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PART III

PERMANENT INFORMATION

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3. PERMANENT INFORMATION

3.1 Science Facilities

3.1.1 Automatic Recording Stations and Observatories

Neumayer and Kohnen Station

Meteorological Observatory

Since March 1981 a meteorological observatory programme has been carried out at the Georg-von-Neumayer Station (70°37'S, 8°22'W) continuously.
The programme consists of 3 main parts:

- 3-hourly routine synoptic observations,
- daily upper air soundings,
- surface radiation and mast measurements.

The current station, called Neumayer station II (70°39'S, 8°15'W) took over these activities in March 1992. The programme was extended to incorporate new main parts:

- upper air ozone soundings were included,
- receiving of satellite picture (HRPT, DMSP),
- and the surface radiation measurements were intensified.

The meteorological measurements are performed in close cooperation with the measurements of the air chemistry observatory at Neumayer. Both observatories contribute to the network of "Global Atmospheric Watch" from the WMO under the WMO-NO: 89002.
For the third summer season the meteorological observatory of Neumayer will additionally 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).
For further information see:
http://www.awi.de/en/infrastructure/stations/neumayer_station/observatories/meteorological_observatory/summer_weather_forecast_iframe/

Geophysical Observatory

The geophysical observatory at the second base, Neumayer Station, is in operation since 1992. In this observatory the geophysical long term observations are continued which started already in 1982 at the first base, Georg-von-Neumayer Station. The main topics of the observatory are observations in following field: seismology and geomagnetism. Beside these two points with high priority in the continuous observatory work secondary programs had been carried out or are still running, e.g. measuring the melting rate at the bottom of the ice shelf.
For seismological research a local network with now three seismological stations is operated. This network consists of the observatory itself (VNA1) and two other remote stations. The remote stations are located on the ice rises Halvfar Ryggen (VNA2) and Søråsen (VNA3). They are located approx. 50 km and 85 km away from the base, in the Southeast and Southwest, resp.. These locations, where the ice is grounded, are much more suitable for seismological observations than the site of VNA1 on a floating ice shelf. The seismic signals from these stations are transmitted digitally to the base for recording. At the site of VNA2 a small aperture, short period detection array was installed in the beginning of 1997. This array proved to be a powerful tool for

the detection of weak local and regional seismicity. In the beginning of 2003 another seismological station was installed at Kohnen Station, Amundsenisen. This station, which is a very broad band station, was designed to operate autonomously with data retrieval every year. Complementary to this local network a very broad band seismological station was set up at the South African base Sanae IV in the beginning of 1997. This station, with station code SNAA, has to be considered as integral part of the seismological network of Neumayer Station.

Inside the geomagnetic observatory the Earth's magnetic field and its variations with time are continuously measured. A 3-component fluxgate triple sensor is installed to measure the three field components NS, EW and Z. To determine the absolute field values two proton precession magnetometers are buried in the snow somewhere in the vicinity of the geomagnetic observatory. The three field components are recorded at 1 Hz and then subsequently reduced to means of 1-minute and 1-hour intervals. Absolute values for the field components are derived from manual determinations of declination D and inclination I. This is accomplished with a non-magnetic theodolite and a gyro-compass. Measurements are carried out every 2 to 3 days.

For further information see:
http://www.awi.de/en/research/research_divisions/geosciences/geophysics/geophysical_observatories_at_neumayer/

Site name	Coordinates	Parameters	Elevation (m)	Frequency
VNA1 (observatory)	70° 38.838' S 08° 15.935' W	earthquakes, geomagnetic field, melting rate	42	continuous recording
VNA2 (Halvfar Ryggen)	70° 55.524' S 07° 23.575' W	earthquakes	approx. 350	continuous radio transmission to Neumayer Station
VNA3 (Søråsen)	71° 14.512' S 09° 40.112' W	earthquakes	approx. 500	continuous recording (until failure)
Kohnen Station	75° 00' S 00° 00' E	Seismology	approx. 2850	continuous recording (until failure)
Neumayer Station	70° 38.393' S 08° 15.688' W	PRARE Station	40	continuous recording

Establishment of the IS27DE Infrasound Array

The Federal Institute for Geosciences and Natural Resources (BGR) in close co-operation with the Alfred Wegener Institute for Polar and Marine Research (AWI) has installed an infrasound array IS27DE in the vicinity of the German “Neumayer” Antarctic Research base. The array named IS27DE is used for measuring micropressure fluctuations in the atmosphere. It is one of 60 elements of the global infrasound network of the International Monitoring System (IMS), which is being established for monitoring the compliance of the Comprehensive Nuclear Test Ban Treaty (CTBT) with respect to atmospheric nuclear explosions. The infrasonic network has been designed to detect and locate worldwide any atmospheric nuclear explosion of 1 kiloton TNT equivalent or more. IS27DE is one of a total of four infrasound arrays which are being established for monitoring the atmosphere of Antarctica with its surrounding oceans: I55US (Windless Bight, USA), I03AU (Davis Base, Australia) and I54US (Palmer Station, USA).

IS27DE consists of nine individual array elements. They have been distributed on a spiral at regularly increasing radii from the center point, resulting in a configuration like a “pinwheel” with an aperture of about 2 km. The center point of the array is about 3 km southwest of the Neumayer base. At each array element an insulated aluminum container (1200 · 800 · 500 mm) has been installed. It contains an MB2000 microbarometer, a Callisto Remote Field Authenticating Digitizer, a Telesto radio frequency data transceiver, and a power supply unit. Polyethylene foam insulation protects the sensor and the electronic devices from low temperatures. A post with a Yagi antenna a few meters from the container provides for continuous transmission of the infrasound data via radio telemetry at frequencies between 406 and 416 MHz. A GPS antenna supplies the time signals for the digitizer system. The array center station in the middle of the spiral is additionally equipped with an ultrasonic anemometer for measuring wind speed and wind direction, as well as with a temperature sensor. Both instruments are installed on a second post.

