EXPEDITION PROGRAM ANTARCTICA

(ANT – Land 2006/2007)

STATIONS AND FLIGHT MISSIONS

Neumayer Station

Kohnen Station

Flight Missions

Dallmann Laboratory

Other Activities

Co-ordination

Heinz Miller

Christian Wiencke

Hartwig Gernandt

Guido Kleffel

Thomas Matz

ALFRED WEGENER INSTITUTE

FOR POLAR AND MARINE RESEARCH

HELMHOLTZ ASSOCIATION

November 2006

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EXPEDITION PROGRAM ANTARCTICA

(ANT – Land 2006/2007)

STATIONS AND FLIGHT MISSIONS

Neumayer Station

31 October 2006 – 18 February 2007

Kohnen Station

No activities at Kohnen this season

Flight Missions

8 December 2006 – 3 February 200

Dallmann Laboratory

5 December 2006 – 27 March 2007

Other Activities

15. October 2006 – 10 May 2007

Co-ordination

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CONTENTS

1. ANT – LAND 05/06: NEUMAYER / KOHNEN

1.1 Summery and Itinerary

Activities at Neumayer Station

The Neumayer Station is permanently occupied. The exchange of the wintering staff will be performed as a regular task during summer season. In parallel technical works are planned for maintenance of the station buildings and technical facilities.
Likewise the scientific observatories for air chemistry, meteorology, and geophysics will be maintained and advanced data management and instrumentation will be replaced as well. These activities will include the maintenance of the infrasound station IS27DE and the hydro acoustic observatory PALAOA (Perennial Acoustic Observatory in the Antarctic Ocean).
Medical studies of the Berlin Centre for Space Medicine (ZWMB) will be continued the second year.
Neumayer Station will be used as the operational base for the Dornier 228-101 aircraft Polar2. As a contribution to the international project Dronning Maud Land Air Network (DROMLAN) the regular weather forecast service is provided to all national operators within the Dronning Maud Land region.
Additional activities comprise the visit of a TV-team (Eikom), which works on a long-term documentary "Working and Living in Antarctica", for German and French television. Furthermore a group of two persons from AWI and DLR will visit Neumayer Station in the frame technical evaluation of DROMLAN cooperation.

Activities at Kohnen Station

Kohnen Station will not be opened this summer season. In the frame of scientific flight missions Polar 2 will land at the station for refuelling. During this period the self-sustaining air-chemistry observatory at Kohnen will be checked.

Itinerary, international coordination and transport facilities

The season ANT - Land 2006-2007 is scheduled for the period from 31 October 2006 until 19 February 2007. The 27th wintering staff will stay at Neumayer Station until summer season 2007/2008.
In total 42 scientists and technicians are workings or temporarily staying at Neumayer during the expedition ANT – Land 2006/2007. All participants will fly to Neumayer station within the scope of intercontinental and feeder flights of DROMLAN and return the same way at the end of season. Aircraft will also transport a substantial part of freight in order to get technical and scientific equipment

available in the beginning of season. Altogether 10 intercontinental flights have been scheduled in the scope of DROMLAN. The final flight for return personnel and freight is scheduled on 19 February 2007.
RV Polarstern (ANT XXIII/8) ships the majority of freight and fuel for Neumayer and aircraft support. The call at Atka Bay is scheduled between 04 and 05 December 2006. The resupply of Neumayer station is also to be performed by RV Polarstern in February 2007.
Further ship calls at Atka Bay are planned for S.A. Agulhas in the frame of the South African National Antarctic Program (SANAP).

The logistic operations have been coordinated with the South African National Antarctic Program (SANAP), the British Antarctic Survey (BAS) and the national programs within DROMLAN, mainly with RAE, ALCI, NPI, and SPRS. Following aircraft are scheduled to land at Neumayer during the season:

Basler (BT-67)	operated by ALCI for feeder flights in the scope of DROMLAN
Dornier (Do 228-101)	operated by AWI for science and logistics
Twin Otter (DHC-6)	operated by BAS to transport own personnel to and from Halley
Helicopter (Bell 212)	operated by SANAP for support their own ship calls

Ship calls for Atka Bay during the season:

RV Polarstern	operated by AWI/Reederei F. Laeisz
S.A. Agulhas	operated by SANAP

1.2 Neumayer Station

1.2.1 Logistics

ANT Land 2006-2007 – Summer Season at Neumayer and Kohnen Stations

The scientific and logistic projects during the Antarctic summer season at Neumayer and Kohnen Stations will start at the beginning of November 2006 and last till Mid-February 2007.

The personnel participating this season will enter from and return to Cape Town, South Africa with the Dronning Maud Land Airway Network (DROMLAN) via the Russian station Novolazerevskaya or the Norwegian station Troll respectively. These flights will be carried out with a Iljushin 76 and a Lockheed Orion P3N. The continental flights to Neumayer Station will be carried out with a Basler BT67 as in the previous season. Up to 45 persons will travel this way.

Deutscher Wetterdienst (DWD) at Neumayer Station guarantees a weather forecast service for the 11 intercontinental flights as well as for the flights to the different stations within DROMLAN.

The delivery of supply to Neumayer Station will take place at the beginning of December by RV Polarstern. The ship will bring provisions, cargo and fuel for the summer campaign and for the winter. In February the ship will call at Neumayer again and care for the waste disposal.

Extensive maintenance works will also be carried out during this season. The areas at the eastern ramp and the garage ramp will repaired. Various ventilation and exhaust gas shafts will be elevated. In the outer area several platforms of the observatories and emergency exits must be elevated too. The measuring fields of the infrasound arrays IS27 are uncovered and repositioned on the snow as a matter of routine. Due to the pressure of the ice on the station the tubes show further deformations and so it will be necessary to carry out maintenance works here as well. Especially the cross tube within the area of the fuel store is affected by deformation. During the past years steel plates from the ceilings and ice have already been removed in the fuel store. In order still to be able to use the ice tunnel to the garage as a shelter for two heavy trucks (chieftains) it is necessary to remove ice here as well. The station containers in the west and east tubes will be re-adjusted

The vehicles (Pistenbully) will be maintained and repaired. This is very important so that all vehicles will be ready for start of work on the new Neumayer Station III during the summer season 2007/2008.

In order to be able to carry out the necessary works within the disposable time limit five technicians from other companies will work together with the logistic staff on this job.

Furthermore the logistics will at Neumayer Station be responsible for the realisation of the preparation for the scientific projects ANTSYO II and the traverse to the Halvfar Ridge which is a geophysical/glaciological exploration for a potential ice core drilling within the IPY project IPICS.

At Neumayer Station the 26th wintering team will be replaced by its successor team consisting of 4 women for the scientific part, 4 men for the operation of the station and a physician, who will be responsible for the daily work at the station and for the health of the team. In Bremerhaven the team has been trained and prepared for the wintering period.

The Kohnen Station will not be operated this season. There will be no traverse from Neumayer Station. Measuring flights will be carried out with Polar 2 at Kohnen within ANTSYO II. Polar 2 will use the station for re-fuelling. During this period the self-sustaining air-chemistry observatory at Kohnen will be checked.

The different scientific projects and the supervision of the long-term measurements at the observatories at Neumayer are described in the following reports.

1.2.2 Observatories and services

1.2.2.1 Air Chemistry Observatory

R. Weller (AWI) and D. Wagenbach (IUPH)
Participants: Andrea Möller (over-winterer 2006)

Summer Campaign 2006 / 2007 at Neumayer and Kohnen Stations

During the forthcoming summer campaign, our activities at Neumayer Station will focus on extended aerosol measurements at the Air Chemistry Observatory in connection with the AGAMES (Antarctic Trace Gas and Aerosol Airborne Measurement Study) campaign. A modified optical particle counter (OPC, type LASX) will be set up to measure the size distribution of the aerosol above and within the firn layer in the aerodynamic size range between 0.08 µm and 3.5 µm. It is planned to continue this experiment during the over wintering season 2007. In addition, maintenance of the equipment, validation of the measured data, as well as practice of the new over-winterer will be performed as every year.

The main focus of our work at Kohnen Station (EPICA-DML) is maintenance of the automated aerosol sampler designed for year-round measurements. The equipment was set up during summer campaign

2002/2003 in a purpose-built container located in the clean-air sector about 300 m north-easterly of the drilling trench. Electric power supply is realized by a combination of a wind turbine and solar panels, buffered by Ni/Cd batteries. A sophisticated version of the automated aerosol sampler has been installed in January 2005. The aerosol sampler consists of 22 filter holders, each one equipped with a teflon/nylon filter combination. Hence in total 22 aerosol samples per year are achievable with an individual sampling period of 15 days. Due to the fact that Kohnen Station will not be opened in the forthcoming season, only the filter holders with the aerosol samples can be removed and the automated aerosol sampler will be shut down for one year. The project is a close cooperation with the Institut für Umweltphysik, University of Heidelberg (IUPH). The samples are destined for analysis of the ionic composition by ion chromatography.

1.2.2.2 Meteorological Observatory

Loose (AWI), Rudolph (AWI)

The meteorological observatory program at Neumayer 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, DMSP).

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 2006/2007 the following activities are planned.

- Exchange of all radiation sensors with recently calibrated ones.
- Repair and maintenance of all other equipment of the meteorological observatory as necessary.
- Training of the new overwinterers.
- Upgrade of the radiosounding system.
- Heightening of the meteorological mast.
- Support of the observatory with expendable goods, spare parts and new equipment.
- Disposal of the observatory of old or defective equipment.

- Tests with a special ventilation system for air temperature measurements:
  Aim is the development of a system which ensures an optimal ventilation of the inserted Pt100 – thermometers at all wind directions and speeds.
  In order to avoid incorrect measuring results which are mainly arising during periods of strong solar radiation or storm, it is planned to install this system permanently at the Neumayer III station.

- Tests with a modified ventilation system for pyranometers:
  The use of ventilation systems in conjunction with radiation sensors is nowadays a standard procedure. But all of the available devices are not perfect for use in polar regions. Their ability to avoid or to reduce the deposition of rime or hoarfrost on the domes of the radiation sensors is not sufficient. Tests with a newly developed air flow and heating system shall demonstrate that improvements are feasible.

1.2.2.3 DROMLAN weather forecast service

Ralf Brauner (DWD), Hans-Arnold Pols(DWD)

For the fifth summer season the meteorological observatory of the German Antarctic station Neumayer offer 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). The increasing flight activities within the Dronning Maud Land and especially the intercontinental air link between Cape Town and Novolazarevskaja has made the ment of this service mandatory.
Neumayer station has a central position within the Dronning Maud Land due to its good communication facilities including a permanent satellite data link (128 kb, Intelsat), and the modern infrastructure of the meteorological observatory.
The forecasts based on special model outputs from the European Centre for Medium-Range Weather Forecasts (ECMWF), the Antarctic Mesoscale Prediction System (AMPS) and the Global-Model (GME). New outputs are available twice a daily. They are used to cover a forecast period up to one week.
For short-term forecasts and flight activities the satellite picture receiving station from Neumayer (HRPT, SeaSpace) is of great importance. Up to 20 satellite passes can be obtained daily (NOAA, DMSP). Visual as well as infrared pictures get geocoded automatically on a variety of masters covering the synoptic scale (2500 x 5000 km) down to local scale with a spatial resolution up 500 x 500 m at any place in the Dronning Maud Land.
Additionally, all information from the Global Telecommunication System (GTS) – including the 3-hourly synoptic observations and daily upper air soundings – are available via the permanent data link at any

time. Also measurements from surrounding automatic weather stations transponding via ARGOS but not included into the GTS get extracted automatically from the NOAA-satellite information.
The forecaster at Neumayer can be reached at any time from all DROMLAN members by email, fax, telex, phone, and short-wave communication. While the forecaster is not at Neumayer his service can be obtained via Iridium.
During the summer season 2006/2007 more than 2500 forecasts get performed for field parties, ships, stations and especially aircrafts It is obvious, that this service increased the safeness of the ambiguous projects in the Dronning Maud Land. Furthermore, it helps to reduce weather induced idle times of expensive flight operations to a minimum.

1.2.2.4 Geophysical Observatory

Christian Müller, Michaela Bock, Tobias Müller-Wrana, Nora Graser, Christine Läderach

During the coming summer campaign 2006/07 all necessary service works at the two remote seismographic stations VNA2 on Halvfar Ryggen and VNA3 on Søråsen Ice Rise have high priority. At station VNA2 with its detection-array the container housing all data acquisition systems must probably pulled out from accumulated snow masses and set up again at an elevated ramp. Evtl. on top of some of the 15 tubes, in which the seismometers of the array are installed, must be lengthened by another segment. Other necessary works are the recovery of the 3-component seismometer out of the deep snow and changing batteries. At station VNA3 the data acquisition box, the seismometer and the mast with its solar panels and transmitting antenna had to be pulled out of the snow and batteries have also to be changed. These job is at this site especially laborious as the annual snow accumulation can amount her up to 3 meters. At both remote stations the back-up power supply during winter with air-depolarized zinc-oxygen primary batteries failed this year. These batteries are intended to provide electrical power during the dark winter time when solar panels cannot charge the accumulators. Probably the necessary ventilation of the snow pits, wherein the batteries had been installed, had not been sufficient enough. A practicable solution has to be found when visiting these stations to guarantee again an uninterrupted operation also during winter.

Until a few years ago it was generally believed that the Antarctic continent is almost completely “a-seismic”, i.e. that there occur almost no earthquakes. But this is not true at all. Especially since the deployment of the detection-array at station VNA2 quite a number of tectonic quakes could be detected and localized in Dronning Maud Land (DML) with the Neumayer Station seismographic network (which also includes the seismographic broad-band station at the South African base SANE IV). However, these earthquakes were too low in magnitude ($M_L \leq 4.0$) to be also recorded at seismographic monitoring stations outside Antarctica. Until now we can identify two areas with a distinct and significant seismic activity: the area of the Jutul-Penck Graben in the East of SANAE IV and an area along the continental margin, especially off shore of Kapp Norvegia in the North-West of

Neumayer Station. These seismic activities are in direct relation to recent neotectonic processes. However, the different natures of these neotectonic processes are yet not completely clear. The Jutul-Penck Graben might be an old rift-system of the geological past which has now been reactivated again. The earthquakes occurring along the continental margin may be induced by an isostatic, post-glacial rebound movement of the lithosphere following a glacial maximum. For the investigation of these different neotectonic processes on a larger, regional scale we need a denser seismographic network across entire DML. Therefore, during this season another autonomously operating seismometer station should be installed at the Swedish summer base SVEA. The installation will be made in close cooperation with Swedish and Finnish institutions. It should be a first step towards a large scale seismographic network in entire DML. The seismographic station at Kohnen Station should also be set up again into operation after probably another year of malfunction. During the last years we had always encountered always technical problems and recorded data is unfortunately rather limited.

