HORIZON 2020

Coordination and Support Action

Grant Agreement No: 652641

CONNECTING SCIENCE WITH SOCIETY

Deliverable D3.2

European Polar Infrastructure Catalogue

 26/07/2016

Submission of Deliverable

Work Package	WP 3
Deliverable no. & title	D3.2 European Polar Infrastructure Catalogue
Version	Draft V1
Creation Date	25.06.2016
Last change	14.07.2016
Status	☐ Draft ☒ WP lead accepted ☒ Executive Board accepted
Dissemination level	☒ PU-Public ☐ PP- Restricted to programme partners ☐ RE- Restricted to a group specified by the consortium ☐ CO- Confidential, only for members of the consortium
Lead Beneficiary	IPEV (partner 6)
Contributors	☒ 1 – AWI, ☐ 2 – CNRS, ☒ 3 - NERC-BAS, ☐ 4 - CNR-DTA, ☐ 5 – SPRS, ☒ 6 – IPEV, ☒ 7 - IGOT-UL, ☐ 8 – RUG, ☐ 9 - RCN, ☐ 10 – MINECO, ☒ 11 – CSIC, ☐ 12 - UW-APRI, ☐ 13 – BAI, ☐ 14 – GEUS, ☐15 – VUB, ☐ 16 – UOULU, ☐ 17 – RBINS, ☐ 18 - IGF PAS, ☐ 19 - IG-TUT, ☐ 20 – AMAP, ☐ 21 – WOC, ☐22 - GINR
Due date	30.06.2016
Delivery date	26.07.2016

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1. Introduction

Europe has a long tradition and a very strong reputation for world-class scientific research in the Polar Regions. This research is enabled and supported by **significant and substantial scientific infrastructures,** facilities and platforms operated by many European nations in both the Arctic and the Antarctic. Whilst there is already a degree of coordination and cooperation between European polar operators there is great potential for these considerable resources to be used more coherently and effectively to deliver the highest quality European research. There is also a significant opportunity to link much more productively with other nations in the wider international polar science community, including those without infrastructure or facilities and with businesses that operate infrastructures in the Polar Regions, such as shipping. This will allow implementation of mechanisms for **joint programming of infrastructure,** particularly **of polar ships to allow bigger and more complex science projects** to be undertaken.

The EU-PolarNet consortium comprises **all infrastructures** (research vessels, stations, aircraft, observatories, autonomous instrumentation on land, in air and ocean research) of the **European Union in the Arctic and 95% of those present in the Antarctic**. These polar research infrastructures are powerful assets for supporting a vast range of scientific research and represent significant investments made by individual nations, yet lack an overall co-ordinated framework for shared access and interoperability. EU-PolarNet therefore aims at initiating a **European Network of Polar Operations** that will develop a management system for trans-national access to these infrastructures. These will thereby be made available to the whole European research community, their international partners and other users engaged in the Polar Regions to deliver the highest quality and relevant research.

However, achieving these objectives first requires a comprehensive, exhaustive and updated mapping of the European polar research infrastructures, which will serve as a basis of the future EU-PolarNet work and planning.

In 2007, the European Polar Consortium, (EUROPOLAR), an ERA-NET funded by the European Commission during FP6, provided an overview of European polar research infrastructures controlled and owned by European countries that operate in the Arctic and Antarctic. According to this analysis, the 24 organisations which were members of the European Polar Board (representing 17 European nations) managed and operated 22 Antarctic stations, 26 Arctic stations, 13 polar vessels and a substantial polar air support and airborne research capability. However, the 2007 inventory requires a thorough update and should be expanded in order to present an encompassing vision of the scientific capacities of these infrastructure and assets, including their role in the environmental monitoring of the Polar Regions.

The present Deliverable 3.2 is one of the objectives of the Task 3.1 of the Eu-PolarNet project:

> D3.2 European Polar Infrastructure Catalogue incl. all types of polar infrastructures, facilities and large instruments (such as AUV´s and ROV´s) based on the model of the INTERACT Arctic station catalogue and with the agreement and participation of the INTERACT community. It will provide all necessary information on the capacities of European Arctic and Antarctic infrastructures to support science and their availability to international scientists.

2. Available information and methodology

2.1 Sources of information on polar research infrastructures

The two task leaders (IPEV and IGOT) firstly explored the availability of data on polar research infrastructure, their degree of comprehensiveness, as well as their updating status.

Polar research facilities

Regarding the scientific facilities established in the Arctic, a lot of information is already available through INTERACT (http://www.eu-interact.org/), an infrastructure project under the auspices of SCANNET, a circum-arctic network of currently 77 terrestrial field stations in northern Europe, Russia, US, Canada, Greenland, Iceland, the Faroe Islands and Scotland, as well as stations in northern alpine areas. INTERACT is funded by the EU.

In Antarctica, information is less comprehensive and not updated. Data was collected a few years ago by the Council of Managers of National Antarctic Programs (COMNAP), the international organization which brings together those organizations that have responsibility for delivering and supporting scientific research in the Antarctic Treaty Area on behalf of their respective governments (https://www.comnap.aq). COMNAP consists of 30 National Antarctic Program Members, 15 of them being European. The information currently available in COMNAP on Antarctic research facilities is not comprehensive (https://www.comnap.aq/Information/SiteAssets/SitePages/Home/Antarctic_Facilities_List_13Feb2014.xls).

Vessels

Eurofleets, a Research Infrastructures project under the 7th Framework Programme of the European Commission (http://www.eurofleets.eu), aimed at consolidating the coordination of a pan-European distributed research fleet infrastructure with a common strategic vision and promoting access to European marine research vessels and equipment. With these objectives, Eurofleets II established very recently a European vessel database (http://www.eurofleets.eu/rvs/).

Aircrafts

Regarding the aircrafts used by European Polar programs in the Arctic or in the Antarctic, it appears that the number is scarce and they are operated by two member organisations of the EU-PolarNet consortium, AWI (Germany) and BAS (United Kingdom).

Both organizations are partner of EUFAR2, an Integrating Activity of the 7th Framework Programme (FP7) of the European Commission, following three previous contracts under FP5, FP6 and FP7. EUFAR2 brings together 24 European institutions and organisations involved in airborne research, operating 17 instrumented aircraft and providing access to 3 remote-sensing instruments.

Large instruments

Currently, there is no information or listing of national or international large instruments used in the Polar Regions for scientific research. Moreover, the remote operated vehicles (such as AUV and ROV) are becoming more and more numerous and the technology is rapidly evolving. For this reason, an attempt of listing such large instruments is nearly impossible and the list would be quickly obsolete. Consequently, it was decided to not consider these large instruments in the current Task 3.1.

As a conclusion, at the initial stage of this task, it appeared that the information on the European Polar infrastructures was disperse and very different in comprehensiveness, depending on their nature and geographical location. Consequently, the task leaders adopted the objective to gather the information in a single database on a homogeneous way. This approach required the establishment of formal agreements between EU-PolarNet and other entities like INTERACT, COMNAP and Eurofleets II in order to use the already available data and to increase these sets of information with additional data, which will be useful for the EU-PolarNet overall objectives.

2.2 Methodology

Consultation with EU-PolarNet Partners

Taking advantages of international meetings (e.g. ASSW, European Polar Board General Assemblies), several workshops were organized in 2015 and 2016 in order to collect the advices of other EU-PolarNet partners on the proposed approach, as well as on the desired data on the European polar infrastructures.

- European Polar Board Meeting - ASSW **Toyama**, Japan, **April 24 2015**: presentation of the project, first exchanges with the EU-PolarNet partners.
- Task 3.1 Meeting, **Lisbon**, Portugal, **October 6-7th 2015**: Small « task group » including task leaders staff, INTERACT representatives, EU-PolarNet WP1 & WP3 leaders; discussed cooperation, objectives, content of the catalogue, possible structure of the database etc.
- Task 3.1 Meeting, **Vienna**, Austria, **November 4th 2015**: presentation of a possible structure of the database to the European Polar Board Members and EU-PolarNet partners; validation of the structure.
- EU-PolarNet 2nd General Assembly, **Fairbanks**, Alaska, USA, **March 13th 2016**: report on the Task 3.1 status and planned actions; this meeting offered the room for comments and suggestions prior finalization of the infrastructure catalogue.

In order to build the infrastructure catalogue, it was decided 1) to not reinvent the wheel and to use the existing information, mainly through partnerships with other communities or EU Projects (INTERACT, Eurofleets II), 2) to collect additional information, which could be useful for the EU-PolarNet objectives, and 3) to adopt different approaches depending on the type of infrastructures.

The following approaches were consequently developed:

Facilities database

According to the discussions held during the above mentioned meetings between the EU-PolarNet partners, a station database (or also called facilities database because including more than stations, but also camp, shelters etc.) was designed using Microsoft Office Access. The database started with a compilation of the existing field in the INTERACT station catalogue, followed by a detailed discussion with the consortium partners, which resulted in the inclusion of new data fields and on a standardization of the database, both for including Arctic and Antarctic facilities data. This was a

complex process involving the agreement of both COMNAP and INTERACT. Databases on the Arctic and the Antarctic, respectively, will be made available to these two organizations for their own use. This work was done by IGOT (Gonçalo Vieira, Luis Encalada and Carla Mora). Once the structure of the database was fixed (after the Vienna meeting in November 2015), IGOT developed a specific form to be filled for each operator (Figure 1). Forms were pre-filled with the available information from COMNAP and INTERACT before submission to the managers of the facilities, who updated the existing fields and provided new information for the new fields. The work was conducted separately for the Arctic and the Antarctic:

- Arctic: the managers of the European stations already present in the INTERACT station catalogue were asked to complete the information through the INTERACT channel; for the few European stations not members of INTERACT (France, Germany, Italy), the managers were asked by INTERACT (Jan-Elmer Topp-Jørgensen, Morten Rasch) to review and complete the form for their stations.

- Antarctic: information on Antarctic facilities was much poorer than for the Arctic. For this reason, COMNAP was interested in the EU-PolarNet Task 3.1 project and decided to collaborate and to fully organize the data collection among its members (covering all the National Antarctic Programmes operating facilities in Antarctica). COMNAP (Michelle Rogan-Finnemore, Andrea Colombo) sent the forms to the managers responsible for the operation of each Antarctic facility. Once data were collected, COMNAP sent to IGOT the extract of the database related to European Antarctic infrastructures.

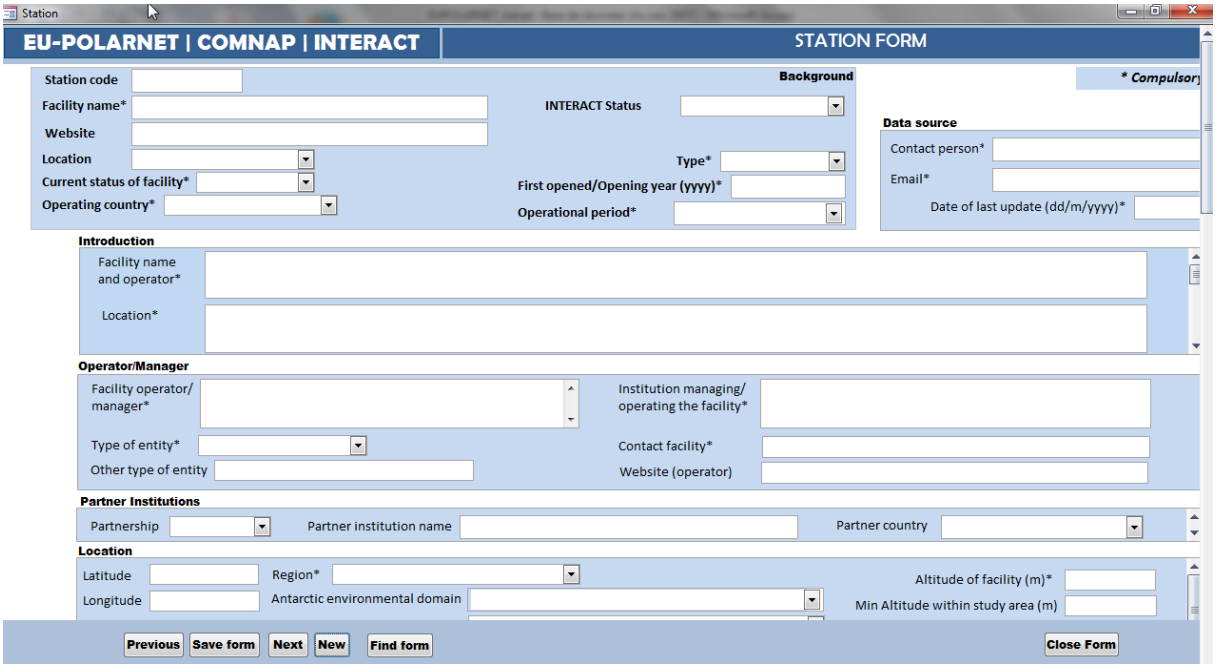


Figure 1 – Form sent to the manager of Polar Facilities in order to collect updated information on these infrastructures

Vessel database

In recent years the European Commission has promoted through the Eurofleets 2 project an analysis of the European status of the Polar Research Vessels (PRVs). The EU-PolarNet partners estimated that the most useful information on these PRVs was consequently already collected and updated. It was agreed that the database established by Eurofleets 2 would be made available to the EU-PolarNet project and contribute to its European infrastructure catalogue.

Here we summarize the studies on the large scale facilities after assembling information on PRVs operating at both poles (Arctic and Antarctica).

In our presentation, we have distributed the PRV´s in accordance with the new International Maritime Organization (IMO) Polar Code classification. 3 categories are distinguished:

- **Category A ship**: Category A ship means a ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions.
- **Category B ship**: means a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions.
- **Category C ship**: means a ship designed to operate in open water or in ice conditions less severe than those included in categories A and B.

Among these 3 categories, 7 polar classes are defined on the basis of their operational capacities in the ice:

Polar Class	**Ice descriptions** (based on WMO Sea Ice Nomenclature)
PC 1	Year-round operation in all polar waters
PC 2	Year-round operation in moderate multi-year ice conditions
PC 3	Year-round operation in second-year ice which may include multi-year ice inclusions
PC 4	Year-round operation in thick first-year ice which may include old ice inclusions
PC 5	Year-round operation in medium first-year ice which may include old ice inclusions
PC 6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice which may include old ice inclusions

Most of the information has been assimilated from the EU-project Eurofleets2 and information by EurOcean, Council of Managers National Arctic Program (COMNAP), International Research Ship Operators (IRSO), European Research Vessel Operators (ERVO), etc.

Aircrafts

Because the main European polar research aircrafts are operated by Germany (AWI) and United Kingdom (BAS), we asked these two organizations to produce a description of their aircraft fleet for inclusion in the present report.

