

Distributed Biological Observatory

Centrum Badań Ziemi i Planet



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Distributed Biological Observatory: Background

- Need for sustained observations of changes in biological systems and evaluating climate change impacts.
- Biological observations cannot be automated to the same extent as many physical measurements can (e.g. salinity on moorings, etc.).
 - much less scientific documentation of how biological systems are changing and/or adapting as a result of environmental change.



Arctic sea ice minimum extent on 11.09.2024.
Yellow boundary - minimum extent averaged over the
30-year period from 1981 to 2010.

*NASA's Scientific Visualization Studio/Trent L. Schindler
svs.gsfc.nasa.gov/5382*

www.dbo.cbl.umces.edu

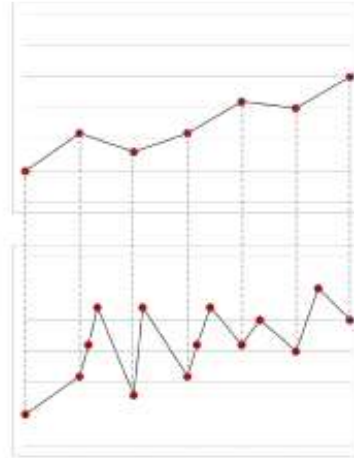
Overview – what is a Distributed Biological Observatory?



Collaborative framework
- leverage our scientific outcomes, act as unified voice



Ocean Ecosystem focus
- multidisciplinary efforts to decipher its drivers and functioning



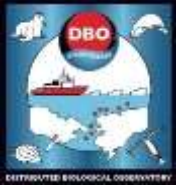
Joint efforts at Key Sites
- increase sampling frequency and number of parameters



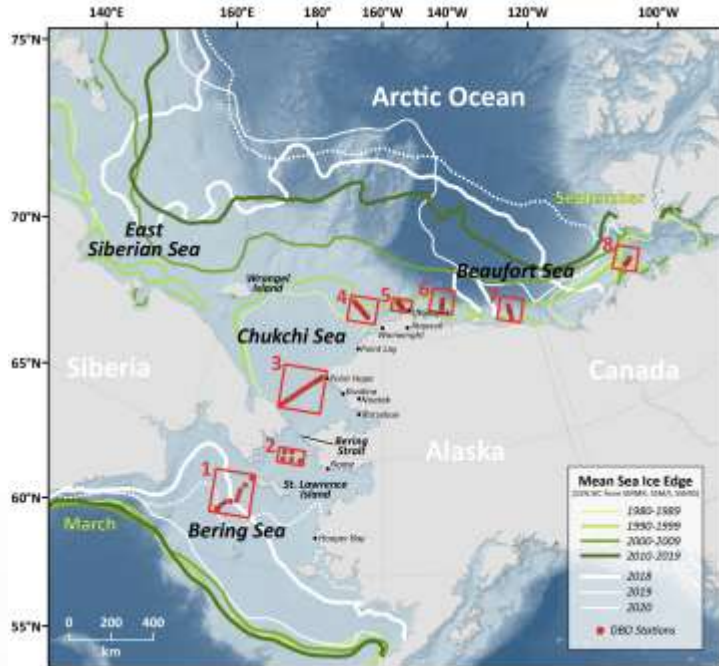
Continuity
- bridge over short-term and long-term efforts



Advancement
- increase observational capacity, improve info & data flow



The Pacific Distributed Biological Observatory (DBO): Linking Physics to Biology



serves as a change detection array for consistent monitoring of biophysical responses to environmental drivers in the Pacific Arctic and now expanding to pan-Arctic network