In the geomagnetic observatory another integrated digital 3-component flux-gate sensor had been installed last summer season. This new sensor with integrated AD conversion and RS-232 interface has an extreme low noise level and offers a very high dynamic range (the former system was limited to record field variations less than ±1000 nT). In August this year the coaxial cable for data transfer to a laptop in the I27DE container broke during a heavy storm. Thus a new cable has to deployed. However, first it should be tested if a stable WLAN inter-connection between the laptop in the geomagnetic observatory and the station's computer network might be accomplished. Some repair works at the entrance shaft into the geomagnetic observatory must probably also to be made to guarantee a further safe access into the observatory. Another new geomagnetic observatory has to be built when the the successor base Neumayer-Station-III will be built within the next two years.

As every summer season it is also about for the necessary service works at the I27DE infrasound array. These works are carried out by the geophysicists together with a supporting group of the logistics team. At each of the nine single array elements the box with the barograph and the recording electronics had to be dug out from deep below the snow surface and set up again at a higher level. Also all eight porous wind-noise reducing hoses (15 meters long) and their connecting pipes to the barograph box (25 meters long) had to be pulled out from the snow and laid out again radially on the snow surface.

Besides all these different service works the comprehensive training of the new geophysics intended to stay for wintering has highest priority. Only an extensive introduction at the base will impart all the necessary knowledge to the winterers about the recording instruments, the processing and evaluation of all data and also the administration of the station's computer network.

1.2.2.5 Maintenance of the infrasound station IS27

Grasse (BGR), Vorshelen, Medenwald, Eron (ManPower)

Responsible organisations

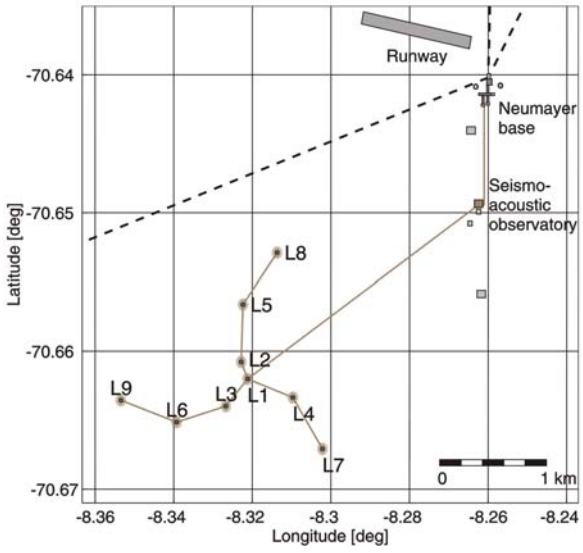
Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany
Alfred Wegener Institute for Polar and Marine Research (AWI), Bremerhaven, Germany
Provisional Technical Secretariat (PTS) of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO), Vienna, Austria

Scientific goals

According to the Comprehensive Nuclear Test Ban Treaty (CTBT), the IS27 infrasound station is to be operated continuously with at least 98 % data availability over a year's time. Routine maintenance of the array has to be carried out every year. The nine array elements have to be recovered from the snow and re-installed on the surface. The condition of the equipment has to be checked and hardware and software upgrades have to be installed.

Area of activity

The IS27 array is located at 70.66ºS, 8.32ºW, about 3 km southwest of the Neumayer base (see figure below). The aperture of this array is about 2 km. The central array control system is installed in the seismo-acoustic observatory about 800 m south of the Neumayer base.

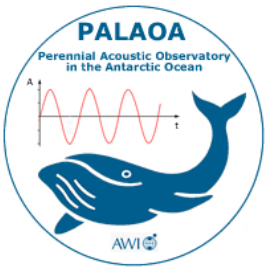


Location of the IS27 infrasound array

1.2.3 Projects

1.2.3.1 Perennial Acoustic Observatory in the Antarctic Ocean (PALAOA)

Kindermann, Klinck (AW)



Scientific background: Marine mammals use sound for communication, navigation and prey detection. Thus they can be detected and studied acoustically even during polar winter months, when restricted visibility prohibits visual observations. In polar waters the animals are continuously surrounded by environmental sounds dominated by the movement of ice. Acoustic long-term recordings can provide information on intensity and temporal variability of this characteristic natural background and its influence on the acoustical behaviour of the animals - and also to re-conceive the effects of man generated sounds to marine mammals.

Scientific objectives: The **P**erenni**AL** **A**coustic **O**bservatory in the **A**ntarctic Ocean (PALAOA, Hawaiian “whale”) has been set up during summer 2005/06 near Neumayer Station. It continuously records the underwater soundscape in the vicinity of the ice shelf edge with 4 hydrophones located along with a CTD about 80m below the 100m thick Ekström shelf ice @ 70°31'23"S, 8°13'49"E. The recording system and the control technology of PALAOA are placed in a 10 foot container, powered by a wind generator, solar panels and a methanol fuel cell. The station is connected by a WLAN link to Neumayer. A webcam allows visual observations of the sea surface of Atka Bay. The recordings are used to register species specific vocalizations, infer the approximate number of animals inside the measuring range, calculate their movements relative to the observatory, and examine possible effects of the natural sounds and the sporadic shipping traffic on the acoustic and locomotive behaviour of marine mammals. During the recent year the observatory provided numerous recordings of multiple species of whales and seals as well as natural events like colliding icebergs, which generated extraordinarily high sound levels, even at a distance of several kilometres.

Work at Neumayer: While a low bandwidth audio stream has been accessible continuously in real time at Bremerhaven, the high quality audio data - several month of up to 4 channel / 192kHz / 24Bit recordings – is stored on tapes at Neumayer. This data will be previewed to optimize recording settings for the next year. In addition to the annual maintenance like replacing batteries and methanol and relocating the container to prevent sastrugi build-up, some repairs and improvements of the energy supply system and modifications of the sound recording system will be executed. It has turned out that the cables of the hydrophone array form a loop antenna and pick up electromagnetic interference, so called “spherics”, caused by thunderstorms on the southern hemisphere. Each lightning stroke generates a click in the acoustical data, up to hundreds per second during peaks in

thunderstorm activity in the Amazonas and Congo area. To minimize this noise we will isolate the hydrophones electrically from each other by installing separate power supplies and A/D converters for each channel and connect them by optical cables.

1.2.3.3 Change of body weight, body composition and adaptation of the cardiovascular system during wintering over in Antarctica 2006

H.-C. Gunga (ZWMB, Berlin) and E. Kohlberg (Laeisz/AWI)

Participants: wintering over personnel 2007/2008

During summer season 2004/2005 a medical study started at Neumayer Station in cooperation with the Berlin Centre for Space Medicine (ZWMB) and the Alfred Wegener Institute. Data collection has been continued the complete wintering over periods 2005 and 2006. The 27th wintering over team should resume the project in 2007. Measurements will be made during the whole wintering over period focussed on the nine months lasting phase of isolation. All members of the wintering team will be involved.

The project derives from space medicine which made it possible to study the impacts of extreme environments referring to the human organism. In the same way Antarctica presents the opportunity to do research on change of body weight, body composition and adaptation of the cardiovascular system under isolated conditions. It is intended to record the body composition of the wintering over personnel with the non-invasive body impedance analysis. Conditional on dehydration of the organism in Antarctic climate there is an increased loss of water through respiratory tract and skin. This potential dehydration can be recorded by the measurement of the impedance. Additional monthly taken blood samples should give information about possible correlation between changes of the autonomous nervous system and some metabolic parameters.

The autonomous nervous system is always involved in adaptation to extreme environments. That may become apparent in sleeplessness, loss of appetite, nausea and heart trouble. Early symptoms can be found in changes of the variability of heartbeat. These variabilities should produce knowledge about influence on the autonomous nervous system during isolation. There is a direct correlation between variability of heart frequency and actual state of reaction of the autonomous nervous system. All members of the wintering over team will be introduced to the method and record an electrocardiogram weekly before getting up in the morning. The data are saved on a datalogger, the medical officer of Neumayer Station will transmit the data via computer and internet to the Berlin Centre for Space Medicine (ZWMB). Due to these periodical checkups the state of health of the personnel can be followed. The data-loggers are developed by the Berlin Centre for Space Medicine. They record the beat-to-beat intervals of the heart to find out the variability.

1.2.3.4 Telemedicine at Neumayer Station and its Development

In Antarctica the Alfred Wegener Institute has to manage the medical service of the Neumayer Station, Kohnen Station and the Research Vessel Polarstern. Neumayer Station has a year round a Medical Officer who takes care of the health of the wintering team. Basic prerequisite for employment at the stations as well as onboard Polarstern is to be a specialist in surgery. In addition the candidate must have knowledge and experience in dentistry, anaesthesia and general medicine, so that with specialist support they can treat nearly any case.

Since a few years there is a close cooperation with the Central Hospital "Reinkenheide" in Bremerhaven. In the Central Hospital all specialities are available, and the Consultants who train the Medical Officers are the same as those providing the specialist advice if there are inquiries from the stations or the ship.

During the period between April and November the Medical Officer is on his own and in case of emergency surgery the only support he can get is via satellite link. The difficulty is that he is both surgeon and anaesthetist. So the doctor of the wintering team needs some help or better a "third eye" to take care of the patient during an emergency operation. The surgeon can focus on his main job, the operation, and gets online support from the anaesthetic department of the Central Hospital in Bremerhaven. Over a distance of a about 14000 km the anaesthetist can observe all vital parameters of the patient on his monitor and send messages immediately or give advice via a standing telephone link if it is necessary to modify the narcosis.

In the year 2000 a permanent satellite link between the AWI and Neumayer Station with 128 kb transmission rate was opened. This was the starting point of telemedicine. First we only could transmit ECG data online. At the moment in case of an emergency operation we are able to monitor a patient automatically with 5 important parameters such as CO2, body temperature, 12-channel ECG, blood pressure and O2 SAT. Coming season we are going to extend this system and establish the online monitoring of narcotic gases such as O2, Sevoflurane and nitrous oxide (laughing gas) combined with the installation of a new anaesthetic apparatus. At the end of the season we should be able to transmit 8 vital parameters in real time to Bremerhaven. The next step for the following years should be the online transmission of ultrasound scans.

1.2.3.5 Working and Living in Antarctica

Jens Dücker, EIKON

A long term documentary for public German and French/German television./ part 2

We know the pictures of the spectacular landscapes in the southern polar-regions, we love pinguins, and sometimes we see scientists studying icedrilling cylinders and measuring the ocon-whole. But we have no idea, what is behind working on the Antarctical ice. To show the amazing logistics necessary

to enable surviving on the 6th continent is the aim of our project for ARD and ARTE, produced bei Eikon-filmproductions in Stuttgart. We have accompanied the crew going to run the Neumayer-Station of Alfred-Wegener-Institute for one year. We have filmed their training and preparation, we`ve seen tons of material prepared to be shipped to Neumayer Station, and now we will go to Neumayer to film the last weeks of isolation before the summer-campaign begins, we will object the summer with our crew touching their successors and have to face that they are the old winterers now. And finally we will see them flying home.

1.2.3.6 Pre-site survey VOR_ IPICS 2006/07

Steinhage, Wesche, Bock (AW), Schwander, Kaufmann(Uni Bern)

Aim of the project is to determine basic glaciological properties of the ice sheet surrounding Ekströmisen by various glaciological, geodetic and geophysical methods. These data are needed with regard to the IPY project IPICS in order to decide which subproject of IPICS AWI might join. Moreover this field work can be used for the validation of different satellite projects (e.g. CryoSat, TerraSar).

The areas of investigation are the ice ridges Søråsen, west of Ekströmisen, and Halvfarryggen, east of Ekströmisen, from their northern most extend up to 72.5° S (see figure map_vor_ipics). The planned field work consists will be carried out by conducting a small traverse with 2 Pistenbulli snow cats with 4 sledges, 2 snow scooter with Nansen sledges.

The glaciological programme consists of up to 4 ~120 m shallow ice cores, 2 or more ~ 30 m deep firn cores. Furthermore several snow pits will be dug. By carrying out dielectric profiling (DEP) measurements immediately after recovering of the ice core, drilling will be stopped by detection of the prominent signal of Tambora from 1815 instead of aiming for maximum achievable length of the ice cores. Finally we will log temperature in the bore holes.

In the vicinity of all shallow ice core drill sites strain figures will be established by means of static GPS surveying. A reference station will be set up prior to the planned traverse by the geophysicists of the wintering-over teams from Neumayer Station during their maintenance work in December 2006 close to the seismological observatory Watzmann on Halvfarryggen. Kinematic GPS surveys will be carried out together with ground penetrating radar profiles on the ice ridges around the drill sites and connecting them for more detailed interpretation. The GPR survey will comprise CMP measurements and profiles revealing the internal structure of the upper 20 m and 100 m at different vertical resolution.

In addition an automatic weather station will be erected on Halvfarryggen. The position is not fixed yet, but most likely close to the southern shallow ice core drill site on the ridge.