Large instruments

It was decided that autonomous instruments would be excluded from the infrastructure catalogue, as these are frequently renewed and the update of the database/catalogue would be too extensive. Rather showcases will be included in the catalogue.

3. Data

3.1 European Polar Research Facilities database

The following structure of the polar facilities database was adopted, taking into account the fields already present in the INTERACT Station catalogue database, as well as the suggestions from partners, and from COMNAP for the Antarctic facilities.

The compulsory fields are indicated with an *.

Background

Fields	Field comment / proposed selections
* Station Code	Code used only during the catalogue's production.
* Facility Name	
INTERACT Status	This field is related to Arctic facilities only.
Website	Facility website.
Location	Choose from the list as appropiate for this facility: □ Arctic □ Sub-Arctic □ Antarctic □ Subantarctic
* Type	Choose from the list as appropiate for this facility: □ Camp □ Laboratory □ Station □ Shelter
* Current status of facility	Choose from the list as appropiate for this facility: □ Open □ Closed
* First opened/Opening year	Insert the opening year of this facility.
* Operating country	Choose from the list as appropiate for this facility.
* Operational period	Choose from the list as appropiate for this facility: □ All year round □ select the appropriate months

Data sources

Fields	Field comment / proposed selections
* Contact person	
* Email	
* Date of last update	Date/Month/Year

Introduction

Fields	Field comment / proposed selections
* Facility name and Operator	All the information inserted in the "Introduction" section, will be used to create introductive paragraphs.
* Location	Describe the location as appropriate for this facility.
* Biodiversity and natural environment	Describe biodiversity and natural environment as appropriate for this facility.
* History and Facilities	Describe history and previous facilities, if any, previously built.
* General research and databases	Describe general research conducted as appropriate for this facility.
* Human dimension	Describe human activities as appropriate for this facility.

* Access	Describe how is possible to reach the facility (e.g. flight from, by land from, ship).

Operator / Manager

Fields	Field comment / proposed selections
* Facility operator / manager	
* Institution managing / operating the facility	
* Type of entity	Choose from the list as appropiate for this facility. If the type of your enity is not listed, please type in "other". □ Government □ Private □ Other
* Contact facility	Facility contact number or email.
Website (operator)	Insert the operator website.

Partner institutions

Fields	Field comment / proposed selections
Partnership	Choose "yes" or "no" as appropriated for this facility.
Partner Institution Name	
Partner Institution Country	If yes, choose from the list as appropriate for this facility.

Location

Fields	Field comment / proposed selections
* Latitude	Deg Min Sec
* Longitude	Deg Min Sec
* Region	Choose from the list as appropriate for this facility: □ Antarctic Peninsula □ Continental Antarctica □ European Arctic □ North America Arctic □ Russian Arctic □ Sub-Antarctic Islands
Antarctic Environmental Domain	For Antarctic facilities only: A. Antarctic Peninsula northern geologic B. Antarctic Peninsula mid-northern latitudes geologic C. Antarctic Peninsula southern geologic D. East Antarctic coastal geologic E. Antarctic Peninsula and Alexander Island main ice fields and glaciers F. Larsen Ice Shelf G. Antarctic Peninsula offshore island geologic H. East Antarctic low latitude glacier tongues I. East Antarctic ice shelves J. Southern latitude coastal fringe ice shelves and floating glaciers K. Northern latitude ice shelves L. Continental coastal-zone ice sheet M. Continental mid-latitude sloping ice N. East Antarctic inland ice sheet O. West Antarctic Ice Sheet P. Ross and Ronne-Filchner ice shelves Q. East Antarctic high interior ice sheet R. Transantarctic Mountains geologic S. McMurdo – South Victoria Land geologic

	T. Inland continental geologic U. North Victoria Land geologic
Antarctic Conservation Biogeographic Zone	For Antarctic facilities only: 1 North-east Antarctic Peninsula 2 South Orkney Islands 3 North-west Antarctic Peninsula 4 Central south Antarctic Peninsula 5 Enderby Land 6 Dronning Maud Land 7 East Antarctica 8 North Victoria Land 9 South Victoria Land 10 Transantarctic Mountains 11 Ellsworth Mountains 12 Marie Byrd Land 13 Adelie Land 14 Ellsworth Land 15 South Antarctic Peninsula
Sub-Antarctic Islands	Choose from the list as appropriate for this facility: □ Antipodes Isl. □ Auckland Isl. □ Bounty Isl. □ Bouvet Isl. □ Crozet Isl. □ Heard and Mc Donald Isl. □ Kerguelen isl. □ Macquarie Isl. □ Marion and Prince Edward Isl. □ South Georgia Group □ South Sandwich Isl. □ Snares Isl.
* Altitude of facility (m)	
Min. altitude (m)	within study area
Max. altitude (m)	within study area
Distance to nearest town(km)	
Distance to nearest transport facility	(airstrip/helipad/dock) (km)
Distance to nearest station (km)	
Type of surface facility built on	Choose from the list as appropriate for this facility. If the type of surface is not listed, please type in "other". □ Ice-free ground □ Ice-shelf □ Ice-sheet □ Glacier □ Other

Climate

Fields	**Field comment / proposed selections**
* Climate zone	Choose from the list as appropriate for this facility: □ High-Arctic □ Low-Arctic □ Sub-Arctic □ Inland Antarctica □ Coastal Antarctica

	□ Maritime Antarctica □ Sub-Antarctic
* Permafrost	Choose from the list as appropriate for this facility □ Continuous □ Discontinuous □ Sporadic □ None
* Mean annual wind speed (km/h)	
Max. wind speed (km/h)	
Dominant wind direction	Choose from the list as appropriate for this facility.
Sea Ice break up	Select Months or "None"
Lake ice break up	Select Months or "None"
River ice break up	Select Months or "None"
* Snow free period	Select Months or "None"
Total annual precipitation (mm)	
Precipitation type	Choose from the list as appropriate for this facility.If the precipitation type is not listed, please type in "other": □ Snow □ Rain □ Rain and Snow □ Other
* Period of temperature measurements (start)	Date/Month/Year
* Period of temperature measurements (end)	Date/Month/Year
* Mean annual Temp. (°C)	
Mean Temp. Jan. (°C)	
* Mean Temp. Feb. (°C)	
Mean Temp. March (°C)	
Mean Temp. April (°C)	
Mean Temp. May (°C)	
Mean Temp. June (°C)	
* Mean Temp. July (°C)	
Mean Temp. August (°C)	
Mean Temp. Sept. (°C)	
Mean Temp. Oct. (°C)	
Mean Temp. Nov. (°C)	
Mean Temp. Dec. (°C)	
Max. Temp. (absolute) - date	Date/Month/Year
Max. Temp. (absolute) (°C)	
Min. Temp. (absolute) - date	Date/Month/Year
Min. Temp. (absolute) (°C)	

Features in the facility area

Fields	**Field comment / proposed selections**
* Features in the facility area	Choose from the list as appropriate for this facility. If the type of feature is not listed or you want add other features, please type in "other": □ Biological features □ Bird colonies □ Blue ice □ Bluff □ Clear air zone □ Coast

	□ Crevasses □ Fauna □ Fjord □ High elevation □ Hill □ Ice cap or glacier □ Ice shelf □ Ice tongue □ Lake □ Low artificial light pollution □ Low humidity □ Melt stream □ Moraines □ Mountains □ Nunatak □ Permanent snow patches □ Plateau □ River □ Rock □ Sea □ Sea ice □ Seal colony □ Shoreline □ Snow □ Sustrugui □ Terrestrial geothermal □ Tree line □ Tundra □ Valley □ Other

Main science disciplines

Fields	**Field comment / proposed selections**
* Main science disciplines	Choose from the list as appropriate for this facility. If a science discipline is not listed or you want add other disciplines, please type in "other": □ Anthropology □ Archaeology □ Astrophysics □ Atmospheric chemistry and physics □ Climate change □ Climatology □ Ecology □ Environmental sciences □ Fishery □ Geocryology □ Geodesy □ Geology □ Geomorphology □ Geophysics □ GIS □ Glaciology □ Human biology □ Hydrology □ Isotopic chemistry □ Limnology □ Mapping

	□ Marine biology □ Medicine □ Microbiology □ Oceanography □ Palaeoecology □ Palaeolimnology □ Pollution □ Sedimentology □ Sociology □ Soil science □ Terrestrial biology □ Other

Infrastructure

Fields	Field comment / proposed selections
* Area under roof (m2)	
* Area Scientific laboratories (m2)	
* Type of scientific laboratories	Choose from the list as appropriate for this facility. If a scientific laboratory is not listed, please type in "other": □ Biology □ Chemistry □ Geology □ Geophysics □ GIS □ Scientific diving □ Other □ None
* Logistics area (m2)	
* Number of beds	
Conference room	capacity
* Showers	Yes or No
* Laundry facilities	Yes or No
* Hydroponics facilities	Yes or No
* Power supply (type)	Choose from the list as appropriate for this facility: □ Fossil fuel □ Renewable
* Power supply (V)	
Power supply	hours per day

Staff capacity

Fields	Field comment / proposed selections
* Number of support staff on station (peak/summer season)	This field **does not** Include scientists, researchers and tourists.
* Number of scientists on station (peak/summer season)	
* Number of support staff on station (off peak/winter season)	This field **does not** Include scientists, researchers and tourists.
* Number of scientists on station (off peak/winter season)	

* Max number of personnel at any one time (staff, scientists and other)	Total maximum number of all people that station can accommodate at any one time.
Number of tourists (annual average)	

Scientific equipment

Fields	Field comment / proposed selections
Specific devices / Scientific equipment	
Scientific services possible	
Long-term monitoring/observations	

Medical facilities

Fields	Field comment / proposed selections
* Medical facilities	Yes / No / No data
* Area of medical facility (m2)	
* Staff with relevant training	Choose from the list as appropriate for this facility: □ Medical doctor □ Non-medical trained person □ Nurse □ Paramedic □ Physician assistant □ None
* Staff with basic medical training or doctor (summer)	Number
* Staff with basic medical training or doctor (winter)	Number
Distance to hospital (km)	
Closest emergency facility	in Antarctica only (km)
Closest emergency facility	elsewhere (km)
* Capability	Choose from the list as appropriate for this facility: □ Basic □ Dental □ Surgery □ Other □ None
* Beds	Number
* Medical research capabilities	Choose from the list as appropriate for this facility.
* Medical screening requirements	Choose from the list as appropriate for this facility.
* Equipment	Choose from the list as appropriate for this facility. If an equipment is not listed, please type in "other": □ Aeromedical equipment □ Altitude medicine □ Anaesthesia □ Biochemistry □ Blood transfusion medicine □ Diagnostic ultrasound □ Diagnostic x□ray □ Endoscopy □ Haematology

	□ Hyperbaric recompression chamber □ Laboratory diagnostics □ Microbiology □ Ophthalmology □ Telemedicine □ Other
Compulsory safety equipment	
Recommended safety equipment	

Vehicles at facility

Fields	Field comment / proposed selections
Sea transportation	
Land trasportation	

Workshop facilities

Fields	Field comment / proposed selections
* Workshop facilities	Choose from the list as appropriate for this facility. If a workshop facility is not listed, please type in "other": □ ICTS (Staff available to assist with construction) □ Mechanical □ Metal workshop □ Plexiglas workshop □ Wood workshop □ Other

Communication

Fields	Field comment / proposed selections
* Communications	Choose from the list as appropriate for this facility: □ Computer □ E-mail □ Fax □ Internet □ Printer □ Satellite phone □ Scanner □ Telephone □ VHF

Access

Fields	Field comment / proposed selections
* Access	Choose from the list as appropriate for this facility: □ Air □ Land □ Sea

Aircraft landing facilities

Fields	Field comment / proposed selections
Number of airstrips	
Length (m) of longest runway	
Width (m) of longest runway	
Airstrip surface	Choose from the list as appropriate for this facility. If an airstrip surface is not listed, please type in "other":

	□ Blue ice □ Grass □ Gravel □ Macadam / tarmac □ Sea ice □ Snow □ Uncertain □ Other
Description of airstrips	Free text to describe multiple airstrips.
Helipad	Yes / No / No data

Transport and freight

Fields	Field comment / proposed selections
* Transport to facility	Choose from the list as appropriate for this facility. If a means of transport is not listed, ease type in "other": □ 4WD □ Airplane □ Car □ Helicopter □ Quad □ Ship □ Ski □ Skidoo □ Walking □ Other
Ship landing facilities	Choose from the list as appropriate for this facility. If a ship landing facility is not listed, please type in "other": □ Breakwater / Bulkhead □ Drydock □ Floating dock / Pontoon □ Ice Pier □ None □ Pier / Jetty □ Port □ Wetdock □ Other
No. of ship visits per year	
Period of ship visits / yr	Select months or "None"
No. of flight visits / yr	
Period of flight visits / yr	Choose from the list as appropriate for this facility.

Permitting issues categories

Fields	Field comment / proposed selections
Permits required for access to the facility	
Permits required for studies	
Contact (permit issues)	
Email contact	

Human activities

Fields	Field comment / proposed selections
Human activity	Yes / No / No data

	Recreation	Choose from the list as appropriate for this facility: □ Recreational activities □ Resort / Leisure activities
	History of human presence in the area	
	Production / Economical activities	This field is most applicable to the Arctic Stations.
*	Long term monitoring	Yes / No / No data
*	Waste management	Yes / No / No data
*	Hazard management	Yes / No / No data
*	Fuel spill response capability	Yes / No / No data

3.2 European Polar Research Vessels database

The following structure of the Polar Research Vessels database was adopted, according to the fields already present in the EUROFLEET 2 database.

General information

Fields	Comments
Polar code Category	A, B or C
IACS Class	PC1 to PC 7
Ship Name	
Country	
Length	(m)
Built year	
Operator	
Ice Class in New Polar Code	PC1 to PC8
Operating area	
Major Refit	
Supply Station	

Technical information

Fields	Sub-field
Polar Code Category	
IACS Class	
Ship Name	
Dimensions	Length
	Draft
	GRT (Gross Register Tonnage)
People	Crew
	Scientifics+Technicians
Laboratories	Area Wetlab (m2)
	Area Drylab (m2)
Cargo	Capacity Dry Cargo Area (m3)
	Capacity cargo container (nº)
A-Frames	No. Capacity
Cranes	Number and max load (T)
Winches (Scientific, Others)	No/Type/length (m)
Moon-pool	
Telecommunication Broad-band	
Dynamic positioning system (DP)	DPS1

Scientific equipment onboard

Fields	Sub-field
Polar Code Category	
IACS Class	
Ship Name	
Acoustics	Multibeam
	Parametric

Geophysics	Gravimetry
	Magnetism
Coring	Gravity
	Piston
	Multi
Seismic	Navigation
	Streamer
	Air Guns
Sampling	Nets
	Multinets
	Dredge
Water column	CTD
	Radiometer
	LADCP
	ADCP

4. Results

4.1 European Polar Research Facilities

4.1.1 Updated information on European Polar Research Facilities

We provide in the next pages the list of all European polar facilities currently presen t in the database as well as the summary of some important data for each facility (all the information is available in the database).