Wind-noise reducing pipe arrays are used for suppressing wind-generated disturbances. They consist of 16 arms of 15-m long porous hoses, each encased in a perforated polyethylene pipe. These pipes have been laid out radially from each sensor position in the aluminium container starting alternately at a distance of 20 m and 10 m. Due to continuous snow accumulation, it will be necessary to dig out all nine array elements with their pipe arrays during the forthcoming Antarctic expedition and to re-install them on the surface every year.

A new container placed on a platform on stilts about 800 m south of Neumayer houses the central array control system that provides power for the array elements and records the continuously incoming data streams from the IS27DE array before they are sent via the AWI satellite link to the German NDC (National Data Center) at BGR and to the IDC (International Data Center) of the CTBTO (Comprehensive Test Ban Treaty Organization) in Vienna. The equipment of the central array control system consists of a computer for data recording including a backup system, a radio frequency receiver system, power supply units, and an uninterrupted power supply. The nine array stations are connected to the central array control system by 2.6 – 4.0 km long power cables.

I27DE cannot be operated without the infrastructure of the co-located Neumayer base, which provides the logistics and the personnel for array operation and maintenance, as well as power and communications. A fibre-optic cable and, alternatively, a WLAN (Wireless Local Area Network) is used to connect the central array control system with the intranet of Neumayer base, which is again connected to the dedicated satellite link established between Neumayer base and AWI. For further details please notice www.seismologie.bgr.de

Air Chemistry Observatory at Neumayer Station (70.65°S 8.25°W (42 m a.s.l.))

The Air Chemistry Observatory is installed approximately 1.5 km south of Neumayer station which is located on the Ekström Ice shelf, about 8 km from the Atka Bay. During the summer months, the bay and the nearby coastline are mainly free of sea ice and there is always open water present. The German Antarctic research station "Neumayer" is operated continuously throughout the year with an over wintering staff of 9 persons. These include two scientists working in the fields of meteorology and atmospheric chemistry.
Air chemistry observations are carried out in a dedicated observatory located 1500 m off the main station. The observation programme is maintained jointly by AWI, and the University of Heidelberg. The observation programme comprises the following observables:

category	**sampling method (sampling interval)**	**analysed compounds**	**institute**
long lived trace gases	compressed air (200 bar) (every week, spot measurement)	SF_6, CH_4, $^{13}CH_4$, $CH_3{}^2H$, $^{14}CH_4$	IUPH
		^{85}Kr	IUPH/IAR
	compressed air (2 bar) (flask sampling) (every week, spot measurement)	CO_2, $^{13}CO_2$, $CO^{18}O$, N_2O, CH_4	IUPH

	absorption (in NaOH) (one week)	$^{14}CO_2$	IUPH
Water vapour	cryogenic sampling (10 days)	H_2O, ‰^{2}H, ‰^{18}O,^{3}H	IUPH
reactive trace gases	low volume sampling (teflon/nylon filter combination) (1day)	SO_4^{2-}, NO_3^-, Cl^-, MSA, Na^+, NH_4^+, HNO_3, SO_2	AWI
aerosol	high volume sampling (Whatman 541 filter) (1 week)	SO_4^{2-}, NO_3^-, Cl^-, MSA, Na^+, NH_4^+, ...	AWI
		(‰^{15}N (NO_3^-), ‰^{34}S (SO_4^{2-}))*	IUPH/ÖFS
	high volumel sampling (2 weeks)	^{210}Pb, ^{7}Be, (^{10}Be)*	IUPH
fresh snow	(occasionally)	SO_4^{2-}, NO_3^-, Cl^-, MSA, Na^+, NH_4^+, ...	AWI
		‰^{2}H, ‰^{18}O	GSF/AWI

Table 1: Summary of the actual sampling programme. Abbreviations and symbols: *measured only during special campaigns; AWI, Alfred Wegener Institut für Polar- und Meeresforschung, Bremerhaven; GSF, Forschungszentrum für Umwelt und Gesundheit GmbH, Institut für Hydrologie, München-Neuherberg; IAR, Institut für Atmosphärische Radioaktivität, Freiburg; IUPH, Institut für Umweltphysik der Universität Heidelberg; ÖFS, Österreichisches Forschungszentrum, Seibersdorf.

	Property (sampling interval)	**method**	**institute**
aerosols physical properties	particles (>10 nm), (5 min)	condensation nuclei counter	AWI
	ultra fine particles (>3 nm), (5 min)	condensation nuclei counter	AWI
	aerosol size distribution 0.5-20 (1 hour)	optical particle counter	AWI
	black carbon, aerosol absorption (4 hours)	aethalometer	AWI
	aerosol scattering, (10 min)	integrating nephelometer	AWI
trace gases	222Rn , (3 hrs)	〈-spectroscopy of ^{214}Po	IUPH
	surface O3 ,(5 min)	UV-absorption	AWI
trace gases	column density of O3, NO2, OClO, (10 min)	UV spectroscopy (DOAS)	IUPH

Table 2: Summary of the actual in situ measuring programme. Abbreviations and symbols see Table 1.category

For further information see:
http://www.empa.ch/gaw/gawsis/reports.asp

Remote Aerosol sampler at Kohnen Station (75°S 0°E (2892 m a.s.l.)