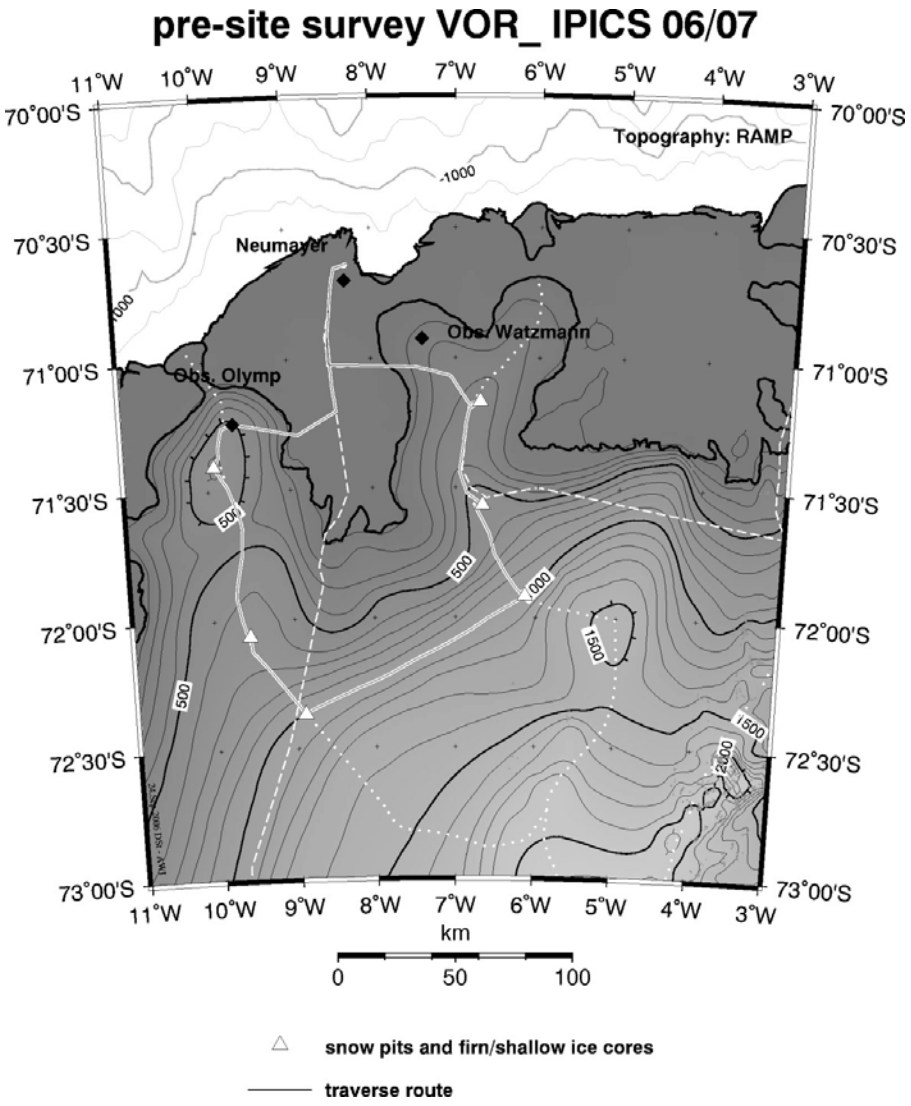


Figure map_vor_ipics: The map shows the planned traverse route and the proposed drill sites. On the southernmost location on each ice ridge the firn cores will be drilled, while at the other shallow ice cores will be drilled. The tracks for GPS/kinematic GPS profiles are not shown. They will be defined in the field according to ice and weather conditions at the place.

2. ANT-LAND 06/07 FLIGHT MISSIONS

2.1 Summary and Itinerary

Dronning Maud Land Air Network (DROMLAN)

AWI has co-ordinated the air transport of personnel and freight to Neumayer within the frame of DROMLAN, which is organized by 11 national operators. Altogether 10 intercontinental flights are planned. DROMLAN performs 7 flights from Cape Town to Novo-Airbase (Russia) and back with aircraft Iljushin IL-76TD, 4 flights in November and December 2006 and 3 flights in February 2007. Another 3 flights are scheduled from Cape Town to Troll Station (Norway) and back with aircraft Lockheed Orion P3Nin January 2007.
Feeder flights to the station Neumayer will be performed with Basler (BT-67) aircraft.

AWI aircraft Dornier 228-101 (Polar 2)

One aircraft Do228-101 (DAWI) - Polar 2 will perform scientific and logistic flight missions within the ANT – Land 06/76 program. The aircraft will be operated for ANTSYO II flight missions from Neumayer and S17/Syowa. The preliminary schedule is as follows:

Ferry flight southbound in 2005:	25 November:	departure Braunschweig, Germany
	10 December:	arrival at Neumayer

At Neumayer Polar 2 will perform logistic flights between Neumayer, Kohnen and Halley and additional scientific flights from the beginning of 11 December. The ANTSYO II mission is scheduled at S17/Syowa from 04 January until 27 January.

Ferry flight northbound in 2007:	01 February:	departure Neumayer
	13 February:	arrival at Bremerhaven, Germany

International cooperation

Aircraft missions for AWI needs close co-operation with other national operators. Beside DROMLAN co-operation special support is given by BAS, SANAP, NIPR and ALCI.
The Dornier 228-101 (Polar 2) ferry flights is supported by the British Antarctic survey with ground service at stations Rothera and Halley. Transportation of the ski equipment for Polar 2 is also made by BAS shipment from Rothera back to UK.
Ground service for scientific missions provides NIPR staff at S17/Syowa.

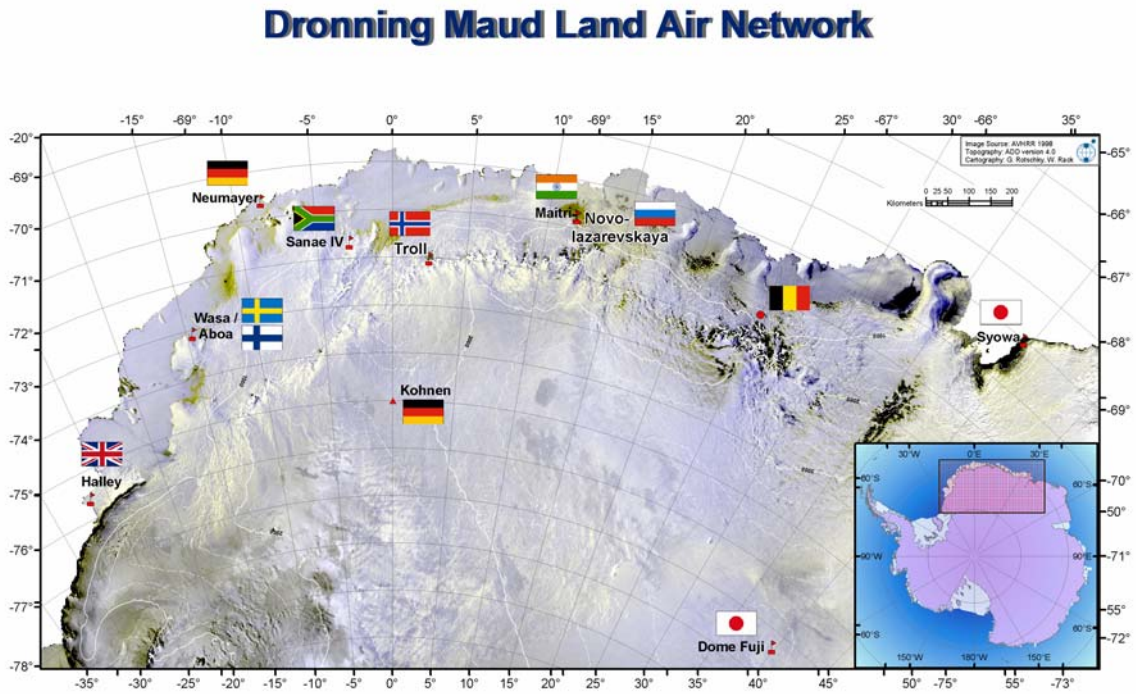
Beside the DROMLAN co-operation additional logistic flights and service for SAR will be performed in the scope of AWI by BT-67 (ALCI) and by helicopters (Bell 212) in co-operation with SANAP.

2.2.1 Dronning Maud Land Air Network (DROMLAN)

DROMLAN performance

The aim of the Dronning Maud Land Air Network (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 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 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). 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 (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) organizes 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 smaller ski-equipped aircraft as Basler (BT-67) and by request or need by Dornier 228-101 and Twin Otter. The map shows destinations within Dronning Maud Land. DROMLAN member's co-ordinate 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 6 to 8 intercontinental flights with connecting flights to the various destinations.

DROMLAN for 2006/2007

For season 2006/2007 altogether 10 intercontinental flights are scheduled in order to carry personnel and cargo for AWI (Germany), BAS (UK), BELARE (Belgium), FIMR (Finland), NCAOR (India), NARE (Norway), NIPR (Japan), RAE (Russia) and SPRS (Sweden).
For DROMLAN seven flights are planned with IL-76TD from Cape Town to Novo Airbase, 4 flights in November and December 2006 and 3 flights in February 2007. The IL-76TD flights and running Novo-Airbase as well are arranged by ALCI. Three flights are scheduled with aircraft P3N (Lockheed Orion) from Cape Town to Troll runway in mid-summer, beginning of January 2007.
The Norwegian Polar Institute (NPI) is organizing the P3N flights in cooperation with the Norwegian Air Force. 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 nine DROMLAN members are going to join the intercontinental flights. In total - including support personnel, pilots and others for Novo-Airbase - 252 persons will fly into Antarctica and 246 persons back. About 31.57 tons of airfreight has to be carried in and about 17.46 tons out.

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 – 7 flights	139 / 213	13.6 / 9.3	31 / 42	1.7 / 2.9
P3N – 3 flights	55/ 31	0.50 / 0.15	11 / 3	0.15 / 0

The BT-67 will carry out the feeder flights to various stations and summer camps in Dronning Maud Land. ALCI co-ordinates and performs feeder flights according to the requirements for DROMLAN as well as for RAE activities at the Russian stations Progress and Vostok.

DROMLAN for AWI activities

Altogether 42 scientists and technicians with about 1.85 ton cargo will be carried from Cape Town to Neumayer, and 45 persons with about 2.93 ton cargo back from to Cape Town (schedule details in 5.1.1). Additionally BT-67 flights are scheduled in order to assist the Polar2 scientific missions at S17/Syowa (ANTSYO II).

Helicopters (Bell 212) based at station SANAE IV will support AWI traverses south of Neumayer Station. This is in the scope of bilateral co-operation between DEAT/SANAP and AWI.

The following aircraft will perform transportation of AWI personnel and cargo:

Iljushin (IL-76-TD)	operated by ALCI for DROMLAN
Lockheed Orion (P3N)	operated by Norwegian Air Force for DROMLAN
Basler (BT-67)	operated by ALCI for feeder flights in the scope of DROMLAN
Dornier (Do 228-101)	operated by AWI for science and logistics

2.2.2 Airborne Geophysics with Polar 2 in East Dronning Maud Land

Herber, Treffeisen (AWI), Minikin (DLR), Gabrecht, Höltig (Optimare), Hara (NPIR), Krecji (SPRS)

Antarctic Flight Missions at Syowa Region (ANTSYO II)

Airborne Geophysical, Glaciological, and Atmospheric Research in East Antarctica

The ANTSYO II operation of one aircraft of type Dornier Do228-101 (POLAR 2) is planned to take place in the vicinity of Neumayer station as well as Kohnen station (Atlantic sector of Antarctica) and additional in the area around Syowa station – S17 airfield (East Antarctica) The aim of this research activity is to contribute the understanding of relevant processes and interdependencies in the highly dynamic Earth System. Each, however, poses its own very special challenge, emanating from its unique environment and role within the system, which needs to be met individually. The anticipated airborne operation in Antarctica is a unique opportunity to improve the insight of interdependencies between especially the atmospheric sciences and glaciology as well as between glaciology and geodynamics. Therefore, it is logistically a challenging effort which can only be met by the combined support of Alfred Wegener Institute Bremerhaven (Germany) and National Institute of Polar Research Tokyo (Japan). Both national Antarctic programs combine their logistical potential to firstly perform extensive air-borne missions in this area over a period of three Antarctic summer seasons (05/06 till 07/08).

The knowledge about aerosol properties and distribution over the Antarctica is fairly limited and based on relatively few ground-based measurements, mostly confined to the coastal regions. The aerosol vertical distribution in the Antarctic troposphere, and therefore aerosol transport patterns and life cycle in general, cannot be sufficiently described based on ground-based observations only. This gap in knowledge considerably limits the ability to decipher Antarctic ice core records of past climate and paleo-environment. Furthermore, investigations of the aerosol air-snow transfer of aerosol species requires knowledge of the vertical distribution of aerosol chemical and microphysical characteristics, which is so far not well understood.

The atmospheric part of the ANTSYO II program, named AGAMES **(Antarctic trace Gas and Aerosol airborne MEasurement Study)** will focus on characterization of the Antarctic tropospheric aerosol, delivering unique comprehensive observational aerosol data sets never achieved before. Investigation of the aerosol physico-chemical properties, origin and transport pathways over the Antarctica ice sheet as well as over the coastal part of the continent and sea ice area are the main objectives of the program. In addition, the occurrence and frequency of “diamond dust” events will be observed and trace gas variability in the Antarctic troposphere will be studied. To achieve the ambitious project goals, airborne in-situ measurements will be closely linked to ground-based and satellite observations and appropriate modelling tools.

The project was initiated by the Alfred Wegener Institute for Polar and Marine Research Bremerhaven (Germany), the National Institute of Polar Research Tokyo (Japan), together with the Institute of Applied Environmental Research/Department of Meteorology Stockholm University (Sweden) and the Institute for Physics of Atmosphere of DLR Oberpfaffenhofen (Germany). Aircraft based measurements will be performed as a joint international collaboration in East Antarctica and the Atlantic sector of the Southern Ocean during two consecutive austral summer 2006/07. The scheduled project AGAMES includes annually 3 weeks operation at Syowa station from b ginning of January to the end of January 2007 as well as measurement activities in the vicinity of Neumayer and Kohnen stations for in December 2006.

Acronyms:

ANTSYO	**Ant**arctic flight missions at **Syo**wa Region: airborne geophysical, glaciological, and atmospheric research in East Antarctica
CHAMP	**Cha**llenging **m**inisatellite **p**ayload)
DISTINCT	**D**ronning Maud Land **i**ce **s**hee**t** **in**corporative **t**ask
EPICA	**E**uropean **P**roject for **I**ce **C**oring in **A**ntarctica
GPS	**g**lobal **p**ositioning **s**ystem
GRACE	**G**ravity **R**ecovery **a**nd **C**limate **E**xperiment
WEGAS	**W**est-**E**ast **G**ondwana **a**malgamation and its **s**eparation

3. ANT – LAND 05/06: DALLMAN LABORATORY

3.1 Summary and Itinerary

Activities at Dallmann Laboratory

The Dallmann Laboratory will be opened in beginning of December 2006. It is operated in co-operation with the Instituto Antártico Argentino (IAA) and placed at the Argentinean station Jubany. During the season 2006/07 up to 13 German scientists (5 scientific groups will work at the Potter Cove and the station area) and technicians will stay at the Dallmann Laboratory. The planned scientific activities of AWI focus on terrestrial and shallow water biological projects.

At the beginning of the season one technician will be at the station to support the scientists and prepare the laboratories for the following work. In December 2006 the last part of the reorganisation of the Dallmann-Laboratory will be done. A new sleeping room will be prepared for up to 4 persons. From the beginning of January 14 permanent places and 8 extra beds area available at the Dallmann-Laboratory. Further technical works:

- Installation of a new cooling system for the aquarium container
- Re-installation of a maintained cooling system for the salt water supply system
- New Quad for the station
- In cooperation with the DNA
    - Building a new ramp for slipping Zodiacs
    - Installation of an electrical hitch and a new trailer for big zodiacs

A German diving group will support the scientific work in cooperation with the Argentine divers, who took care for a year around support of scientific projects and infrastructure.

