as to the SIMBIS project itself.

Work program

All field measurements will be made on the fast ice of Atka Bay. The measurements will spread over the entire bay, as much as safety issues allow, in order quantifying spatial variability of sea ice properties over the bay. All these measurements will extend the ongoing monitoring of sea ice thickness and snow depth (AFIN project).

The work on the ice will comprise:

Repeated transects of sea ice thickness, snow depth, and freeboard by manual drillings and continuous measurements using the EM-31 instrument.

Ice coring and snow sampling for structure analyses and standard observations (salinity, temperature, Chlorophyll-a content), focusing on the amount and distribution of platelet ice.

Measuring the thickness and distribution of the sub-ice platelet layer with a camera system

Continuous measurements of solar irradiance, surface albedo and light transmittance through snow and sea ice. We will set up a radiation station on the sea ice, close to the existing automatic weather station (AWS).

Manual measurements of under-ice light conditions at different sites of Atka Bay.

Continuous measurements of atmospheric turbulence and fluxes over sea ice. Therefore, we will set up an automatic station close to the AWS.

CTD-casts through bore holes in the sea ice.

Retrieval of all instrumentation from the sea ice before ice break up or at the end of the field work, whatever comes first.

In addition to the field measurements, some work will be performed in the station, such as measurements of ice-core properties on frozen and melted samples. Furthermore, some ice cores will be transported back to Bremerhaven for more detailed analyses.

Another aspect is the inventory and coordination of the AFIN measurements with the wintering team. The stay at the station and on the sea ice will also help to improve methodology, communication, and understanding for coming years of observations.

Work schedule / personnel

Two members of the group are scheduled to arrive at NEUMAYER STATION III mid November and leave end November/ early December again. The two others will only return mid January and continue the work, particular repeating transects and maintaining continuous measurements.

Data and samples

All data will be made publically available in the PANGAEA database within one year. Sea ice thickness and snow depth data will also enter the data base of the Antarctic Fast Ice Network (AFIN), which is currently under construction. Sea ice cores taken at ice stations will be archived in the cold storage facilities of the Alfred Wegener Institute.

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1.3.4 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 (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 National inspection

In January a national inspection team of the the Federal Ministry of Education and Research (BMBF) will visit NEUMAYER STATION III.

Members of the inspection team are Dr. Horst Freitag (German Ambassador), Mr. Wilfried Kraus (BMBF, Deputy of Department), Prof. Dr. Karin Lochte (AWI), Prof. Dr. Heinz Miller (AWI).

Dr.Horst Freitag and Mr. Wilfried Kraus will thus have the opportunity to get a general idea of the scientific and logistic facts in view of decisions to come.

1.4.2 International Inspection

In January an international (South African /German) inspection team will visit NEUMAYER STATION III.

Members of the German inspection team are Dr. Uwe Nixdorf (AWI), Dr. Hartwig Gernandt (AWI), Fritz Hertel (Department of Environmental Affairs), Heyn (Federal Ministry of Education and Research (BMBF), Dr. Ney (Ministry of Foreign Affairs)

1.5 Scientific projects during wintering

1.5.1 Human Physiology at NEUMAYER STATION III – Campaign 2013

Alexander Stahn, Mathias Steinach, Hanns Christian Gunga (ZWMB Berlin, Charite), Eberhard Kohlberg (AWI), participants wintering team 2012 (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 2012 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 in 2010 and 2011. 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 overwintering 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 2013. 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, for the first time a detailed, comprehensive documentation of each single experiment will be provided to implement successfully the entire project. Thus, NEUMAYER STATION III will be provided with a new PC included all the required software, abundant supply of consumables, new equipment, and a step-by-step guide that allows a more convenient and less time-consuming implementation of all experiments. 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 Cord Drücker

The season ANT-Land 2012/2013 is scheduled for the period from 21st of November 2012 until 29th of January 2013.

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.

Polar ice is a particular paleo climate archive because it has air entrapped within the ice. Air within polar ice provides over the last 800 ka information about the greenhouse gas concentrations, the depth of the firn ice transition where the permeable pores close off to single isolated bubbles, the elevation of the ice sheet (in the total air content) and an insolation (Milancovitch) signal in the O2/N2 ratio and the total air content to date ice core climatic records. Air becomes entrapped in ice when the initially permeable porous firn is compacted and becomes impermeable at densities above 820 kg/m3. Therefore the age of air and ice differ up to several thousands of years in the same depth causing significant difficulties to date the enclosed greenhouse gases. The densification of polar firn is influenced by the deposition history at the surface and in greater depths by the impurities. Thus air entrapment and the age of the enclosed greenhouse gases is controlled by the resulting density stratigraphy. The objective of the our work at the KOHNEN STATION and on the ice divide connecting KOHNEN STATION and Dome Fuji and beyond is 1. to drill the coldest firn as the closest analogue of glacial polar firn and 2. how the signals relevant for a better understanding of the entire firnification process form and become imprinted in firn.