courtesy Karen Frey, Clark University

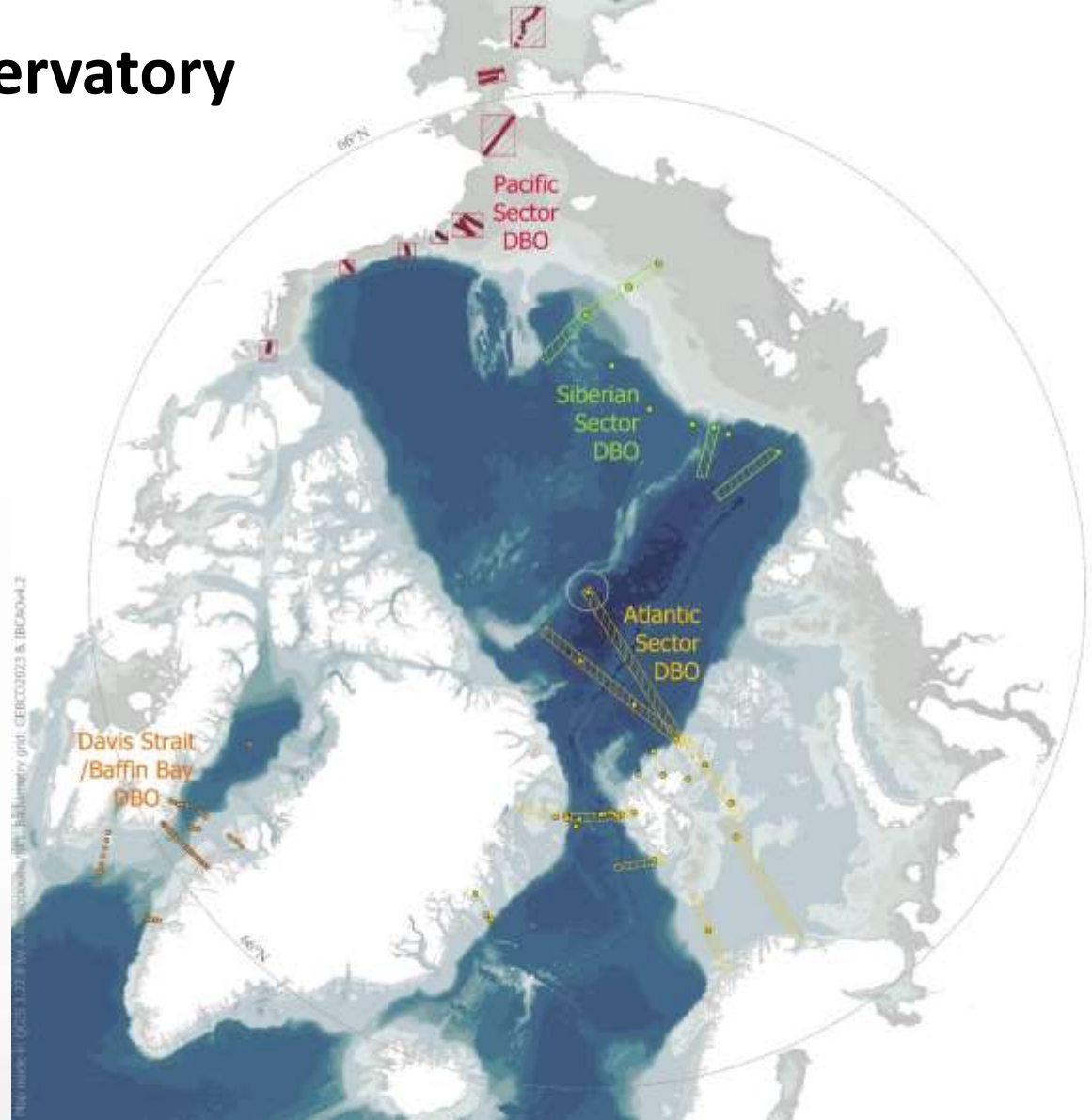
Courtesy: Jackie Grebmeier



Distributed Biological Observatory (DBO)

The concept has been expanding and currently includes:

- **Pacific DBO** (expanding)
- **Atlantic DBO**
- **Davis Strait/Baffin Bay DBO**
- **Siberian DBO** (in progress)