In order to perform all planned scientific works and technical activities works up to 8 ton of cargo have to be shipped by sea and up to 0,5 ton by air.

On 27th March RV James Clark Ross will call for King George Island and pick up to 2 tons of cargo. After this operation the station will be closed till the end of October 2007.

International cooperation and transport facilities

The transport of personnel and cargo needs close coordination and assistance by various national programs and commercial operators. That includes aircraft and ship transportation. German personnel will join intercontinental flights with aircraft LC-130 (Hercules) performed by the Chilean Air Force (FACH) and Uruguayan Air Force (FAU) between Punta Arenas and Teniente Marsh at King George Island (see details on schedule 5.2.1). Feeder flights to Jubany/Dallmann are planned with helicopter

BO-105 operated by the commercial company DAP Antarctica LTDA and FACH. During season various ships call for different stations at King George Island to get personnel and cargo to the Dallmann Laboratory and back (see details on schedule 5.2.2). The following ships will assist transportation:

RV Almirante Irizar	operated by DNA / Argentine Navy
MV Las Palmas	operated by SPC / Spanish Navy
MV Oscar Viel	operated by INACH / Chilean Navy
MV Artigas	operated by IAU / Uruguayan Navy
RV James Clark Ross	operated by British Antarctic Survey (BAS)
MV Vistamar	operated by plantours & partner (NGO)
MV Bremen	operated by Reederei Hapag Lloyd (NGO)

For ship and aircraft transportation agreements have been made with national and commercial institutions of Chile (INACH, FACH, DAP), Argentina (DNA/IAA), Russia (AARI/ALCI), Uruguay (IAU, FAU), South Korea (KORDI), Spain (SPC), and Germany (Hapag Lloyd/plantours & partner).

3.2 Planned scientific projects

3.2.1 Genetic diversity and geographical differentiation of green-algal photobionts in Antarctic lichens

Prinzen, Ottich (Forschungsinstitut Senckenberg)

The biomass and diversity of terrestrial Antarctic ecosystems is almost entirely made up of bryophytes and lichens. As highly specialized symbiotic systems of fungi and algae or cyanobacteria lichens are especially sensitive to rapid climatic changes. Lichen fungi depend critically on the availability and ecological performance of suitable algal strains and genotypes in their environment. Up to now, the genetic diversity and geographical differentiation of Antarctic green algal lichen photobionts has not been studied in detail and little is known about the photobiont selectivity of green algal lichens. Based on DNA-sequences, we want to study the genetic diversity and structure of Antarctic populations of trebouxioid lichen photobionts and mycobionts and compare them with populations from other continents. As a model system, the photobiont diversity in different haplotypes of the macrolichen *Alectoria nigricans* will be examined and compared to the total stand diversity. Within the Antarctic, *Alectoria nigricans* occurs on the northern Antarctic Peninsula, South Georgia, the South Orkney Islands and the South Shetland Islands. The genetic variability of ca 20 individuals of *Alectoria nigricans* and 20 associated lichen thalli from ca. 10 different populations from various part ranges shall be studied and compared with the species diversity of these stands (lichens and bryophytes). We

are especially interested in the question, how strongly Antarctic populations of *A. nigricans* select for certain photobiont strains and whether Antarctic photobiont populations are genetically isolated from those of other continents. Our study shall enable us to better estimate whether Antarctic green-algal lichens can respond to rapid climate warming by range shifts or photobiont switches.

3.2.2 Response of the Antarctic bivalve *L. elliptica* in physiology and population structure to changes in near coastal benthic environments due to climate induced glacial melting in the Western Antarctic Peninsula (Part of IPY Activity 34, ClicOPEN)

Philipp, Abele (AWI)

The long lived Antarctic bivalve *L. elliptica* (maximum lifespan >36years) is a major biomass constituent, colonizing the muddy bottom sediments of Antarctic coastal environments, and a key species of the Antarctic bentho-pelagic carbon flux. We hypothesize that glacier melting, ongoing at Western Antarctic Peninsula (WAP), and drastically affecting also the study area Potter Cove on King George Island (Fig. 1), causes increased environmental stress on the benthic infauna through enhanced iceberg-scouring and sedimentation as well as hypoxic/anoxic incidents during burial of animals underneath sediment, either due to sedimentation or iceberg-scouring, in shallow coastal areas. We further hypothesize that these stressors lead to a change in energy allocation, which lead to a change in *L. elliptica* population structure, in turn affecting the community structure in coastal bethic populations. The project objective is to describe and cross check the effects of glacier melting - effected by local warming - on a benthic key species of WAP at the individual, the population and, eventually, in the context of the IPY-Topic ClicOPEN, at the community level.

We will compare different *L. elliptica* subpopulations within Potter Cove under distinctly different impact of these stress categories. The age/size composition and growth in each population will be investigated as well as physiological stress markers in individual animals throughout the whole age range within the populations. To interpret the data of the *in-situ* investigations, physiological performance under stress (increased sedimentation, increased ice-scouring and burial/hypoxia) will be investigated in the laboratory. Biochemical investigation of stress is especially useful as proxies of early and acute stress response, whereas changes in life history parameters of a population (growth rate, size-age structure) reflect the integrated response to long-term stress exposure at a given locality. In the present study both approaches will be linked. Parameters will be measured in differently aged individuals, as the response to environmental stressors can differ between different life-stages.

The Project is part of the ClicOPEN IPY activity, endorsed as lead project by the ICSU/WMO Joint Committee for the IPY. ClicOPEN investigates the Impact of CLimate Induced glacial melting on terrestric and marine COastal communities off the Western Antarctic PENinsula.

3.2.3 Photosynthesis and photo-inhibition at low temperatures: D1-turnover in Antarctic Rhodophytes

Wiencke (AWI), Bischof, Becker (IPÖ)

Performing photosynthesis under high light but at low temperature conditions poses the problem of slowed down enzymatic reactions and increased generation of reactive oxygen species. However, these are the abiotic conditions macroalgae from Antarctica are usually exposed to during the Antarctic summer season. Our study aims at a characterisation of photosynthetic performance of Antarctic red algae under different temperature and light conditions. In particular, the interactive effect of high light and low temperature will be evaluated.

Temperature dependence of photosynthetic activity and photo-inhibition will be monitored and related changes in pigment composition will be measured. The generation and scavenging of reactive oxygen species in photosynthesis at low temperature conditions will be investigated. Changes in the concentration of the D1 reaction centre protein in photo-system II and the velocity of its turnover in relation to stress exposure and species-specific lipid composition will be studied in laboratory and mesocosm experiments.

For mesocom experiments, macroalgal samples will be collected in the field and inserted in large plastic ponds with a water column of approx. 15 cm covering them. These pools will be set up in front of the Dallmann Laboratory. The mesocosms will be exposed to the natural course of solar radiation. Temperature will be controlled by thermostats and running seawater is supplied by seawater resistant pumps. In one of the pools, temperature will permanently adjusted to the temperature of surface waters of Potter Cove close to the shore. In a second pool, temperature will be elevated by approx. 5 ^{o} C, whereas water in the third pool will be cooled down by 5^{o} C, or even until freezing. Irradiance may artificially be increased by installing additional halogen spots above the pools. Under these conditions algal specimens will be cultivated over a period of about four weeks, to allow sufficient time for temperature acclimation. In addition, various short-term experiments of light and temperature interaction will be performed inside the Dallmann Laboratory. Experiments will focus on abundant red algal species from the eulittoral and upper sublittoral zone, and within tidepools, with a particular emphasis on endemic Antarctic species. The Antarctic endemit *Palmaria decipiens* will be the key species of our study.

The results of our study will substantially increase the understanding of physiological adaptation of plant life in extreme environments, like coastal ecosystems of polar areas.

3.2.4 Polar and Bird Ecology

Peter, Lisovski, Lorenz (Uni Jena)

From December 2006 to March 2007 there are two main research fields on Potter, Barton and Fildes Peninsula (King George Island, South Shetland Islands):

1) Phylogeography , hybridisation, migration and population ecology of Skuas (Catharacta maccormicki, C.antarctica lonnbergi)

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 and Potter 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 Potter and 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). Additional studies at Potter Peninsula will investigate in detail the consequences of hatching date for chick growth. There is a close cooperation with Korean colleagues on Barton Peninsula.

The migration routes of skuas will be investigated by using dataloggers (project with British Antarctic Survey).

Additionally we will continue to investigate the phylogeography of the southern skua complex and deepen our knowledge about processes in the hybrid zone between South Polar Skua and Brown Skua in the area of the Antarctic Peninsula. This first goal will be achieved by sequencing the HVR I region of the mitochondrial D-Loop. Many scientists cooperate in this international project and will deliver samples from populations all around Antarctica.

Wilson´storm petrel: adult and chick

2) Effects of variable environmental conditions on breeding, feeding and population ecology of Wilson's Storm Petrel (Oceanites oceanicus)

This project is a sequel to last year's investigations of the Wilson's Storm Petrel (*Oceanites oceanicus*) in the area around the Tres Hermanos, Potter Peninsula, King George Island. Since 1996 the of 500 marked nests consisting breeding colony is studied in terms of ecology and adaptation to the

prevailing weather conditions. We now have sufficient data on nest losses and observer disturbance to start a constant-effort monitoring site with a work scheme designed to minimize disturbance and follow the reproductive effort and the identity of a sample of nests effectively.
The continuation of the long term monitoring program is planned which includes amongst others the ascertainment of breeding success, chick's growth rates of different sexes and morphometric data of the adults as well as their ringing.

3.2.5 ZDF-Team "Fascination Earth"

The department of natural sciences of the German TV station ZDF is currently producing a new episode of the series "Fascination Earth", which will be about Antarctica. It will be broadcasted in February 2007.
The series is about science, natural history and people in a given region of the earth. Each episode focuses on a specific country of landscape and is presented by Dr. Joachim Bublath on location. The program on Antarctica deals with geology, natural history, astronomy and climate of this region.

4. ANT – LAND 06/07: OTHER ACTIVITE

4.1 Summery and Itinerary

4.1.1 Geological Investigations of the first ANDRILL-Core from underneath the Ross Ice Shelf

Geological Investigations of the first ANDRILL-Core from underneath the Ross Ice Shelf

Niessen, Kuhn, Gebhardt, Helling, Magens (AWI), Siegmund (Uni Heidelberg), Läufer (BGR)

ANDRILL is a multi-national (USA, NZ, IT, GER) initiative to investigate the tectonic history of Antarctica and the role of the continent in Cenozoic-Recent global environmental change through stratigraphic drilling along the Antarctic margin (http://andrill.org). ANDRILL provided the development of a new drilling rig that enables sampling of more than 1500 m below the sea surface utilizing both fast ice and ice shelf as drilling platforms. Based on the successful international ANDRILL Proposal submitted in 2002, funding allows drilling at sites in the McMurdo Sound region in 2006 and 2007. The first project, the **McMurdo Ice Shelf Project (MIS)** with its drilling phase from October 2006 into January 2007, aims recovery of a 1200 m long core comprising Plio-Pleistocene glacimarine terrigenous, volcanic, and biogenic sediment that has accumulated in a flexural moat basin that surrounds the Ross Island volcanic complex.

A major objective of the project is a better understanding of the natural history of the Ross Ice Shelf (RIS) as important component of the West Antarctic Ice Sheet (WAIS). Variability of WAIS-RIS system has major imprints on Antarctic ice cover, ocean deep-water formation, sea level and global climate. This knowledge is fundamental to the recognition and assessment of the RIS vulnerability providing precursory signals of global warming affects on Antarctica's ice sheets. Another objective is a better understanding of the history of the Ross Island Volcanic Complex and its relationship between rift-related and "hot-spot" volcanism as well as the relationship between volcanism, ice volume and sea level.

The German scientific involvement in ANDRILL projects is based on the 6.5% share of the total ANDRILL logistics costs provided by funds from the Alfred Wegener Institute for Polar and Marine Research. For the MIS project, this includes on-ice science work such as logging of physical core properties (AWI), XRF core-scanning (AWI), structural core-logging (BGR) and interpretation of the data after the field season. In addition using core material off-ice, geochemical and petrological work will be carried out by the Universities of Jena and Göttingen.

4.1.2 Bathymety and Geodesy

Gütz (AWI)

For several years the AWI and the Instituto Antártico Argentino – Dirección Nacional del Antártico (IAA/DNA) are jointly operating three **permanent GPS tracking stations** at the Argentine bases Belgrano 2, Jubany and San Martin. The project is related to the Antarctic Neotectonics (ANTEC) program of the Scientific Committee on Antarctic Research (SCAR) and continues the former GAP campaigns.

The gathered GPS-observations are used to connect geodetic points in Antarctica via the IGS-network to the International Terrestrial Reference Frame (ITRF) with highest accuracy. Other objectives are the determination of the relative motion rates and directions of the Antarctic Plate with respect to the adjoining plates and the determination of the vertical motion of the Antarctic lithosphere due to changes of the ice and ocean loading.

Besides the GPS aspects, some of the Argentine bases host additional scientific instruments of different fields of study:

- Belgrano II runs a **DORIS** station. The French data receiving system DORIS (Doppler Orbit and Radio Positioning Integration by Satellite) is presently used to supply a highly accurate orbital position data for Envisat and was supposed to do the same for the CryoSat satellite. CryoSat's main instrument, the SAR/Interferometric Radar Altimeter (SIRAL), would have monitored very precisely changes in the elevation and thickness of polar ice sheets and floating sea ice and helped to explain the connection between the melting of the polar ice and the rise in sea levels and how this is contributing to climate change. The CryoSat spacecraft was lost during its launch on October 8th 2005, but with ESA's willingness to continue this program, DORIS will be on duty when CryoSat-2 will be launched.

- On San Martin **a permanent tide gauge** station determines the height of the sea level. This continues data is used to observe the mean sea level and its changes over the last couple of years.

During the upcoming Austral Summer Antarctic Campaign 2006/07 of Argentina, tasks will be carried out for all of the above mentioned instruments. These include regular maintenance and checks as well as tests whether last year installed equipment is running smoothly. Furthermore the permanent GPS stations San Martín and Jubany will undergo several changes in its hard- and software configuration and the DORIS station needs several substitutions and control measurements.

In addition maintenance and repair tasks on Orcadas will be conducted for the IAA and the geodetic reference points "ESP1" at the station Esperanza and "MAR1" at Marambio will be maintained and inspected.

In order to reach all stations/bases in the area of activity the IAA/DNA kindly offers an AWI employee

the opportunity to participate in the second and third leg (presumably 26.12.2006 – 24.03.2007) of the military ice-breaker “A.R.A. Almirante Irizar”.

