

FRAM | FRontiers in Arctic marine Monitoring



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FRAM | FRontiers in Arctic marine Monitoring: Aims and key tasks

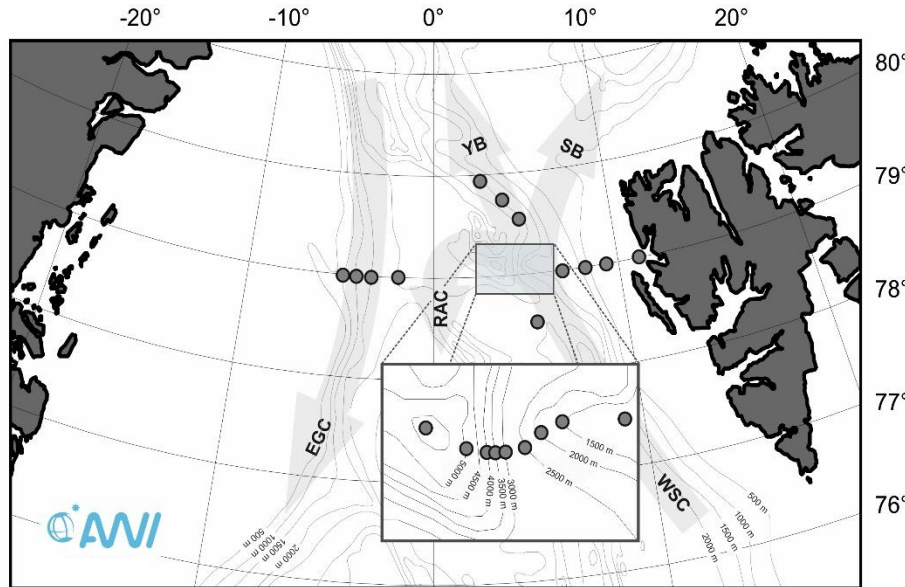
Sustained multidisciplinary, year-round surface to seafloor observations in the changing Arctic to address variability and trends in physical and chemical conditions, and ecosystem response

- 5 (7) year HGF Strategic Investment (25 Mio. Euro) to implement a distributed observatory infrastructure in Fram Strait and in the central Arctic (start: August 2014)
- Long-term operation by AWI for minimum 20 years
- Develop and implement cutting edge technologies
(moored, mobile, and drifting platforms; autonomous sensors, samplers)
- Establish procedures for data dissemination
(web portal, data archive, visualization of results, also for educative uses)



FRAM | FRontiers in Arctic marine Monitoring: Building on existing infrastructure

**Integrating existing AWI time-series programmes (HAUSGARTEN, HAFOS)
and extending the scientific scope as well as spatial and temporal coverage**



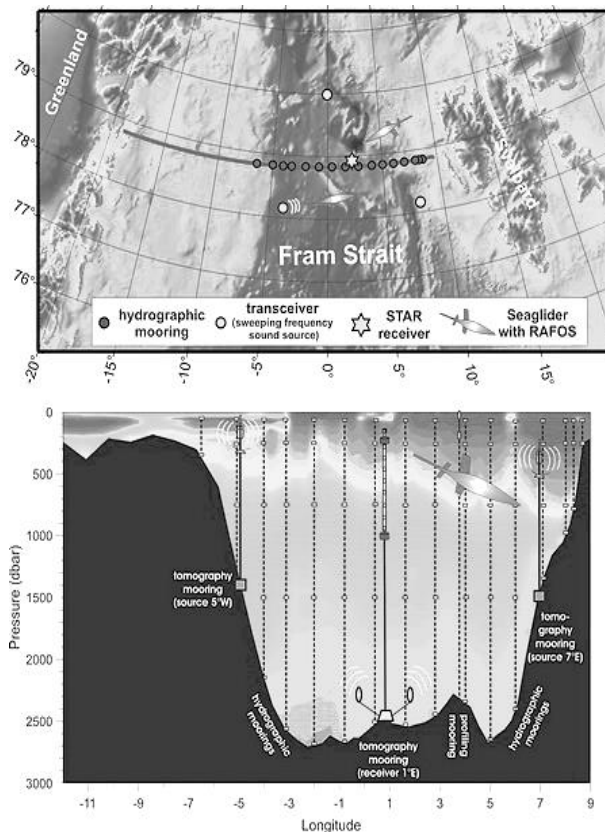
LTER HAUSGARTEN

- since 1999
- 21 stations
- 250 - 5500 m
- bathymetric and latitudinal transect
- repeated sampling
- continuous sampling and measurements
- visual observations
- experimental work

... to generate a mechanistic understanding of polar marine ecosystem response to environmental change

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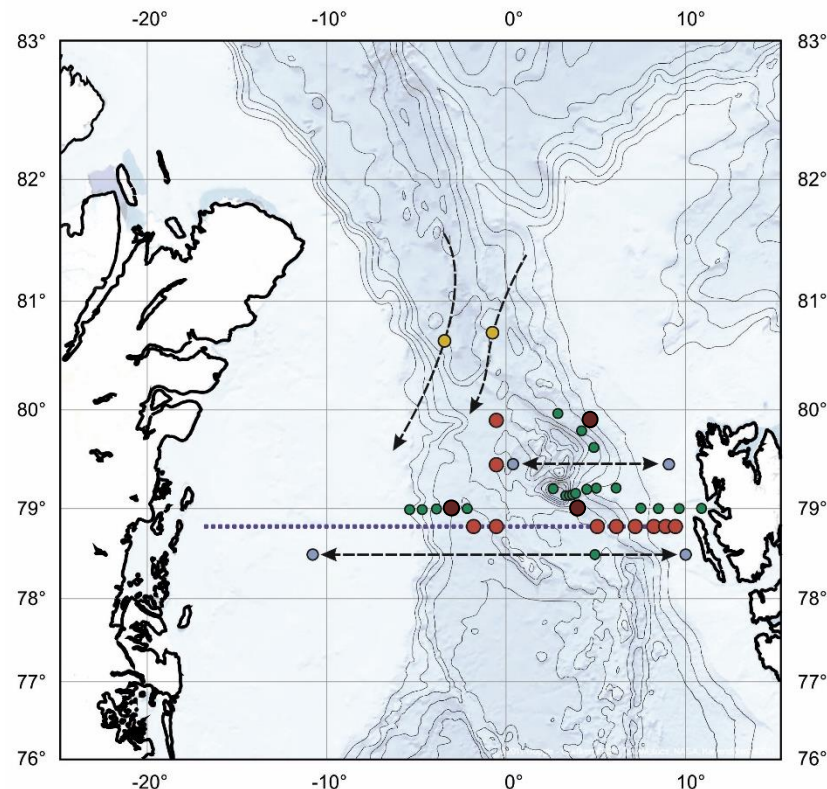
Hybrid Arctic Float Observation System

