

Shipboard Polar Research

32 YEARS POLARSTERN

and the requirement for POLARSTERN II

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DPFVS POLARSTERN DBLK

Build	09.12.1982
Power Main Engine	14116 kW
Midlife Conversion“	1998-2002
Displacement	12 614 BRZ
Beam	25 m
Draft	11,21 m
Length of all	118 m

**44 Crew and
<79 scientist on board**



Classification	Hull	GL + 100A5 ARC 3
	Machinery	GL + MC ARC 3 Aut



Howaldtswerke Kiel
Nobiskrug Rendsburg

Icebreaker

Supply Vessel

Research Vessel

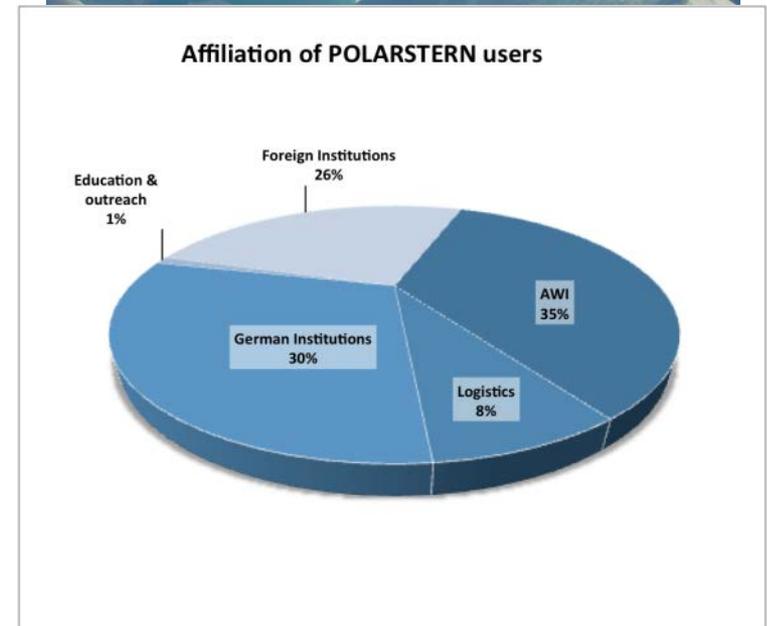
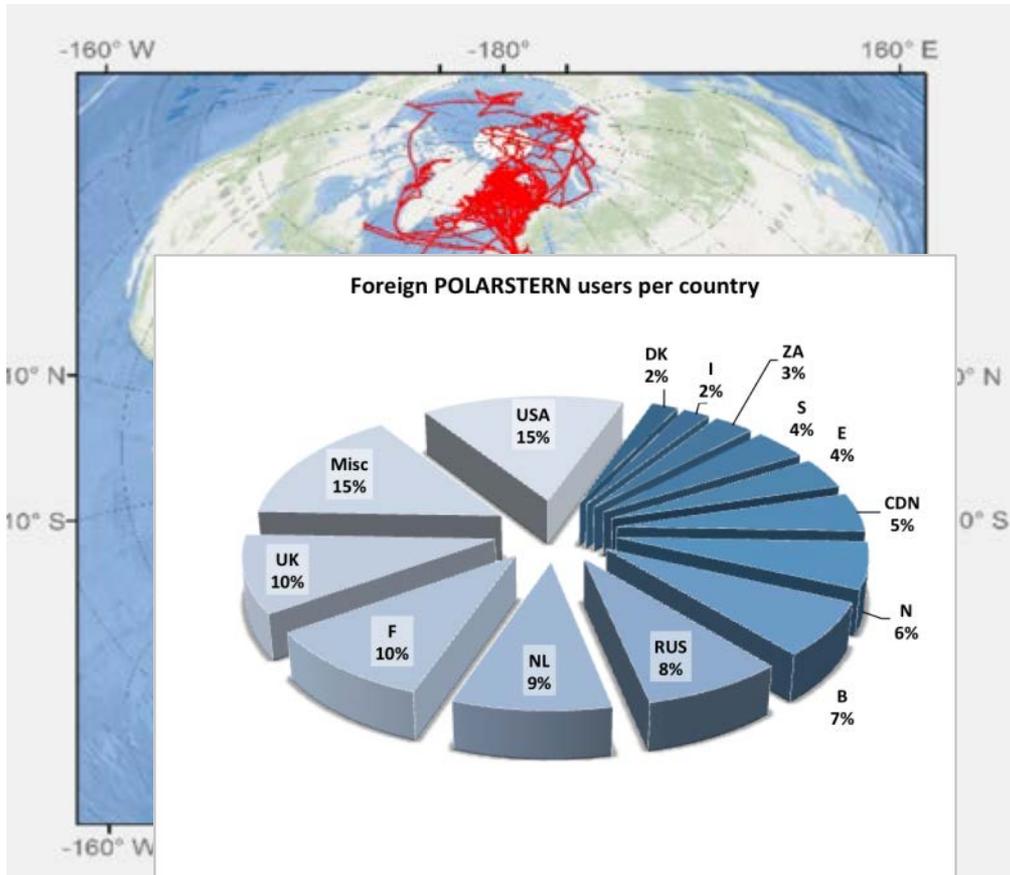