Area of activity: Weddell Sea and Antarctic Peninsula
Base Belgrano 2 77° 52’ 29” S 34° 37’ 37” W
Base Jubany 62° 14’ 16” S 58° 39’ 52” W
Base San Martin 68° 07’ 47” S 67° 06’ 12” W
Base Orcadas 60° 40’ 22” S 44° 44’ 17” W
Base Esperanza 63° 23’ 42” S 56° 59’ 46” W
Base Marambio 64° 14’ 42” S 56° 39’ 25” W

4.1.3 Late Quartenary Envronmental History of Amery OASIS and Rauer Island, Prydz Bay Region, as deduced from Lake, Epishef Lake, and Fjord Sediments

Martin Melles (University of Leipzig), Bernd Wagner (IOW Warnemünde)

Objectives

Paleoclimatological and paleoenvironmental investigations in currently ice-free coastal areas (oases) of Antarctica function as a crucial link between respective investigations on the adjacent Antarctic Ice Sheet and Southern Ocean. From the oases, comprehensive information can exclusively be obtained on the natural variability of the local ice sheet extension, ice sheet altitude, climate, and relative sea-level. A detailed reconstruction of these variabilities throughout the recent geological past, allowing to identify their interdependencies, is a precondition for a thorough understanding of the ice sheet stability or lability against future climate change.

The Polarstern cruise ANT-XXIII/9 focuses on the Late Quaternary history of the Prydz Bay region, which is regarded as the key area for a better understanding of the East Antarctic Ice Sheet (EAIS) history. Significant volumes of the EAIS, which covers 79 % of the global ice volume, are drained into the Prydz Bay, most of which via the Lambert Glacier / Amery Ice shelf, the world´s largest glacial drainage system. In order to investigate the variability of this drainage system in comparison to smaller drainage systems of the Prydz Bay region, and to better understand Holocene climate variabilities, which apparently exist in the coastal regions around Prydz Bay, the terrestrial paleoenvironmental research within the scope of the Polarstern expedition is carried out in Amery Oasis and Rauer Group. Amery Oasis is located at the western margin of the Lambert Glacier, being inundated by several smaller outlet glaciers from the west. The Rauer Islands, in contrast, form a coastal oasis bordered by the ice sheet to the southeast and the Prydz Bay to the northwest.

The key questions to be answered by the terrestrial paleoenvironmental investigations are

- Paleoglaciology: How did the ice sheet, the outlet glaciers, and the Amery Ice Shelf evolve through time both in extension and altitude, and what are the reasons therefor?
- Sea-level history: Which changes in the relative sea level have occurred in Amery Oasis and Rauer Group, and how did the sea-level changes interact with the glacial history?
- Paleoclimatology: Which changes in temperature and precipitation are documented in Amery Oasis and Rauer Group, and how did these changes interact with the glacial history as well as the sea-ice coverage and oceanic circulation patterns of the adjacent ocean?
- Comparison: Can the regional differences in the climatic and environmental history within the Prydz Bay region and in other East Antarctic coastal regions, as indicated in past work, be confirmed and, if so, what are their reasons?

Work on Land

The reconstruction of the Late Quaternary climatic and environmental history of Amery Oasis and Rauer Islands will mainly be based on sediment sequences, which are sampled with light coring devices from lakes and fjords, usually following bathymetrical and hydrological site surveys. The sediments will be investigated with a multi-disciplinary approach involving geochronological, sedimentological, geochemical, and biological methods. The study is carried out in close collaboration with microbiologists, geomorphologists, and geocryologists working in the Rauer Islands (D. Wagner et al.), and with marine geologists working on the continental shelf and slope of Prydz Bay (B. Diekmann et al.). It is part of the BIPOMAC initiative ("Bipolar Climate Machinery"), which has been established within the scope of the International Polar Year (IPY) 2007/2008.

The field work in Amery Oasis will be restricted to a maximum of four weeks, due to the remoteness of the region and the related uncertainties in helicopter transport. The work shall start at a small lake located at c. 60 – 80 m a.s.l. on a bedrock ridge at the southern margin of the oasis. This lake, due to the absence of glacial ice in the catchment and limited fluvial supply, promises to hold a highly biogenic sediment sequence that can well be dated using the radiocarbon method and may very sensitively reflect the climatic history of the oasis in its biogenic composition. Subsequently, the field party shall move the camp to the southwestern shore of the much larger Beaver Lake. This lake is located at the southern end of a horseshoe-shaped valley, which is inundated from the north by a tongue of the Nemesis Glacier. It is a so-called epishelf lake that has a hydraulic connection to the ocean beneath the floating glaciers and Amery Ice Shelf. At Beaver Lake, 3 to 5 transects perpendicular to the shore shall be studied for bathymetry, hydrology, and sediment sections. The major purpose are reconstructions of the glacial history and of sea-level changes below modern.

In the Rauer Group hydrological and bathymetric measurements, water sampling, and sediment coring shall be conducted on the lakes as well as in the fjords, which inundate the oasis from the north. Seven lakes were selected according to different altitudes (2 to 30 m a.s.l.) and hydrological

characteristics (e.g., freshwater to hypersaline). Their investigation shall help to reconstruct the sea-level history of the oasis by identification and dating of marine-limnic sediment transitions. Furthermore, reconstructions of paleosalinities of closed saline lakes can supply important information concerning the precipitation history. In the fjords of Rauer Islands, coring sites were selected in bays, which according to their shape likely are separated from the open ocean by submarine sills. Cores from these basins offer the opportunity to study relative sea-level changes below modern, and may contain sapropel sequences, which usually are characterized by a sensitive documentation of regional climate change in their biogenic composition, as well as high sedimentation rates and lack of bioturbation, leading to very good time resolutions.

Expected Results:

From the results a significantly better understanding of the interactions between the glacial history, the morphology at the ice margin, and changes in relative sea level and climate of the Prydz Bay is expected. The results shall be put in a circum-antarctic context in order to better understand the pecularities of the Prydz Bay region. Furthermore, they shall be used to validate a new numerical ice sheet model for East Antarctica, which is run by collaborators in Australia and the U.K, and thus foster predictions of the ice sheet behaviour under future climatic and environmental changes.

Associated Scientists

• Bernhard Diekmann (land-ocean linkages)

• Dirk Wagner (permafrost behaviour Rauer Islands)

4.1.4 Functional microbial diversity in extreme Antarctic habitats: Abundance, phylogeny and ecology

Dirk Wagner (AWI-P), Andreas Gattinger (GSF)

Within the scope of the project, the diversity and ecology of microbial communities and their function in nutrient turnover under the extreme conditions in Antarctic periglacial regions will be studied. Polar regions are vast and unique natural laboratories, both because of their geographical isolation and the minor anthropogenic influences active there, for studying microbial life under extreme environmental conditions. For this purpose the diversity and abundance of the microflora in dependence of important site characteristics such as hydrological, thermal and weathering processes will be investigated in different habitats in ice-free areas on Larsemann Hills and Rauer Islands (Prydz Bay, Antarctica). The main objectives are the genotypic and phenotypic characterization of the microbial community by cultivation-independent methods such as lipid profiling and rRNA-based analyses and by physiological

characterization of isolated microorganisms. Stable isotope probing will be used to identify the main microbial players in nutrient turnover in the different environments.
The scientific investigations will concentrate on the following goals:
Soil chemical and physical characterization of the investigation sites regarding microbial life under extreme environmental conditions
Cutivation independent characterization of microbial communities to improve the knowledge of the abundance and biodiversity of the indigenous microflora
Understanding of the structure and function relationships of microbial communities in nutrient fluxes in polar habitats
During the fieldwork soil samples from ice-free areas of the Prydz Bay region (Larsemann Hills, Rauer Islands) will be taken from each horizon of the different soil and sediment profiles for microbiological analysis. Additionally, physical parameters like soil temperature, soil moisture and permafrost depth as well as the description of the sampled soils and sediments will be done.
The acquired data will give insights into the early stage of life on Earth, the development of extreme habitats and the functioning of microbes within the ecosystem. Furthermore it is planned to obtain pure cultures of microorganisms from soils and sediments of the study sites to characterize and to describe microbes surviving under harsh environmental conditions in Antarctica. The planed study contributes to the research topics of the *International Polar Year* proposal entitled “Antarctic and sub-Antarctic Permafrost, Periglacial and Soil Environments” (ANPAS, No. 627, by Dr. Jan Boelhouwers).

4.1.5 Deciphering the evolution of ultrahigh temperature granulites, Prydz Bay, Antarctica: Reaction textures, reaction history and the relationship between lower crustal and mantle processes during continent formation and destruction.

R. Oberhänsli and P. J. O’Brien (Univ. Potsdam)

Objectives

One of the critical areas for understanding Antarctic geology is the Region along the eastern side of Prydz Bay where existing studies reveal metamorphic complexes of different character and age. In the space of about 150 km, from north to south, are found the Vestfold Block, Rauer Group islands, Brattstrand Bluffs and Larsemann Hills. The Rauer Group of islands sits in an unusual situation - just to the North (Vestfold Hills) granulites are Archaean (2520-2485 Ma) whereas just to the south (Brattstrand Bluffs) are widespread units with a dominantly Pan-African (530-510 Ma) age (Fitzsimons and Harley, 1991; Sheraton and Collerson 1983). The rocks of the Rauer Group have yielded ages for three different episodes (Sheraton et al., 1984; Kinny et al., 1993; Hensen and Zhou 1995a) of metamorphic/magmatic activity - Archaean, Grenvillian (1000 Ma) and Pan African (around 500 Ma).

Is this just a fragment of reworked Archean basement as to the north? Is this a separate terrane? Is the whole of the Rauer Group a transitional zone with fragments of both? A definitive answer to these questions is needed in order to properly understand the geodynamic evolution during Gondwana formation and destruction.

Our aims are two-fold. Firstly, we wish to use our self-developed, state-of-the-art methods of quantitative mapping of reaction textures combined with domain-linked thermodynamic calculations, to determine more precisely and accurately the pressure-temperature evolution of the granulite facies rocks of the Rauer Group and Larsemann Hills areas. Due to the complexity of multiple reactions, as outlined by previous workers, the rocks show disequilibrium on a large scale but an approach to equilibrium on a local scale can be tested once the actual mass balance has been determined. Combined with this analytical part of the research we will also search out domains where compositional variation exists such that the temperature-time evolution can be determined, or at least bracketed, by diffusion modelling. The second part of the study will be to attempt to determine accurate age information for the different stages of the metamorphic evolution. This will involve microanalytical techniques as well as state-of-the-art micro-extraction techniques many of which have been widely used and developed by our working groups. This information, when combined, will yield a well established pressure-temperature-time path for the Rauer Group and Larsemann Hills areas and thus enable us to clearly determine which of the manifold tectonometamorphic scenarios for the area are appropriate. The ability to distinguish between a supposed Pan-African near isothermal decompression at high temperature and Pan-African re-heating of older (Archaean and/or Grenvillian) medium to high pressure rocks at lower pressures will have extremely important consequences for Gondwana reconstruction and destruction models.

Work on land

The areas to be investigated are the numerous islands of the Rauer Group and the islands and peninsulas comprising the Larsemann Hills (both Prydz Bay). For the islands already visited various geological maps exist (with different emphasis on lithology, structure or metamorphism) but where necessary we will augment these maps with our own observations and interpretations as well as undertaking new mapping of islands and areas not already investigated. In the Rauer Group we will be searching for, and sampling the dominantly felsic orthogneisses, but also mafic dykes, metapelites, calc-silicate gneiss and granitic pegmatites. We will focus on collecting samples with macroscopically-visible (at least with a hand lens) reaction textures such as coronas, symplectites and intergrowths. These will allow us to quantify the different metamorphic stages in terms of formation conditions and hopefully also age. Although two distinctive metamorphic stages have already been identified in the metapelites (e.g. Harley 1987) including an ultrahigh-temperature stage (>1000°C) (e.g. Harley, 1998) there is some dispute as to the validity of the methods applied with respect to the particular bulk compositions (e.g. Kelsey et al., 2003). We intend to expand the number of intensively investigated

samples and, in the light of new experimental and empirical thermodynamic data and activity models, try to resolve this dispute which has important consequences for the investigation and interpretation of ultrahigh- temperature granulites.

In the Larsemann Hills we will be sampling the dominant migmatitic othogneisses (e.g. Carson et al.,1997) as well as the various metasedimentary rocks. Again we will be searching for reaction domains – in this case often where partial melting has modified original microstructures and mineral assemblages – with the intention of documenting both the age and conditions for the reaction stages. The critical point to the field studies is to identify and collect rocks that show a definite history. These 'special' samples can then be compared petrologically and geochronologically with our collection of 'standard' rocks from the area.

Expected results

As in all areas of high grade metamorphism with a complex multistage history it is necessary to investigate a large number of samples in order to piece together the whole reaction history. Therefore, despite previous investigations in parts of these areas, we expect, as in other previously–investigated areas where we have studied, that there are still undiscovered pieces of the puzzle to be unearthed. The main advances will come from the state-of-the-art microanalytical techniques we will be using once back in the laboratory. With the use of quantitative compositional mapping of reaction domains (method outlined in de Andrade et al., 2006) we will make the first attempts to quantify the different reaction domains such that powerful thermodynamic methods can be applied with realistic values for changing effective bulk composition (see also Kelsey et al., 2003). One of the expected results is that so-called decompression textures will turn out to require less extreme pressure changes and be more strongly affected by local bulk compositional controls. The quantitative mapping will also allow us to model kinetic effects (such as grain boundary or volume diffusion effects, nucleation site variation or grain size distribution) in order to better understand the extent and controls of reactions. In addition, our in-house microsampling methods combined with microanalysis will be utilised for micro-geochronological investigations of monazite and zircon in the same thin sections for which we undertake geothermobarometric studies in order to get the highest possible controls on pressure-temperature-time histories..

4.1.6 Seal Studies at Marion Island

Two scientists of the AWI will participate in the South African National Antarctic Programme (SANAP) in 2006/07. The Mammal Research Institute (MRI) at the University of Pretoria (UP), South Africa, is in charge of the logistic coordination of two collaborative projects between the AWI and the MRI being carried out at the South African Marion Island Research Base in November 2006 and April 2007.

Marion Island (46°54'S, 37°45'O) is located 1770 km south-east of South Africa, and 2300 km north of Antarctica's Lutzow-Holm Bay. The closest landfall apart from proximate (19 km) Prince Edward Island is Ile aux Cochons of the Crozet Island group, 950 km to the east.