We have identified **a total of 66 European polar facilities, 34 in theAntarctic and 32 in the Arctic**:

- **13 facilities in Antarctic Peninsula** (Table 1, Figure 2)
  - 4 permanent stations,
  - 6 summer stations,
  - 1 summer laboratory,
  - 2 summer camps.
- **18 facilities in Continental Antarctica** (Table 2, Figure 2)
  - 5 permanent stations,
  - 6 summer stations,
  - 4 summer camps,
  - 3 summer shelters.
- **3 facilities in Sub-Antarctic islands** (not comprehensive) (Table 3)
- **32 facilities in the Arctic** (Table 4, Figure 3)
  - 24 permanent stations,
  - 8 summer stations.

The stations are operated by 17 European countries: Belgium, Bulgaria, Czech Republic, Faroe Islands, Finland, France, Germany, Greenland, Iceland, Italy, Netherlands, Norway, Poland, Spain, Sweden, Ukraine, and United Kingdom. Most of these facilities are governmental or operated by Universities (only one is operated by a non-profit organization).

As illustrations, we provide on the next pages information on climatic data recorded at these facilities (Table 5), their staff and scientists accommodation capacities (Table 6) and, for the Antarctic facilities, their distribution according to the Antarctic Environmental Domains and the Antarctic Conservation Biogeographic Zones (Table 7).

Table 1 – European facilities in the Antarctic Peninsula, Antarctica

Facility name	Operating country	Partner country	Type	Operational period	Opening year	latitude	longitude	altitude (m)	website
Antarctic Peninsula									
St. Kliment Ohridiski	Bulgaria		Station	Nov-Mar	1988	62° 38′ 44.30′′S	060° 21′ 91.40′′W	15	http://www.bai-bg.net/bulgarian-base.html
Johann Gregor Mendel	Czech Republic		Station	Dec-Mar	2006	63° 48′ 03.80′′S	057° 52′ 95.60′′W	10	www.sci.muni.cz/CARI/
German Antarctic Receiving Station	Germany		Station	Year-round	1991	63° 19′ 00.00′′S	057 ° 54′ 00.00′′W	17	http://www.dlr.de/gars
Dallmann	Germany	Argentina	Station	Oct-Mar	1994	62° 14′ 25.07′′S	058° 40′ 00.30′′W	10	ttp://www.awi.de/en/expedition/stations/dallmann-laboratory.html
Dirck Gerritsz Laboratory	Netherlands	United Kingdom	Laboratory	Oct-Mar	2012	67° 34′ 11.80′′S	068° 74′ 63.00′′W	16	www.nwo.nl/npp
Arctowski	Poland		Station	Year-round	1977	69° 09′ 35.76′′S	058° 28′ 08.57′′W	2	http://www.arctowski.pl/
International Field Camp Peninsula Byers	Spain		Camp	Dec-Feb	2001	62° 39′ 49.70′′S	061° 05′ 59.80′′W	10	
Gabriel de Castilla	Spain		Station	Nov-Mar	1990	62° 58′ 37.28′′S	060° 40′ 30.09′′W		http://www.ejercito.mde.es/unidades/Antartica/antartica/Localizacion/index.html
Juan Carlos I	Spain		Station	Nov-Mar	1988	62° 39′ 80.50′′S	060° 23′ 28.90′′W	12	http://www.csic.es/base-antartica-juan-carlos-i
Vernadsky	Ukraine		Station	Year-round	1996	65° 14′ 74.50′′S	064° 15′ 44.90′′W	7	
Fossil Bluff	United Kingdom		Camp	Oct-Mar	1961	71° 19′ 24.28′′S	068° 17′ 20.63′′W	92	https://www.bas.ac.uk/polar-operations/life-in-the-polar-regions/virtual-tours/virtual-trip-to-
Rothera research station	United Kingdom		Station	Year-round	1975	67° 34′ 00.00′′S	068° 07′ 59.00′′W	16	https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/rothera/
Signy	United Kingdom		Station	Oct-Mar	1947	60° 42′ 29.83′′S	045° 35′ 43.40′′W	5	https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/signy/

Table 2 – European facilities in continental Antarctica

Facility name	Operating country	Partner country	Type	Operational period	Opening year	latitude	longitude	altitude (m)	website
Continental Antarctica									
Princess Elisabeth Antarctica	Belgium		Station	Nov-Feb	2009	71° 56′ 99.10′′S	023° 20′ 81.30′′E	1382	www.bpolar.be
Aboa	Finland		Station	Dec-Feb	1989	73° 03′ 00.00′′S	013° 25′ 00.00′′W	440	http://www.antarctica.fi/aboa-research-station
Cap Prud'homme	France	Italy	Camp	Nov-Feb	1994	66° 41′ 25.60′′S	139° 54′ 43.00′′E	10	http://www.institut-polaire.fr/ipev-en/support-for-science/antarctica/dumont-durville/
Concordia	France	Italy	Station	Year-round	2005	75° 06′ 06.00′′S	123° 19′ 95.00′′E	3220	http://www.institut-polaire.fr/ipev-en/infrastructures-2/stations/concordia/
Dumont d'Urville	France		Station	Year-round	1956	66° 39′ 77.00′′S	140° 0 ′ 08.00′′E	42	http://www.institut-polaire.fr/ipev-en/support-for-science/antarctica/dumont-durville/
Neumayer III	Germany		Station	Year-round	1981	70° 41′ 00.00′′S	008° 16′ 00.00′′W	43	http://www.awi.de/en/expedition/stations/neumayer-station-iii.html
Gondwana	Germany		Station	Oct-Mar	1983	74° 38′ 13.00′′S	164° 13′ 27.00′′E	20	
Kohnen	Germany		Station	Oct-Mar	2001	75° 00′ 06.00′′S	000° 04′ 04.00′′E	2892	http://www.awi.de/en/expedition/stations/kohnen-station.html
Mid Point	Italy		Camp	Nov-Feb	1998	75° 32′ 50.20′′S	145° 49′ 22.00′′E	2520	
Sitry	Italy		Camp	Nov-Feb	2000	71° 39′ 10.40′′S	149° 39′ 28.00′′E	1600	
Browning Pass	Italy		Shelter	Jan-Feb	1997	74° 37′ 37.40′′S	163° 54′ 91.00′′E	63	
Enigma Lake	Italy		Shelter	Dec-Feb	2005	74° 43′ 15.00′′S	164° 16′ 63.00′′E	250	
Stazione Mario Zucchelli	Italy		Station	Oct-Feb	1986	74° 41′ 42.00′′S	164° 7 ′ 23.00′′E	15	
Tor	Norway		Shelter	Nov-Feb	1993	71° 53′ 37.10′′S	005° 9 ′ 59.40′′E	1625	http://www.npolar.no/en/about-us/stations-vessels/tor/
Troll	Norway		Station	Year-round	1990	72° 07′ 17.00′′S	002° 31′ 98.40′′E	1275	http://www.npolar.no/en/about-us/stations-vessels/troll/
Wasa	Sweden		Station	Dec-Feb	1989	73° 03′ 00.00′′S	013° 25′ 00.00′′W	440	
Sky Blu	United Kingdom		Camp	Oct-Mar	1997	74° 51′ 38.10′′S	071° 35′ 11.20′′W	1400	

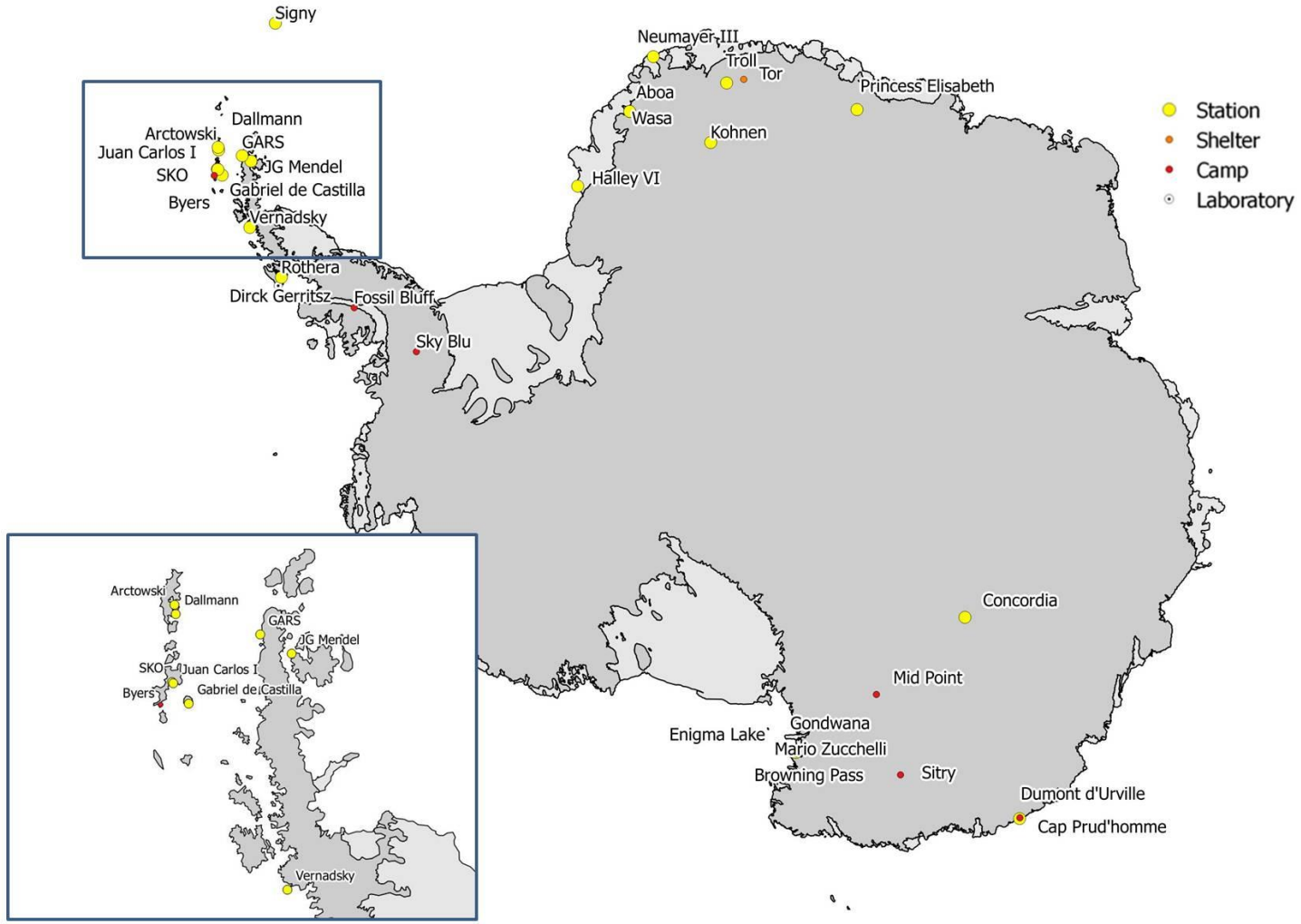


Figure 2 – Map of the European Antarctic facilities as listed in the Eu-PolarNet database

Table 3 – European facilities in the Sub-Antarctic islands (not comprehensive)

Facility name	Operating country	Partner country	Type	Operational period	Opening year	latitude	longitude	altitude (m)	website
Sub-Antarctic Islands									
Alfred-Faure	France		Station	Year-round	1962	46° 25´ 48.00´´S	051° 51´ 40.00´´E	146	http://www.institut-polaire.fr
Martin-de-Viviès	France		Station	Year-round	1950	37° 47´ 53.00´´S	077° 34´ 18.00´´E	27	http://www.institut-polaire.fr
Port aux Français	France		Station	Year-round	1949	49° 21´ 00.00´´S	070° 13´ 10.00´´E	20	http://www.institut-polaire.fr

Table 4 – European facilities in the Arctic

Facility name	Operating country	Partner country	Type	Operational period	Opening year	latitude	longitude	altitude (m)	website
Arctic 1/2									
Czech Arctic Research Station of Josef	Czech Republic		Station	Mar-Oct	2007	78° 13´ 23.00´´N	015° 39´ 32.00´´E	2	http://polar.prf.jcu.cz/station.htm
Faroe Islands Nature Investigation	Faroe Islands		Station	Year-round	1999	62° 04´ 00.00´´N	006° 58´ 00.00´´W	725	www.jf.fo
Kilpisjärvi Biological Station	Finland		Station	Year-round	1964	69° 03´ 00.00´´N	020° 50´ 00.00´´E	480	www.helsinki.fi/kilpis
Kevo Subarctic Research Station	Finland		Station	Year-round	1958	69° 45´ 00.00´´N	027° 01´ 00.00´´E	80	www.utu.fi/en/units/cerut/kevo
Värriö Subarctic Research Station	Finland		Station	Year-round	1967	67° 44´ 00.00´´N	029° 36´ 00.00´´E	388	www.atm.helsinki.fi/varrio/fi
Pallas Research Station	Finland		Station	Year-round	1991	67° 58´ 00.00´´N	024° 07´ 00.00´´E	565	www.fmi.fi / http://fmigaw.fmi.fi
Sodankylä Research Station	Finland		Station	Year-round	1949	67° 22´ 00.00´´N	026° 39´ 00.00´´E	179	http://fmiarc.fmi.fi
Kolari Research Unit	Finland		Station	Year-round	1964	67° 21´ 00.00´´N	023° 49´ 00.00´´E	221	www.luke.fi/en
Oulanka Research Station	Finland		Station	Year-round	1966	66° 22´ 00.00´´N	029° 19´ 00.00´´E	165	http://www.oulu.fi/oulankaresearchstation/
Kainuu Fisheries Research Station	Finland		Station	Year-round	1935	64° 24´ 00.00´´N	027° 30´ 00.00´´E	135	www.kfrs.fi
Hyytiälä Forest Research Station	Finland		Station	Year-round	1995	61° 51´ 00.00´´N	024° 17´ 00.00´´E	180	www.atm.helsinki.fi/SMEAR/index.php/smear-ii
AWIPEV	France	Germany	Station	Year-round	2003	78° 55´ 24.00´´N	011 ° 55´ 15.00´´E	20	http://www.awipev.eu/
Sudurnes Science and Learning Center	Iceland		Station	Year-round	2012	64° 02´ 00.00´´N	022° 42´ 00.00´´W	3	www.thekkingarsetur.is
Litla-Skard	Iceland		Station	Year-round	1996	64° 43´ 00.00´´N	021° 37´ 00.00´´W	115	www.ust.is/litla_skard
Rif Field Station	Iceland		Station	Year-round	2014	66° 27´ 00.00´´N	015° 57´ 00.00´´W	1	www.rifresearch.is
CNR Arctic Station Dirigibile Italia	Italy		Station	Mar-Oct	1997	78° 55´ 00.00´´N	011° 56´ 00.00´´E	10	www.dta.cnr.it