POLARSTERN

1982 – 2012: 30 Years operation for science and logistic
Sailing millage until 31. Dec 2012: 1 487 123 SM

9456 users

27 Arctic expeditions 29 Antarctic expeditions
310 Days / Year on sea 45 Cruises



Since commissioning every year successful supply of NEUMAYER station

Georg von Neumayer Station

1981-1992

Neumayer Station

1992-2009

Neumayer III

2009-20??

- Overwintering Station
- all the year science observation
- Logistic base for Antarctic field work
- Supply Base for Kohnen Station
- DROMLAN hub



POLARSTERN –

Icebreaker and supply vessel



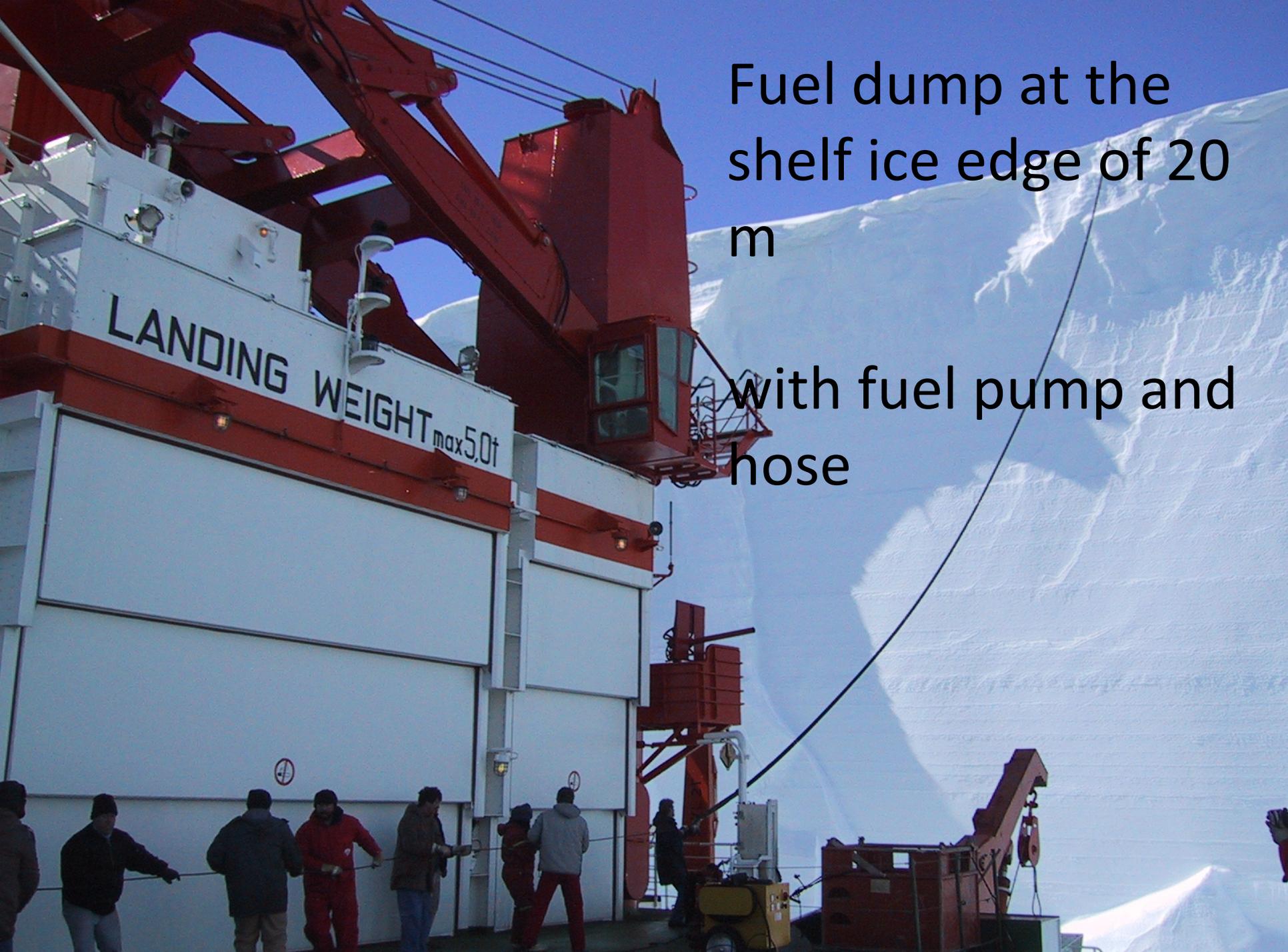


Offloading of Pistennbully,
Tanks, crans, goods and
container on Atka shelf ice

Atka-Bucht, 16.1.2008

Torben Riehl





Fuel dump at the shelf ice edge of 20 m

with fuel pump and hose



POLARSTERN –

**The ship for rough weather in the
southern ocean**





The image shows the interior of a restaurant named Polarstern. The room features wood-paneled walls and a dark blue patterned carpet. Several rectangular tables are arranged in rows, each covered with a white tablecloth and set with white plates, glasses, and