Satellite telemetry of southern elephant seals

J. Plötz, H. Bornemann (AWI) & M.N. Bester, C. Tosh (MRI)

Scientific background: A total of 19 female and 41 male southern elephant seals of different ages have been equipped with ARGOS satellite transmitters at Marion Island since 1999 to obtain data on their diving activities and seasonal movements to their foraging areas. The seals ranged north of Marion Island to South Africa, south to and below the Antarctic Polar Front, and east to Îles Crozet and Îles Kerguelen. The seals oriented on, and several spent most of their time foraging over the spreading ridges in the southern Indian Ocean and South Atlantic. They seem to be focusing their foraging effort on prey that occur in areas of upwelling correlated with predominant currents or current boundaries near and over spreading ridges and sub-surface plateaus. The foraging areas of males and females overlapped substantially in contrast to patterns of sexual segregation reported for southern elephant seals in the Atlantic Sector of the Southern Ocean, e.g. King George Island, where seals are being studied synoptically.

Objectives: Only two percent of the instruments deployed so far cover the short pelagic phase between breeding and moult, when fat reserves of females have been depleted by lactation 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. It is planned to deploy CTD-combined satellite relayed dive loggers on adult female southern elephant seals 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. The complex synthesis of data on seal positioning and diving behaviour and likely links with oceanography and bathymetry aims to identify those parameters which are characteristic for feeding areas of top predators in the respective regions. This will further our understanding of the behaviour of marine top predators and the role they play in the Antarctic and Subantarctic marine ecosystems of the Southern Ocean.

Work at Marion Island: Six satellite relayed dive loggers combined with CTD will be deployed in November 2006 on female southern elephant seals, and shall be recollected after about two months when the animals will have returned ashore to complete their annual moult. The retrieved units will be redeployed on male southern elephant seals in April 2007. The project is part of the IPY activity "Marine Mammal Exploration of the Oceans Pole to Pole" (MEOP).

Audiometric measurements of southern elephant seals

L. Kindermann, H. Bornemann, J. Plötz (AWI) & M.N. Bester (MRI)

Scientific background:

The sensitive hearing of seals and whales has lead to concerns that anthropogenic sounds in the ocean could impede their communication, cause stress, damage hearing or lead to behavioural disorders. Amongst the wide variety of data necessary to determine potential impacts of anthropogenic sound sources on seals and whales, knowledge about their basic hearing abilities is fundamental for all further auditory and bio-acoustic research and also for the evaluation and mitigation of possible impacts of anthropogenic noise. Audible frequency ranges and corresponding hearing thresholds are the most characteristic properties of the auditory system for any species. They are typically displayed in the form of an audiogram as the function of minimal audible sound level in respect to frequency. For about 90% of marine mammal species including all Antarctic seals audiograms have not been measured yet.

Objectives:

We intend to register audiograms of southern elephant seals. Audiograms can either be obtained by training subjects to react in a deterministic manner to any sound stimulus within their hearing range, or by using neurophysiological techniques to measure the brain's bioelectric response to a given acoustic input. Behavioural audiograms, which are the common method to test human hearing abilities, are impossible to obtain from wild animals. Hence we measure auditory evoked potentials (AEP), especially the auditory brainstem responses (ABR) of immobilised seals by electro-encephalogram (EEG) electrodes. This non invasive method is frequently used in neonatology to test for hearing disabilities of newborn humans. It is also common for the investigation of hearing in dolphins and whales but has only recently been adapted to seals, where amplitudes of the evoked responses are much smaller and thus harder to detect.

Work at Marion Island:

The experiments will be conducted at the moulting sites of southern elephant seals at Marion Island during the peak haul-out period of the males in April 2007. Southern elephant seals will be studied primarily, but other phocid seal species may be included on occasion. The bio-acoustic study is designed to provide results by measuring pure tone sensitivity from 1 kHz to 120 kHz. It is envisaged to obtain basic audiograms of up to 12 immobilised seals.

4.2 DFG and other activities mainly supported by AWI

4.2.1 Composition and distribution of polar inter-tidal benthic communities

Bick, Arlt (IOW)

Polar inter-tidal benthic communities are more influenced by abiotic factors than benthic assemblages in temperate latitudes. Ice-grounding, high salinity fluctuations caused by melt water and heavy sedimentation in spring and summer are most responsible for the impoverished benthic inter-tidal communities. It has been assumed that genuine tidal flat communities do not exist in polar regions, and non-permanent 'summer communities' should be recruited by r-strategists. However, it has also been shown that abundances of benthic species resemble those known from boreal or even subtropical areas. But it is completely unknown which species survive the dark winter season and which species re-colonize these areas in spring or summer. To understand the mechanisms of development of spatial and temporal pattern of inter-tidal communities in polar regions the adaptive capability for persistence and recruitment of the species concerned needs to be studied. The principal objective of the intended project is to investigate the composition and distribution of inter-tidal benthic macro- and meiofauna from different substrates of the coastal area in the vicinity of the Dallmann Laboratory. Beside faunal analyses substrate quality and salinities will be measured. The obtained data will be a prerequisite for a subsequent major project on mechanisms governing spatial and temporal patterns of polar intertidal benthic communities.

4.2.2 Glaciological field measurements on King George Island

A joint project of the Universities of Münster and Bonn and the Stuttgart University of Applied Sciences in the scope of the projects

DATIC (DYNAMICS OF AN ANTARCTIC TEMPERATE ICE CAP)

Dr. Norbert Blindow, DFG-Az. BL 307/3-1 (Institute for Geophysics, Münster)

GLAVOMA (GLACIER VOLUME CHANGES AND ICE MASS FLUX ON THE ANTARCTIC PENINSULA)

Dr. Matthias Braun, DFG-Az. BR 307/3-1 (Center for Remote Sensing of the Land Surface, Bonn)

PRECISE KINEMATIC AND STATIC DGPS-MEASUREMENTS

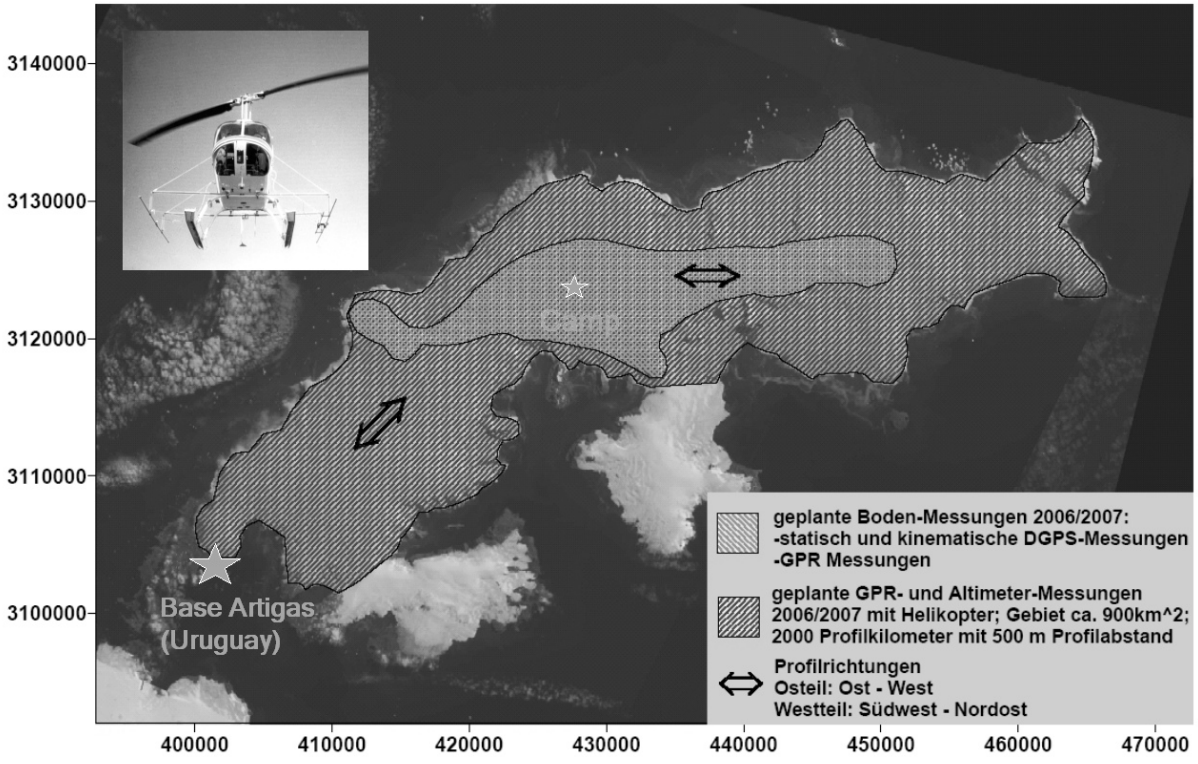
Prof. Dr.-Ing. Manfred Stober (Laboratory for electronic measurement techniques, Stuttgart)

The mainly temperate and partly more than 300m thick ice cap of King George Island, South Shetland Islands, Antarctica, is being regarded most sensitive with respect to changing climatic conditions because it is situated in the sub-polar zone with a maritime climate at a mean annual temperature of –2,4°C. Especially the glacial changes observed during the last 50 years can be connected with the regional warming on the Antarctic Peninsula. Within the scope of previous work it became obvious that

for a real comprehensive description of the ice dynamics on King George Island the data base has to be completed.

The tasks of the activities during this expedition consist of area-covering radar measurements of the ice geometry (mainly by helicopter) and of surface flow measurements by DGPS. In addition, surface accumulation measurements will be prepared and corner reflectors for the analysis of satellite SAR data installed. The airborne measurements will be carried out from the Uruguayan Base Artigas, while the surface measurements will also use a small camp in the middle of the ice cap (see map).

The ice geometry data will be used for ice flow modelling. Velocity and accumulation data serve as a validation for the modelling results. At the same time, the data are needed as ground truth and for the calibration of remote sensing data, especially satellite interferometry.



5. LOGISTICS AND DETAILED SCHEDULES

5.1 Neumayer, Kohnen
Flight schedules and ship calls

5.1.1 DROMLAN intercontinental schedule

For season 06/07 altogether 10 intercontinental flights are scheduled in order to carry personnel and cargo for AWI (Germany)from Cape Town to Novo Airbase and Troll Airbase.

Date	Flight number	Route	for Novo/Troll	for Cape Town
			AWI-pax/cargo	AWI-pax/cargo
31-Oct – 01-Nov-2006	IL 27	CPT - Novo - CPT	3 /545 kg	0 /22 kg
(10-14)-Nov-2006	IL 28	CPT - Novo - CPT	4 /230 kg	3 /0 kg
(28-29)-Nov-2006	IL 29	CPT - Novo - CPT	14 /345 kg	1 /0 kg
(07-11)-Dec-2006	IL 30	CPT - Troll - CPT	10 /600 kg	0 /0 kg
(06-07)-Jan-2007	P3N 1	CPT - Troll - CPT	5 /50 kg	3 /0 kg
(09-10)-Jan-2007	P3N 2	CPT - Troll - CPT	6 /100 kg	0 /0 kg
(12-16)-Jan-2007	P3N 3	CPT - Troll - CPT	0 / 0 kg	0 /0 kg
(02-05)-Feb-2007	IL 31	CPT - Novo - CPT	0 /25 kg	8 /2405 kg
(12-14)-Feb-2007	IL 32	CPT - Novo - CPT	0 /0 kg	23 /300 kg
(18-19)-Feb-2007	IL 33	CPT - Novo - CPT	0 /0 kg	7 /150 kg

5.1.2 DROMLAN feeder flights for AWI

Feeder flights (logistics) will be carried out by BT-67. These flights are executed in co-operation between RAE, AWI and ALCI.

Feeder flights for IL27 (31-Oct-01-Nov-2006)

Novo – Neumayer: B3-O 3 Pax, 545 kg Cargo
Neumayer – Novo: 0 Pax, 22 kg Cargo

Feeder flights for IL28 (10-14-Nov-2006)

Novo – Neumayer: B4a-c-N 3 Pax, 0 kg Cargo
Neumayer – Novo: B5-N 3 Pax, 0 kg Cargo

Feeder flights for IL29 (28-29-Nov-2006)

Novo – Neumayer:	B6-N	15 Pax, 470 kg Cargo
Neumayer – Novo:	B7-N	1 Pax, 0 kg Cargo

Feeder flights for IL30 (07-11-Dec-2006)

Novo – Neumayer:	B4-D	10 Pax +4 Pax UK, 600 kg Cargo
Neumayer – Novo:	B4-D	0 Pax, 0 kg Cargo

Feeder flight for P3N-1 (06-07-Jan-2007)

Troll – Neumayer:	B3-J	5 Pax, 50 kg Cargo
Neumayer – Troll:		3 Pax, 0 kg Cargo

Feeder flight for P3N-2 (09-10-Jan-2007)

Troll – Neumayer:	B6-J	6 Pax, 100 kg Cargo
Neumayer – Troll:		0 Pax, 0 kg Cargo

Feeder flight for P3N-3 (12-16-Jan-2007)

Troll – Neumayer:		0 Pax, 0 kg Cargo
Neumayer – Troll:		0 Pax, 0 kg Cargo

Feeder flights for IL31 (02-05-Feb-2007)

Novo – Neumayer:	B3-F	0 Pax + 1 Pax UK, 25 kg Cargo
Neumayer – Novo:		3 Pax + 1 Pax SW+1 Pax J, 1700 kg Cargo
	B4b-F	5 Pax + 4 Pax UK, 860 kg Cargo

Feeder flights for IL32 (12-14-Feb-2007)

Novo – Neumayer:	B10-F	0 Pax, 0 kg Cargo
Neumayer – Novo:		9 Pax, 300 kg Cargo
	B11-F	14 Pax, 0 kg Cargo

Feeder flights for IL33 (18-19-Feb-2007)

Novo – Neumayer:	B12-F	0 Pax, 0 kg Cargo
Neumayer – Novo:		7 Pax, 150 kg Cargo

5.1.3 Logistic flights for AWI

Logistic flights by BT-67:

Neumayer – S17 (02-05-Jan-2007):	B1a-J /B1b-J	2 Pax + 1 Pax SW+1 Pax J, 1100 kg Cargo
	B2a-J /B2b-J	4 Pax, 1000 kg Cargo

Stand by at S17 for Polar 2 flight missions (ANTSYO II): (Bs-J, 12-21-Jan-2007)

S17 – Neumayer (27-29-Jan-2007):	B13-J	4 Pax + 1 Pax SW+ 1 Pax J, 900 kg Cargo
	B14a-J /B14b-J	2 Pax, 1500 kg Cargo

Scientific and logistic flights by Polar 2:

Neumayer – Kohnen – Neumayer (13-15-Dec-2006):

Scientific flights each day from Neumayer, landing at Kohnen only for refuelling.
Maintenance of the airchemistry observatory at Kohnen.