A hybrid system of ice-resistant profiling subsurface floats, surface drifters on the ice and moored stations communicating acoustically

- ... to improve the endurance, depth range and reliability of the various systems
- ... to integrate new sensors, e.g. to measure biogeochemical parameters and ice thickness
- ... to develop high frequency acoustic data transfer by use of messenger platforms

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**Integrating existing AWI time-series programmes (HAUSGARTEN, HAFOS)
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fixed components:

- *oceanographic moorings*
- *moorings with sediment traps and water samplers*

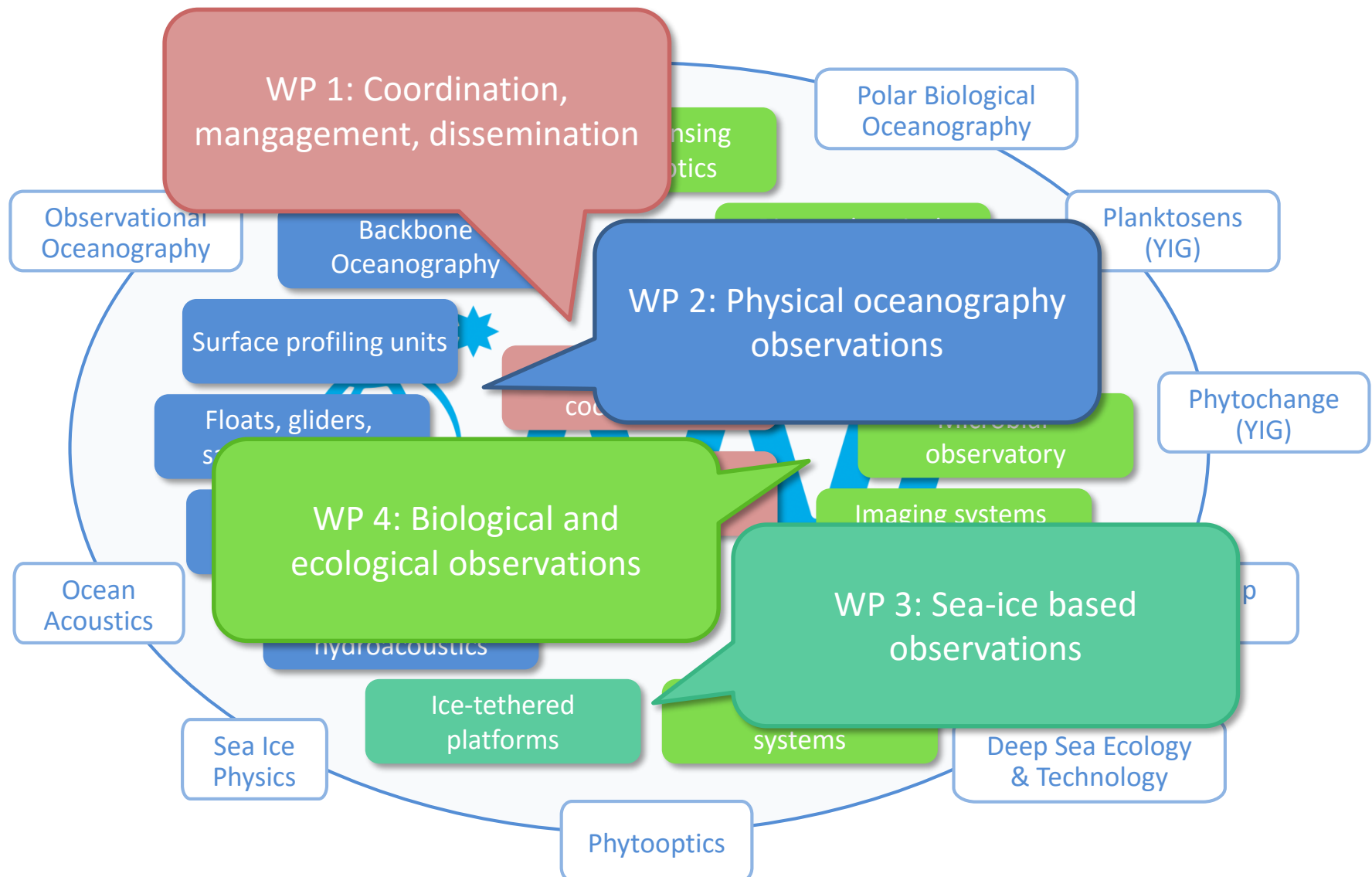
mobile components:

- *ice-tethered platforms*
- *seagliders / floats*

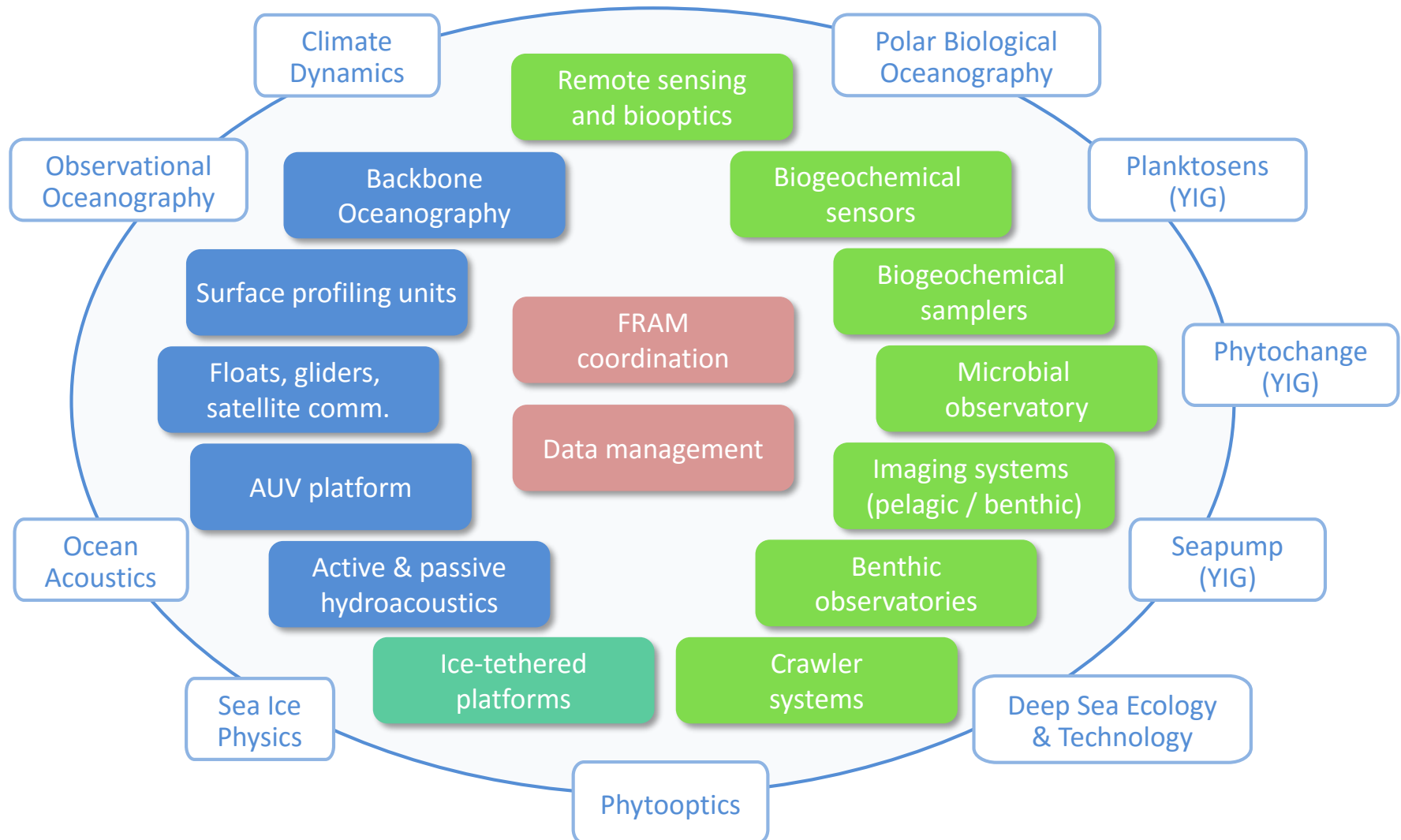
annual campaigns:

- *plankton / benthos sampling*
- *CTD casts, incl. water sampling plus en-route measurements*

FRAM | FRontiers in Arctic marine Monitoring: Contributing sections, work packages and task teams



FRAM | FRontiers in Arctic marine Monitoring: Contributing sections, work packages and task teams



FRAM | FRontiers in Arctic Marine Monitoring:

Tasks addressed in the first two years

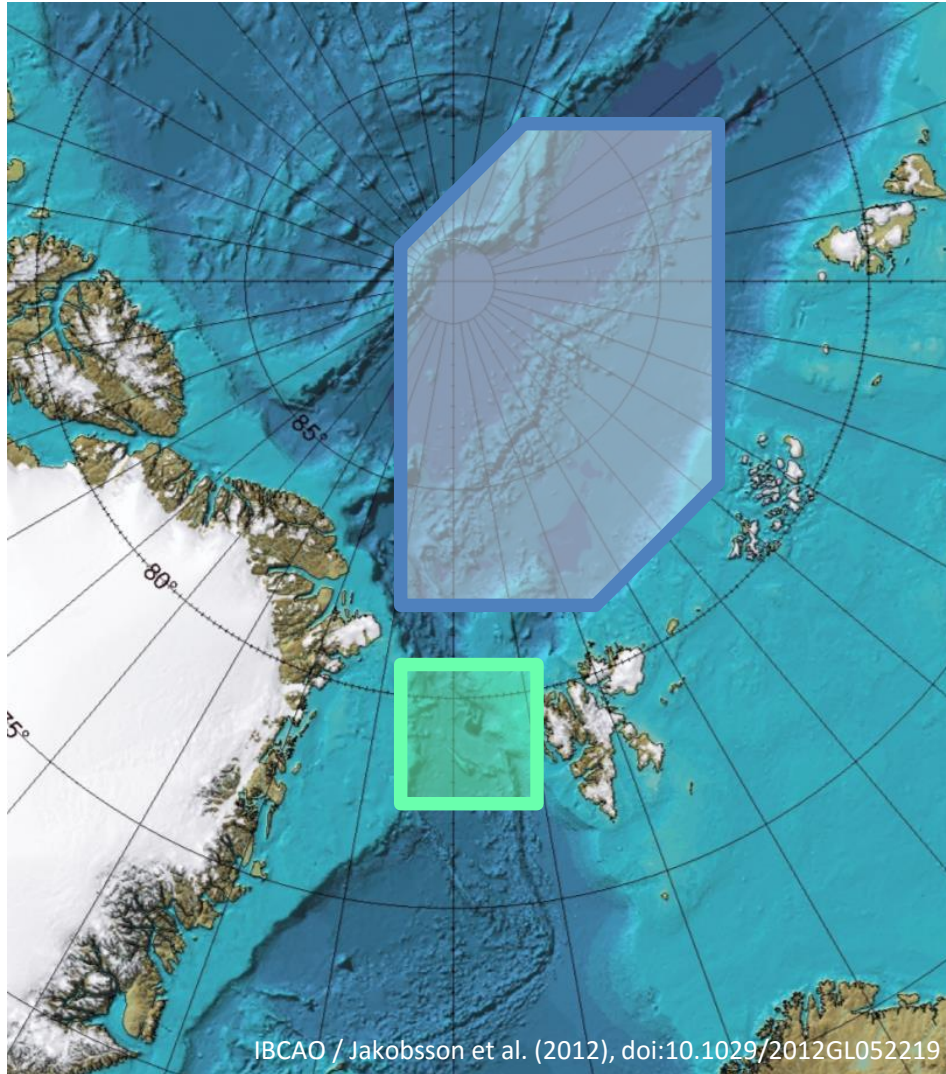
- Hiring personnel
(1 coordinator, 11 scientists, 3 engineers, 10 technicians)
- Select and purchase state of the art instruments and sensors
(autonomous samplers and filtration devices, sensors, zooplankton and seafloor imaging systems, sea ice buoys, ...)
- Develop and improve systems and components for autonomous observations
(AUV payload, profiling sensor packages, ship-based filtration system, particle cameras, instruments measuring benthic flux, ...)
- Design novel observatory platforms
(multidisciplinary ice-tethered platforms, benthic crawler, ...)