CoFi - Coldest Firn

We plan to drill several cores up to 200 m deep in the close vicinity of KOHNEN STATION and on the ice divide to Dome Fuji (Fig. 1) to learn more about the natural variability of all firnification related parameters at a single site. Along the entire core we measure the dielectric properties of the ice (DEP) and determine the bulk density by weighing the single cores. At least on one core microstructural properties (e.g. grains size and grain boundary density) are determined from images taken by a large area scanning macroscope (LASM). The c-axis distribution is obtained from thin section using an automated fabric analyzer. These measurements will be done over 1 m long sections every 10 m or 5 m if time allows.

In Bremerhaven x-ray density will be determined. We will also measure a wide spectrum of climatic parameters (e.g. water isotopes) and impurities. This first high resolution high quality data set of density and impurities will allow us to characterize and quantify the effect of impurities on densification over a wider range of climatic conditions than has been ever before. Particularly across the firn-ice transition of the new cores drilled we will derive the 3d-structure of the pore space by our full ice core computer tomograph. Density, tomography and impurities will help to improve the firn models used to predict the densification and air enclosure process during glacial periods.

CoFiAP - Coldest Firn Associated Projects

Over the year the snow surface on the polar plateaus is extremely variable. We see sastrugi forming and disappearing, flat and smooth surfaces after a little snow fall and not much wind, snow dunes sometimes soft and extremely hard at other times, glaced surfaces and many more features. Despite this visible variability a tantalizing question is how seasonal signals in many climatic and environmental parameters or radar horizons over large distances can develop even at a low accumulation site as KOHNEN STATION (65 mm water equivalent/year). Objective of all the projects within the framework of CoFiAP is to characterize the variability of the surface snow and the top meter (or meters) of the firn in as many properties as possible. Microstructural properties will be correlated with climatic and environmental parameters (e.g. water isotopes, ions or dust).

The isotopic signal (delta-18O and D) will be measured in the water vapour above the snow surface and within the firn column in at least 5 different heights and depths. Surface snow is sampled daily in high resolution in the top 20 cm. Samples of fresh snow are taken during and after precipitation events. Furthermore, we will sample the top meter of the firn for isotopes and impurities several times over the summer field season.

Not much is known about the variability of the snow density at the surface and the density of firn in the top meter(s). The classical way of weighing snow samples of specified volume taken directly on the surface or in snow pits is time-consuming and tricky under windy conditions. Various methods will be tested to replace the classical weighing method, e.g. by snow fork or DEP measurements. Density will be derived on a stationary DEP bench in the EDML science trench and a new handheld DEP instrument directly done at the drill site. To obtain high quality density of the fragile firn in the top meter the cores are drilled by a modified Rufli hand auger containing a thin liner. During the DEP measurements the firn core is kept in the liner. To further characterize density and the microstructure we plan to determine the specific surface area of surface snow and firn by an IceCube A2 Photonic Sensor and by the large area scanning macroscope.

The stratigraphy of snow and firn close to the surface is an important part to understand the past isotopic composition of the ice, the inclusion of air, and finally its interpretation. In this sub-project we plan to investigate the stratigraphy down to about 3 m depth using different quantitative methods, which cover the different scales of spatial resolution.

The SnowMicroPen measures the microstructural hardness with a spatial resolution of 4 μm to a depth of 1.1 m (Fig. 2). Based on the raw data, snow density and the structural correlation length of the structure can be derived with a vertical resolution of 1 mm. One measurement requires about 2-3 min, and consequently 100-300 measurements per day can be accomplished. The current plan is to investigate areas of about 70 m x 70 m, by rows distanced by about 2 m, parallel and orthogonal to the main direction of the sastruga. Distance between measurements is planned to be about 0.5 m, based on previous experience in the expedition EXPLORE of LGGE. Complementary, we plan to use 1.6 GHz ground-penetrating radar to record the continuity of marker layers.

The snow pits will be quantitatively measured using a combination of near-infrared photography and quantitative translucent profile (NIRtran). The surface of a profile will be 0.5 m x 1.2 m. Specific surface area and density will be evaluated with a spatial resolution of 4 x 4 mm2. Preparation and measurement require about 1 day, including traditional pit description, photography of the grain shapes and sampling for microtomography.

The snow structure will be investigated at the highest resolution by micro-tomography. To this end, samples of 20 cm x 7 cm x 7 cm are cut out, casted with diethyl phthalate (to prevent any further metamorphism) and deep-frozen. Representative samples are taken especially close to the surface, where specific surface area is large. At larger depth, block of 100 cm x 30 cm x 30 cm are cut out undisturbed, packaged in core-boxes and investigated in the laboratory in Davos using micro-tomography. Ideally, such large samples are taken from each location in duplicate. We also plan to measure the fabric of these samples, as recent investigations have shown a re-orientation of the fabric caused by metamorphism.