5.1.4 Ship calls for Atka Bay

Supply Neumayer:

RV Polarstern (ANT XXIII/8)	02-05-Dec-2006
Pax:	0
Cargo:	19 containers, 5 sledges, 1 Pistenbully
	Fuel: Polar diesel, Kerosene, Petrol

Back-loading Neumayer:

RV Polarstern (ANT XXIII/9)	11-15-Feb-2007
Pax:	5 pax going from board and travel via DROMLAN flight out
Cargo:	17 containers, 4 sledges, 1 Pistenbully
Cargo supply:	fresh provisions
	Fuel: Polar diesel

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2

preliminary list			30-October-2006	AWI-Logistics, Germany	
arrival /departure with	Date ETD CPT / ETA Novo/Troll - ETA CPT	ID	route	pax arrival	pax departure
DROMLAN flight - Iljushin	**31-Oct - 01-Nov-2006**	**D1 (IL27)**	CPT - Novo - CPT	3	0
DROMLAN flight - Iljushin	**(10-14)-Nov-2006**	**D2 (IL28)**	CPT - Novo - CPT	4	3
DROMLAN flight - Iljushin	**(28-29)-Nov-2006**	**D3 (IL29)**	CPT - Novo - CPT	14	1
DROMLAN flight - Iljushin	**(07-11)-Dec-2006**	**NGO (IL30)**	CPT - Novo - CPT	10	0
DROMLAN flight - Lockheed Orion P3N	**(06-07)Jan-2007**	**D4 (P3N-1)**	CPT - Troll - CPT	5	3
DROMLAN flight - Lockheed Orion P3N	**(09-10)-Jan-2007**	**D5 (P3N-2)**	CPT - Troll - CPT	6	0
DROMLAN flight - Lockheed Orion P3N	**(12-16)-Jan-2007**	**D6 (P3N-3)**	CPT - Troll - CPT	0	0
DROMLAN flight - Iljushin	**(02-05)-Feb-2007**	**D7 (IL31)**	CPT - Novo - CPT	0	8
DROMLAN flight - Iljushin	**(12-14)-Feb-2007**	**D8 (IL32)**	CPT - Novo - CPT	0	23
DROMLAN flight - Iljushin	**(18-19)-Feb-2007**	**D9 (IL33)**	CPT - Novo - CPT	0	7
DROMLAN Basler positioning (ferry)	**(24-29)-Oct-2007**	**BT**	Punta-Bellingshausen-Halley-Novo	0	0
Dornier 228-101 Polar 2	**10-Dec-2006 - 01-Feb-2007**	**Polar2**	at Neumayer and S17	3	4
Polarstern - ANT XXIII /8 (supply NM)	**23-Nov - (04-05)-Dec-2006**	**PS /8**	Cape Town - Neumayer	0	0
Polarstern - ANT XXIII /9 (re-supply)	**(11-15)-Feb - 11-Apr-2007**	**PS /9**	Neumayer - Cape Town	5	1
			DROMLAN Pax in / out:	**42**	**45**
Total number of participants:	**67**		**total Pax in / out:**	**50**	**50**

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2

Surname	Given name	Institute/firm	Profession		Arrival	Departure
Neumayer Station						
Logistics:						
Matz	Thomas	AWI-logistics	engineer	fieldoperator	D3	D9
Weynand	Markus	AWI-logistics	technician	logistic activities	D3	D9
Waldow	Mario	maintenance company	technician	maintenance station	D3	D7
Pyrskalla	Boleslaw	maintenance company	technician	maintenance station	D3	D7
Eron	Andreas	maintenance company	technician	maintenance station / IS27DE	D3	D7
Falkenberg	Falk	maintenance company	technician	maintenance station / ISDE27	D3	D7
Blattner	Mark	Kaessbohrer (Pistenbullys)	technician	maintenance	D2	D9
						7
Observatories / Service						
Loose	Bernd	AWI	scientist	meteorology observatory	D5	D8
Weller	Rolf	AWI	scientist	air chemistry observatory	NGO	D4
Müller	Christian	AWI / FIELAX	scientist	geophysics observatory	D3	D4
Hofmann	Joerg	FIELAX	engineer	IT maintenance	D5	D9
						4
PALAOA:						
Kindermann	Lars	AWI	scientific leader		D5	D8
Klinck	Holger	AWI	scientist		D5	D8
						2
Tele-Medicine						
Kohlberg	Eberhard	Laeisz	physician		D5	PS/9
Weiße	Volker	Laeisz	physician		PS/9	D8
						2

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2

Surname	Given name	Institute/firm	Profession	Arrival	Departure
DROMLAN weather service:					
Pols	Hans-Arnold	DWD	weather forecaster	D1	D3
Brauner	Ralf	DWD	weather forecaster	D3	D9
					2
Wintering Team 2007:					
Waltner	Karlheinz	AWI	physician, station leader	NGO	2008
Boehler	Rene	AWI /Laeisz	engineer	D3	2008
Lennuck	Michael	AWI /Laeisz	electrician	D3	2008
Denecke	Mirko	AWI /Laeisz	IT, radio operator	D3	2008
Fröhlich	Mike	AWI /Laeisz	cook	D3	2008
Smolla	Karin	AWI	air chemist	NGO	2008
Graser	Nora	AWI	geophysicist	D3	2008
Laederach	Christine	AWI	geophysicist	D3	2008
Rudolph	Claudia	AWI	meteorologist	NGO	2008
					9
Wintering Team 2006:					
Petzel	Maja	AWI	physician, station leader	2005	D8
Behrendt	Chris	AWI /Laeisz	engineer	2005	D9
Buhl	Andreas	AWI /Laeisz	electrician	2005	D9
Bruecklmeier	Eric-Roger	AWI /Laeisz	IT, radio operator	2005	D8
Schultz	Corinna	AWI /Laeisz	cook	2005	D8
Moeller	Andrea	AWI	air chemist	2005	D8
Bock	Michaela	AWI	geophysicist	2005	D8
Mueller-Wrana	Tobias	AWI	geophysicist	2005	D8
Anastou	Anja	AWI	meteorologist	2005	D8

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2

Surname	Given name	Institute/firm	Profession	Arrival	Departure
					9
Public Relations:					
Drewing	Christian	Eikon-Südwest	journalist	D5	D8
Duecker	Jens	Eikon-Südwest	journalist	D1	D8
Marohl	Christian	Eikon-Südwest	journalist	D1	D8
					3
DROMLAN inspection:					
Finkenzeller	Heinz	DLR	DROMLAN flight inspection	D2	D2
Gernandt	Hartwig	AWI	DROMLAN flight inspection	D2	D2
					2
IPICS Traverse					
Steinhage	Daniel	AWI	chief-scientist	D4	D8
Wesche	Christine	AWI	scientist	D4	D8
Bock	Michael	AWI	scientist	D4	D8
Schwander	Jakob	AWI /Uni-Bern (Switzerland)	scientist	D4	D8
Kaufmann	Patrick	AWI /Uni-Bern (Switzerland)	scientist	D4	D8
					5
Pax from Polarstern via DROMLAN Neumayer to Cape Town					
Calcara	Massimo	Italian, Rom	Mabel project on ship Polarstern	PS /9	D8
Lagalante	Marco	Italian, Rom	Mabel project on ship Polarstern	PS /9	D8
Gerber	Hans W.	Italian, Rom	Mabel project on ship Polarstern	PS /9	D8
de Vries	Haiko	Italian, Rom	Mabel project on ship Polarstern	PS /9	D8
					4

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2

Surname	Given name	Institute/firm	Profession	Arrival	Departure
BAS personnel		**in /out with Twin Otter via Neumayer station to /from Halley**			
Bell	Martin	BAS		(NGO)	(external)
Mc Goldrick	P.	BAS		(NGO)	(external)
Norrish	B.	BAS		(NGO)	(external)
Culshaw	R.	BAS		(D7)	(external)
Downie	Rod	BAS		(external)	(D7)
Tanner	David	BAS		(external)	(D7)
					6
			Number of participants:		55
Aircraft missions (Polar 2)		**Neumayer and S17**			
ANTSYO:					
Herber	Andreas	AWI	scientific leader	NGO	D7
Treffeisen	Renate	AWI-Potsdam	scientist	NGO	D7
Minikin	Andreas	DLR	scientist	NGO	D4
Garbrecht	Thomas	Optimare	engineer	NGO	D7
Höltig	Jürgen	Optimare	engineer	NGO	D7
Krecji	Radovan	SPRS-Uni Stockholm	scientist	(NGO)	(D7)
Hara	Keiichiru	NIPR	scientist	(NGO)	(D7)
P2 crew:					
Berns	Hans - Jürgen	DLR		P2	P2
Grillenbeck	Stefan	DLR		P2	P2
Gebhardt	Regina	DLR	technician	P2	P2
Koch	Roman	DLR	technician	NGO	P2
			number of participants:		11

Antarctic Season 2006 /07 - Participants Neumayer /Kohnen/ Polar 2					
Surname	**Given name**	**Institute/firm**	**Profession**	**Arrival**	**Departure**
Other projects					
Kramer	Ingo	J.H.K.	Visit of Neumayer	D2	D2
					1
			Total number of participants:		**67**

5.2 Dallmann Laboratory – Jubany Station

5.2.1 Intercontinental flights

Transport of personnel and cargo to Dallmann-Laboratory/Jubany will be done in co-operation with the Instituto Antarctico Uruguayo, Instituto Antarctico Chileno. These flights will be performed with a C-130 aircraft operated by the Uruguayan and Chilean air force between Punta Arenas (PA) and the airfield at Teniente Marsh. DAP will operated with a DASH 7 from Punta Arenas to Teniente Marsh – the flight schedule of DAP should be presented in the Chilean Report. AWI will use this operator as a back up.

Date	**Nation**	**Route**	**For Frei**	**For Punta Arenas**
			Pax / cargo	**Pax / cargo**
20 – 25 November 2006	Chile	PA – Frei – PA	2 / 100 kg	0 / 0
04 – 09 December 2006	Chile	PA – Frei – PA	11 / 420 kg	2 /0
14 – 20 December 2006	Uruguay	PA – Frei – PA	1/ 200 kg	0 / 0
08 – 14 January 2007	Chile	PA – Frei – PA	4 / 0	5 / 200 kg
25 – 31 January 2007	Uruguay	PA – Frei – PA	0 / 0	1 / 0
19 – 25 February 2007	Chile	PA – Frei – PA	1 / 0	0 / 0
27 March 2007	Chile	PA – Frei – PA	0 / 0	6 / 0

5.2.2 Ship calls

Date	**operator**	**Route**	**To Dallmann**	**To South America**
			Pax / cargo	**Pax / cargo**
22 November 2006	Chilean Navy	MV Oscar Viel	271 kg	0
12 December 2006	Argentine Navy	RV Almirante Irizar	1309 kg	0
07 January 2007	Argentine Navy	RV Almirante Irizar	7961 kg	0
13 January 2007	Plantours	MV Vistamar	3	2
19 January 2007	NGO	MV Delphin	0	3 / 50 kg
11 March 2007	Argentine Navy	RV Almirante Irizar	1	0
27 March 2007	BAS	James Clark Ross	0	0 / 5000 kg

Antarctic Summer Season 2006 /07 - Participants KGI and other expeditions

preliminary plan — 20. October 2006, G. Kleffel, AWI-Logistics

arrival /departure with	date	name	route	arrival	departure
C-130 (FACH)	20.-25.11.2006	**Flight 4**	PA - Frei - PA	2	0
C-130 (FACH)	04.-09.12.2006	**Flight 6**	PA - Frei - PA	10	2
C-130 (FAU)	14.- 20.12.2006	**Flight 7**	PA - Frei - PA	1	0
C-130 (Chile)	08.-14.01.2007	**Flight 8**	PA - Frei - PA	1	4
C-130 (Uruguay)	25.-31.01.2007	**Flight 9**	PA - Frei - PA	0	1
C-130 (Chile)	19.-25.02.2007	**Flight 11**	PA - Frei - PA	1	0
C-130 (Chile)	27.03.2007	**Flight 14**	PA - Frei - PA	0	6
DASH 7	07.01.2007	**Flight 16**	PA - Frei - PA	3	0
DASH 7	15.01.2007	**Flight 17**	PA - Frei - PA	0	3
C4	16.10.2006	**C1**	Christchurch - Mc Murdo	3	0
C4	19.10.2006	**C2**	Christchurch - Mc Murdo	2	0
C4	20.10.2006	**C3**	Christchurch - Mc Murdo	1	0
C4	23.10.2006	**C4**	Christchurch - Mc Murdo	1	0
C4	20.11.2006	**C5**	Mc Murdo - Christchurch	0	1
C4	20.12.2006	**C6**	Mc Murdo - Christchurch	0	1
C4	05.01.2007	**C7**	Mc Murdo - Christchurch	0	4
C4	09.01.2007	**C8**	Mc Murdo - Christchurch	0	1
Irizar	29.12.2006 – 06.01.- 08.01.2007	**Irizar 2**	BA - USHU - Jubany	2	0
Irizar	10.02.2007 – 11.03.- 15.03.2007	**Irizar 3**	BA - USHU - Jubany	0	2
Las Palmas	19.02.2007-03.03.2007	**LP 4**	Ushuaia - ANT - Ushuaia	0	1
James Clark Ross (cargo)	27.03.2007	**JCR**	Stanley - Rothera - Stanley - MV - UK	0	0
MS Bremen	27.12.06 - 30.12.06. - 09.01.07	**BRE 0700**	PA - Jubany - U	0	1
MS Vistamar	06.01.– 13.01.– 20.01.2007	**Vista 2**	PA - U - Jubnay - BA	3	2
MS Delphin	14.01. – 19.01. – 22.01 2007	**Delphin 1**	U - Jubnay - U	0	(4)
Federov		**Federov 1/2**	CT- Mirny -CT	5	5
Polarstern (ANT XXIII-9)		**Polarstern**	Mirny - CT	13	13
Agulhas		**Agulhas**	CT - Marian Island - CT	2	2
				50	50
			total in / out:	**pax**	**pax**