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Tasks addressed in the first two years

- Test systems under laboratory conditions and at test sites
(test basins, pressure tanks, North Sea, Kattegat, ...)
- Instrument deployments and tests in the Fram Strait and Central Arctic, continuation of running time-series observations
(profiling moorings, zooplankton and seafloor imaging systems, ...)
- Installation of flow-trough systems on RV Polarstern
(en-route measurements as part of the observing system, e.g. FerryBox, ...)
- Develop procedures and tools for data dissemination and product generation
(data portal with webGIS content, remote sensing products, ...)

FRAM | FRontiers in Arctic Marine Monitoring: Working areas



Central Arctic

(focus on the Eurasian Basin)

Ice tethered platforms,
moorings, ...

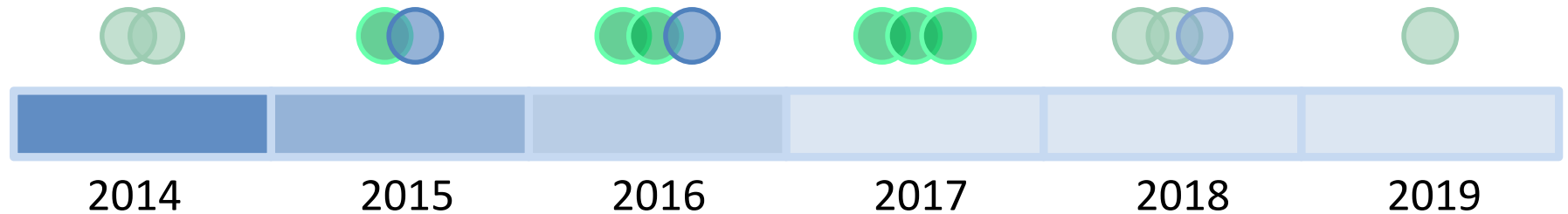
Fram Strait

(extending to Nordic Seas)

Floats, gliders, moorings,
benthic observatories,
benthic crawlers, ...

+ *ship-based observations*

FRAM | FRontiers in Arctic Marine Monitoring: Expeditions (Polarstern, Svalbard, Merian, ...)



pre-FRAM cruises, but contributing to FRAM tasks (mooring installations):

2014: PS85, KV Svalbard (Fram Strait)

2015: PS93.2 (Fram Strait), PS94 (Central Arctic)

2016: PS99.2, PS100 (Fram Strait), PS101 (Central Arctic)

confirmed:

2017: PS107, PS108, PS109 (Fram Strait)

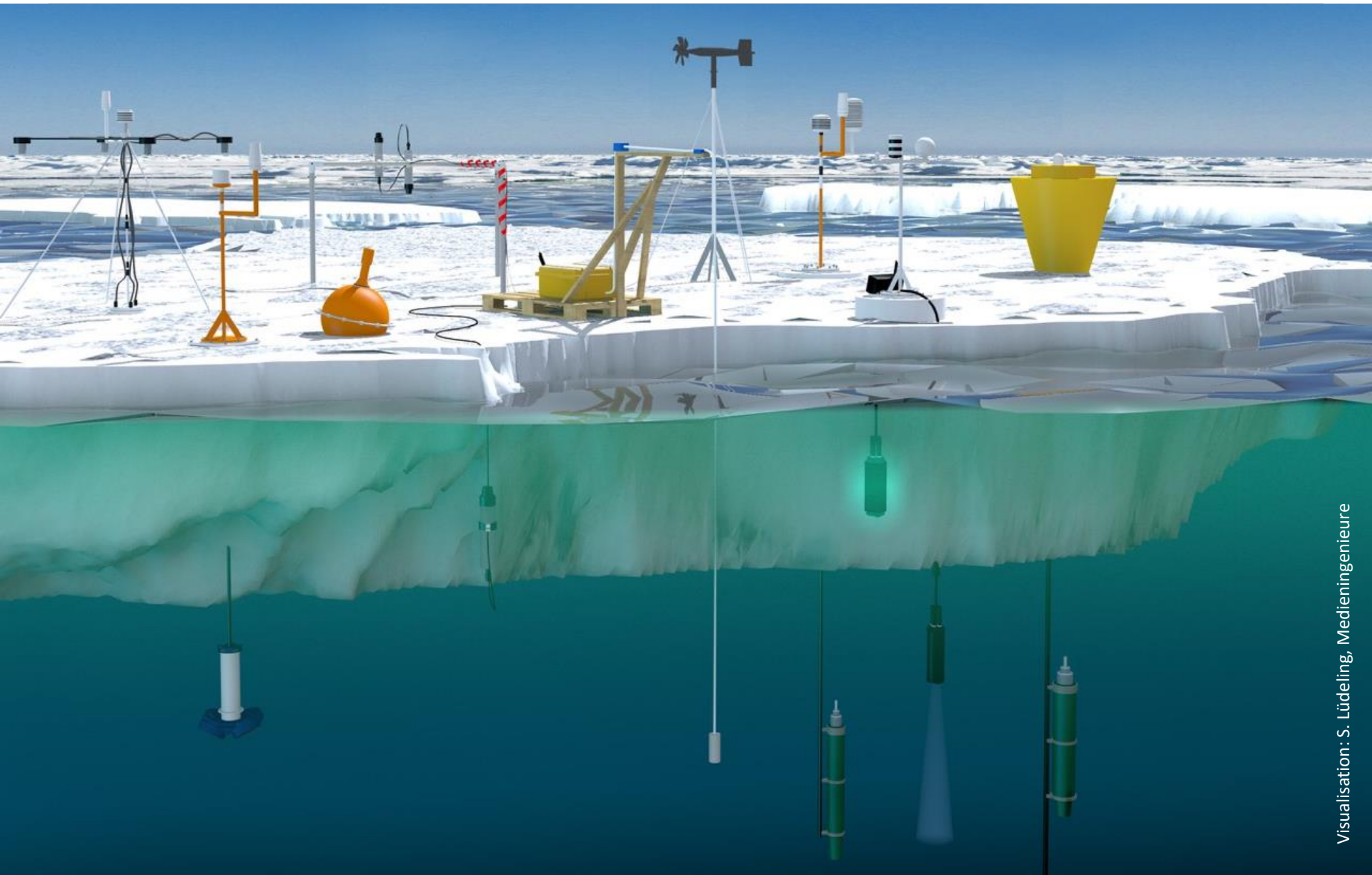
proposed:

2018: MSM?, ODEN?? (Fram Strait), ??? (Central Arctic)