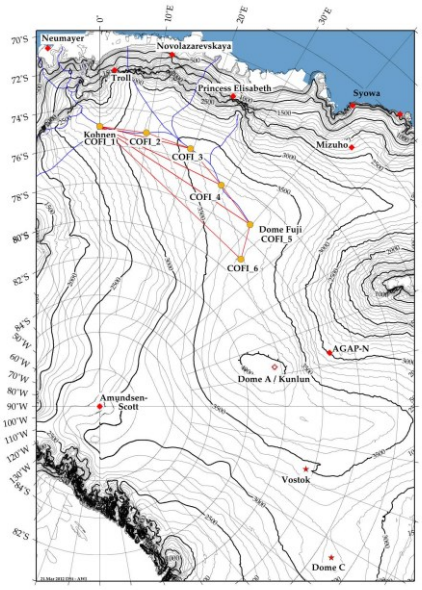


Fig. 1: Map showing sites where it is planned to drill shallow cores on the ice divide to Dome Fuji and beyond.

2.2.2 LIMPICS ANT 2011/12 - Linking micro-physical properties to macro features in ice sheets with geophysical techniques ANTARCTICA 2011/12

Coen Hofstede (AWI), Anja Diez (AWI), Rick Blenkner (AWI), Pascal Bohleber (Uni Heidelberg)

Reflection seismic measurements near KOHNEN STATION

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. A particular property of ice is its anisotropy for a number of physical properties such as rheology, electromagnetic and seismic wave speed. Especially the resistance of ice to applied forces varies by four orders of magnitude, depending on if the force is applied parallel or perpendicular to the ice crystal's c-axis, and strongly depends on temperature.

The project's goal is to obtain the first seismic vibroseis data at KOHNEN STATION with AWI's EnviroVibe to deduce the distribution of the crystal orientation fabric (COF) as a function of depth and compare it to the in-situ deep ice-core data and radar analysis for future applications; furthermore, to deduce the properties of the bed underneath the ice sheet. To this end a vibroseismic survey in AVO (amplitude variation with offset) configuration along two perpendicular profiles will be deployed. This is complemented by several profiling surveys with the p-wave vibrator EnviroVibe. The measurements complement the explosive seismic survey performed in January 2012. In addition to the vibroseismic measurements, selected explosive profiles will be shot.

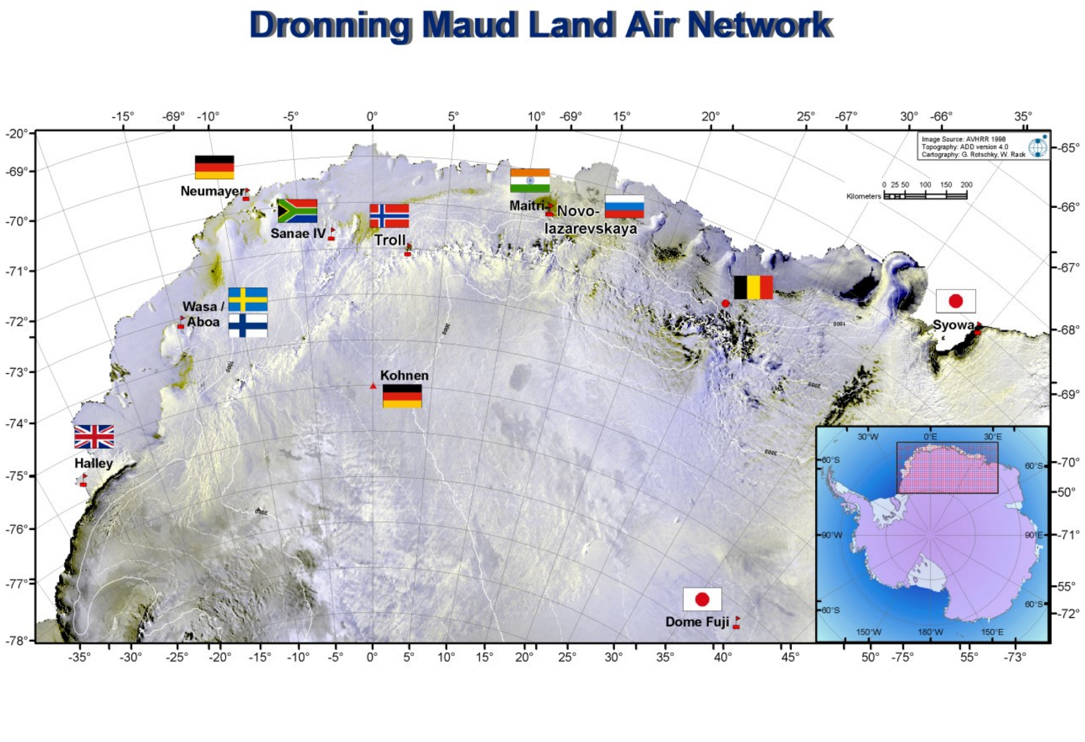
3. AWI FLIGHT MISSIONS AND DROMLAN

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 12 intercontinental flights with connecting flights to various destinations.