Facility name	Operating country	Partner country	Type	Operational period	Opening year	latitude	longitude	altitude (m)	website
Arctic 2/2									
Netherlands Arctic Station	Netherlands		Station	Jun-Aug	1995	78° 55′ 00.00′′N	011° 56′ 00.00′′E	10	www.arcticstation.nl
Sverdrup Research Station	Norway		Station	Year-round	1968	78° 55′ 00.00′′N	011° 56′ 00.00′′E	5	http://sverdrup.npolar.no
Finse Alpine Research Centre	Norway		Station	Year-round	1965	60° 36′ 00.00′′N	007° 30′ 00.00′′E	1215	www.uio.no
NIBIO Svanhovd Research Station	Norway		Station	Year-round	1934	69° 27′ 00.00′′N	030° 03′ 00.00′′E	35	www.nibio.no
Polish Polar Station, Hornsund	Poland		Station	Year-round	1957	77° 00′ 00.00′′N	015° 33′ 00.00′′E	9	www.hornsund.igf.edu.pl; www.hornsund.pl
Svartberget Research Station	Sweden		Station	Year-round	1923	64° 14′ 00.00′′N	019° 45′ 00.00′′E	230	www.slu.se
Abisko Scientific Research Station	Sweden		Station	Year-round	1911	68° 21′ 00.00′′N	018° 49′ 00.00′′E	385	www.polar.se/abisko
Tarfala Research Station	Sweden		Station	Mar-Sep	1946	67° 55′ 00.00′′N	018° 35′ 00.00′′E	1130	
UK Arctic Research Station	United Kingdom		Shelter	Mar-Sep	1991	78° 55′ 00.′′N	011° 56′ 00.00′′E	0	www.arctic.ac.uk
Arctic Station	Greenland		Station	Year-round	1906	69° 15′ 00.00′′N	053° 34′ 00.00′′W	20	http://arktiskstation.ku.dk/english
Greenland Institute of Natural Resources	Greenland		Station	Year-round	1995	64° 11′ 00.00′′N	051° 41′ 00.00′′W	50	www.natur.gl, www.g-e-m.dk
Villum Research Station	Greenland		Station	Year-round	1990	81° 36′ 00.00′′N	016° 39′ 00.00′′W	30	www.villumresearchstation.dk
Summit Station	Greenland	United States	Station	Year-round	1989	72° 34′ 00.00′′N	038 ° 27′ 00.00′′W	3210	www.geosummit.org, www.summitcamp.org
Sermilik Research Station	Greenland		Station	May-Sep	1970	65° 40′ 51.12′′N	037° 54′ 57.87′′W	15	www.ign.ku.dk/english/about/field-stations/sermilik-station/
EGRIP Field Station	Greenland	Germany	Station	May-Aug	2015	75° 38′ 00.00′′N	036° 00′ 00.00′′W	2708	www.iceandclimate.nbi.ku.dk
Zackenberg Research Station	Greenland		Station	Mar-Oct	1995	74° 28′ 00.00′′N	020° 34′ 00.00′′W	38	www.zackenberg.dk, www.g-e-m.dk

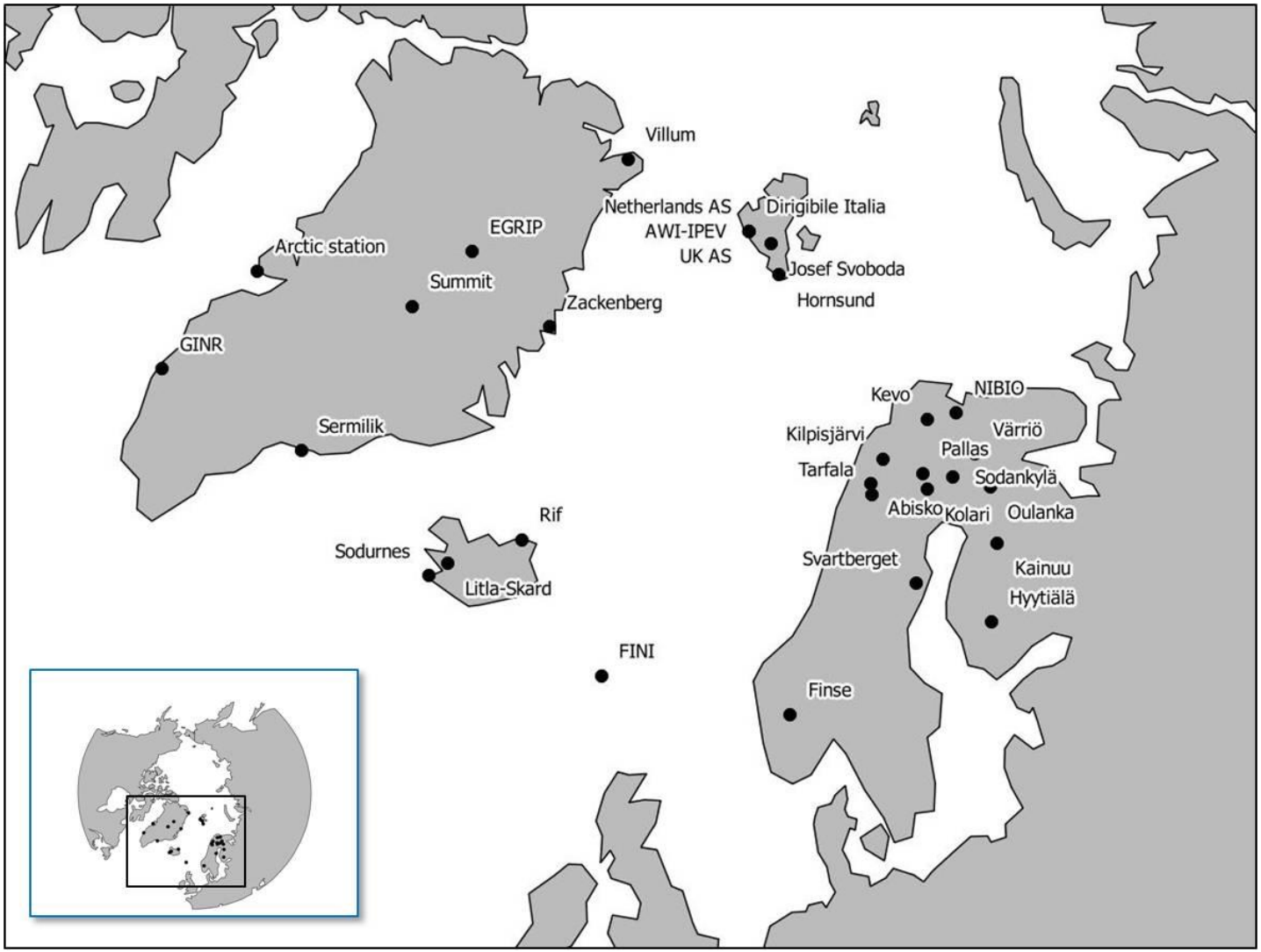


Figure 3 – Map of the European Arctic stations as listed in the EU-PolarNet database

Table 5 – Climatic features at the European Polar facilities

Facility name	Operating country	Climate zone	Permafrost	snow free period	Mean annual wind speed (m/s)	precipitation type	mean annual temperature (°C)	Mean T (°C) February	Mean T July (°C)
EUROPEAN ANTARCTIC / SUBANTARCTIC FACILITIES									
Alfred-Faure	France	Sub-Antarctic	None	all year round	32	Snow and Rain	5.5	8.4	3.7
Martin-de-Viviès	France	Sub-Antarctic	None	all year round	24.9	Rain	14	17.4	11.4
Port aux Français	France	Sub-Antarctic	None	all year round	34.7	Snow and Rain	4.9	8.1	2.1
Arctowski	Poland	Maritime Antarct.	None	Dec-Feb	24	Snow and Rain	-1.6	2.3	-6.6
Gabriel de Castilla	Spain	Maritime Antarct.	Discontinuous	Jan-Mar	24	Snow and Rain	-0.7	2.6	-6.9
Intern. Field Camp Penins. Byers	Spain	Maritime Antarct.	Sporadic	Jan-Apr	26	Snow and Rain	-2.5	1.2	-6.4
Juan Carlos I	Spain	Maritime Antarct.	Sporadic	Feb	14	Snow and Rain	-1.2	2.2	-5.1
Signy	United Kingdom	Maritime Antarct.	Discontinuous	Feb-Apr		Snow and Rain	-2.2	1.4	-7.7
St. Kliment Ohridiski	Bulgaria	Maritime Antarct.	Continuous	None		Snow and Rain			
Vernadsky	Ukraine	Maritime Antarct.	Continuous	Feb-Mar	15.4	Snow and Rain	3.8	0.6	-8.7
Browning Pass	Italy	Coastal Antarctica	None	None	18	Snow	-15	-11	-26
Cap Prud'homme	France / Italy	Coastal Antarctica	None	Jan-Feb	43	Snow	-12	-6	-18
Dallmann	Germany / Arg.	Coastal Antarctica	Continuous	Dec-Feb	36		-2.4	2	-6
Dirck Gerritsz Laboratory	Netherl. / UK	Coastal Antarctica	Continuous				-5	-0.1	-11.6
Dumont d'Urville	France	Coastal Antarctica	None	None	33.2	Snow	-10.7	-4	-16.7
Enigma Lake	Italy	Coastal Antarctica	Continuous	None	34		-15	-9	-23
GARS O'Higgins	Germany	Coastal Antarctica	None	Dec-Feb	35		-3.9	0	-9
Gondwana	Germany	Coastal Antarctica	Continuous	Jan-Feb	23.8		-14	-6.3	-19.8
Johann Gregor Mendel	Czech Republic	Coastal Antarctica	Continuous	Dec-Mar	6	Snow	-6.8	-0.1	-14.1
Neumayer III	Germany	Coastal Antarctica	None	None	32.4		-16	-8.1	-24.9
Rothera research station	United Kingdom	Coastal Antarctica	Continuous				-3.7	-0.6	-6.7
Stazione Mario Zucchelli	Italy	Coastal Antarctica	Continuous	all year round	22	Snow	-14	-7	-22
Aboa	Finland	Inland Antarctica	Continuous			Snow			
Concordia	France / Italy	Inland Antarctica	None	None	10.8	Snow	-52.1	-43.7	-64.2
Fossil Bluff	United Kingdom	Inland Antarctica	Continuous			Snow			
Halley VI	United Kingdom	Inland Antarctica		None			-20	-13	-31
Kohnen	Germany	Inland Antarctica	None	None	16.2		-42.2	-32.2	-52.3
Mid Point	Italy	Inland Antarctica	None	None	21	Snow	-42	-37	-56
Princess Elisabeth Antarctica	Belgium	Inland Antarctica	Continuous	None	7	Snow	-18	-12.3	-24.9
Sitry	Italy	Inland Antarctica	None	None	21	Snow	-32	-30	-47
Sky Blu	United Kingdom	Inland Antarctica	Continuous	None		Snow			
Tor	Norway	Inland Antarctica	Continuous	None		Snow			
Troll	Norway	Inland Antarctica	Continuous	None	4	Snow	-18	-10.9	-24.8
Wasa	Sweden	Inland Antarctica	Continuous			Snow			
EUROPEAN ARCTIC FACILITIES									
Abisko	Sweden	Sub-Arctic	Discontinuous		3.9	Snow and Rain	-0.6	-11	11
Faroe Islands Nature Invest.	Faroe Islands	Sub-Arctic	None	Jul-Sep	21	Snow and Rain	1.71	-2	8
Finse Alpine Research Centre	Norway	Sub-Arctic	Sporadic	Jul-Sep	19.3	Snow and Rain	-1.3	-9	8.6
Kainuu Fisheries Research St.	Finland	Sub-Arctic	None	Jun-Oct	10	Snow and Rain	1.8	-10.5	15.3
Kevo Subarctic Research St.	Finland	Sub-Arctic	Sporadic	Jun-Sep	10.1	Snow and Rain	-1.4	-13.5	12.9
Kilpisjärvi Biological Station	Finland	Sub-Arctic	Sporadic	Jun-Sep	3.6	Snow and Rain	-2.23	-13	11
Kolari Research Unit	Finland	Sub-Arctic	None	Jun-Oct	7	Other	0.8	-18.4	15.4
NIBIO Svanhovd Research Stat.	Norway	Sub-Arctic	Sporadic	May-Oct	1.5	Snow and Rain	-0.6	-11.6	13.7
Oulanka Research Station	Finland	Sub-Arctic	None	May-Sep		Snow and Rain	-0.4	-13.6	14.9
Pallas Research Station	Finland	Sub-Arctic	None	Jun-Oct	25	Snow and Rain	-0.6	-11.2	12.3
Rif Field Station	Iceland	Sub-Arctic		May-Oct	23	Snow and Rain	3.4	-0.7	9.1
Sodankylä Research Station	Finland	Sub-Arctic	None	Jun-Sep	9.7	Snow and Rain	-0.4	-12.7	14.5
Sudurnes Sci. and Learning Cent.	Iceland	Sub-Arctic	None	Apr-Sep	24	Snow and Rain	4.7	0.7	10.6
Svartberget Research Station	Sweden	Sub-Arctic	None	May-Oct	11	Snow and Rain	1.8	-8.9	14.6
Tarfala Research Station	Sweden	Sub-Arctic	Discontinuous	Jul-Sep		Snow and Rain	-3.3	-10.7	8.5
Värriö Subarctic Research St.	Finland	Sub-Arctic	None	Jun-Aug	31	Snow and Rain	-0.5	-8.2	12.1
Greenland Inst. Nat. Resources	Greenland	Low-Arctic	Sporadic	May-Oct	21	Snow and Rain	0.3	-7.6	10.8
Hyytiälä Forest Res. St. (SMEAR II)	Finland	Low-Arctic	None	Apr-Nov	10	Snow and Rain	3.5	-7.7	16
Litla-Skard	Iceland	Low-Arctic	None	May-Oct	15	Snow and Rain	3.1	-1.8	10.8
Sermilik Research Station	Greenland	Low-Arctic	Discontinuous	Jul-Aug		Snow and Rain	-1.7		6.4
Arctic Station	Greenland	High-Arctic	Continuous		15	Snow and Rain	-3.2	-11.6	7.6
AWIPEV	France	High-Arctic	Continuous	Jun-Sep	14.4	Snow and Rain	-3.3	-9.3	6.1
CNR Dirigibile Italia	Italy	High-Arctic	Continuous	Jun-Oct	16	Snow and Rain	-6.3	-14.6	4.7
EGRIP Field Station	Greenland/Germ.	High-Arctic	Continuous	None	21.6	Snow	-29	-50	-10
Josef Svoboda	Czech Republic	High-Arctic	Continuous	Jun-Sep	4	Snow and Rain	-6	-7	8
Netherlands Arctic Station	Netherlands	High-Arctic	Continuous	Jun-Oct	4	Snow and Rain	-6	-14.6	4.9
Polish Polar St. Hornsund	Poland	High-Arctic	Continuous	Jul-Aug	6	Snow and Rain	-4	-10	4.5
Summit Station	Greenland / USA	High-Arctic	Continuous		14.8	Snow	-31	-42	-13
Sverdrup Research Station	Norway	High-Arctic	Continuous	Jul		Snow and Rain	-6.3	-14.6	4.9
UK Arctic Research Station	United Kingdom	High-Arctic	Continuous	Jun-Aug		Snow and Rain	-6	-14.6	4.9
Villum Research Station	Greenland	High-Arctic	Discontinuous	Jul-Aug	14	Snow	-16.9	-30.9	3.4
Zackenberg Research St.	Greenland	High-Arctic	Continuous	Jun-Aug	10	Snow and Rain	-9.2	-19.4	6.1