2019: PS113 (Fram Strait)

FRAM | FRontiers in Arctic Marine Monitoring: From artist expression to reality

ICE STATIONS



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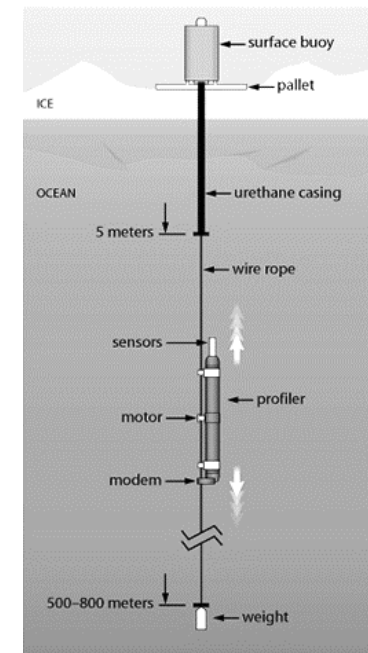
Polar area weather station (PAWS)

*surface unit mast with GPS,
Iridium satellite antenna,
anemometer, barometer,
temperature and humidity sensor;
sea surface temperature sensor
internal to the hull assembly;
transmission of weather related
data on a 3-hour interval*



Photos: M. Hopmann

*surface buoy supporting a wire
that extends through the ice flow
and down into surface waters;
underwater profiler carrying
oceanographic and various
bio-optical sensors;
water property data are sent
to shore in near-real time*

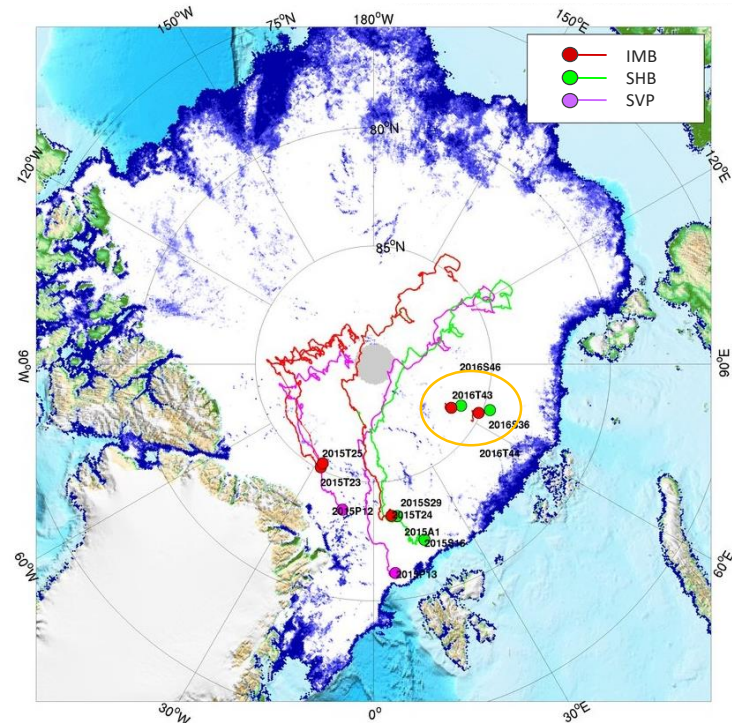


Ice-tethered bio-optical buoys (ITBOB)