PAX					
name	**first name**	**institute/firm**	**profession**	**arrival**	**departure**
Antarctic Peninsula					
Dallmann Laboratory					
Science:					
Lisowski	Simon	Jena	scientist	Flight 6	Flight 14
Lorenz	Stefan	Jena	scientist	Flight 6	Flight 14
Philipp	Eva	AWI	scientist, scientific leader	Flight 7	LP 4
Printzen	Christian	FI Senkenberg	scientist	Flight 6	Vista 2
Ottich	Indra	FI Senkenberg	scientist	Flight 6	Vista 2
Becker	Susanne	Kiel/AWI	scientist	Vista 2	Flight 14
Schwanitz	Max	AWI	diver, head of diving group	Vista 2	Flight 14
Leopold	Peter	AWI	diver	Vista 2	Flight 14
Daniel	Claudia	AWI	diver	Flight 11	Flight 14
Technician & TV					
Steinmetz	Richard	AWI	technician o irizar 1 y Flight 17	Flight 6	Flight 9
Bublat	Jochim	ZDF-AWI	TV	Flight 16	Flight 17
Dores	Mariano	ZDF-AWI	TV	Flight 16	Flight 17
Zürcher	Peter	ZDF-AWI	TV	Flight 16	Flight 17
			number of participants		**13**
Bellinghausen					
Brick	Andreas	Rostock	scientist	Flight 4	Flight 6
Arlt	Günter	Rostock	scientist	Flight 4	Flight 6
Böcker	Dietmar	Jena	scientist	Flight 8	unknown
Blindow	Norbert	Münster	scientist	Flight 6	Flight 8
Suckro	Sonja	ZFL Bonn	scientist	Flight 6	Flight 8
			number of participants		**5**
Filed Party Artovski Glacier / Artigas / Bellingshausen Dome					
Braun	Matthias	ZFL Bonn	scientist	Flight 6	BRE 0700
Rückamp	Martin	Münster	scientist	Flight 6	Flight 8
Moll	Albert	ZFL Bonn	scientist	Flight 6	Flight 8
			number of participants		**3**

PAX					
name	**first name**	**institute/firm**	**profession**	**arrival**	**departure**
Other Expeditions					
Mc Murdo					
Kuhn	Gerd	AWI	scientist	C1	C7
Niessen	Frank	AWI	scientist	C1	C7
Gebhardt	Catalina	AWI	scientist	C1	C6
Siegmund	Alexander	Heidelberg	scientist	C2	C5
Läufer	Andreas	BGR	scientist	C2	C8
Helling	Donata	AWI	scientist	C3	C7
Magens	Diana	AWI	scientist	C4	C7
			number of participants		**7**
ANT XXIII – 9 – Prydz Bay					
Wagner	Bernd	IOW	scientist	Polarstern	Polarstern
Klug	Martin	Uni Leipzig	scientist	Polarstern	Polarstern
Ortleb	Sabrina	Uni Leipzig	scientist	Polarstern	Polarstern
Müller	Gerald	AWI-Potsdam	technician	Polarstern	Polarstern
Bennike	Ole	GEUS	scientist	Polarstern	Polarstern
Berg	Sonja	IOW	scientist	Polarstern	Polarstern
Vogel	H.	IOW	scientist	Polarstern	Polarstern
White	Duanne	Australian	scientist	Polarstern	Polarstern
Wagner	Dirk	AWI-Potsdam	scientist	Polarstern	Polarstern
Ganzert	Lars	AWI-Potsdam	scientist	Polarstern	Polarstern
Miller	Christina	AWI	scientist	Polarstern	Polarstern
Oberhänsli	Roland	Uni Potsdam	scientist	Polarstern	Polarstern
O'Brian	Patrick	Uni Potsdam	scientist	Polarstern	Polarstern
			number of participants		**13**

Merian Island						
Plötz	Jochen	AWI	scientist		Agulhas	Agulhas
Bornemann	Horst	AWI	scientist		Agulhas	Agulhas
				number of participants		**2**
Mirny - Vostok						
Knöpfel	Christioph	TU Dresden	scientist		Federov 1	Federov 2
Groh	Andreas	TU Dresden	scientist		Federov 1	Federov 2
Richter	Andreas	TU Dresden	scientist		Federov 1	Federov 2
NN	NN	Aerogeodeziya (St. Petersburg)	scientist		Federov 1	Federov 2
NN	NN	Aerogeodeziya (St. Petersburg)	scientist		Federov 1	Federov 2
				number of participants		**5**
Begrano II / Irizar						
Scheinert	Mirko	TU Dresden	scientist		Irizar 2	Irizar 3
Gütz	Sonja	AWI	scientist		Irizar 2	Irizar 3
				number of participants		**2**
				number of participants (AWI-expeditions)		36
				number of participants (foreign expeditions)		14
				total number of participants:		**50**

6. PARTICIPANTS

Neumayer and Kohnen Station

Name	First Name	Institute	Profession
Anastou	Anja	AWI	Scientist
Behrendtr	Chris	AWI/Laeisz	Engineer
Bell	Martin	BAS	Scientist
Berns	Hans-Jürgen	DLR	Chief pilot
Blattner	Mark	Kaessbohrer	Technician
Bock	Michael	AWI	Scientist
Bock	Michaela	AWI	Scientist
Böhler	Rene	AWI/Laeisz	Engineer
Brauner	Ralf	DWD	Scientist
Brücklmeier	Eric-Roger	AWI/Laeisz	Engineer/IT
Buhl	Andreas	AWI/Laeisz	Electrician
Calcare	Massimo	Rome	Scientist
Culshaw	R.	BAS	Scientist
De Vries	Kaiko	Rome	Scientist
Denecke	Mirko	AWI/Laeisz	Engineer / IT
Downie	Rod	BAS	Scientist
Drewing	Christian	Eikon-Südwest	TV
Duecker	Jens	Eikon-Südwest	TV
Eron	Andreas	Maintenance	Technician
Falkenberg	Falk	Maintenance	Technician
Finkenzeller	Heinz	DLR	Flight Inspection
Fröhlich	Mike	AWI/Laeisz	cook
Garbrecht	Thomas	Optimare	Scientist
Gebhardt	Regina	DLR	Technician

Name	First Name	Institute	Profession
Gerber	Hans W.	Rome	Scientist
Gernandt	Hartwig	AWI	Head of Logistics
Graser	Nora	AWI	Scientist
Grillenbeck	Stefan	DLR	Pilot
Hammerton	John	BAS	Scientist
Hara	Keiichiru	NIPR	Scientist
Herber	Andreas	AWI	Scientist
Hofmann	Jörg	FIELAX	Scientist
Höltig	Jürgen	Optimare	Technician
Kaufmann	Patrick	AWI/Uni Bern	Scientist
Kindermann	Lars	AWI	Scientist
Klinck	Holger	AWI	Scientist
Koch	Roman	DLR	Technician
Kohlberg	Eberhard	Laeisz	Physician
Kramer	Ingo	J.H.K.	Engineer
Krecji	Radovan	SPRS	Scientist
Läderach	Christine	AWI	Scientist
Lagalante	Marco	Rome	Scientist
Lenuck	Michael	AWI/Laeisz	Engineer
Loose	Bernd	AWI	Scientist
Maltby	M.	BAS	Scientist
Marohl	Christian	Eikon-Südwest	TV
Matz	Thomas	AWI	Engineer
McGoldrick	P.	BAS	Scientist
Minikin	Andreas	DLR	Scientist
Moeller	Andrea	AWI	Scientist
Müller-Wrana	Tobias	AWI	Scientist

Name	First Name	Institute	Profession
Müller	Christian	AWI/FIELAX	Scientist
Norrish	B.	BAS	Scientist
Petzel	Maja	AWI	Physician
Pols	Hans-Arnold	DWD	Scientist
Pyrskalla	Boleslaw	Maintenance	Technician
Rudolph	Claudia	AWI	Scientist
Schutz	Corinna	AWI/Laeisz	Cook
Schwander	Jakob	AWI/Uni Bern	Scientist
Smolla	Karin	AWI	Scientist
Steinhage	Daniel	AWI	Scientist
Tanner	David	BAS	Scientist
Treffeisen	Renate	AWI	Scientist
Waldow	Mario	Maintenance	Technician
Waltner	Karlheinz	AWI	Physician
Weiße	Volker	Laeisz	Physician Polarstern
Weller	Rolf	AWI	Scientist
Wesche	Christine	AWI	Scientist
Weynandt	Markus	AWI	Logistics

Dallmann Laboratory and other activities

Name	First Name	Institute	Profession
Arlt	Günter	Uni Rostock	Scientist
Becker	Susanne	Uni Kiel/AWI	Scientist
Bennike	Ole	GEUS	Scientist
Berg	Sonja	IOW	Scientist
Blindow	Norbert	Uni Münster	Scientist
Böcker	Dietmar	Uni Jena	Scientist
Bornemann	Horst	AWI	Scientist
Braun	Matthias	ZFL Bonn	Scientist
Brick	Andreas	Uni Rostock	Scientist
Bublat	Joachim	ZDF/AWI	TV
Daniel	Claudia	AWI	Diver
Dores	Mariano	ZDF/AWI	TV
Ganzert	Lars	AWI	Scientist
Gebhardt	Catalina	AWI	Scientist
Groh	Andreas	TU Dresden	Scientist
Gütz	Sonja	AWI	Scientist
Helling	Donata	AWI	Scientist
Klug	Martin	Uni Leipzig	Scientist
Knöpfel	Christoph	TU Dresden	Scientist
Kuhn	Gerd	AWI	Scientist
Läufer	Andreas	BGR	Scientist
Leopold	Peter	AWI	Diver
Lisowski	Sion	Uni Jena	Scientist
Lorenz	Stefan	Uni Jena	Scientist
Magens	Diana	AWI	Scientist

Name	First Name	Institute	Profession
Miller	Christina	AWI	Scientist
Moll	Albert	ZFLBonn	Scientist
Müller	Gerald	AWI	Technician
Niessen	Frank	AWI	Scientist
NN	NN	Aerogeodeziya/Russia	Scientist
NN	NN	Aerogeodeziya/Russia	Scientist
Oberhänsli	Roland	Uni Potsdam	Scientist
O'Brian	Patrick	Uni Potsdam	Scientist
Ortleb	Sabrina	Uni Leipzig	Scintist
Ottich	Indra	FI Senckenberg	Scientist
Philipp	Eva	AWI	Scientist
Plötz	Jochen	AWI	Scientist
Printzen	Christian	FI Senckenberg	Scientist
Richter	Andreas	TU Dresden	Scientist
Rückamp	Martin	Uni Münster	Scientist
Schreinert	Mirko	TU Dresden	Scientist
Schwanitz	Max	AWI	Diver
Siegmund	Alexander	Uni Heidelberg	Scientist
Steinmetz	Richard	AWI	Technician
Suckro	Sonja	ZFL Bonn	Scientist
Vogel	H.	IOW	Scientist
Wagner	Bernd	IOW	Scientist
Wagner	Dirk	AWI	Scientist
White	Duanne	Australia	Scientist
Zürcher	Peter	ZDF/AWI	TV

7. PARTICIPATING INSTITUTES

Institute/Company	Address
ALCI	Antarctic Logistics Centre Intl. (Pty.) Ltd. 97, Keerom Street Cape Town 8001 Republic of South Africa
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft Postfach 12 01 61 27515 Bremerhaven
BAS	British Antarctic Survey High Cross, Madingley Road Cambridge CB3 OET Great Britain
DAP	DAP Antarctica LTDA O'Higgins 891 Punta Arenas Chile
DLR	German Space and Air Centre Postfach 1116 82234 Wessling
DNA	Dirctión National del Antártico Cerrito 1248 1010 Buenos Aires Argentina
DWD	Deutscher Wetterdienst Bernhard-Nocht Str. 76 20359 Hamburg
Eikon Südwest	Eikon Film Bergmannstraße 102 10961 Berlin
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 Schifferstraße 10 – 14 27568 Bremerhaven

Hapag Lloyd	Hapag-Lloyd Kreuzfahrten GmbH Ballindamm 25 20095 Hamburg
Heli-Tranair	Heli Transair GmbH Postfach 11 02 63323 Egelsbach
IAA	Instituto Antártico Argentino Cerrito 1248 1010 Buenos Aires Argentina
IAU	Instituto Antártico Uruguayo Av. 8 de Octubre 2958 Montevideo 11600 Uruguay
IFM-GEOMAR	Leibnitz-Institut für Meeresforschung IFM-GEOMAR Düsternbrooker Weg 20 24105 Kiel
INACH	Instituto Antarctico Chileno Plaza Munoz Gamero 1055 Punta Arenas, Chile
IOW	Leibnitz-Institut für Ostseeforschung Warnemünde Seestraße 15 18119 Rostock
Kässbohrer	Kässbohrer Geländefahrzeug AG Kässbohrerstr. 11 88471 Laupheim
Laeisz	Reederei F. Laeisz GmbH Barkhausenstraße 37 27568 Bremerhaven
ManPower	MANPOWER GmbH Personaldienstleistungen Bürgermeister-Smidt-Str.16-18 27568 Bremerhaven
NPI	Norwegian Polar Institute Polar Environmental Centre 9296Tromsø Norway
NPIR	National Institute of Polar Research 9-10, Kaga Chome, Itabashi-ku Tokyo 173-8515 Japan
Optimare	Optimare Sensorsyteme AG Am Luneort 15a 27572 Bremerhaven

SANARP	Department of Environmental Affairs and Tourism Directorate: Antarctica and Islands P.O. Box 8172, Roggebaai 8012 Cape Town 9012 Republic of South Africa
SPC	Spanish Polar Committee Comité Polar Espanol Minsterio de Educacion y Ciencera José Abascal 4 28003 Madrid Spain
SPRS	The Swedish Polar Research Secretariat P.O. Box 50003 SE-104 05, Stockholm Sweden
RAE	Russian Antarctic Expeditions 38, Bering St. 199397 St. Petersburg Russia
University of Bonn	Zentrum für Fernerkundung der Landoberfläche (ZFL) Walter-Flex-Str. 3 53113 Bonn
University of Heidelberg (IUPH)	Institut für Umweltphysik (IUPH) Im Neuenheimer Feld 229 16120 Heidelberg
University of Jena	AG Polar-und Ornithoökologie Institut für Ökologie Dornburger Str. 159 07743 Jena
ZWMB	Zentrum für Weltraummedizin Berlin Arnimallee 22 14195 Berlin

DROMLAN – Partners

AWI	Alfred Wegener Institute for Polar and Marine Research, Germany
BAS	British Antarctic Survey, UK
BELARE	Belgian Antarctic Research Expedition Belgium
FINARP	Finnish Antarctic Survey, Finland

NCAOR	National Centre for Antarctic and Ocean Research, India
NIPR	National Institute of Polar Research, Japan
NPI	Norsk Polar Institutt, Norway
NWO	Nederlanse Organisatie voor Wetenschappelijk Onderzoek, Netherlands
RAE	Russian Antarctic Expeditions, Russia
SANARP	South African National Antarctic Research Programme, South Africa
SPRS	Swedish Polar Research Secretariat, Sweden