Table 6 – Staff and scientists accommodation capacities at the European Polar facilities

Facility name	Operating country	Number of staff on station (peak/summer season)	Number of staff on station (off peak/winter season)	Max number of personnel at any one time (staff, scientists, other)	Area Scientific laboratories (m2)	Type of scientific laboratories							
						Biology	Chemistry	Geology	Geophysics	GIS	Diving	Other	None
ANTARCTIC / SUB-ANTARCTIC EUROPEAN FACILITIES													
Aboa	Finland		0	17									
Alfred-Faure	France	17	16	45	612	x			x				
Arctowski	Poland	14	8	40	200	x	x		x				
Browning Pass	Italy	0	0	0	0								x
Cap Prud'homme	France / Italy	22	0	30	20								x
Concordia	France / Italy	35	8	80	748		x		x			x	
Dallmann	Germ. / Argent.	2	2	16	118	x	x				x		
Dirck Gerritsz Laboratory	Netherl./UK			10		x	x						
Dumont d'Urville	France	44	14	90	872	x			x		x		
Enigma Lake	Italy	0	0	0	0								x
Fossil Bluff	United Kingdom	2	0	6									x
Gabriel de Castilla	Spain	13	0	36	142	x	x				x		
GARS - O'Higgins	Germany	10	4	10	50							x	
Gondwana	Germany	20	0	33	44								
Halley VI	United Kingdom	52	13	70	200		x		x				
Int. Field Camp Peninsula Byers	Spain	2	0	12	16								x
Johann Gregor Mendel	Czech Republic	4	0	20	33	x	x	x				x	
Juan Carlos I	Spain	16	0	50	220	x	x	x	x			x	
Kohnen	Germany	4	0	28									x
Mario Zucchelli	Italy	80	0	120	2400	x	x	x	x		x		
Martin-de-Viviès	France	21	13	55	341	x	x		x				
Mid Point	Italy	0	0	0									x
Neumayer III	Germany	20	5	60	410		x		x			x	
Port aux Français	France	45	34	125	952	x	x	x	x			x	
Princess Elisabeth	Belgium	12	8	40	50				x			x	
Rothera	United Kingdom	120	22	136	450	x	x				x		
Signy	United Kingdom	8	0	8		x							
Sitry	Italy	0	0	0	0								x
Sky Blu	United Kingdom	3	0	6	0								x
St. Kliment Ohridiski	Bulgaria	6	0	22	20	x		x					
Tor	Norway	2	0	7	2	x							
Troll	Norway	35	6	70	0								x
Vernadsky	Ukraine	10	5	24	180	x			x		x		
Wasa	Sweden		0	20									
ARCTIC EUROPEAN FACILITIES													
Abisko Scientific Res. St.	Sweden	14	10	90	600								
Arctic Station	Greenland	3	3	26	225								
AWIPEV	France	3	3	30	610	x	x	x	x				
CNR Arctic St. Dirigibile Italia	Italy	1	0	7	160	x	x						
EGRIP Field Station	Greenl./Germ.	5	0	30	350							x	
Faroe Islands Nature Invest.	Faroe Islands	1	1	16	30			x		x			
Finse Alpine Research Centre	Norway	2	0	54	70	x	x	x					
Greenland Inst. Nat. Resources	Greenland	60	60	85	250	x				x			
Hyytiälä Forest Res. St. (SMEAR II)	Finland	25	20	200	274	x	x	x	x				
Josef Svoboda	Czech Rep.	2	2	12	30	x					x		
Kainuu Fisheries Res. St.	Finland	10	8	14	402	x							
Kevo Subarctic Research Station	Finland	12	5	80	750	x			x				
Kilpisjärvi Biological Station	Finland	10	8	8	150	x							
Kolari Research Unit	Finland			10	36								
Litla-Skard	Iceland	1	1	6	0								x
Netherlands Arctic Station	Netherlands	1	0	7	16	x							
NIBIO Svanhovd Res. St.	Norway	25	25	80	200	x	x						
Oulanka Research Station	Finland	8		15	95	x	x				x		
Pallas Research Station	Finland	0	0	20	0								
Polish Polar Station, Hornsund	Poland	16		20	120	x	x		x				
Rif Field Station	Iceland	1	1	8	15								
Sermilik Research Station	Greenland	2	0	3									
Sodankylä Research Station	Finland	30	20	60	250							x	
Sudurnes Sci. and Learning Center	Iceland	10	8	24	320	x							
Summit Station	Greenland / USA	15	5	50	112		x			x			
Svartberget Research Station	Sweden	15		20	35	x	x			x		x	
Sverdrup Research Station	Norway	5	4	30	40	x			x		x	x	
Tarfala Research Station	Sweden	10	6	40	40	x	x						
UK Arctic Research Station	United Kingdom	1	0	15	77	x							
Värriö Subarctic Res. St.	Finland	2		50	15								
Villum Research Station	Greenland	2	2	24	220	x	x	x	x			x	
Zackenberg Research Station	Greenland	5	0	31	90							x	

Table 7 – Distribution of the Antarctic European facilities according to the Antarctic Environmental Domains and the Antarctic Conservation Biogeographic Zones

Facility name	Operating country	Antarctic Environmental Domain	Antarctic Conservation Biogeographic Zone
Aboa	Finland	F. Larsen Ice Shelf	6 Dronning Maud Land
Arctowski	Poland	A. Antarctic Peninsula northern geologic	3 North-west Antarctic Peninsula
Browning Pass	Italy	U. North Victoria Land geologic	8 North Victoria Land
Cap Prud'homme	France / Italy	L. Continental coastal-zone ice sheet	13 Adelie Land
Concordia	France / Italy	Q. East Antarctic high interior ice sheet	
Dallmann	Germ. / Argent.	A. Antarctic Peninsula northern geologic	1 North-east Antarctic Peninsula
Dirck Gerritsz Laboratory	Netherl./UK	G. Antarctic Peninsula offshore island geologic	4 Central South Antarctic Peninsula
Dumont d'Urville	France	L. Continental coastal-zone ice sheet	13 Adelie Land
Enigma Lake	Italy	U. North Victoria Land geologic	8 North Victoria Land
Fossil Bluff	United Kingdom	F. Larsen Ice Shelf	4 Central south Antarctic Peninsula
Gabriel de Castilla	Spain	G. Antarctic Peninsula offshore island geologic	3 North-west Antarctic Peninsula
GARS - O'Higgins	Germany	A. Antarctic Peninsula northern geologic	3 North-west Antarctic Peninsula
Gondwana	Germany	U. North Victoria Land geologic	8 North Victoria Land
Halley VI	United Kingdom	I. East Antarctic ice shelves	6 Dronning Maud Land
Int. Field Camp Peninsula Byers	Spain	G. Antarctic Peninsula offshore island geologic	3 North-west Antarctic Peninsula
Johann Gregor Mendel	Czech Republic	A. Antarctic Peninsula northern geologic	1 North-east Antarctic Peninsula
Juan Carlos I	Spain	G. Antarctic Peninsula offshore island geologic	3 North-west Antarctic Peninsula
Kohnen	Germany	N. East Antarctic inland ice sheet	6 Dronning Maud Land
Mario Zucchelli	Italy	U. North Victoria Land geologic	8 North Victoria Land
Mid Point	Italy	Q. East Antarctic high interior ice sheet	7 East Antarctica
Neumayer III	Germany	I. East Antarctic ice shelves	6 Dronning Maud Land
Princess Elisabeth	Belgium	N. East Antarctic inland ice sheet	6 Dronning Maud Land
Rothera	United Kingdom	G. Antarctic Peninsula offshore island geologic	4 Central South Antarctic Peninsula
Signy	United Kingdom	G. Antarctic Peninsula offshore island geologic	2 South Orkney Islands
Sitry	Italy	Q. East Antarctic high interior ice sheet	7 East Antarctica
Sky Blu	United Kingdom	C. Antarctic Peninsula southern geologic	4 Central South Antarctic Peninsula
St. Kliment Ohridiski	Bulgaria	G. Antarctic Peninsula offshore island geologic	3 North-west Antarctic Peninsula
Tor	Norway	Q. East Antarctic high interior ice sheet	6 Dronning Maud Land
Troll	Norway	N. East Antarctic inland ice sheet	6 Dronning Maud Land
Vernadsky	Ukraine	G. Antarctic Peninsula offshore island geologic	3 North-west Antarctic Peninsula
Wasa	Sweden	F. Larsen Ice Shelf	6 Dronning Maud Land

4.1.2 Example of comprehensive information

In this section, we provide two examples of the full information collected for a European polar facility and currently available in the database: one station in Antarctica (Concordia Station), and one station in the Arctic (Abisko Station).

Example of an Antarctic European Station: the French-Italian Concordia Station

Background

*	Station Code	CO1102
*	Facility Name	Concordia
	Website	http://www.institut-polaire.fr/
	Location	Antarctic
*	Type	Station
*	Current status of facility	Open
*	Opening year	2005
*	Operating country	France / Italy
*	Operational period	All year round

Data sources

*	Contact person	Yves Frenot
*	Email	yfrenot@ipev.fr
*	Date of last update	02/02/2016

Introduction

*	Facility name and Operator	Concordia station is jointly funded, staffed and operated by Italy (Programma Nazionale di Ricerche in Antartide - PNRA) and France (French Polar Institute Paul-Emile Victor - IPEV)
*	Location	Concordia station is located at Dôme C, on the high East Antarctic plateau. The site is one of the coldest and among the most remote places on Earth. Among the permanent stations in Antarctica, only 3 are located inland the continent (Amundsen-Scott, Vostok and Concordia). The closest stations are Dumont d'Urville and Mario Zucchelli.
*	Biodiversity and natural environment	Dome C is 1 100 km from the coast at a height of 3 233m a.s.l., surrounded by thousands of kilometers of solid ice. Temperatures hardly rise above -25°C in summer and can fall below -80°C in winter with record of -84.6°C reached in 2010. As a consequence, there is no fauna and no flora.
*	History and Facilities	The idea of constructing a European permanent research station in the heart of Antarctica, with an environment particularly hostile for humans, sprang up when the site at Dome C was revealed to be especially favourable for deep ice coring and astronomy. This scientific challenge is accompanied by another, parallel adventure: the design and construction of a modern station, capable of yielding new scientific knowledge concerning not only our 6th continent, but also concerning the whole our planet and beyond, the Universe. IPEV and PNRA have therefore pooled their skills and know-how, resources and combined operations to develop this new station between 1999 and 2005. Concordia has been continuously occupied since that time.
*	General research and databases	The research projects implemented at Concordia are linked to many subjects involving societal concerns, such as climate change, the role of greenhouse gases or aerosols in past and present trends or the hole in the ozone layer. Beside the EPICA ice-core, which was completed in December 2004 and extended the record of climate variability to around 800 000 years BP, Concordia remains an active site for glaciology. Dome C also offers an

	exceptional environment for astronomical observations and provides good conditions for calibration and validation of sensors embarked on polar orbit satellites. Observatories in seismology, geomagnetism, or Earth-Sun interactions are present. Concordia station itself is also considered as an excellent Earth-based analogue for orbital space stations or Mars-bound vessels and projects in collaboration with ESA are implemented.
* Human dimension	The station is suitable for 14 persons winter residents to live in, completely isolated from the rest of the world for 9 months in the year. Up to 70 people can work at the station in summer, using the nearby "summer camp".
* Access	Resupply of the station is ensured in summer by the traverse from Dumont d'Urville whereas personnel are brought over by air, from the Italian base Mario Zucchelli or from Dumont d'Urville. The R/Vs Italica and Astrolabe also form part of the supply chain from Europe to Australia/New Zealand.