FRAM | FRontiers in Arctic Marine Monitoring: Instruments deployed



Buoy positions on 26.09.2016



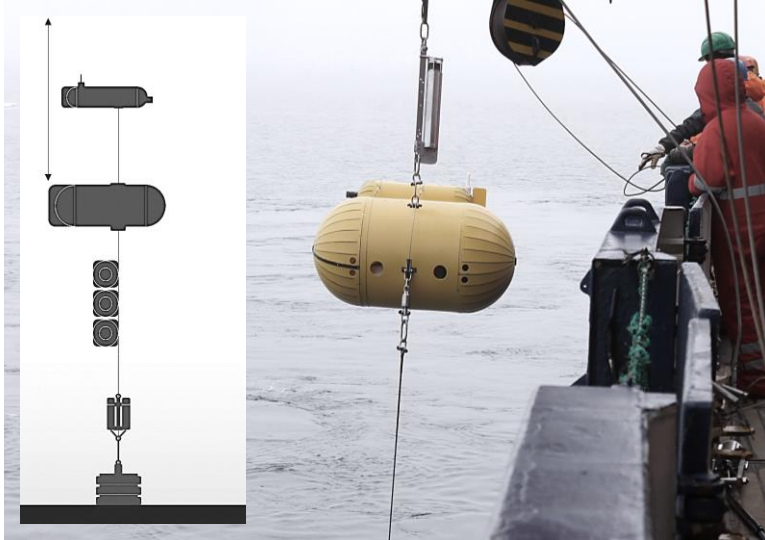
seaiportal.de

FRAM | FRontiers in Arctic Marine Monitoring: From artist expression to reality

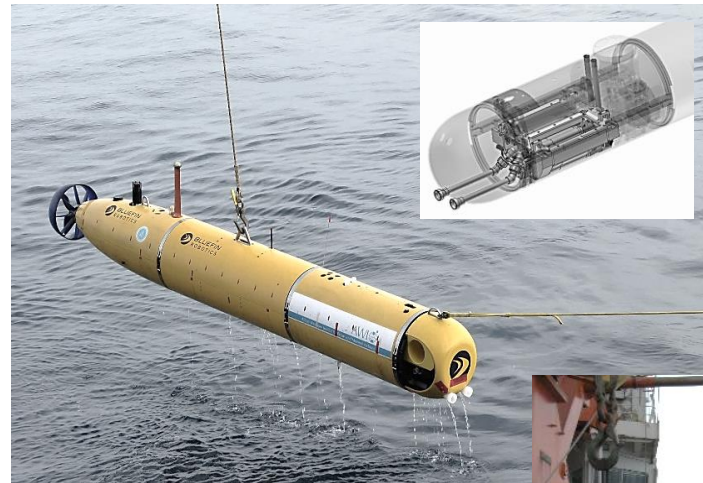
SURFACE WATERS



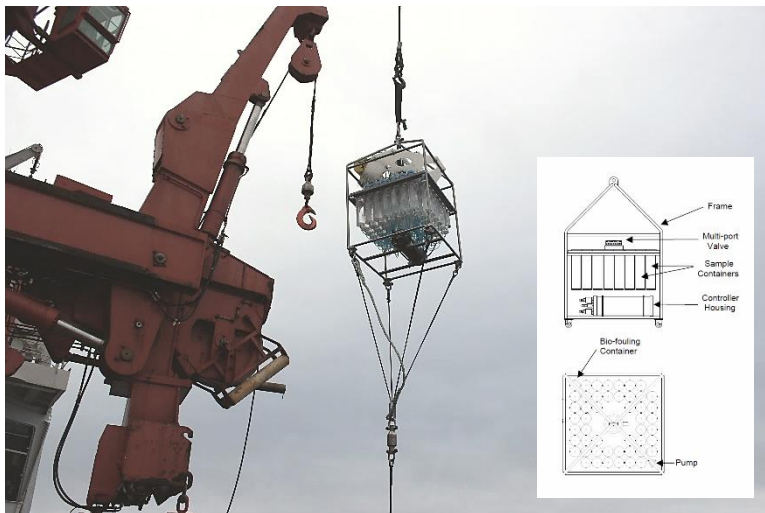
FRAM | FRontiers in Arctic Marine Monitoring: Instruments deployed



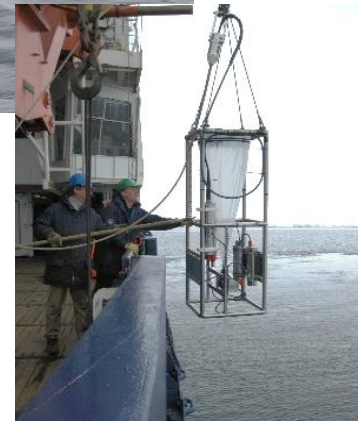
Mooring with profiling sensor unit ...