bottles. The tables are surrounded by wooden chairs with blue upholstered seats. The ceiling is equipped with recessed lighting fixtures. On the left wall, there are framed pictures. A long, light-colored counter or bar is visible in the foreground on the right side.

POLARSTERN –

But shelter inside

Frühstück
 Milch, Pflanzmilch, Weiz, Quark,
 Maltose, Eier, Milch, Weiz,
 mit Speck, Zerkleinert, Pflanz,
 Pflanzmilch mit Früchten
 Nachspeise
 Milchsaure
 Milch mit Zitrone,
 Erdbeeren,
 Beeren,
 Karotten, Kakao,
 Eiscreme
 Vegetarisches Gericht
 Gratinierter Aubergin mit Tomaten
 11.30 Uhr
 Kaffee & Kuchen
 Abendessen
 Saugnapf, Bratkartoffeln, Spargel,
 Käse Platten
 Güter: August |

FS POLARSTERN
 Sunday, February 4th, 2007
 MENU OF THE DAY
 Breakfast
 Milk, Juice, Cereals, Curls,
 Corn Flakes, Eggs - Four Cheese
 with Bacon, Onions, Mushrooms,
 Pancakes with Fruit
 Chopped Peas (+ Raw Minced & Spiced Pork)
 Lunch
 Soup with Beef,
 Duck Leg,
 Red Cabbage,
 Potatoes, Dumplings,
 Ice-cream
 Vegetarian Dish
 Gratinated Potatoes with Tomatoes
 11.30 Hours: Day's Tea,
 Coffee & Cakes
 Dinner
 Salad w/Peas, Fried Potatoes, P...