In season 2012/2013, for DROMLAN altogether 12 intercontinental flights are scheduled with IL-76TD, between 6 Nov. 2012 and 27 Feb 2013.
The IL-76TD flights running via Novo Airbase and Troll are arranged by ALCI.
At TROLL runway flight management is arranged by NARE. 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 - 356 persons will fly into Antarctica and 316 persons back. About 45 tons of cargo have to be carried in and about 14 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 – 12 flights	356 / 316	45 / 14	85/ 85	21,7/ 5.4

The three BT-67 POLAR 6 (C-GHGF), LIDIA (C-GEAI), and MIA (C-GEAJ) 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 85 scientists and technicians with about 22 tons of cargo will be carried from Cape Town to NEUMAYER STATION III, and 85 persons with about 5.4 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) 2 operated by ALCI (LIDIA and MIA) for feeder flights in the scope of DROMLAN and 1 (POLAR 6, AWI) for scientific and logistic tasks

The detailed flight schedules are shown in chapter 5.

3.3 Logistic flight missions of POLAR 6

Logistic flights (approximately 30 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 DoCo, DOMECair, GEA, RECISL, and WEGAS

(AWI, FIELAX, TUD, KBA)

In 2012/13 AWI's research aircraft POLAR 6, a Basler BT-67 on skis, will be used for five different geophysical and glaciological projects. Furthermore logistic flights within DROMLAN, for support of the maintenance of the remote observatories of the NEUMAYER STATION III and the project CoFi are planned. In total are approximately 395 flight hours planned within a period of 116 days from beginning of November 2012 until mid of February 2013, including the ferry to and from Antarctica.

For logistic reasons POLAR 6 will be based at the beginning of the forthcoming season at Novo airfield and move during the season to several other stations: Princess Elisabeth, Concordia, Kohnen, and NEUMAYER STATION III. The team for the scientific project will consist of 2 scientists and 2 engineers. The only exception will be DoCo. During the survey flights for this project the capacity on board is limited and the crew will be reduced. The flight crew for all project including logistic flights comprises 2 pilots and 1 aircraft engineer.

The scientific equipment and personnel for the planned missions will be flown in from Cape Town, South Africa. A preliminary schedule of the season is given in table aero.tab1.

Table aero.tab1: Preliminary schedule of POLAR 6.

Begin	End	Project
02/Nov	15/Nov	Ferry Bremerhaven – Novo airbase

16/Nov	18/Nov	Integration at Novo, test flight
19/Nov	09/Dec	GEA (camp Crown Bay, Princess Elisabeth)
10/Dec	09/Jan	RECISL & WEGAS (Kohnen)
10/Jan	21/Jan	DOMECair
22/Jan	30/Jan	DoCo (Neumayer, Progress/Zhongshan, Novo, Princess Elisabeth)
31/Jan	01/Feb	De-integration at Novo or Neumayer
01/Feb	15/Feb	CoFi logistics, DROMLAN, logistic support NM III observatories
16/Feb	25/Feb	Ferry Neumayer - Calgary

The instrumentation of POLAR 6 varies for the four missions:
DoCo: Ice thickness radar, accumulation radar, laser scanner, laser altimeter, nadir camera, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, and pressure).
DOMECair: EMIRAD, gravity meter, laser scanner, laser altimeter, nadir camera, accumulation radar, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, pressure).
GEA & WEGAS: Ice thickness radar, gravity meter, magnetics, laser scanner, laser altimeter, nadir camera, accumulation radar, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, and pressure).
RECISL: Ice thickness radar, accumulation radar, magnetics, laser scanner, laser altimeter, nadir video, 50 Hz and 1 Hz geodetic GPS receiver, basic meteorology (temperature, humidity, wind, and pressure).

On ground several GPS reference and magnetic base stations will be set up during the surveys near the station from which POLAR 6 will be operated and during WEGAS also on the polar plateau.

3.4.1 DOMECair (approximately 50 flight hours including ferry to Concordia station):

DomeCair is a joint project ESA project for calibration and validation of ESA's SMOS satellite in the Dome C region and supplements the ground based ConCalVal project of Italian and French groups also operating at Dome C. Main instrument for the planned flights is an L-Band radiometer, developed by the Technical University of Denmark, Lyngby. The survey layout consists of two grids of 200x200 km^2 perpendicular to each other with a line spacing of 20 km.

3.4.2 DoCo East Antarctica (approximately 30 flight hours):

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 January 2013. The map in aero.fig1 shows the planned profile and those already flown.