The main focus of our work at Kohnen Station (EPICA-DML) is year-round aerosol measurements by means of an automated aerosol sampler. The equipment was set up during January 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. 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. The chemical composition of the aerosol samples will be analysed by ion chromatography (Cl-, SO42-, NO3-, MSA-, Na+, Ca2+, NH4+). The project is a close cooperation with the Institut für Umweltphysik, University of Heidelberg (IUPH).

3.1.2 Scientific equipment

(a) RV Polarstern

Main Communication Systems:
2 INMARSAT-B plants, NERA Saturn B
1 IRIDIUM System, EUROCOM MARINE

Working Deck Areas and laboratories:
After Deck: 40 m long, 14 m width (partly fixed installations), 560 sq m
Helicopter Deck: 18 m X 15 m, 270 sq m
15 Lab-Containers (ISO 20 ft) could be installed inside the ship at E-Deck (10), at F-Deck (5)
5 dry laboratories, 2 wet laboratories, 3 PC laboratories

Winch Systems:
A-Frame (30 to) at after deck
2 traction winches (pull 30 to)
2 hydrographical winches (pull 5 to), armoured coaxial cable (11 mm, length 7000 m
1 hydrographical winch (pull 5 to), armoured coaxial cable (18 mm, length 8000 m operated on the traction winches
2 geological winches (pull 20 to) wire (18 mm, length 10.000 m) operated on the traction winches
1 cantilevered beam (5 to)
1 cantilevered beam (20 to)
main crane (25 to, 25 m forward)
Midships crane (15 to at 16 m and 10 to at 24 m)
After deck crane, port, 5 to at 18 m

Scientific instrumentation:
fiber optic based 100 MB network, 200 TP, RJ45 ports and 800 fiber optic direct connections
3 X SISCO 6509 routers
Main computer system, 3 X SUN Enterprise 2500
30 PC, display and working PC (COMPAQ Deskpro 6600)
Data-Logging system: PODAS, about 120 sensors
Atlas Hydrographic DS 2 multibeam swath bathymetry system
Atlas Hydrographics PARASOUND, parametric sub-bottom profiler
SIMRAD Deep Water Sounder (DWS 500), scientific and navigation sounder
SIMRAD EK 60 fishery sounder, four frequencies (38, 70, 120, 200 kHz)
SCANMAR net sonde
Acoustic Doppler Current Profiler (ADCP)
Short Base under Water Navigation System, POSIDONIA 6000
2 X SeaBird Thermosalinograph, SBE 21
1 X CTD system, SEABIRD SBE 911 Plus, Deck unit SBE 11 Plus and 24 X 12 rosette sampler

XBT-System, Sippican & Nautilus
Ship Magnetometer
Gravimeter
Seismic compressor for air gun, Leobersdorfer, 32 l /minute, 210 bar
Air gun handling equipment.
Meteorological observatory including:
Radio Sounding System, VAISALA
All sensors and data acquisition system
SeaSpace HRPT-Satellite image receiving system

For further information see http://www.awi.de/en/infrastructure/ships/polarstern/

(b) Neumayer station II

Main Communication Systems:
Permanent Data Link via INTELSAT to Bremerhaven, 128 kBit/s
including Vox and Fax
1 Iridium system, Eurocom Marine
1 INMARSAT-A-Plant, Vox, Fax and Telex

Computer and Network:
Fibre optic based 100 MB network, 50 TP, RJ45 ports, direct access to the Internet
2 SISCO 2621 routers
Main computer system, 2 X SUN Fire V120
10 Windows PC
Wireless LAN, CISCO Aironet
3 Printers, Scanner and copy machine

Meteorological Observatory:
Radio Sounding System – Digi Cora III (Vaisala)
All sensors and data acquisition systems needed for data logging: Wind speed, wind direction (two levels 2, 10 m), Temperature (two levels 2, 10 m), humidity (two levels 2, 10 m), solar radiation, visibility, ceiling (BSRN station)
SeaSpace HRPT-Satellite image receiving system
Data logging system

Geophysical Observatory:
Magnetometer station
Glaciological work and measurements
Infra Sound Network (IS 27)
Data logging systems
Seismometer network at different locations up to 100 km distance from station consisting of seismological detection array VN A2 at Halvfar-Ryggen and 3-component station VN A3 on Søråsen Ice Rise. HF data link to the main station.

Air Chemistry Observatory:
Air sampler using high and low volume pumps and impactors
Particle counters
Aerosol Sampler
Trace gases detectors (DOAS)
C-13, C-14 Samplers
Data logging systems

For further information see http://www.awi.de/en/infrastructure/stations/neumayer_station/

(c) Kohnen Station

ice coring equipment
combined bench for measuring dielectric properties (DEP) and density
continuous aerosol sampling equipment
automatic weather stations
3-component STS-2 broadband seismometer together with a RefTek data acquisition unit
automated aerosol sampler for year-round measurements
wind turbine and solar panels

For further information see http://www.awi.de/en/infrastructure/stations/kohnen_station/

(d) Dallmann Laboratory

wet and dry laboratories
controlled temperature room with aquaria
light microphysical equipment
instruments for physiological studies
spectroradiometer
Scuba diving equipment and facilities
Zodiak and boats for diving and dredging in shallow waters

For further information see http://www.awi.de/en/infrastructure/stations/dallmann_laboratory/

(e) GARS O'Higgins (DLR)

Operation concept:	campaigns (110d/y), multimission capability
Satellites:	ERS 2, NOAA, BIRD, CHAMP, ENVISAT, TERRA Modis, AQUA Modis, VLBI operations
Reflector size:	9 m
Receptionband:	L/S/X-band
Pedestal:	El/Az, +9° tilt angle
SystemGain/Temp.:	14 dB/K (L); 19 dB/K (S); 33 dB/K (X)
Tracking:	auto and program tracking
	GPS, IRIG-A/B, Caesium, Maser
Recording:	DLT, CD, Near Real Time Data Link DAS (Direct Archive System / MacDonald Dettwiler), MDPS (Multi Data Processing System) / ACS (Advanced Computer Systems) SLRDPF / Kongsberd
Processing:	MDPS (Multi Data Processing System) / ACS (Advanced Computer Systems) Main Archive and Processing at D-PAF (DLR – OP)

Major scientific equipment is a 9-meter parabolic antenna system on a reinforced concrete foundation and additional pillars for GPS and other survey utilization and fixed buildings. The tide gauge sensor is positioned close to the shore at few meters depth. A permanent data satellite link with a fixed 2.4 m offset antenna dish is used for telephone, Internet connection (256 kb/s) and an additional ISDN line (in particular reserved for TT&C).