Bitte bei Eingangs- und Ausgang
 Ihren Namen eintragen
 Please Sign in at Entry and Exit



POLARSTERN —

recreation area



POLARSTERN –

medical help at all time all weather



POLARSTERN –

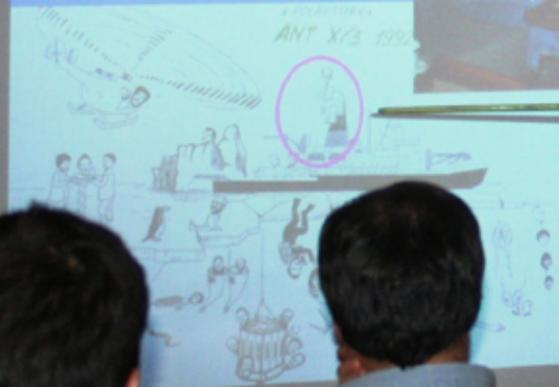
The research icebreaker



POLARSTERN –

Scientific colloquium and planning facilities

Bilateral cooperation has been much improved by AWI scientists for many years since 1990.



Polarstern-

Arctic icebreaking and deployed Seismic Streamer and Airguns

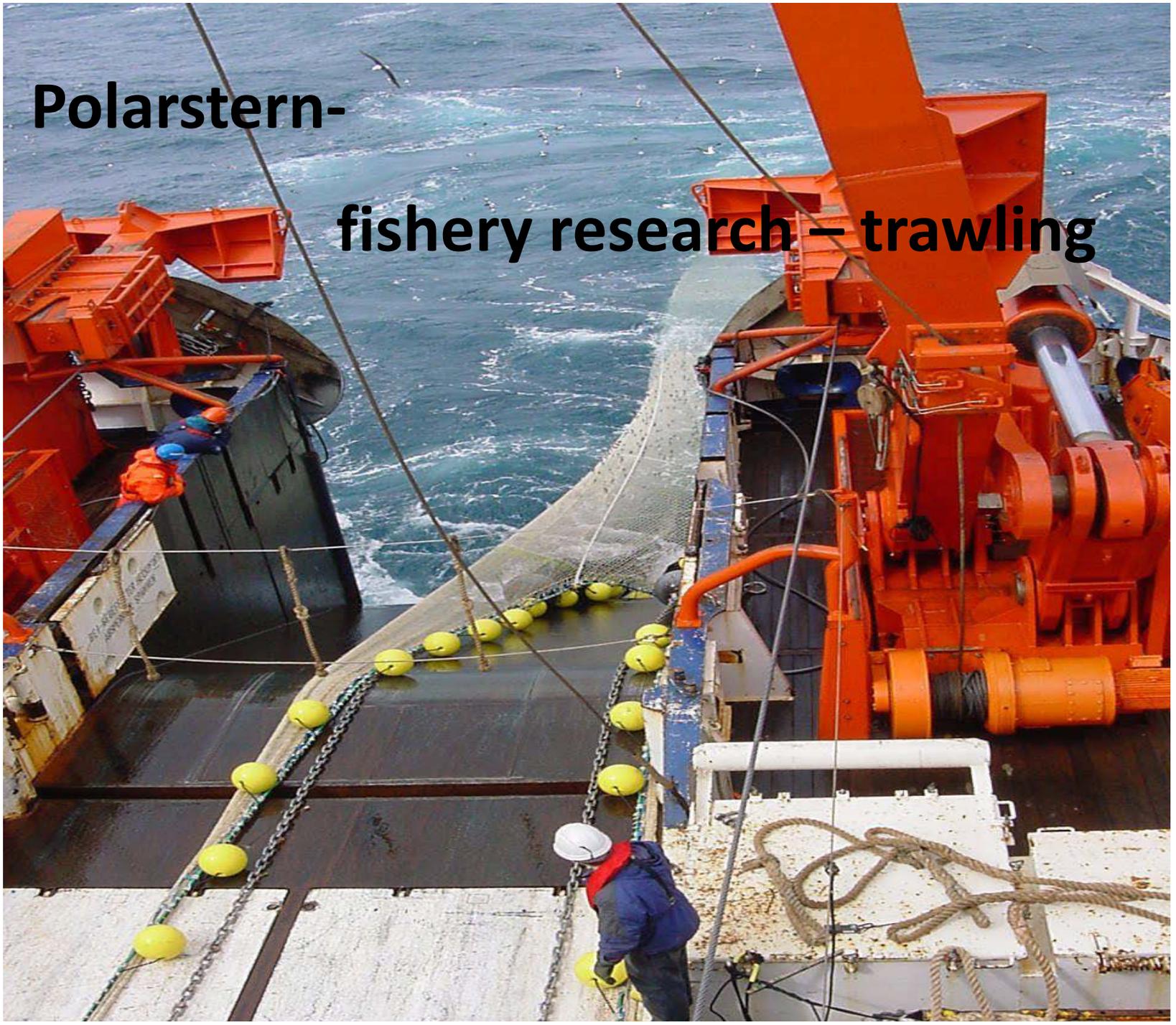
Streamer

Airguns



Polarstern-

fishery research – trawling





BEI GEÖFFNETER HECKPÖRT
ABSPERRESEIL SPANNEN

Polarstern-

Hydroacoustic systems



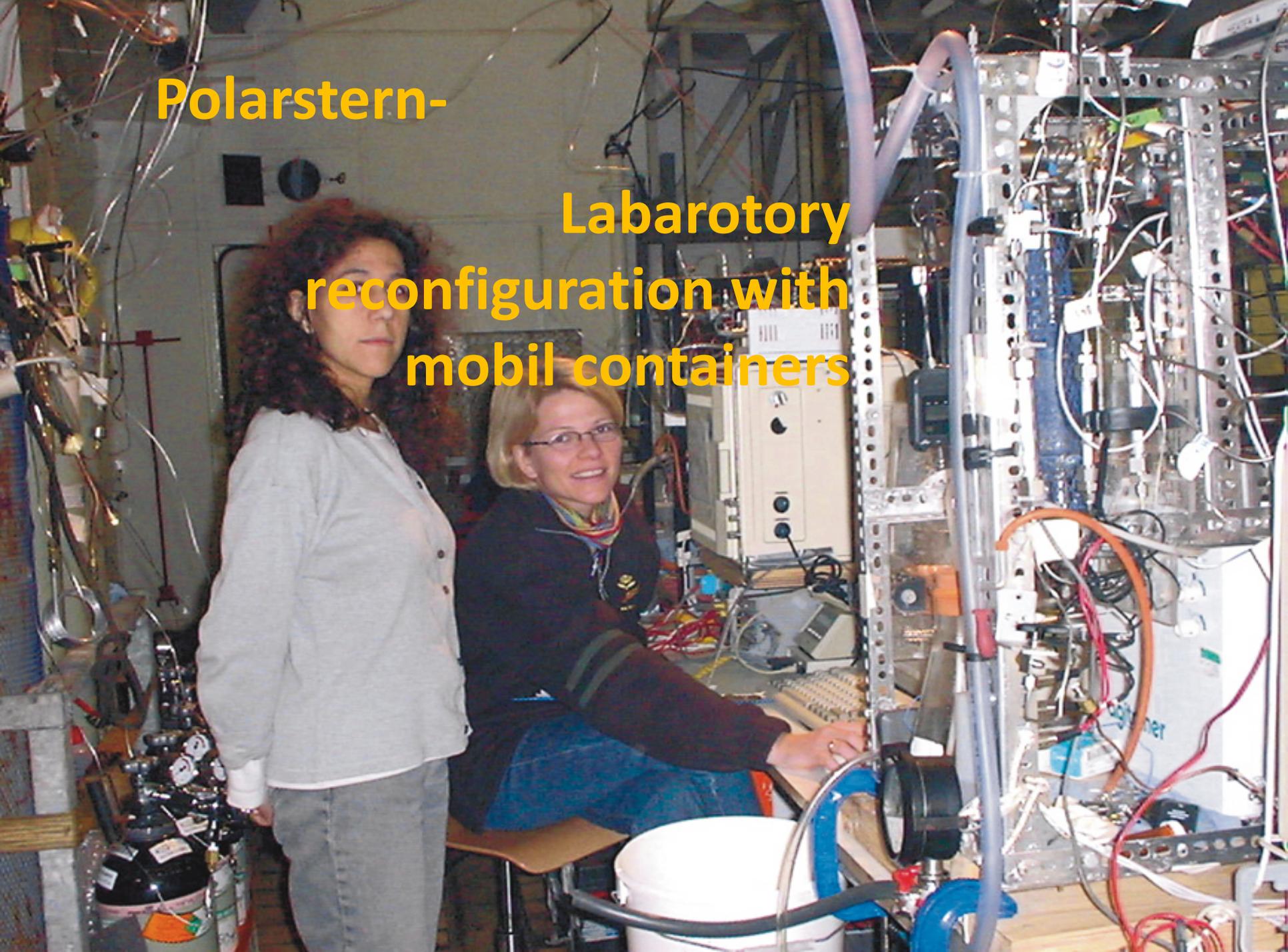