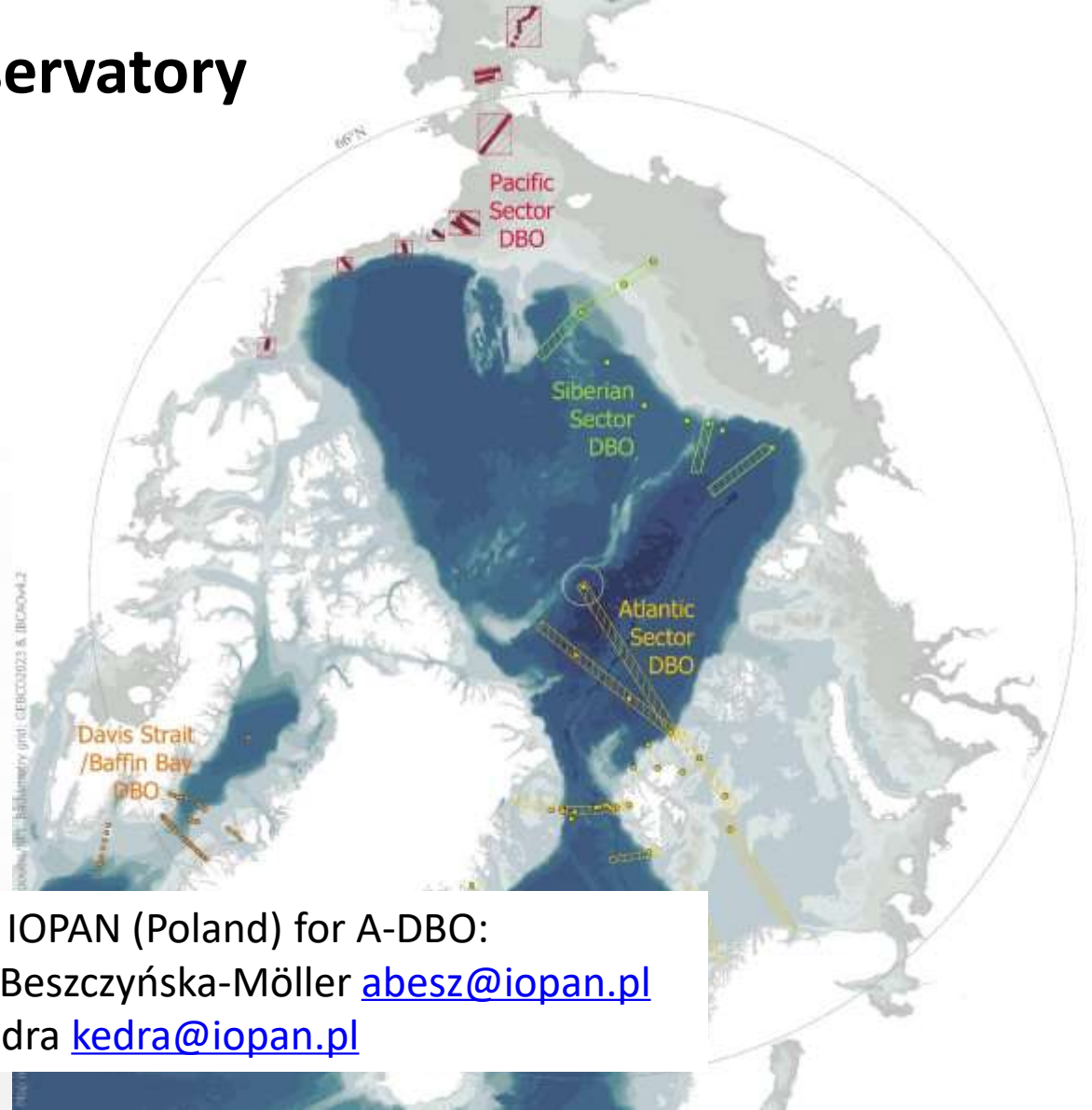
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