Technical details of the Receiving Station, for further information see http://ivs.bkg.bund.de/vlbi/ohiggins/

(f) Gondwana Station (BGR)

No scientific equipment, accommodation available for field parties

(g) Aircraft POLAR 5 (Basler BT67) and POLAR 2 (Do 228-101)

Meteorological Instruments
Basic meteorological instrumentation (Humicap, PT100)
Turbulence Probing System
Radiation Measurements (short- and long-wave radiation sensor, up and downward)
Surface Thermometer KT15
Meteorological probe

Surface Remote Sensing Instruments
Line Scanner Systems
Laser Scanner LMSQ280
Laser Altimeter LD90
Laser Altimeter Optech
Laser Scanner IBEO
Airborne Mobile Aerosol Lidar (AMALi)
Hyperspectral camera EAGLE
Digital camera
Video system

Trace Gas and Aerosol Instruments
PMS probes for in-situ cloud and aerosol measurements
Grating Spectrometer
Gas Analysers
Methane detector

Geophysical Instruments
Scintrex CS horizontal gradiometer system with decoupler
Modified ships gravimeter
Geodedic GPS receivers
Radio Echo Sounding System
FMCW Radar system
EM Bird & EM System

Basic Data Acquisition System MEDUSA-P

For further information see http://www.awi.de/en/infrastructure/aircraft/research_aircraft/

3.2 Operational Information

A. Stations

(a) Summer and winter operation

Station	Position	Opened	Remarks
Neumayer Station II	70°39'S, 08°15'W	31 March 1992	Operated by AWI, permanently occupied. Technical base for aircraft missions and surface traverses.
German Antarctic Receiving Station (GARS) Annex to Station General B. O'Higgins (Chile).	63°19'S 57°54'W	since 1992	Operated by DLR in co-operation with INACH (Chile), occupied during campaigns in winter and summer.

Neumayer Station II (70°39‘S, 08°15‘W, 40 m a.s.l.)

The Neumayer Station is the permanently occupied German research station located at the Eckstrøm ice-shelf of the Atka Bay. The station was commissioned in 1992 and replaced the former Georg von Neumayer station established in 1981.

The station operates scientific observatories, and it is used as the operational base for aircraft missions and deep field traverses with the polar vehicle fleet during the summer season.
The station is constructed on ice. The central facility is a steel tube system consisting of two main tubes (eastern tube 82 m, western tube 92 m in length), a 92 m long cross tube and a garage for polar vehicles. The tube diameter is between 8 and 8.4 m. The total area is 3420 sqm. The tube system accommodates 56 containerised modules such as sleeping rooms, laboratories, mess, hospital, social rooms, kitchen, snowmelter, power plant with two diesel generators (100 KW each) and 1 emergency generator (50 KW), air-condition and ventilation control system, workshop, warehouse and other technical facilities. The cross tube accommodates tank containers and food store. Other structures on steel platforms are the Radom with dish antenna, balloon launching shed, wind generator and air chemistry laboratory.

Scientific and technical equipment is at a high level standard. The local computer network serves laboratories and the data acquisition systems of the observatories and measurement sites. Communication, data transfer and Internet connection is performed via a permanent satellite link (64 kbit/s). Further communication equipment is Inmarsat A, VHF and HF facilities.
The key wintering staff is 1 station leader/physician, 4 scientists, 3 technicians, 1 cook.
During summer season about 30 to 60 scientists and technicians are temporarily at the station. These are scientists and technicians for maintenance works at the station, aircraft missions and traverses departing for Kohnen Station. Outdoor facilities are set up such as modules for accommodation of personnel, aircraft landing strip, fuel tank containers, track vehicles and transportation facilities.
RV "Polarstern" until the middle of December regularly performs supply every year. At the end of February or beginning of March other ships are usually requested to perform the resupply operation. Currently SANAP provides assistance by SA ”Agulhas” in the frame of logistic co-operation.

On station science is based on three observatories carrying out long-term measurements. The meteorological observatory regularly performed radiation measurements, balloon-borne soundings of the atmosphere and synoptical observations contributing to networks of WMO (GTS, GAW, BSRN) and NDSC. Meteorological staff additionally provided local weather information for airborne, ship and field operations during summer season.

The air chemistry observatory is designed for contamination-free sampling and in-situ measurements of trace gases and aerosols in the boundary layer. The long-term programme is focussed on sampling, in-situ measurements and optical observations to analyse green-house gases snow samples, stratospheric trace gases and spectral optical properties of aerosols. Long-term recordings of the geophysical observatory are mainly used for recording of global and regional seismic activity as well as to continuously record temporal variations of the Earth magnetic field.

For further information see http://www.awi.de/en/infrastructure/stations/neumayer_station/

German Antarctic Receiving Station (GARS) (63°19'S, 57°54'W)

DFD's Antarctic Station was designed to meet the needs of the German Antarctic and geodetic research community for data from the South Polar Region. The high data rates of SAR sensors made it necessary to locate the station within the study area, and after inspection of several sites, the Bernardo O'Higgins military base, operated by Chile, was selected because of its excellent conditions regarding infrastructure, bedrock foundation, and access.