3.4.3 GEA (up to 75 flight hours):

The intension of this mission is to map small-scale magnetic anomalies of the western Sør Rondane in support of the geological mapping activities of BGR in this region. First flights for this project were already conducted seasons ago. The survey allows linking the geological studies and future planned overview mapping activities. The line spacing will be 5 km and the length of the lines 200 km. It is planned to set up magnetic and GPS reference base near Princess Elisabeth station.

3.4.4 RECISL (up to 50 flight hours):

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.

3.4.5 WEGAS (up to 50 flight hours):

It is planned to carry out 8-10 survey flights for the WEGAS project operating from KOHNEN STATION. The aim is to extent the investigated area of the earlier VISA and WEGAS surveys further south. The line spacing will be 10 km and the flight level 11500 ft. The WEGAS data set will serve as a reference for satellite based magnetic and gravity field measurements, e.g. GRACE.

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 STATION III, 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.

Fig. aero.fig1: Map showing the areas of investigation as dark grey regions, from east to west: DOMECair, DoCo, GEA, WEGAS, and RECISL. The main profile of DoCo is shown as bold dashed line along the ice divide between Dome A and Dome Fuji. The ferry routes are not shown.

Acronyms:

DoCo (East Antarctica)	Dome Connection East Antarctica
DOMECair	Dome C airborne calibration and validation experiment
DROMLAN	Dronning Maud Land Air Network
GEA	Geodynamic evolution of East Antarctica
GPS	global positioning system
GRACE	Gravity Recovery and Climate Experiment
KBA	Kenn Borek Air Ltd
RECISL	Recovery Glacier and Lakes, ice thickness, bedrock

Topography and basal properties	
SMOS	Soil Moisture and Ocean Salinity
TUD	Technical University of Denmark, Lyngby
VISA	Verdichtung und Interpretation von Satellitendaten zur Bestimmung von Magnetfeld, Schwerefeld, Eismassenhaushalt und Krustenstruktur in der Antarktis unter Nutzung flugzeuggestützter und bodengebundener Messungen
WEGAS	West-East Gondwana Amalgamation and its Separation

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 January 2013. It is operated in cooperation with the Instituto Antártico Argentino (IAA). During the season 2012/13 4 German scientists (2 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 3.8 tons of cargo have to be shipped by sea.
End of October 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 2013.

4.3 Planned scientific projects

4.3.1 Sources and reaction pathways of soluble Fe from the Western Antarctic Peninsula to the Southern Ocean

Michael Staubwasser (Uni Cologne), Susann Henkel (Uni Cologne), Sabine Kasten (AWI)

The objective of this study is to reveal sources and mechanisms responsible for high supply of soluble Fe in regions close to ocean islands in the otherwise HPLC Southern Ocean with the common effect of stimulating plankton growth. The focus of this study will be on King George Island (KGI), Western Antarctic Peninsula. Fe isotopes from glacial outwash material, shelf sediments and pore waters, and transects of water column profiles together with full diagenetic inorganic geochemical profiling will be used to fingerprint Fe sources and supply pathways. In the light of rapid glacier retreat on KGI due to global warming and enhanced outwash of glacially eroded material, three possible reaction pathways will be investigated: 1) early diagenetic recycling of Fe and diffusion out of sediments fuelled by high productivity; 2) accumulation and resuspension of solid reactive Fe phases (including diagenetic Fe-oxyhydroxides) in surface sediments; 3) direct dissolution of reactive Fe minerals and Fe-rich silicates from glacial outwash.

4.3.2 Glacier mass balance measurements on King George Island

Ulrike Falk (Uni Bonn)

Our main objectives are the quantification of hydrological and geophysical processes of Potter Cove Glacier, its energy and water exchange with the atmospheric boundary layer as well as melt water production and glacier mass balance. In the context of the ESF IMCOAST project we intend to start an extensive field programme on Potter Glacier in addition to previous observations on Bellingshausen Dome and the main ice cap of King George Island. The observations on Potter glacier shall be run over three years and comprise the installation of an automatic weather station (AWS) including direct measurements of surface energy fluxes on the glacier. Additionally snow courses and mass balance stakes will be placed on the glacier. The data from this instrumentation will form the base for point and spatially distributed melt and glacier surface mass balance modelling. Applied methods include assimilation of remote sensing products into a glacier mass balance and melt modelling. TerraSAR-X satellite data will be used to map glacier retreat, i.e. changes in glacier extent and snow covered areas. The remote sensing data serves as a platform to spatially validate the glacier melt modelling.
Different weather patterns will be analysed with regard to their impact on glacier melt rates. The snow courses and modelling activities shall also cover Potter Peninsula in order to link them to the hydrological and sedimentological measurements and other research works within IMCOAST or any other colleagues.