AUV



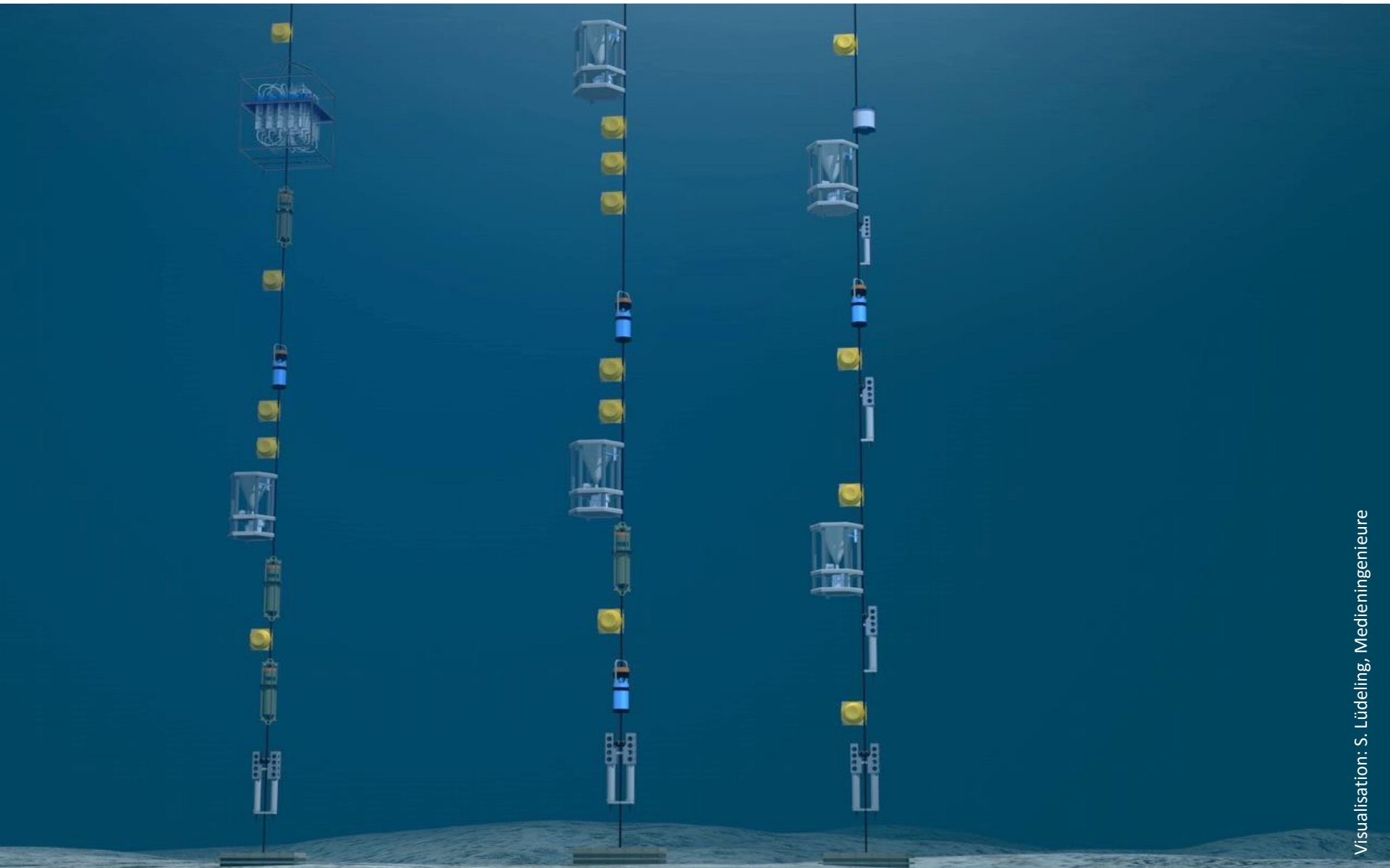
LOKI



... and autonomous water sampler

FRAM | FRontiers in Arctic Marine Monitoring: From artist expression to reality

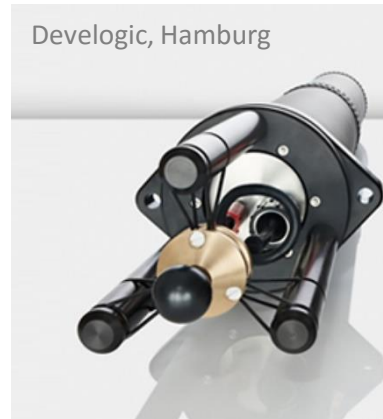
WATER COLUMN



FRAM | FRontiers in Arctic Marine Monitoring: Instruments deployed



Sediment Traps



Acoustic Recorder



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SEAFLOOR



FRAM | FRontiers in Arctic Marine Monitoring: Instruments deployed

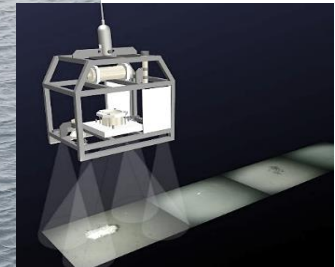
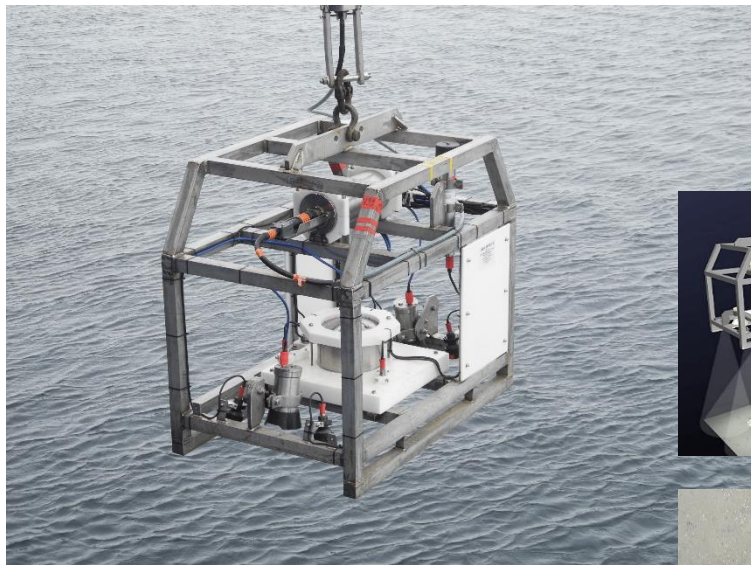
Free-falling Systems



short-term:
SCOC incubations, micro-profiling

long-term:
time-lapse cameras, sediment trap,
optodes, experiments

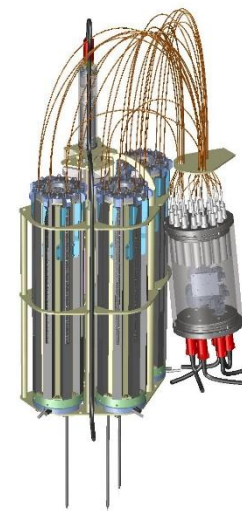
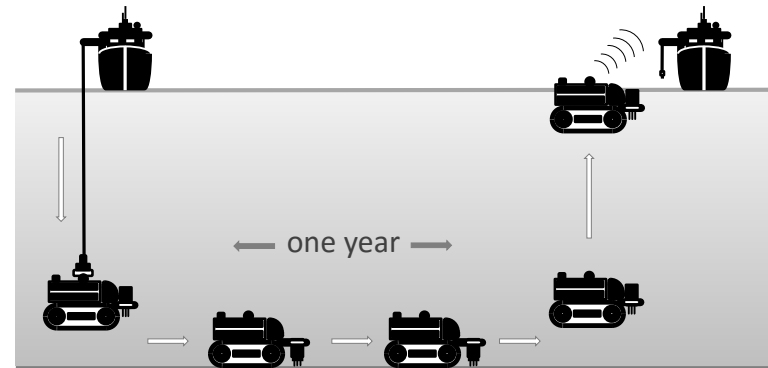
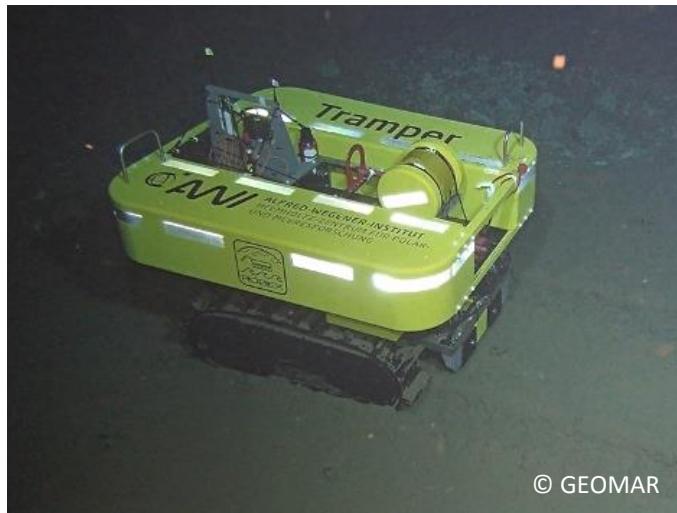
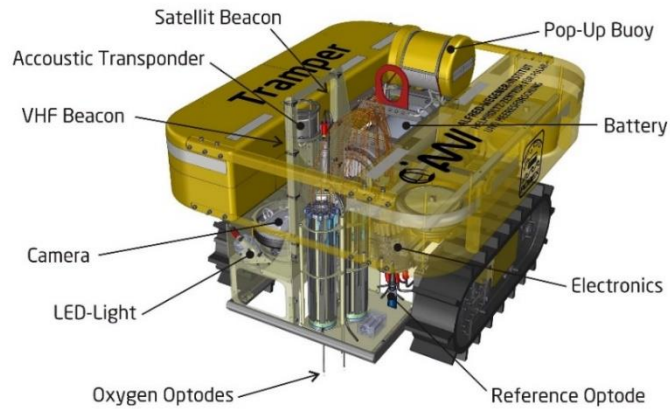
Towed Camera Systems



seafloor imaging:
Ocean Floor Observation System

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Benthic Crawler



video-guided
lowering

↓

measurement and sampling
in determined intervals

↓

ascent after acoustic
release signal

FRAM | FRontiers in Arctic Marine Monitoring: Data supply and visualisation

The screenshot displays the FRAM DATA.awi.de website. The browser address bar shows the URL <http://expediti...awi.de/search?> and the page title is DATA.awi.de. The website's navigation bar includes links for PLATFORMS, EXPEDITIONS, DATA, DATA STREAMS, COLLECTIONS, and STUDIO, along with a LOGIN button. The main content area is divided into several sections: STUDIO, which features a map of the Arctic region with a yellow line indicating a data path; COLLECTIONS, which highlights the FRAM - FRontiers in Arctic marine Monitoring project as a large-scale ocean observation infrastructure; DATA, which includes a magnifying glass icon and the text 'Find datasets and data products'; and EXPEDITIONS, which includes a flag icon and the text 'Find expeditions, flights, dives'. Below these sections is a 'Latest Publications' section listing three items: a dataset by van Heuven et al. (2016) on physical oceanography and carbon dioxide measurements, an article by von Appen et al. (2016) on the seasonal cycle of mesoscale instability, and a report by Peeken et al. (2016) on the Expedition PS92 of the Research Vessel POLARSTERN. At the bottom, a 'Services' section contains three buttons: SENSOR, DASHBOARD, and WORKSPACE, each with a corresponding icon.