Because satellite ground station technology is similar to what is required to measure continental drift by very long baseline interferometry (VLBI), an important component of scientific investigations in the Antarctic, it was decided to create a facility which permitted combined ERS/VLBI operation.

Data are processed by the D-PAF (processing and archiving facility) according to ESA standards and under ESA contract. Special products and the support of individual projects can be arranged on request of national and international users. According to availability of new satellites the acquisition program was extended to further earth observation satellites (ERS-2, LANDSAT, NOAA, TERRA-Modis, CHAMP) and is planned to be continue for ENVISAT and others.

Performed are continental drift measurements by Very Long Baseline Interferometry (VLBI) geodetic measurements and services like earth rotation monitoring and sea level measurements.

Beside the usage of the main antenna system for data reception from satellites, BKG is using the system as a radio telescope for astronomical objects. Regular VLBI operations were started in January 1992. Additional sensors for geodetic applications are operated permanently (GPS, PRARE, tide-gauge sensors) or periodically (gravimetry).

The station is in operation 90-120 days throughout the year, although the focus is on Antarctic summertime, when it is possible to obtain ground measurements for reference purposes, as well as to exchange personnel and magnetic tape data carriers, and bring in supplies and replacement parts.

For further information see: http://www.antarktis-station.de

(b) Summer operation only

Station	Position	Opened	Remarks
Kohnen Station	75°00'S 00°04'E	11 January 2001	Operated by AWI, occupied during summer season.
Dallmann Laboratory at Base Jubany (Argentina).	62°14'S 58°40'W	since 1994	Operated by AWI and DNA, occupied during summer season.
Gondwana Station	74°38'S 164°13'E	23 January 1983	

Kohnen Station (75° S, 00° E, 2892 m a.s.l.)

An outstanding highlight has been the construction of the first German summer station at the inland ice plateau of Dronning Maud Land. As part of AWI's commitment to the European Programme for Ice Coring in Antarctica (EPICA) the Department of Logistics designed and constructed the station. The facility was commissioned in January 2001.

Kohnen Station consists of a 32 m long and 8 m wide platform on steel pillars where 11 prefabricated container modules are mounted. The functions of these modules are radio room, mess room, kitchen, sanitary facilities, two sleeping rooms, snowmelter, store, workshop and power plant. Food store containers on sledges and additional sleeping modules can be parked beside the platform. Up to 20 persons can be accommodated. Communication facilities are Inmarsat B for data transmission, phone and fax. The power plant provides 80 kW with an average fuel consumption of 250 ltr. per day. The fuel depot consists of specially certificated tank containers mounted on sledges. For the deep ice coring a 66 m long, 6 m deep and 4.8 m wide trench was excavated and covered with a wooden roof. Furnishings and installations have been completed in January 2002 when deep ice coring began. A landing strip for small ski-equipped aircraft like Dornier 228 or Twin Otter completes logistic facilities.

The distance between Neumayer and Kohnen is 757 km. Supply is mainly based on traverses. Design and power of towing vehicles meet the conditions, which are encountered at the inland ice plateau. The vehicle fleet consists of 6 towing vehicles, 12 sledges carrying piece goods and containers, and 5 sledges with tank containers and accommodation facilities. GPS navigation is used. Depending on weather conditions a traverse takes 9 to 14 days. Two traverses with up to 6 sledge trains are performed each field season carrying about 200 tons of construction material, scientific equipment, consumables and fuel.

For further information see http://www.awi.de/en/infrastructure/stations/kohnen_station/

Dallmann Laboratory (62°14'S, 58°14'W, 15 m a.s.l.)

The Dallmann Laboratory is located at the Argentinean Jubany station at King George Island. It was established as an international laboratory funded by the Instituto Antartico Argentino (IAA), The Netherlands Council of Earth and Life Sciences (NWO) and AWI in 1994. Since then it has been occupied during summer season each year. About 25 to 35 scientists from Germany, Argentina and The Netherlands are working in the laboratory each season.

Research is focussed on marine and terrestrial biological studies, solar UV and ecophysiological investigations as well as geological field works. German research projects include investigations, which are in parallel carried out at AWIPEV Station in the Arctic.

The facility consists of one building with laboratories, workshop, store, social rooms and 12 berths and several container modules with aquarium and wet laboratories. AWI, NWO and IAA provide support for new technical and scientific installations. In 1998 a biological sewage treatment plant has been installed to improve the

sewage disposal at Jubany station. In 2001 a new building has been constructed to currently accommodate facilities for Scuba diving. In March 2005 3 new laboratories and one new store for dangerous good was build up.

Logistics and supply of the laboratory is mainly performed in co-operation between AWI and IAA. On site support is provided by the technical staff of Jubany station.

For further information see http://www.awi.de/en/infrastructure/stations/dallmann_laboratory/

Gondwana Station (74°38´ S; 164°13´ E)

Gondwana Station is operated by the Federal Institute for Geosciences and Natural Resources (BGR), Hannover. It is located on a small peninsula at Gerlache Inlet, Terra Nova Bay, Ross Sea. The station can be reached either by ship or airplane. The sea ice conditions are generally favourable for aircraft operation (including Hercules C-130) early in the season. Later in the season landings are only possible on Browning Pass west of Gondwana. In this case helicopter shuttle flights have to provide the linkage to the Gondwana Station.