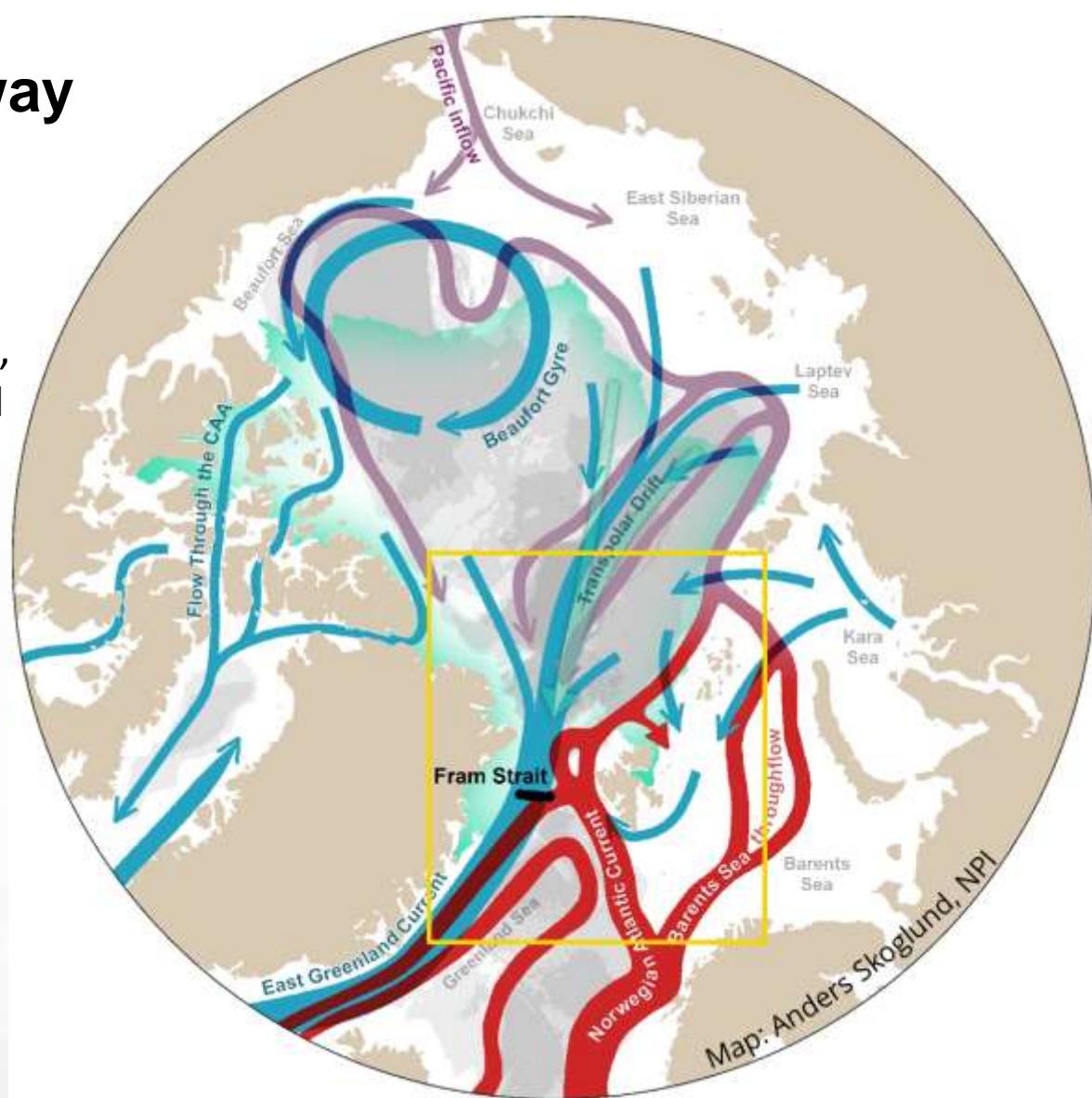
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Monika Kędra kedra@iopan.pl