Operator / Manager

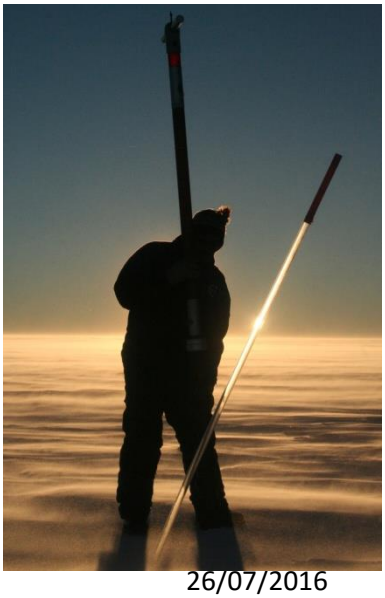
* Facility operator / manager	Institut Polaire Francais (IPEV)
* Type of entity	Government
* Contact facility	stationleader@concordiastation.aq
Website (operator)	http://www.institut-polaire.fr/

Partner institutions

Partnership	Yes
Partner Institution Name	ENEA / PNRA
Partner Institution Country	Italy

Location

* Latitude	75° 06´ 06.00´´S
* Longitude	123° 19´ 95.00´´
* Region	Continental Antarctica
Antarctic Environmental Domain	Q. East Antarctic high interior ice sheet
Antarctic Conservation Biogeographic Zone	None
* Altitude of facility	3220 m
Distance to nearest transport facility	0 km
Distance to nearest station	1100 km
Type of surface facility built on	Glacier



Features in the facility area

* Features in the facility area	• Clear air zone • Ice cap or glacier • Low artificial light pollution • Low humidity • Plateau • Sustrugui

Main science disciplines

* Main science disciplines	Astrophysics, Atmospheric chem.and physics, Environ. sci., Geophysics, Glaciology, Human biology, Medicine,

	Microbiol., Astonomy, Earth Observ., Engineering, Paleoclimatology

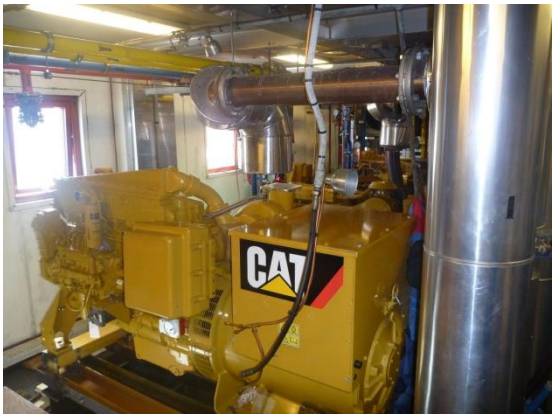
Climate

*	Climate zone	Inland Antarctica
*	Permafrost	None
*	Mean annual wind speed	10.8 km/h
	Max. wind speed	114.8 km/h
	Dominant wind direction	South
*	Snow free period	None
	Precipitation type	Snow
*	Period of temperature measurements (start)	27/01/2005
*	Period of temperature measurements (end)	29/01/2016
*	Mean annual Temp.	-52.1 °C
	Mean Temp. Jan.	-31.5 °C
*	Mean Temp. Feb.	-43.7 °C

	Mean Temp. March	-55.0 °C
	Mean Temp. April	-62.1 °C
	Mean Temp. May	-62.2 °C
	Mean Temp. June	-63.2 °C
*	Mean Temp. July	-64.2 °C
	Mean Temp. August	-63.1 °C
	Mean Temp. Sept.	-61.0 °C
	Mean Temp. Oct.	-54.6 °C
	Mean Temp. Nov.	-41.0 °C
	Mean Temp. Dec.	-30.8 °C
	Max. Temp. (absolute) - date	02/01/2014
	Max. Temp. (absolute)	-14.9 °C
	Min. Temp. (absolute) - date	13/08/2010
	Min. Temp. (absolute)	-84.7 °C

Infrastructure

*	Area under roof	3605 m²
*	Area Scientific laboratories	748 m²
*	Type of scientific laboratories	Chemistry, Geophysics, Astronomy
*	Logistics area	2856 m²
*	Number of beds	80
*	Showers	Yes
*	Laundry facilities	Yes
*	Hydroponics facilities	No
*	Power supply (type)	Fossil fuel
*	Power supply	230 V
	Power supply	24 hours per day



Staff capacity

*	Number of support staff on station (peak/summer season)	35
*	Number of scientists on station (peak/summer season)	35
*	Number of support staff on station (off peak/winter season)	8
*	Number of scientists on station (off peak/winter season)	5
*	Max number of personnel at any one time (staff, scientists and other)	80
	Number of tourists (annual average)	0

Scientific equipment

Specific devices / Scientific equipment	no basic scientific equipment. Each project should bring its own necessary scientific equipment.
Scientific services possible	A scientific engineer (electronician) is appointed in winter for monitoring and maintenance of automated programs.
Long-term monitoring/observations	Earth magnetism (INTERMAGNET Network), Seismology (GEOSCOPE Network), Stratospheric ozone, SuperDARN (Super Dual Auroral Radar Network), Glacier mass balance, Baseline Surface Radiation Network (BSRN), meteorology (incl. Radio-sounding)

Medical facilities

* Medical facilities	Yes
* Area of medical facility	120 m²
* Staff with relevant training	Medical doctor
* Staff with basic medical training or doctor (summer)	2
* Staff with basic medical training or doctor (winter)	2
Distance to hospital	5000 km
Closest emergency facility in Antarctica	1100 km
Closest emergency facility external	5000 km
* Capability	Basic, Dental, Surgery, Other
* Beds	1
* Medical research capabilities	Yes
* Medical screening requirements	Yes
* Equipment	Altitude medicine, Anaesthesia, Biochemistry, Diagnostic ultrasound, Diagnostic x-ray, Haematology, Lab. diagnostics, Telemedicine, Ecography.

Vehicles at facility

Land trasportation	1 Toyota hi lux, 1 Kassbohrer PB100, 1 Kassbohrer PB330, 4 Bombardier Skidoo, 1 Alpine Skidoos, 1 tracked loader Cat 953, 1 Merlo telehandler , 1 Challenger cat 65 in summer, bicycles

Workshop facilities

* Workshop facilities	ICTS (Staff available to assist with construction), Mechanical, Metal workshop, Wood workshop

Communication

* Communications	Computer, E-mail, Internet, Satellite phone, Telephone, VHF

Access

* Access	Air, Land

Aircraft landing facilities

Number of airstrips	1
Length of longest runway	2000 m
Width of longest runway	50 m
Airstrip surface	Snow
Description of airstrips	Landing is suitable with ski only
Helipad	No

Transport and freight

* Transport to facility	Airplane, Traverses from Cap Prudhomme
No. of flight visits / yr	20
Period of flight visits / yr	November to February

Permitting issues categories

	Permits required for access to the facility	Access to the station is authorized by the Steering Committee of Concordia
	Permits required for studies	Access to the station is authorized by the Steering Committee of Concordia
	Contact (permit issues)	dirpol@ipev.fr / direzione@enea.pnra.it

Human activities

	Human activity	No
	Recreation	None
*	Long term monitoring	Yes
*	Waste management	Yes
*	Hazard management	Yes
*	Fuel spill response capability	Yes

Example of an Arctic European Station:
The Swedish Abisko Scientific Research Station

Background

* Station Code	IN0703
* Facility Name	Abisko
Website	www.polar.se/abisko
Location	Sub-Artic
* Type	Station
* Current status of facility	Open
* Opening year	1911
* Operating country	Sweden
* Operational period	All year round

Data sources

* Contact person	Magnus Augner
* Email	magnus.augner@polar.se
* Date of last update	19/05/2016

Introduction

* Facility name and Operator	The Abisko Scientific Research Station is owned by the Swedish Polar Research Secretariat.
* Location	The station is located about 200 km north of the Arctic Circle and approximately 385 m a.s.l., on the south shore of the lake Torneträsk in the Swedish county of Norrbotten. It is situated in a 46-hectare nature reserve bordering the Abisko National Park, which covers 75 km2. The station is located in birch forest and the nearby area offers a great variety in topography, geomorphology, geology, and climate, as well as flora and fauna. The highest mountain in the area reaches 1991 m a.s.l.
* Biodiversity and natural environment	The average annual temperature is approximately 0°C. Annual precipitation for the lake varies greatly over an east west gradient with 1000 mm in the west to 400 mm in the east. Mean annual temperature and the length of the growing season have been increasing over the last decades. The vegetation is extremely varied, ranging from the simple communities that follow retreating glaciers to more complex mountain birch forest ecosystems. About 40% of the surroundings are above the treeline. The area is sparsely populated and land use is minimal being dominated by reindeer husbandry, hunting, fishing, tourism, and research.
* History and Facilities	The Abisko Scientific Research Station was established in 1913. The station can host almost 100 visitors. Accommodation is available in 28 double rooms, seven 4-bed-rooms and four family apartments. In addition, there are also laboratories, offices, workshops and lecture theatres. Meals are either prepared by the visiting scientists themselves in one of the self-catering kitchens available at the station or, during the tourist season, obtainable at tourist hotels and guest houses within 15 minutes walk. In the nearby village Abisko there is a well equipped grocery store.
* General research and databases	Research focuses on plant ecology, geomorphology, and meteorology. The main objectives of the ecological studies are the dynamics of plant populations, identification of the controlling factors at species latitudinal and altitudinal limits, understanding of ecosystem structure and function, and prediction of impacts of global environmental change. The

	meteorological projects deal with recent Climate Change in the region and local variations in the microclimate. The geomorphology research focuses on the mass-wasting of mountains and sediment transport. Existing databases includes bibliography of publications arising from research at the station, climate records, biological, and physical parameters modelling.
* Human dimension	The nearest settlement is the village Abisko which lies about 1 km from the station. The main occupations of the approximately 180 inhabitants are within tourism, transports, and trade. In Abisko there is also both a kindergarden and a school up to the ninth grade. There are a number of tourist hotels in the area, providing a base for both summer and winter tourism. The area is also inhabited by the Sami people who use the area for reindeer husbandry.
* Access	The Abisko Scientific Research Station is easily accessible by train, car, bus, and airplane. There are direct trains from the Swedish capital Stockholm to Abisko. The closest railway station is situated less than 1 km away. The resarch station is located just along the main road between Kiruna (Sweden) and Narvik (Norway). Both in Kiruna (100 km away) and Narvik (75 km away) there are airports with several daily flight connections to Oslo and Stockholm. During the tourist season there are bus connections from Kiruna airport to Abisko.

Operator / Manager

* Facility operator / manager	Swedish Polar Research Secretariat
* Type of entity	Government
* Contact facility	magnus.augner@polar.se or ans@ans.polar.se
Website (operator)	www.polar.se

Partner institutions

Partnership	No
Partner Institution Name	-
Partner Institution Country	-

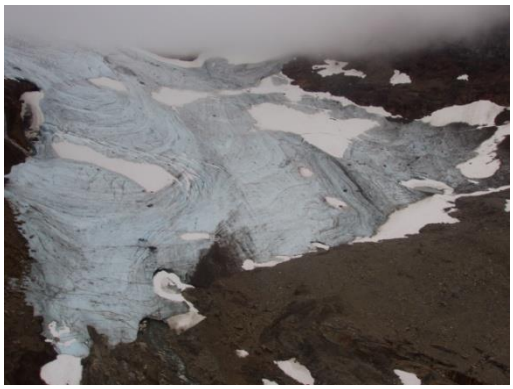
Location

* Latitude	68° 21´ 00. ´´N
* Longitude	18° 49´ 00. ´´E
* Region	European Arctic
Antarctic Environmental Domain	-
Antarctic Conservation Biogeographic Zone	-
* Altitude of facility	385 m
Distance to nearest transport facility	-
Distance to nearest station	-
Type of surface facility built on	-

Features in the facility area

* Features in the facility area	• Ice cap or glacier • Lake • Mountain • Permanent snowpatches

	• Rivers • Shoreline • Tree line • Tundra • Valley • Shrub tundra • Gramminoid tundra • Forest tundra • Peatlands • Wetlands • Palsa mires • Deciduous forest • Evergreen forest



Main science disciplines

* Main science disciplines	Atmospheric chemistry and physics; Climate change; Climatology; Environmental sciences; Geocryology; Geodesy; Geology; Geomorphology; Geophysics; GIS; Glaciology; Hydrology; Mapping; Paleolimnology; Pollution; Sedimentology; Soil science; Terrestrial biology; Other

Climate

*	Climate zone	Sub-Arctic
*	Permafrost	Discontinuous
*	Mean annual wind speed	3.9 km/h
	Max. wind speed	51.5 km/h
	Dominant wind direction	West
*	Snow free period	
	Precipitation type	Snow and Rain
*	Period of temperature measurements (start)	-
*	Period of temperature measurements (end)	-
*	Mean annual Temp.	-0.6°C
	Mean Temp. Jan.	-
*	Mean Temp. Feb.	-11°C

	Mean Temp. March	-
	Mean Temp. April	-
	Mean Temp. May	-
	Mean Temp. June	-
*	Mean Temp. July	11 °C
	Mean Temp. August	-
	Mean Temp. Sept.	-
	Mean Temp. Oct.	-
	Mean Temp. Nov.	-
	Mean Temp. Dec.	-
	Max. Temp. (absolute) - date	-
	Max. Temp. (absolute)	-
	Min. Temp. (absolute) - date	-
	Min. Temp. (absolute)	-

Infrastructure

* Area under roof	5000 m²
* Area Scientific laboratories	600 m²
* Type of scientific laboratories	-
* Logistics area	500 m²
* Number of beds	102
* Showers	Yes
* Laundry facilities	Yes
* Hydroponics facilities	-
* Power supply (type)	-
* Power supply	220 V
Power supply	24 hours per day

Staff capacity

* Number of support staff on station (peak/summer season)	14
* Number of scientists on station (peak/summer season)	70
* Number of support staff on station (off peak/winter season)	10
* Number of scientists on station (off peak/winter season)	10
* Max number of personnel at any one time (staff, scientists and other)	90
Number of tourists (annual average)	-

Scientific equipment

Specific devices / Scientific equipment	Yes (basic lab and field work equipment - contact the station for details)
Scientific services possible	Technical and field-work support, sampling, etc. year-round by technicians
Long-term monitoring/observations	Climate/weather, greehouse gases, phenology

Medical facilities

* Medical facilities	No
* Area of medical facility	-
* Staff with relevant training	-
* Staff with basic medical training or doctor (summer)	-
* Staff with basic medical training or doctor (winter)	-
Distance to hospital	100 km
Closest emergency facility in Antarctica	-
Closest emergency facility external	-
* Capability	-
* Beds	-
* Medical research capabilities	-
* Medical screening requirements	-
* Equipment	-

Vehicles at facility

Land transportation	Cars, minibus, snowmobile

Workshop facilities

*	Workshop facilities	ICTS (Staff available to assit with constructions); Mechanical; Metal workshop; Plexiglas workshop; Wood workshop

Communication

*	Communications	Computer; E-mail; Fax; Internet; Printer; Satellite phone; Scanner; Telephone

Access

*	Access	Air, Land

Aircraft landing facilities

Number of airstrips	0
Length of longest runway	-
Width of longest runway	-
Airstrip surface	-
Description of airstrips	Landing is suitable with ski only
Helipad	Yes

Transport and freight

* Transport to facility	Airplane; Car; Other
No. of flight visits / yr	-
Period of flight visits / yr	-

Permitting issues categories

	Permits required for access to the facility	Yes
	Permits required for studies	Yes
	Contact (permit issues)	magnus.augner@polar.se

Human activities

	Human activity	Yes
	Recreation	-
*	Long term monitoring	Yes
*	Waste management	Yes
*	Hazard management	Yes
*	Fuel spill response capability	No

4.2 European Polar Research Vessels

4.2.1 General information

Eurofleets2 has recently identified worldwide 14 operational Category A vessels potentially empowered to accomplish research in the Polar Oceans, operating at least in first-year sea-ice (according to the new Polar Code classification, between PC1-PC5). Only two of these vessels are European: Polarstern (Germany) and Oden (Sweden). These two heavy icebreakers operate in both Polar Oceans. Polarstern is reaching the end of its life time, after 30 years of continuous operation, while Oden has an estimated 15 years to go without a major refit.