The Terra Nova Bay area is one of the few ideal locations for Antarctic stations In this part of the Ross Sea. Gravel terraces on a slightly sloped terrain provide sufficient space for station buildings and helicopter landing pads. The area is free of snow early in the season and relatively sheltered against catabatic winds which are generally channelled by the Priestley Glacier and deviated towards Hells Gate. The absence of Penguin colonies in the Terra Nova Bay area is another advantage of this location.

The first station building was erected in 1983 during the GANOVEX III (German Antarctic North Victoria Land Expedition) as a bivouac hut like the Lillie Marleen Hut, but with additional 3 container huts for the storage of food and equipment, and for the generator and snow melting facility. During GANOVEX V (1988/89) Gondwana was enlarged and upgraded from a bivouac hut to a summer station. Prior to the construction work an environmental assessment was carried out, which helped to locate the station for minimizing the impact on lichens and other biota, but guaranteed access to the sea for water and sewage. While the seawater is pumped to the station from the southern cove, the waste water is disposed in the eastern cove.

The main building consists of two rows of eight 20´-containers which are connected by a corridor to which all rooms open, i.e. workshop, food store, kitchen, mess and sanitary rooms, the radio room, a lounge and further rooms for scientific programs. In a separate building, the generators are positioned, as well as a seawater desalination plant and the biological sewage treatment. During expeditions, most of the expedition members use tents for sleeping, as the station is basically planned for supporting scientific programs. Up to 20 persons can be hosted at the station.

During GANOVEX IX (2005/06) the station was restored. A new painting of the walls and a new waterproof roof membrane protect the station.

(c) Closed facilities

Base	Position	Opened	Remarks
Lillie Marleen Hut	71°12'S 164°31'E	14 January 1980	Currently closed. Responsibility BGR.

B. Vessels

RV Polarstern, research and supply vessel/ice breaker, operated by AWI

Vessel Ownership:

Vessel name:	Polarstern
Vessel nationality:	Germany
Vessel owner:	Alfred Wegener Institute for Polar and Marine Research
Vessel operator:	Alfred Wegener Institute for Polar and Marine Research
Homeport:	Bremerhaven, Germany

Vessel Characteristics:

Vessel length in meters:	118
Vessel length in feet:	387
Beam (Breadth) in meters:	25
Beam in feet:	82
Draft in meters:	12.2
Draft in feet:	40
Displacement GRT:	17300

Vessel Performance and Capabilities:

Cruising speed (knots, open water):	16
Propulsion power:	14000 kW
Icebreaking capability:	1.5 meters at 5 knots

Research and supply vessel RSV Polarstern

The research and supply vessel RSV ”Polarstern” commissioned in 1982 is the major research tool for AWI’s activities. She provides ideal working conditions for almost all compartments of marine sciences, atmospheric as well as glaciological research (http://www.awi.de/en/infrastructure/ships/polarstern/).

”Polarstern” is designed as a high class ice breaking vessel (GL 100 A 5 ARC3 / MC ARC3 AUT). The overall-length is 118 m and maximum beam 25 m. Displacement and draught are 17.300 tons and 11.2 m, respectively. Propulsion is performed by 4 diesel engines providing approximately 14.000 KW. The maximum speed is 16 knots. The ship is able to sail through 2 m thick fast ice with a speed of 5 knots and it breaks fast ice up to 3 m thickness. Bow and stern thrusters assist to manoeuvre the ship, if required for special observations or for unloading operations at the ice shelf margin.

The overall capacity is 124 persons with 38 to 44 berths for crew. About 50 to 70 scientists can be accommodated and provided with working facilities on board. The demand for using the ship has been permanently high during the years. Altogether about 5.500 scientists have been working on board until 2001. Amongst these 25% to 35% of guest scientists joined the cruise legs.

Since commissioning RSV ”Polarstern” has sailed about 950 millions of nautical miles with an average of 320 days on sea each year. Until now she completed 19 Antarctic and 17 Arctic expeditions. Highlights of Arctic expeditions have been joint operations with the Swedish icebreaker ”Oden” when the North Pole was firstly reached in September 1991. In 1998 she has been working with the Russian nuclear icebreaker ”Arktika” in the heavy accessible Alpha Ridge region. The latest co-ordinated operation was together with the icebreaker USCGC ”Healy” when after a detailed survey of the western Gakkel Ridge she completed her second visit at North Pole in September 2001. Antarctic cruises were performed to the Weddell, Bellingshausen and Amundsen Sea as well as waters around the Antarctic Peninsula where the supply of Neumayer Station is a regular task each year.

In order to maintain the ship's standard at a continuously high scientific and technical level after almost 20 years of permanent operation a comprehensive conversion and modernization was commenced in 1998 and completed in 2001. The shipyard work was focussed on installation of advanced scientific and navigation technology, fiber optic data network and communication systems as well as improvement and reconstruction of lifting gears, cranes, winches, laboratories and other facilities.

The reconstructed bridge with advanced navigation aids and electronic charts, the partially strengthened hull and other technical measures improve manoeuvring in heavy ice conditions. Appropriate cranes support onshore loading. Lifting gears and scientific winches are designed for launching and recovery of devices and sensors, fishing and deep sea sediment probing. Hydro-acoustic survey systems such as Hydrosweep, Parasound and fishery sounders can be continuously operated. The fiber optic network connects bridge, winch control room, laboratories and all scientific working places with several servers and distributes information of the central data acquisition system. Altogether 24 scientific laboratories, aquarium and refrigerating rooms are placed at disposal. Additionally up to 15 mobile laboratory containers can be installed.
Facilities such as flight control, hangar, helideck, tanks and refuelling facilities are available for two helicopters BO 105 CBS 5 used for sea ice reconnaissance, transport of personnel and slingload as well as for scientific observations (http://www.helitransair.com). The weather station collected meteorological data provides forcast information and satellite imagery on sea ice distributions. Recently technical facilities and hydro-acoustic navigation aids have been installed to deploy the remotely controlled underwater vehicle VICTOR 6000 for deep sea missions.
RV ”Polarstern” offers excellent working conditions. The advanced scientific and technical equipment and ability to navigate in heavy ice conditions in almost all regions of the Arctic and Antarctic oceans make her a leading platform of the international polar research fleet.