Polarstern-

Wet-laboratory / hangar

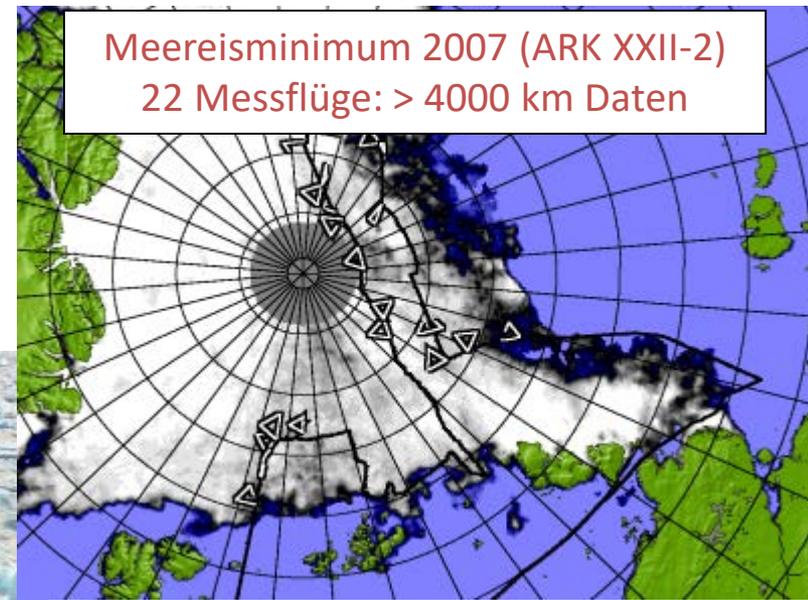


Polarstern-

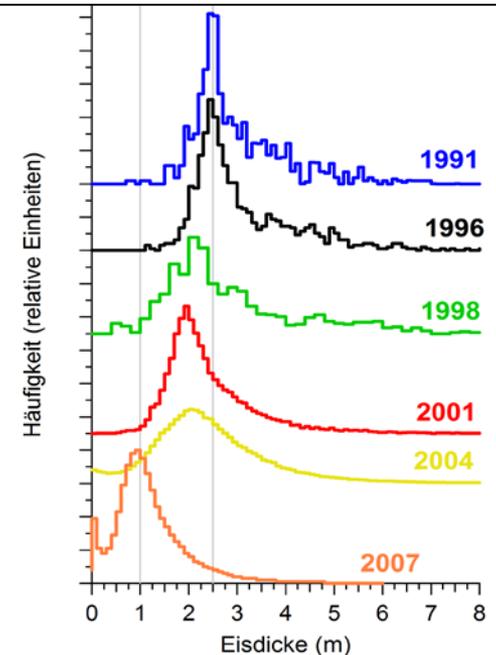
**Labarotory
reconfiguration with
mobil containers**



Helicopter-based operation for science, logistic, observations, and ice recognizances



Rückgang der Meereisdicke
(Messungen von Polarstern)