http://expediti...awi.de/search? DATA.awi.de

apps3.awi.de/data.awi.de/index.html

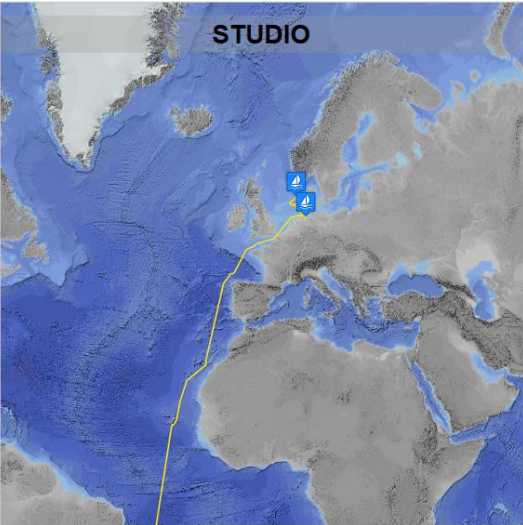
Suchen

AWI

PLATFORMS EXPEDITIONS DATA DATA STREAMS COLLECTIONS STUDIO


LOGIN

STUDIO




COLLECTIONS

FRAM - FRontiers in Arctic marine Monitoring




Large-scale Ocean Observation Infrastructure designed to support various types of long-term time series observations in the Arctic Ocean

DATA



Find datasets and data products

EXPEDITIONS



Find expeditions, flights, dives

Latest Publications


[Dataset] van Heuven, R. et al (2016): Underway physical oceanography and carbon dioxide measurements during POLARSTERN cruise PS82
[doi:10.1594/PANGAEA.763950](https://doi.org/10.1594/PANGAEA.763950)

[Article] von Appen, W. J. et al (2016): Seasonal cycle of mesoscale instability of the West Spitsbergen Current
[hdl:10013/epic.47524](https://hdl.handle.net/10013/epic.47524)


[Report] Peeken, I. (2016): The Expedition PS92 of the Research Vessel POLARSTERN to the Arctic Ocean in 2015
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Services


SENSOR



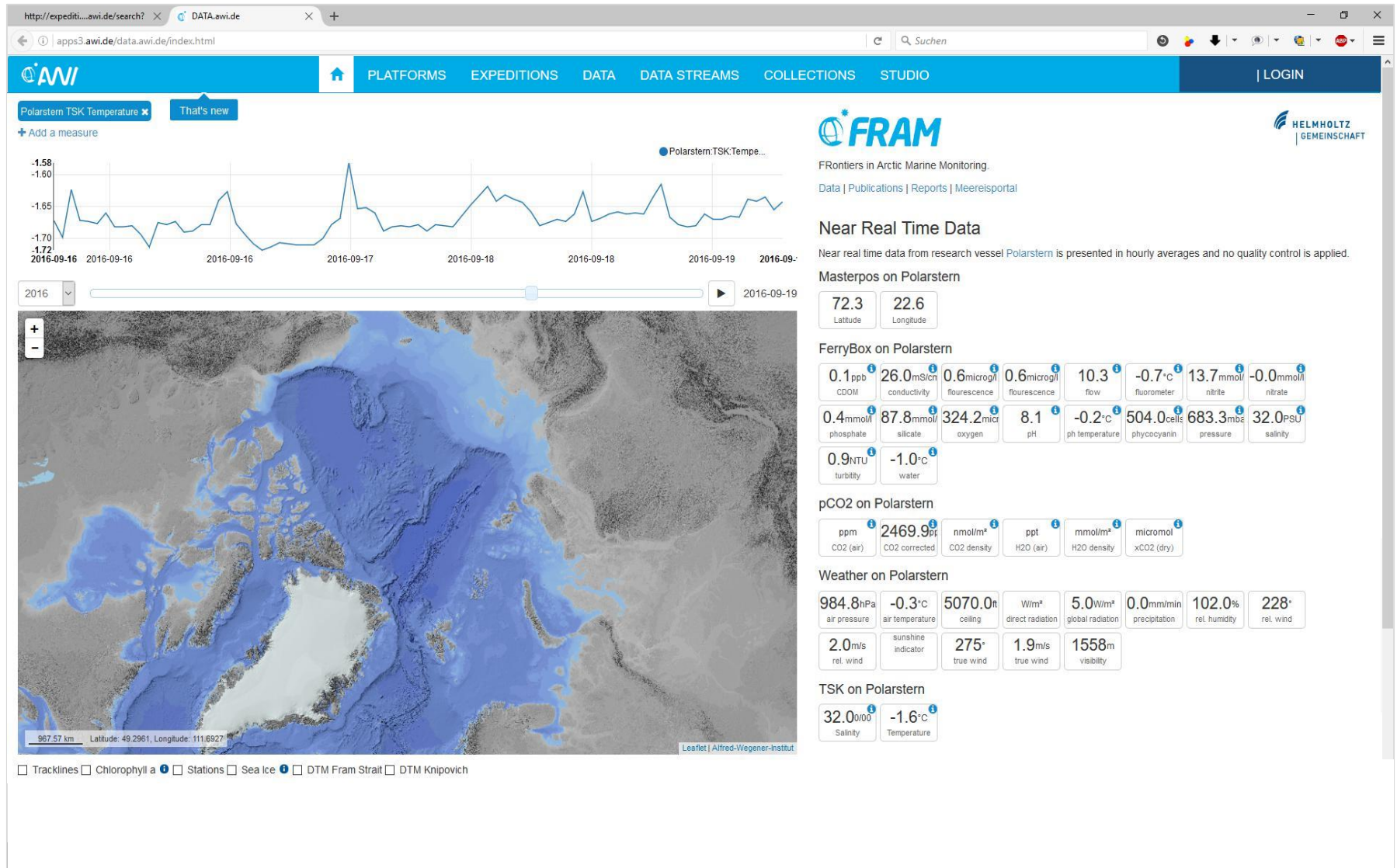
DASHBOARD



WORKSPACE



FRAM | FRontiers in Arctic Marine Monitoring: Data supply and visualisation





THANK YOU !