C. Aircraft

AWI operates two ski-equipped aircraft POLAR 2 (Dornier 228-101) and POLAR 5 (Basler BT-67) for scientific and logistic purposes in polar region. Both aircraft (POLAR 2 and POLAR 5) are equipped with advanced navigation systems and can easily be adapted to different science programs. aero-geophysical instrumentation and different atmospheric systems are available and will used in future projects. Presently only POLAR 5 is in operation in Antarctica.
The Basler BT-67 is based on the hull of a well-known DC-3 and as a present day state of the art modern avionics, turbo prop engines, as well as a combined ski-wheel gear. The fuselage provides sufficient space for scientific installations. Loading capacity and volume allows efficient logistic operations, too. Major changes in comparison to a “standard" Basler BT-67 are large belly doors, several large openings in the cabin, wing stations for antennas and probes as well as more powerful generators for operating more scientific systems as it was possible so far on-board of the earlier operated polar aircraft. Powerful generators with 15.4 KVA have enabled expansion of the existing measuring equipment on-board.

The operational range is more than 3000 km and the required take-off ability from skis at elevations exceeding 3800 meters on the Antarctic plateau has been demonstrated. Powerful generators have enabled expansion of the existing measuring equipment aboard. Loading capacity and volume allowed efficient logistic activities. Based on the take-off elevation up to 4100 m the aircraft can return from all locations on the Antarctic ice plateau and from every point in the Arctic. Outside landing on unprepared surfaces is also possible. It requires less maintenance and can be operated 800 hours per year. The home base of the POLAR 5 is the regional airport Bremerhaven. The technical and mission parameters are shown below.
POLAR 5 is mainly used for air-borne geophysical and glaciological survey missions as well as meteorological studies, in-situ air chemistry and radiation measurements. During Antarctic seasons the aircraft operates mainly from Neumayer station. Mobilisation and demobilisation from Europe via South America is performed with support provided by the British stations Halley and Rothera. In Antarctica POLAR 5 will be available for logistic tasks within DROMLAN (Dronning Maud Land Air Network) after consultation between AWI and ALCI. The transport capacity of POLAR 5 is 18 passengers, respectively up to 2000 kg. POLAR 5 will be integrated in the DROMLAN feeder flight schedule and so the DROMLAN aircraft fleet will be improved by this investment.

Table 2: Parameter of POLAR 5

Technical parameter		**Mission Parameter**	
Length over all	20.66 m	Endurance for Ferry	2,600 km *
Height over all	5.20 m	Endurance with 1500 kg cargo	1,700 km *
Wing span	29 m	Number of passengers	18 PAX
Length of fuselage	12.85 m	Lowest cruising speed	185 km/h
Width of fuselage	2.34 m	Maximum cruising speed	400 km/h
Height of fuselage	2.00 m	Take off/landing speed	118 km/h
Maximum take off weight	13,039 kg	Maximum take-off elevation	4,100 m
Maximum payload	3,900 kg	Lowest flight altitude	32 m
Fuel consumption	500 kg/h	Pitch angel during flight	0 °
Maximum service ceiling	7,600 m	Power supply for science	550 A/28VDC

(*) 45 min reserve and 225 kg survival equipment (only flight crew)

For further information see: http://www.awi.de/en/infrastructure/aircraft/research_aircraft/

D. Aircraft landing Facilities

See AFIM

E) Communications facilities and frequencies

V – voice	F – fax	I-x - Inmarsat (A,B,C or M)	IR – iridium
+ - E. Atlantic - 871,	(581-telex); W. Atlantic - 874 (584);	Indian – 873 (583);	Pacific - 872(582)

Vessel	**Telephone / fax**	**E-mail / telex**	**Radio (HF / VHF)**
R/V Polarstern DBLK Germany	+(870/1/2/3/4) 321 842 611 VIB +(870/1/2/3/4) 321 842 711 VIB +(870/1/2/3/4) 321 842 612 FIB +(870/1/2/3/4) 321 842 712 FIB	kapitaen@awi-polarstern.de 0581 321 842 614 (telex) 0581-321-842-714 (telex) 0581 421 125 510 (telex)	HF: 2,4,6,8,12,16 Mhz VHF: channel 16, 71

Stations	**Telephone / fax**	**E-mail / telex**	**Radio (HF / VHF)**
Neumayer Call sign: DLA21 70° 39´S, 08° 15´W Elevation: 40 m	+871-112 0-171 VIA +871-112 0-172 FIA +8816-214-19947 VIR	neumayer@awi-bremerhaven.de 0581-1120171 DAFS X (telex)	HF: 1145,1200,4059, 6210, 8265 KHz Maritime VHF: channel 6, 16 Air VHF: 123.45 MHz

Stations	Telephone / fax	E-mail / telex	Radio (HF / VHF)
Kohnen 75° 00´S, 00° 00.1´E Elevation: 2850 m	+ 871-682623-235 VIM + 871-682623-236 FIM + 8816-214-19949 VIR	0581-492621-311 (telex)	HF 4104, 5177, 6210, 8265, 9106 KHz Maritime VHF channel 6, 16 Air VHF 123.45 MHz
Dallmann Laboratory 62°14´S, 58° 40´W Elevation 15 m	+870-382623512 VIB +870-382623513 FIB	dallmann@awi-bremerhaven.de	VHF: channel 16 , 60, 62
GARS 63°19'S 57°54'W Evaluation: 10 m	+56-2-5820900 +8741123146 (back Up)	Remote.gars@dlr.de Helpdesk-dfd@dlr.de	none
Gondwana 74°38´ S; 164°13´ E	none	none	none