4.3.3 Research on Antarctic storm-petrels *Oceanites oceanicus* and *Fregetta tropica*

Petra Quillfeldt (Uni Giessen), Simon Thorn (Uni Giessen)

Between 1996 and 2000, we have worked at the storm-petrel colony of the Tres Hermanos, close to the CARLINI (ex Jubany) station. Following on from this previous work, we will study changes in the abundance and food availability due to climate change. We will collect samples for stable isotope analyses and studies 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 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

5. Other activities

5.1 AWI activities at other stations and locations

5.1.1 Population ecology of skuas

Hans-Ulrich Peter (Jena University)

From November 2012 to March 2013 there are two main research fields on Fildes Peninsula (Maxwell Bay, King George Island, South Shetland Islands):
The first aim of the skua project is reached by investigating the skua population inside the hybrid zone between South Polar Skua and Brown Skua at Fildes Peninsula, King George Island. The studies will focus on chick growth in pairs of different pair assemblage, fitness of hybrids and pure species individuals. At Fildes Peninsula the distribution of skua nests will be mapped, adults and chicks are banded and the breeding success of chicks will be determined (long term program).
Long term monitoring of Antarctic seabirds and seals

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).

There is a close cooperation with colleagues from Korea (King Sejong station), Chile (Escudero Station), Russia (Bellingshausen Station) and from Montreal University (Canada).

6. LOGISTICS, SCHEDULES, PARTICIPANTS

6.1 DROMLAN flight schedules October 2012)

Transport	Date	Flight No	Route	Pax in	Cargo in (kg)	Pax out	Cargo out (kg)
Transport of personnel and cargo							
DROMLAN flight - IL-76TD	06-07 Nov 2012	D1	CT - Novo - CT	0	0	0	0
DROMLAN flight - IL-76TD	14-15 Nov 2012	D2	CT - Novo - CT	17	4266	0	400
DROMLAN flight - IL-76TD	21-22 Nov 2012	D3	CT - Novo - CT	7	3011	0	0
DROMLAN flight - IL-76TD	29 Nov - 02 Dec 2012	D4	CT - Novo - CT	15	7243	0	0
DROMLAN flight - IL-76TD	06-07 Dec 2012	D5	CT - Novo - CT	5	1325	2	200
DROMLAN flight - IL-76TD	13-14 Dec 2012	D6	CT - Novo - CT	10	300	1	0
DROMLAN flight - IL-76TD	20-22 Dec 2012	D7	CT - Novo - CT	2	1400	3	0
DROMLAN flight - IL-76TD	09-12 Jan 2013	D8	CT - TROLL - CT	28	890	18	250
DROMLAN flight - IL-76TD	27 - 29 Jan 2013	D9	CT - Troll - CT	0	820	26	800
DROMLAN flight - IL-76TD	06-09 Feb 2012	D10	CT - Novo - CT	1	300	13	2850
DROMLAN flight - IL-76TD	20-21 Feb 2013	D11	CT - Novo - CT	0	900	18	0
DROMLAN flight - IL-76TD	26-27 Feb 2013	D12	CT - Novo - CT	0	0	4	1300
			DROMLAN gesamt	**85**	**20455**	**85**	**5800**
Commissioning and decommissioning POLAR 6							
POLAR 6 (BT-67)		P6		3		3	
Ship transportation							
RV Polarstern		PS	CT - Atka Bay - CT	2		2	
SA Agulhas		SAA	CT - Atka Bay/Penguin Bukta - CT	0		0	
DROMSHIP		DROMSHIP		0		0	
Transport total				**90**	**20455**	**90**	**5800**

6.2 Travel schedule for participants, DML

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 forecast					D8	D12
						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								
Technical operations and supply								
Drücker	Cord	chief logistic team KOHNEN STATION	AWI-LOG	Technician	Germany		D3	D11
Schubert	Holger	Logistic team, technician	RFL	Technician	Germany		D3	D11
Köhler	Jens	Logistic team, technician	RFL	Technician	Germany		D3	D11
Schultz	Corinna	Cook					D3	D11
Birkheuer	Thomas	Physician					D3	D11
Lenuck	Michael	Electrician					D3	D11
Errath	Alexander	Technician Kässbohrer					D3	D11
Gerchow	Lars	Driver					D5	D8
Seibel	Sebastian	Driver					D5	D8
Stocker	Bruno	Driver					D5	D8
Riedel	Christian	Driver					D5	D8
						Total:	**11**	**11**
Scientific projects								
CoFiaP								
Kipfstuhl	Sepp						D4	D9
Leonhardt	Martin						D4	D9
Frenzel	Andreas						D4	D9
Binder	Tobias						D4	D9
Behrens	Melanie						D4	D8
Hilmarsson	Sverrir						D4	D9
Freitag	Johannes						D4	D9
Klein	Katharina						D4	D9