- Limitierung:
- Reichweite Helikopter
 - Lagermöglichkeit wissenschaftlicher Geräte auf Helideck

POLARSTERN II



Status of PSII Project

2012 Design study based on the scientific and technical requirements

2013 Decision for a favorite design study which was further developed

2013 – 2015 Adaption of the scientific requirements and „wish list“

- General Shipbuilding design with general arrangement and investigation for ice breaking capabilities, propulsion power, sea going capabilities at the HSVA
- For this design engineers of
 - ❖ the Federal Waterways Engineering and Research Institute,
 - ❖ a ship design consultant company
 - ❖ the shipping company of Polarstern
 - ❖ lawyer and business advisor
 - ❖ and over more than 40 representatives of the different scientific groups and marine institutes where involved
- This first ship design was the basis for the description which was handed to the shipyards in at 15 January 2016
- Up to now the shipyard tendering process is ongoing and no further information except direct information to the involved shipyards can be given
- Except of a few major requirements which are mandatory, the shipyards are forth to develop there own design, therefore the final negotiation design can be totally different to the preliminary design which is shown here

General requirements

Classification of the ship to Polar Code and relevant requirements for the Antarctic treaty and environmental protocol

- In principal expected operation temperature (– 50°C to +45°C, DAT -30°C limited scientific work up to – 40 °C)
- Possibility for emergency overwintering in the Antarctic Weddel Sea Gyro
- Lifecycle of about 30 years
- Concept of „Safe return to Port“, except when stuck in ice
- Cruising speed in open water 12 kn, maximum speed is due to the necessary installed power for icebreaking about 17-18 kn
- Ice breaking capability 1,5 m with 20 % coverage of snow @ 3 to 5 kn continuous cruising speed
- Capability of cruise trips length up to 90 days (except in Emergency Overwintering scenario)
- Scientific payload 1000 t (incl. supply goods for Neumayer III Station and antarctic summer campaigns)

Requirements for the ship design

- Maximum 130 persons on board,
- same amount of crew (44 persons) living in single and double rooms
- Normal cruises up to 60 scientist
- Safety equipment (life boats) on each side 100%
- 80 places for 20" Containers (laboratories and storage)
- Seakeeping stabilizer suitable for the transit cruises and station operation
- Helicopter Deck and Hangar for 2-3 Helicopter

For science and on and off loading at Neumayer station III:

- ❖ multiple systems like sliding beams
 - ❖ A-Frame
 - ❖ cranes
 - ❖ Hangars with moonpool, and laboratories
 - ❖ Winches
 - ❖ the "german" traditional open working deck in L-Form at starboard
- Reliability of all systems
 - Improved maneuvering capability and dynamic positioning capabilities
 - Rooms for international reception and political delegations

Requirements for the ship design

- POLAR CLASS similar to hull of FS Polarstern : this equivalent to the PC 2
- Optimization of the hull shape for ice breaking capabilities
- Optimization of the hull shape for efficiencies transit cruises (cruising speed, sea keeping capabilities , energy efficiencies etc.)
- Optimization of the hull shape for noise emission and vibration (aim to reach fulfill ICES 209 in open water conditions)
- Optimization of the hull shape for bubble sweep down and hydroacoustic capabilities
- Optimization of the shape wind flow for atmosphere and air chemistry sciences

This list is not ended here

Requirements for Engine

- Diesel-electric propulsion concept
- Noise emission in compliance to ICES 209 with some modifications
- Claim to an overall "quiet ship".
- Compliance with the exhaust emission limits according to IMO Tier III and beyond (NO_x- limits -30% and use of particle filters (reduction of 90 %)
The use of LNG was examined, but rejected on the basis of technical conceptual and logistical evaluation
- Demanding energy efficiency and environmental standards, including the "Blauen Engel"
- High demands on the redundancy levels of the systems



Approximate dimension:

Length of about 145 m

Beam about 27,30 m

Draft (construction) about 11 m

Displacement incl. payload about 26.000 t



Thank you for your attention