Aircraft	Telephone / fax	E-mail / telex	Radio (HF / VHF)
Dornier 228-101 POLAR 2 Call sign: D-CAWI	+ 8816-214-65048 VIR	dcawi@les-raisting.de 0581-49-2621-677 (telex)	VHF: 123,45 MHz HF: 8265, 6210 kHz
Basler BT-67 POLAR 5 Call sign: C-GAWI	+ 8816-41442635 VIR		VHF: 123.45 MHz HF: 8265, 6210 kHz

3.3 Waste Management Plans

Waste management plan has been developed by AWI for stations, ships and field parties. It is used for training and briefing of participants. The Waste management plan is available in German language.

For further information contact: Hartwig.Gernandt@awi.de and Dirk.Mengedoht@awi.de

Annual reports on waste management for the cruises ships MV Hanseatic, MV Bremen, MV Delphin and MV Vistamar as well as for land activities are being provided to the Umweltbundesamt.

3.4 Contingency Plans

For the German Neumayer Station, an Oil Spill Contingency Plan and Emergency Response Plan have been established. As far as ships are concerned, Shipboard Oil Pollution Emergency Plans (SOPEPs) exist, in accordance with MARPOL regulations, for RV Polarstern, MV Vistamar, MV Hanseatic, MV Bremen and MV Delphin.

An Emergency Manual Antarctica has been updated according to the COMNAP/SCALOP guidelines. The manual deals with an Oil Spill Contingency Plan and Plans for Other Contingencies for Neumayer Station, with Ship Loading Operations, Aircraft Operations, and with Traverses.

The Contingency plans for Antarctic stations, research ships and field parties of AWI are available.

For further information contact: hgernandt@awi-bremerhaven.de and Dirk.Mengedoht@awi.de

3.5 Inventory of Past Activities

An inventory containing the main past activities up to the year 2000 carried out by German research institutions has been completed. This inventory is being brought up to date at present.

Contact-point for further questions: antarktis@uba.de

3.6 Relevant National Legislation

The Federal Republic of Germany has taken the following measures to ensure compliance with the Protocol on Environmental Protection to the Antarctic Treaty:

- Adoption of the Act on the Protocol on Environmental Protection of 4 October 1991 to the Antarctic Treaty (Gesetz zum Umweltschutzprotokoll vom 4. Oktober 1991 zum Antarktis-Vertrag) of 22 September 1994 (Federal Law Gazette, part II, p. 2478 et seq.), as amended by Regulation of 21 September 1997 (Federal Law Gazette, part I, p. 2391 et seq.).

- Adoption of the Act to Implement the Protocol on Environmental Protection of 4 October 1991 to the Antarctic Treaty (Gesetz zur Ausführung des Umweltschutzprotokolls vom 4. Oktober 1991 zum Antarktis-Vertrag) of 22 September 1994 (Federal Law Gazette, part I, p. 2594 et seq.), most recently amended by the ordinance of 31 October 2006 (Federal Law Gazette 1 p.2407)

- Adoption of the Regulation on the Composition, Appointment and Procedure of an Independent Commission of Scientific Experts Under Sec. 6 Para. 5 of the Act to Implement the Protocol on Environmental Protection of 22 September 1994 (Verordnung über Zusammensetzung, Berufung und Verfahren einer unabhängigen Kommission wissenschaftlicher Sachverständiger nach § 6 Abs. 5 des Umweltschutzprotokoll-Ausführungsgesetzes vom 22. September 1994) of 22 July 1999 (Federal Law Gazette, part I, p. 1660 et seq.).

- Adoption of the Regulation on Specially Protected Areas, Specially Managed Areas, Historic Sites and Monuments in Antarctica (Verordnung über besonders geschützte Gebiete, historische Stätten und Denkmäler in der Antarktis) of 25 April 2005 (Federal Law Gazette, part II No. 10, p. 386 et seq.). This regulation replaces the previous on this subject of 10 July 2000.

- Adoption of the Amendment of the Regulation on Specially Protected Areas, Specially Managed Areas, Historic Sites and Monuments in Antarctica (Verordnung zur Veränderung der Verordnung über besonders geschützte Gebiete, historische Stätten und Denkmäler in der Antarktis) of 23 May 2007 (Federal Law Gazette, part II No. 17, p. 770 et seq.).

- Adoption of the Regulation on Costs for Official Acts Under the Act to Implement the Protocol on Environmental Protection of 22 September 1994 (Kostenverordnung für Amtshandlungen nach dem

Umweltschutzprotokoll-Ausführungsgesetz vom 22. September 1994) of 17 April 2001 (Federal Law Gazette, part I, p. 834 et seq.).

The Act on the Protocol on Environmental Protection of 4 October 1991 to the Antarctic Treaty entered into force on 6 October 1994. The Act to Implement the Protocol on Environmental Protection of 4 October 1991 to the Antarctic Treaty entered into force on 14 January 1998. Since then, a considerable number of licensing procedures has been concluded. To facilitate procedures, several questionnaires for applicants have been developed. Guidelines for waste management plans have also been set up.

The following national and international legal acts are available at www.umweltbundesamt.de/antarktis:

- Antarctic Treaty
- Protocol on Environmental Protection to the Antarctic Treaty - Survey
- Act Implementing the Environmental Protection Protocol
- Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)
- Convention on the Conservation of Antarctic Seals (CCAS)

Contact-point for further questions: antarktis@uba.de