Schneebeli	Martin						D4	D9
Laepple	Thomas						D4	D8
Lippmann	Erich						D4	D8
Schuett	Philip						D4	D9
Weißbach	Steffi						D4	D9
Instenberg	Katja						D4	D9
Tell	Jan						D4	D8
						Total:	**15**	**15**
LIMPICS								
Diez	Anja	Scientist	AWI				D8	D9
Hofstede	Coen	Scientist	AWI				D8	D9
Blenkner	Rick						D8	D9
Bohleber	Pascal						D8	D9
						Total:	**4**	**4**
KOHNEN STATION total:							**30**	**30**
Scientific flight missions POLAR 6								
WEGAS/DoCo/GEA II Princess Elizabeth Station, KOHNEN STATION								
Mieth	Matthias	Scientific leader	AWI	Scientist	Germany		D2	D8
Kaessbohrer	Johannes	Engineer	Fielax	Scientist	Germany		D2	D7
Baumgarten	Heiner	Engineer	Fielax	engineer	Germany		D2	D7
Binder	Julia	Engineer	AWI	engineer	Germany		D2	D7
Steinhage	Daniel	Scientific leader	AWI	Scientist	Germany		D8	D10
Nehring	Franziska	Engineer	Fielax	Scientist	Germany		D7	D9
NN	NN	Scientist	DTU	Scientist	Denmark		D8	D9
Konrad	Christian	Engineer	AWI	engineer	Germany		D7	D10
NN	NN	Scientist	BGR	Scientist	Germany		D2	D6
						Total:	**9**	**9**

Polar 6 crew									
Emberley	Dean							P6	D8
Sipko	Jon							P6	D8
Bayes	John							P6	P6
Miller	Finlay							D8	P6
Hudon	Roger							D8	P6
							Total:	**2**	**2**
Flight missions total								**11**	**11**
National and international visits/Media									
Visit at Neumayer Station III and Kohnen Station									
Nixdorf	Uwe	Head of Logistics	AWI					D8	D9
Gernandt	Hartwig	Inspection	AWI					D8	D9
Hertel	Fritz	Inspection	UBA					D8	D9
Ney	?	Inspection	Foreign Affairs					D8	D9
Heyn	?	Inspection	Ministery of Research					D8	D9
NN		Inspection						D8	D9
							Total:	**6**	**6**
Visit Neumayer Station III									
Lochte	Karin	official visit	AWI					D8	D8
Miller	Heinz	official visit	AWI					D8	D8
Freitag		official visit	German Embassy SA					D8	D8
Kraus		official visit	Ministery of Research					D8	D8
							Total:	**4**	**4**
Visits total								**10**	**10**
DROMLAN intercontinental total								**85**	**85**

6.3 Travel schedule for participants, KGI

Name	First Name	Institute	Profession	Duration of Stay
Bers	Valeria	AWI	Scientist	Jan - März 13
Esefeld	Jan	Uni Jena	Student	Nov 12- Feb 13
Hartmann	Jan	Uni Heidelberg	Student	Jan-März 2013
Henkel	Susann	Uni Köln	Scientist	Jan-März 2013
Hermann	Thora	Uni Jena	Scientist	Nov 12 - Feb 13
Krietsch	Johannes	Uni Jena	Student	Nov 12 - Feb 13
Mengedoht	Dirk	AWI	Logistics	Jan 13 -Feb 13
Peter	Hans-Ulrich	Uni Jena	Scientist	Nov 12 - Feb 13
Scheld	Jochen	Uni Köln	Technician	Jan-März 2013
Stelter	Michel	Uni Jena	Student	Nov 12 - Feb 13
Thorn	Simon	Uni Gießen	Scientist	Jan 13 - März 13

6.4 Participants

Surname	Given name	Institute / Company	Profession	Nation
Baltes	Uwe	Uni Trier	Scientist	Germany
Baumgarten	Heiner	Fielax	Engineer	Germany
Behrens	Melanie	AWI	Scientist	Germany
Behrens	Lisa Katherina	AWI-LOG	Scientist	Germany
Bers	Valeria	AWI	Scientist	Germany
Binder	Julia	AWI	Engineer	Germany
Binder	Tobias	Uni Heidelberg	Scientist	Germany
Birkheuer	Michael	RFL	Physician	Germany
Blenkner	Rick		Scientist	USA
Bohleber	Pascal	Uni Heidelberg	Scientist	Germany
Chouker	Alexander	LMU	Scientist	Germany
Christian	Boris	RFL	Engineer	Germany
Denecke	Mirko	RFL	Engineer	Germany
Diez	Anja	AWI	Scientist	Germany
Drücker	Cord	AWI-LOG	Technician	Germany
Eder	Pit	RFL	Technician	Germany
Erath	Alexander	Kässbohrer	Technician	Germany
Esefeld	Jan	Uni Jena	Student	Germany
Fabry	Ben	Uni Erlangen	Scientist	Germany
Fiedel	Babara	AWI-LOG	Physician / Station leader	Germany
Fontes	René Pascal	RFL	Engineer	Germany
Freitag	Johannes	AWI	Scientist	Germany
Freitag	Horst	German Embassy Cape Town	Ambassador	Germany
Frenzel	Andreas	AWI	Scientist	Germany
Gerchow	Lars	RFL	Technician	Germany
Gernandt	Hartwig	AWI	Scientist	Germany
Grasse	Torsten	BGR	Engineer	Germany
Hänssler	Thedda	AWI-LOG	Scientist	Germany
Hartmann	Jan	Uni Heidelberg	Student	Germany
Henkel	Susann	Uni Köln	Scientist	Germany
Hermann	Thora	Uni Jena	Scientist	Germany
Hertel	Fritz	UBA	Ministerial official	Germany
Heuck	Hinnerk	RFL	Engineer	Germany
Heyn	Andrea	BmBF	Ministerial official	Germany
Hilmarsson	Sverrir		Technician	Iceland
Hoffmann	Mathias	BGR	Engineer	Germany