European Category B and C ships are more numerous: 9 and 5 vessels were identified, respectively. They are generally designed for science or logistic purposes. Six of them operate in both Polar Oceans, 6 in Arctic only and 3 in Antarctic only. Most of them a relatively old: L'Astrolabe (France) and Italica (Italy) will stop their polar activity in 2017. The James Clark Ross (United Kingdom) and the Hespérides (Spain) will continue in operation until 2020 at the end of their expected life time, while the Ernest Shackleton (United Kingdom) will reach 30 years of polar service by 2025. Only three of the ice classified PRVs, i.e. Arni Fridriksson (Iceland), GO Sars (Norway) and the Maria S. Merian (Germany), mostly operating in Arctic waters, will remain in operation well beyond year 2020.

All of these Research Vessels also have capacities to support polar stations within the Antarctic or Arctic areas, and a few of them are fully equipped for multidisciplinary science. Regarding vessels with full capacity of year-round operations, Europe is currently limited to two PRVs, the German “Polarstern”, and the Swedish “Oden” (Figure 4). Among these PRVs, only the “Polarstern” is exclusively dedicated to research.

Figure 4 – The two polar Class A European Research Icebreakers, Polarstern (left) and Oden (right)

The list of identified Euroepan Polar Research Vessels is given in Table 8.

Table 8 - Summary of Heavy (A) PRV Ice-Classes for year-round polar operations and Ice-Class PRVs for winter navigation in subpolar operations - modified from EUROFLEETS2 (Data collected by Eurofleets 2 project)

Polar Code Category	IACS Class	Ship Name	Picture	Country	Length (m)	Built year	Operator	Ice Class New Polar Code	Operating area		Major Refit	Supply Station
A	PC1 to PC3	**Polarstern**		Germany	118	1982	AWI	**PC2/PC3**	Antarctic	Arctic	2002	Yes
		Oden		Sweden	108	1988	SMA	**PC2/PC3**	Antarctic	Arctic		Yes
B	PC6 to PC7	**Aranda**		Finland	59.2	1989	Finnish Env. Insti.	**PC-6**		Artic		No
		Astrolabe		France	65	1986	IPEV/P&O Maritime	**PC 6**	Antarctic			Yes
		Akad.Federov		Russia	141	1987	AARI	**PC 6**	Antarctic	Arctic		Yes
		James C. Ross		UK	99	1990	BAS	**PC 6**	Antarctic	Arctic		No
		Maria S Merian		Germany	95	2005	IOW_Warnemunde	**PC 7**		Artic		No
		Sanna		Greenland	32.3	2012	GINR	**PC 7**		Artic		No
		Italica		Italy	130	1981	DIAMAR	**PC 7**	Antarctic			Yes
		Helmer Hanssen		Norway	64	1988	University of Tromso	**PC 7**		Artic	1992	No
		Lance		Norway	61	1978	Norwegin Polar Ins.	**PC 7**	Antarctic	Artic		No
C	PC7 to PC8	**G.O. Sars**		Norway	77.5	2003	UiB	**PC 7**	Antarctic	Artic		No
		Hesperides		Spain	82.5	1991	Spanish Navy CSIC-UTM	**PC 7**	Antarctic	Artic		Yes
		E. Shackleton		UK	80	1995	BAS	**PC 7**	Antarctic		2001	Yes
		Dana		Denmark	78	1981	DTU Aqua	**PC 8**		Artic	1992	No
		A. Fridriksson		Iceland	69.9	2000	MRI	**PC 8**		Artic		No
		OGS-Explora		Italy	73	1973	OGS -Trieste	**PC 8**	Antarctic	Artic		No

4.2.2 Technical information

Eurofleets 2 has collected information on the main technical characteristics of the European Polar Research Vessels. These data are reproduced in Table 9.

Table 9 – Technical characteristics of the European Polar Research Vessels (Data collected by Eurofleets 2 project

Polar Code Category	IACS Class	Ship Name	Dimensions			People		Labs		Cargo		A-Frames	Cranes	Winches (Scientific, Others)	Moon-pool	Broad-band	DP
			Length	Draft	GRT	Crew	Scientifics+Technicians	Area Wetlab (m2)	Area Drylab (m2)	Capacity Dry Cargo Area (m3)	Capacity cargo container (nº)	No. Capacity	Crane	No/Type/length (m)		yes	DPS1
A	PC1 to PC3	Polarstern	118	11.2	12640	29	55	177	182	8 TEU	54 TEU	1)	1-15T; 1-25T	11		yes	DPS1
		Oden	108	7-8,5	9438	23	50	92		4000	12 TEU	2) Aft 20 T		CTD/6000	yes		
B	PC6 to PC7	Aranda	59.2	4.6	1734	12	27	67	43	2TEU	1TEU	2) 10T/1,5T	Aft:3 T/	5) Electr/Mec 700;4000	no	yes	no
		Akademik Federov	141	8.5	12660	80	160			8595							
		James Clark Ross	99	6.3	5732	26	50	23.5	44	1500	5 TEU	2) Aft 20 T; Midship 30 T	20T/20m	2) Hydr/Con 9000;8000	no	yes	yes
		Maria S Merian	95	6.5	1345	23	23	120	270	7 TEU	14TEU	200 kN	7 cranes. 3	6) fib op/mech/elc		yes	DPS1
		Sanna	33.2	3.5	450	6	10			1 TEU+ 2-10 fe		1) 4 T		all of 2000	no	no	no
		Helmer Hanssen	64	5.95	2052	11	29	30	50	500			4T-14 m, 2T-9 m	4) Ctd/Hydr/Dreg/Traw 4000;3000;3500;2400		yes	
		Lance	60.8	6.5	1334	13	25	25	46	615	1 TEU	1T /4,2 m	10 T-9m	3) Mec/Cond/Tra			
C	PC7 to PC8	G.O. Sars	77.5	5.8	1408	19	13	8	18				0 Stern 24 T	CTD/Hydr/Dee/ Sei/ Corer	2 Dropkeels		
		Hespérides	82.5	4.42	2827	55	35	72	195	393	2TEU	2) 10T/4T	2) 2T	5/CTD/Hydr/Corer/	no	yes	no
		Ernest Shackleton	80	6.15	1800	25	45	45	45	3000	4 TEU		0 Stern 10 T/Rov 5 t/10M Cargo 30 T-20m			yes	DPS1
		Dana	78	6.1	2545	28	10	52	118	550			Fish. Gears 2) 30 T; 3) 25T	CTD/Hydr/Fib op 1800;2500; 4000	no	yes	no
		Arni Fridriksson	69.9	6.8	2233	16	16	45	16					3) CTD/Hydr/Zoopk	no	yes	no
		OGS-Explora	73	4.8	1408	17	12	60	116	500			Stern 1T/Mid 8T	1		yes	no

4.2.3 Scientific equipment onboard

Similarly, Eurofleets 2 has collected information on the scientific equipments on board the Euroepan Polar Research Vessels (Table 10).

Table 10 – Scientific equipment on board the European Polar Research Vessels (Data collected by Eurofleets 2 project

Polar Code Category	IACS Class	Ship Name	Acoustics		Geophysics		Coring			Seismic			Sampling			Water column			
			Multibeam	Parametric	Grav.	Magne.	Gravity	Piston	Multi	Navigation	Streamer	Air Guns	Nets	Multinets	Dredge	CTD	Radiom.	LADCP	ADCP
A	PC1 to PC3	Polarstern	Hydrosweep DS II	Parasound DS III	KSS31		yes	yes	yes	no	yes	yes	yes	yes	yes	yes		yes	yes
		Oden	EM122	SBP120		no	yes	yes	yes	yes	yes	yes	yes			yes			
B	PC6 to PC7	Aranda	no	no	no	no	yes	yes	yes	no	no	no	yes	yes	yes	yes	yes		yes
		Akad.Federov																	
		James C. Ross	no	SBP, 3,5 kHz	yes	no				yes	yes	yes	yes		yes	yes	yes		yes
		Maria S Merian	EM120/EM1002	TOPAS PS 18			yes	yes	yes				yes	yes	yes	yes	yes	yes	yes
		Sanna	no	no	no	no				no	no	no	yes	yes	yes	yes			yes ?
		Helmer Hanssen	EM300	SBP			yes		yes				yes			yes			yes
		Lance	no					can operate		no	no	no				yes			yes
C	PC7 to PC8	G.O. Sars	EM300/EM1002	TOPAS PS 18	no	no	yes	yes	yes	yes	HIGH RES.	yes	yes	yes	yes	yes	yes	yes	yes
		Hesperides	EM120/1002S/	TOPAS PS 18	yes	yes	yes	yes	no	yes	HIGH RES.	yes	yes	yes	yes	yes	yes	yes	yes
		E. Shackleton	EM12	no		no													
		Dana	no	no	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes			
		A. Fridriksson	EM300													yes			yes
		OGS-Explora	SEBAT 8150/8111	CHIRP 6600	yes	yes	yes	yes	yes	yes	yes	yes				yes	yes		yes

4.3 European Polar Research Aircrafts

The only two nations operating their own polar aircraft are Germany (AWI) and the UK (BAS). The fleets of AWI and BAS are described below.

4.3.1 The fleet of AWI

The fleet and associated infrastructures

AWI operates two research aircraft, the Polar 5 and Polar 6 (Figure 5), which are largely identical:

Name (Registry):	Polar 5 (C-GAWI) || Polar 6 (C-G HGF)
Model:	Basler BT-67 (based on DC-3T)
Manufacturer:	Basler Turbo Conversions (Douglas)
Year commissioned at AWI:	2007 (Polar 5) || 2011 (Polar 6)
Length:	20.66 metres
Wingspan:	29 metres
Basic weight:	8.3 t (with ski landing gear 8.9 t)
Engines:	2 x Pratt & Whitney PT6A-67R
Output per engine:	1,281 HP
Fuel consumption:	570 litres / hour
Max. take-off weight:	13 t
Max. take-off elevation on skis:	4,200 metres
Range without payload:	ca. 3,000 kilometres
Range with 1,000 kg payload:	2,300 kilometres
Max. cruising speed:	370 kilometres / hour (wheel gear only)
Min. cruising speed:	167 kilometres / hour

Figure 5 - Polar 5 and Polar 6, the two polar research aircrafts operated by AWI

The personnel involved

- Crew: 2 pilots and 1 mechanic
- Science support during surveys: normally 2 engineers/technicians
- Science support for integration of new instruments by team of several engineers
- Operator on board during survey flights: max. 6
- PAX on board for transit flights: max. 18

The scientific equipment available on board (AWI owned only)

- laser scanner/altimeter: Riegl VQ-580, Riegl LMS-Q680i, Riegl LD90, Astech LDM301
- ice penetrating radar systems: ice thickness radar, accumulation radar, snow thickness radar, ultra-wideband

radar, microwave ultra-wideband radar
- magnetometer: Scintrex
- Gravity meter: ZLS, GT-2a
- GPS: Novatel, Javad
- cameras: Canon SLR, video, GoPro
- Hyper spectral camera: Sepcm AIRAS Eagle
- Hygrometer CR2
- Thermeter: PT100
- Radiation thermometer KT19
- 5hole probe with absolute and relative humidity, AIMMS20, AIMMS30
- Nezerov probe
- Aerosol lidar AMALI
- Methane sensor Los Gatos RMT200
- Radiation sensors: Ocean optics (long & short wave) Kipp&Zonen pyranometer & pygeometer
- Single particle photometer SP2
- Ultra high sensitivity aerosol spectrometer
- Drop-sonde launch system AVAPS lite
- PMS cannisters
- EM bird
- Data acquisition system ADA

The type of science supported

Monitoring and recording interactions between the Earth's crust, ice- and snow-covered areas, oceans and the atmosphere:

- Mapping of the Earth's magnetic and gravity field, ice thickness & structure, sea ice thickness, snow thickness on sea ice, surface morphology/altimetry
- Measuring in-situ and remotely aerosols and trace gases
- Measuring temperatures, humidity, wind distribution
- Radiation measurements
- Optical remote sensing
- Besides scientific operations, the aircrafts are maintaining logistics between different international research stations in the Antarctic, where the AWI is an active member of the international DROMLAN Network

The AWI strategy in term of aircraft in Polar Regions in the next decade

As in the past, in the forthcoming years AWI aircraft will be operating in Antarctica, as well as in the Arctic in each season. The aircraft will be used for scientific expeditions and for logistic tasks in order to support the science.

4.3.2 The fleet of BAS

The fleet and associated infrastructures

The British Antarctic Survey operates 5 research aircraft: 4 Twin Otters and a Dash 7.

	Twin Otter	Dash 7
Aircraft Registrations	VP-FAZ, VP-FBB, VP-FBC, VP-FBL	VP-FBQ
Range	1,000km	>2,000km
Cruise Speed	65m/s (135 knots with skis, 150kt clean)	120m/s (200kts)
Survey Speed	60m/s	110m/s
Crew	1 Pilot (dependant on role)	2 Pilots
Mission scientists (max)	4	4
Fuel Consumption (planning)	330l/hour	630l/hour
Max Take Off weight	6,360kg (14,000lb)	21,300kg (47,000lb)

Survey power available	300A (28V)	300A (28V)

The type of science supported

The aircraft have supported research monitoring and recording interactions between the Earth's crust, ice- and snow-covered areas, oceans and the atmosphere. This is both from a logistics perspective in deploying instruments and field camps but also as airborne research platforms.

- Mapping of the Earth's magnetic and gravity field, ice thickness & structure, sea ice thickness, snow thickness on sea ice, surface morphology/altimetry
- Measuring in-situ and remotely aerosols and trace gases
- Measuring temperatures, humidity, wind distribution
- Radiation measurements
- Optical remote sensing

Twin Otter

Four aircraft of the DHC 6 300 series with STOL capabilities. They can operate from paved and unpaved surfaces. All four can undertake polar logistics support including to sea-ice camps. They can be equipped with wheel skis and have extended range tanks fitted. Two aircraft are modified to support airborne and remote sensing applications.

Airborne Atmospheric Research Capabilities of the Twin Otter (VP-FAZ)

Instrumentation for Atmospheric Research:

Total Temperature	Goodrich Rosemount Probes mounted on the nose. A non-de-iced model 102E4AL and a de-iced model 102AU1AG logged at 0.7Hz.
Altitude and Position	GPS NMEA and one pulse per second (1pps) is distributed to all systems to provide synchronisation of all the data and formation of coherent data sets.
Air Speed	Static and dynamic pressure from the aircraft static ports and heated pitot tube, logged using Honeywell HPA sensors at 5Hz.