Hofmann	Jörg	FIELAX	IT-Engineer	Germany
Hofstede	Coen	AWI	Scientist	Netherlands
Hoppmann	Mario	AWI	Scientist	Germany
Hunkeler	Priska	AWI	Scientist	Switzerland
Instenberg	Katja	AWI	Scientist	Germany
Janke	Michael	RFL	Cook	Germany
Kaessbohrer	Johannes	Fielax	Scientist	Germany
Kipfstuhl	Sepp	AWI	Scientist	Germany
Klein	Katharina	AWI	Scientist	Germany
Knobelsdorf	Michael	DWD	Meteorologist	Germany
Kohlberg	Eberhard	AWI	Logistics	Germany
Köhler	Jens	RFL	Technician	Germany
König-Langlo	Gert	AWI	Scientist	Germany
Konrad	Christian	AWI	Engineer	Austria
Kooistra	Frerk	RFL	Technician	Germany
Kraus	Wilfried	BMBF	Ministerial official	Germany
Krietsch	Johannes	Uni Jena	Student	Germany
Kristensen	Steen Savstrup	DTU	Scientist	Denmark
Laepple	Thomas	AWI	Scientist	Germany
Lenuck	Michael	RFL	Electrician	Germany
Leonhardt	Martin	AWI	Scientist	Germany
Lippmann	Erich		Scientist	Germany
Lochte	Karin	AWI	Director	Germany
Matz	Thomas	AWI-LOG	Engineer	Germany
Mehl	Hans-Joachim	RFL	Technician	Germany
Mengedoht	Dirk	AWI	Logistics	Germany
Mieth	Matthias	AWI	Scientist	Germany
Miller	Max	DWD	Meteorologist	Germany
Miller	Heinz	AWI	Deputy director	Austria
Nehring	Franziska	Fielax	Scientist	Germany
Ney		AA		Germany
Nixdorf	Uwe	AWI	Head of logistics	Germany
NN		BfN		Germany
NN		GL	Technical survey	Germany
Paul	Stephan	Uni Trier	Scientist	Germany
Peter	Hans-Ulrich	Uni Jena	Scientist	Germany
Regnery	Julia	AWI-LOG	Scientist	Germany
Riedel	Christian	RFL	Technician	Germany
Ruppel	Antonia	BGR	Scientist	Germany
Scheld	Jochen	Uni Köln	Technician	Germany
Schlömer	Antje	AWI	Scientist	Germany

Schneebeli	Martin		Scientist	Switzerland
Schubert	Holger	RFL	Technician	Germany
Schuett	Philipp	AWI	Scientist	Germany
Schultz	Corinna	RFL	Cook	Germany
Seibel	Sebastian	RFL	Technician	Germany
Spiekermann	Georg	AWI-LOG	Scientist	Germany
Steinhage	Daniel	AWI	Scientist	Germany
Stelter	Michel	Uni Jena	Student	Germany
Stocker	Bruno	RFL	Technician	Switzerland
Tell	Jan	AWI	Scientist	Germany
Thomisch	Karolin	AWI	Scientist	Germany
Thorn	Simon	Uni Gießen	Scientist	Germany
Tillmann	Barbara	RFL	Service	Germany
Treuger	Thomas	RFL	Engineer	Germany
Van Opzeeland	Ilse	AWI	Scientist	Germany
Weißbach	Steffi	AWI	Scientist	Germany
Weller	Rolf	AWI	Scientist	Germany

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
FAU	Fuerza Aero de Uruguay Av. 8 de Octubre 2958 Montevideo 11600 Uruguay
FIELAX	Fielax Gesellschaft für wissenschaftliche Datenverarbeitung mbH Barkhausenstr. 4 27568 Bremerhaven Germany
IAA	Instituto Antártico Argentino Cerrito 1248 1010 Buenos Aires Argentina
IAU	Instituto Antártico Uruguayo Av. 8 de Octubre 2958 Montevideo 11600 Uruguay
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