Cooled-Mirror Hygrometer	A Buck 1011C cooled mirror hygrometer is fitted. Chamber pressure and mirror temperature are recorded at 1Hz. A Rosemount mounted Vaisala Humicap sensor is also logged.
Radiometers	Eppley PIR and PSP sensors fitted to the roof and underside of the aircraft. Logged at around 10Hz.
Infra-red Thermometer	Heimann model KT19.82 infra-red thermometer mounted in the floor hatch panel. There is a solenoid operated, ambient temperature, black-body calibration target that can be brought into view during flight. Data are recorded at around 10Hz.
Laser Altimeter	A Riegl LD90-3800VHS-FLP Laser Altimeter is fitted in the floor hatch. Returns up to a few hundred metres are possible depending on the surface at repetition frequencies up to 2kHz.
Cameras	Two Sony DV-tape cameras can be used. One downwards-looking mounted in the camera hatch, one forward-looking mounted in the cockpit. A Canon EOS7D with 15mm lens can be triggered to take 18MP images at up to 1 frame/sec.
Laser Scanner	A Riegl Q240 80 degree laser scanner has been used for mapping sea ice.
Radar Altimeters	Data are recorded from the aircraft's two radar altimeters at around 10Hz. These have a range of 1000m with a wider beam compared to the laser altimeter.
Turbulence Probe	A NOAA/ARA BAT 'Best Aircraft Turbulence' probe is fitted on a boom extending forward from the roof of the aircraft. This 9-hole probe records pressures and exposed thermocouple temperatures for measuring turbulence by eddy covariance in conjunction with attitude measurements. Three-axis accelerometer data are also recorded from the BAT probe. Heaters are fitted inside the hemisphere to enable the instrument to be usable even after encountering icing.
GPS Position	Around 5m position accuracy recorded at 10Hz from the JAVAD 4-antenna GPS attitude system. For greater accuracy this is supplemented by a Trimble 5700 survey system using an antenna mounted above the laser altimeter and processed in kinematic mode with a second ground based unit.
GPS Attitude and Reference System	A JAVAD AT4 4-antenna GPS system records heading, pitch and roll at 20Hz and velocites at 10Hz. Antennas are permanently fitted to each wingtip and fore and aft of the fuselage.
Inertial Attitude and Heading Systems	Aircraft attitudes and rate of change are recorded from the aircraft avionics Litef AHRS system. This is converted from ARINC format at 64Hz. There is also an OXTS Inertial+ GPS linked INU available which stores data internally operating at 100Hz.
Wing Hardpoints	Both wings have hardpoints, zivko carbon fibre pylons and cabling to accept PMS footprint instruments.
Cloud Probe	An under-wing pylon mounted Droplet Measurement Technologies CAPS Probe comprises of a 2D imaging probe (25µm-1550µm), aerosol spectrometer (0.5µm-50µm) and liquid water content probe (0.01-3.0g/m3). The probe has a dedicated logging PC and comprehensive instrument de-icing heaters. An under-nose mount for a DMT CDP instrument has also been fitted.
Closed Path water vapour and CO2 sensor	A LICOR LI-7000 closed path infra-red gas analyser is fitted. Sampling is from a Rosemount inlet and readings are triggered at 50Hz.
Aerosol Inlet	A Brechtel Model 1200 Isokinetic Inlet is fitted. >95% efficient for 0.01µm to 6µm.
Condensation Particle Counter	A TSI 3772 CPC is available.
Aerosol Spectrometer	A Grimm model 1.109 portable aerosol spectrometer. 31 channels 0.25µm to 32µm.
Central Logging System	All instruments apart from the CAPS probe are logged to a single rack PC using Labview and associated National Instruments hardware including networked compact Fieldpoint modules in the roof and floor. The logging can be monitored and controlled from the main rack in the cabin as well as a remote touch screen in the co-pilot's seat. CAPS has a dedicated computer. Dual KVM switches allow both the rear operators screen and the cockpit display to switch to either PC.
ASIRAS	ASIRAS is an airborne SAR-altimeter instrument owned by ESA. ASIRAS is essentially a Ku-band altimeter but with a high pulse repetition frequency such that it is phase sensitive and pulse-coherent. The carrier frequency of the radar is 13.5

	GHz and the bandwidth is 1 GHz. It returns information on surface snow including over sea ice.

Airborne Geophysics Research Capabilities of the Twin Otter Aircraft (VP-FBL)

GPS Positioning	Two GPS logging at 2Hz and 10Hz are used. This provides a true dual redundant system utilising two dissimilar GPS receivers, mitigating against drop-outs due to firmware coding errors. A Leica GPS 500 provides the primary GPS and a Novatel DL-V3 provides the system redundancy.
GPS NMEA and 1pps distribution	GPS NMEA and one pulse per second (1pps) are distributed to all systems to provide synchronisation of all the data and formation of coherent data sets.
Inertial Measurement Unit (IMU)	Aircraft attitude and inertial information is provided by an IMAR FSAS inertial unit (being a non-ITAR controlled system it can be more readily used in foreign countries). The IMU data is logged to a Novatel Span receiver.
Magnetometer	Sintrex CS3 sensors are used due to their high sensitivity, high cycling rates, excellent gradient tolerance, fast response and low susceptibility to the electromagnetic interference.
AGIS (Airborne Geophysical Information System)	The AGIS data-logging system is used to log the magnetometer data at a frequency of 10Hz with a sensitivity of 1 pico Tesla, radar altimeter data and fluxgate magnetometer is also logged. AGIS also provides pilot guidance information.
Radar Altimeters	Data are recorded from the aircraft's radar altimeter fitted in the tail section at 10Hz. These have a range of around 800-1000m and a wider beam compared to the laser altimeter.
Fluxgate Magnetometer	A Billingsley TFM100G2 fluxgate magnetometer is mounted in the tail of the aircraft. This provides corrections for magnetometer data.
Laser Altimeter	A Riegl LD90-3800VHS-FLP Laser Altimeter is fitted in the floor camera hatch. Returns up to 700m over snow are possible depending on the surface reflections. A repetition frequencies up to 2kHz can be achieved giving an along-track measurement every 3cm with an accuracy up to 5cm.
LiDAR	A Riegl LMS-Q240i provides a near-infrared solution for ice research in Polar Regions for ranges up to 650m at 2cm accuracies. An Optech ALTM 3100EA* or Leica ALS50 provides an infrared-based solution suitable for high altitude (1km nominal) wide area (5000+ km2) surveys at 5cm accuracies.

Ice Penetrating Radar	The ice-penetrating radar is a coherent two pulse radar with an output of 4KW radar at 150MHz. The radar is capable of imaging ice to depths of 5km with an along track resolution of 10cm before processing and a depth resolution of 8m.
Gravimeter	Aero gravity measurements are acquired with a modified LaCoste and Romberg air/sea gravimeter. Crossover analysis indicates the free-anomaly field is accurate to ~5mGals for wavelengths greater than 10km. A Chekan* airborne gravimeter has also been flown in Antarctica. Various IMAR strap down gravity systems have also been flown.
AHRS	A secondary aircraft attitude reference is available from the aircrafts Litef LCR92 attitude and heading reference system.
VGA and HD video cameras	A solid state standard or HD Sony video camera can be installed to provide forward looking or downward looking video. This provides standard or high definition video and a forward view for the operator when located in the cabin. These can be time stamped or overlaid with GPS position.
Canon 7D	A downward pointing DSLR in the camera bay provides synchronised high resolution surface imagery.
ASIRAS	ASIRAS is an airborne SAR-altimeter instrument owned by ESA. ASIRAS is essentially a Ku-band altimeter but with a high pulse repetition frequency such that it is phase sensitive and pulse-coherent. The carrier frequency of the radar is 13.5 GHz and the bandwidth is 1 GHz. It returns information on surface snow including over sea ice.
POLARIS	POLARIS is a large antenna enclosure capable of housing a variety of antenna arrays. The current configuration houses four 150MHZ antennas to be used with the PASIN radar system.

Photographic and Remote Sensing Capabilities of both Twin Otter Aircraft (VP-FAZ and VP-FBL)

Specim AISA Fenix	· Spectral range 400-2500nm (VNIR & SWIR) · 620 spectral bands with single optic for both VNIR & SWIR but two spectrometers and two diffraction gratings, one optomised for VNIR, the other for SWIR · 3.5 nm bandwidth in VNIR, 10 nm bandwidth in SWIR. · Field-of-View 32.3^{o} · Spatial resolution @ 1000m (above ground level) is 1.52m · Swath @ 1000m (above ground level) is ~600m (384 spatial pixels) · 12 bit output in VNIR, 16 bit output in SWIR
Specim AISA Owl	· Spectral range 7.6-12.5um (LWIR) · 100 spectral bands · 100nm bandwidth (diffraction grating limited) · Field-of-View 24^{o} · Spatial resolution @ 1000m is 1.2m · Swath @ 1000m ~410m (384 spatial pixels)
Leica Geosystems ALS50-II LiDAR	· 1064nm wavelength laser · Field-of-View between 45^{o} and 75^{o} (as required) · Oscillating mirror system · Average point density 1.8 points /m^{2} (nadir) @ 1000m (above ground level) · XY accuracy 0.1m and Z accuracy 0.08m · Pulse rate 150kHz single and multiple pulse in the air. · Maximum scan rate 90Hz · Maximum operating altitude (AGL): 3500m (II 500ft) · Both discrete and full wave-form intensity data available
Intergraph's Z/I Imaging Digital mapping Camera (DMC)	· Eight individual modules · 4 high resolution 7k x 4k panchromatic camera heads · 4 multispectral 3k x 2k camaera heads · Field-of-View 69.3^{o} cross track, 42^{o} along track

	· Pixel size of 12um x 12um · 15cm GSD @ 550m (140 knts) with 60% overlap · 12 bit output (all cameras) · Turnkey post-processing application software · Operated individually rather than with other instruments

Dash 7

This is a 110 Series aircraft with STOL capabilities that can be operated from both paved and unpaved surfaces.

The aircraft has magnetometer pods on the wing hard points. In addition, there is an instrument port with the dimensions 1.6 x 0.6m. The maximum instrument height is 1.2m including the pressure box associated with the port.

There are fuselage hard points for planar antennas.

Magnetometer	Sintrex CS3 sensors are used due to their high sensitivity, high cycling rates, excellent gradient tolerance, fast response and low susceptibility to the electromagnetic interference.
Altitude and Position	GPS NMEA and one pulse per second (1pps) is distributed to all systems to provide synchronisation of all the data and formation of coherent data sets.
Gravimeter	Aero gravity measurements are acquired with a modified LaCoste and Romberg air/sea gravimeter. Crossover analysis indicates the free-anomaly field is accurate to ~5mGals for wavelengths greater than 10km. A Chekan* airborne gravimeter has also been flown in Antarctica. Various IMAR strap down gravity systems have also been flown.
GPS Positioning	Two GPS logging at 2Hz and 10Hz are used. This provides a true dual redundant system utilising two dissimilar GPS receivers, mitigating against drop-outs due to firmware coding errors. A Leica GPS 500 provides the primary GPS and a Novatel DL-V3 provides the system redundancy.
Radiometers	Eppley PIR and PSP sensors fitted to the roof and underside of the aircraft. Logged at around 10Hz.
Intergraph's Z/I Imaging Digital mapping Camera (DMC)	

The BAS strategy in term of aircraft in Polar Regions in the next decade

We aim to execute a safe, challenging programme of airborne science and logistics and to provide a worldwide capability that gives the environmental science community access to a range of aircraft platforms and instrumentation.

5. European Polar Infrastructures catalogue

All the data collected under the Task 3.1 of the Eu-PolarNet will be available on the website of the project in an interactive format. The legacy of the databases will be supported by the European Polar Board when the EU-PolarNet project will be completed. COMNAP will also publish the data on its website but will extend its information to the whole Antarctic facilities, not only the European ones.

A synthesis of all the information collected is expected to be published as a pdf document, which will be downloadable on the EU-PolarNet website. This document will be ready by the end of 2016.

Finally, as an additional contribution not planned in the EU-PolarNet project, making use of the effort on the database implementation, IGOT will develop a simple WebGIS related to the databases in order allow the production of maps in support of the other EU-PolarNet Tasks. The new database and WebGIS will be facilitators of the forthcoming Deliverables of Work Package 3.

The sum of data collected under this Task 3.1 can be summarized with the following flow chart which also emphasizes the established partnerships (Figure 6):

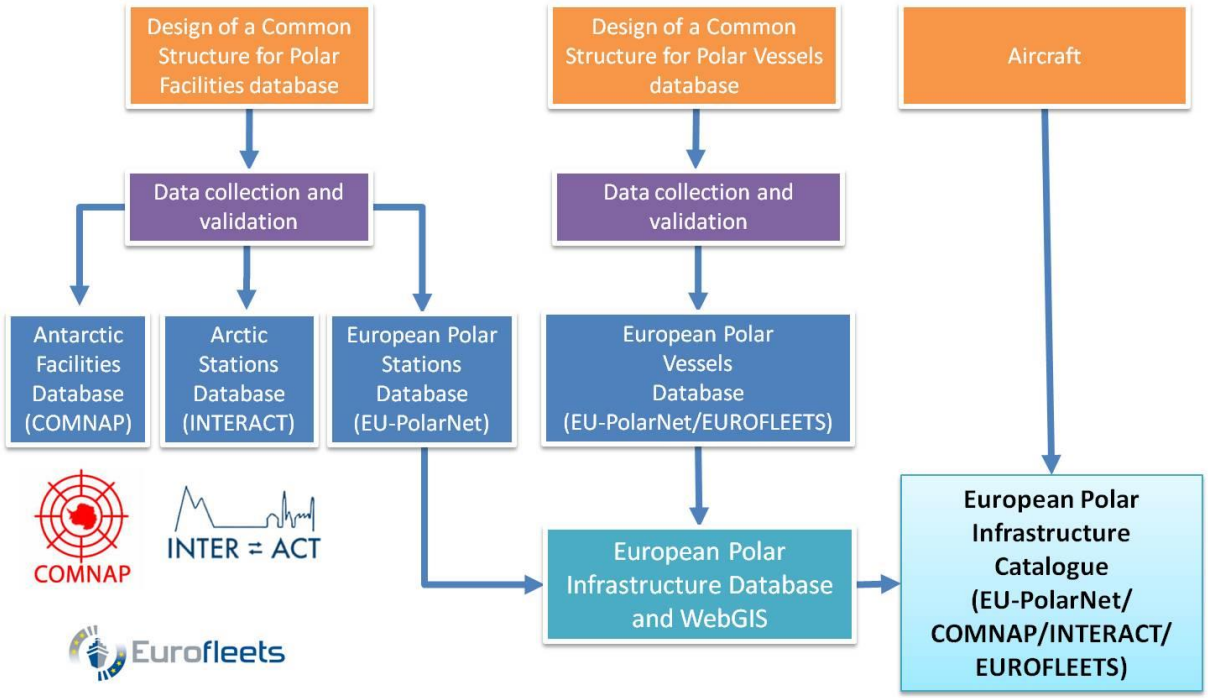


Figure 6 –Partnerships, sources of data and products of the EU-PolarNet Task 3.1