The Atlantic-Arctic gateway

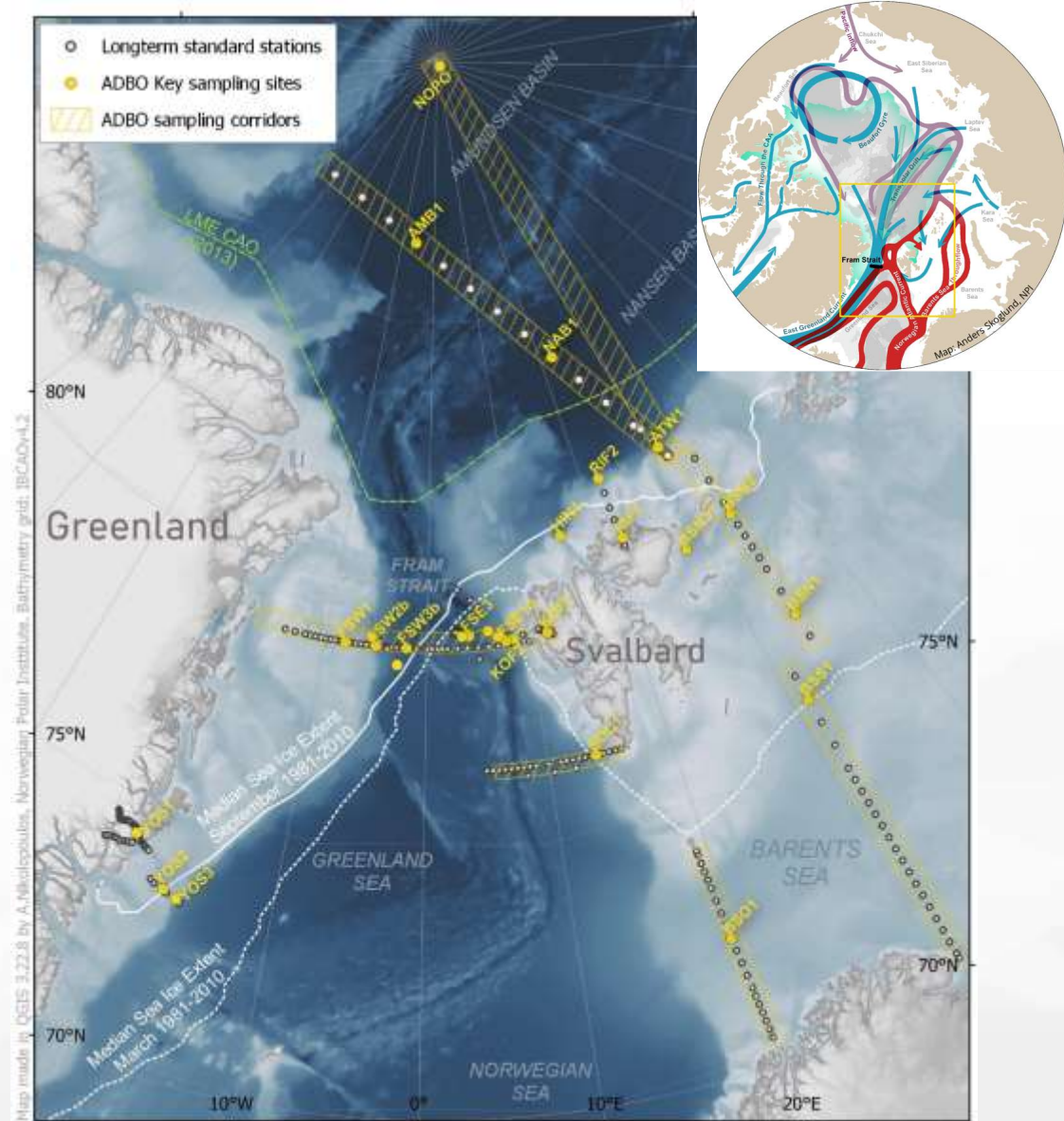
- A very dynamic sector of the Arctic Ocean with vast contrasts
- Spans over shallow shelves and deep basins, with the Fram Strait being the deepest of all Arctic Ocean gateway (>2000 m)
- Hosts the two Atlantic Water inflow branches and the Polar outflow (Transpolar Drift and East Greenland Current)
- Subjected to variable ice conditions (seasonal drifting sea ice, fast ice, ...)



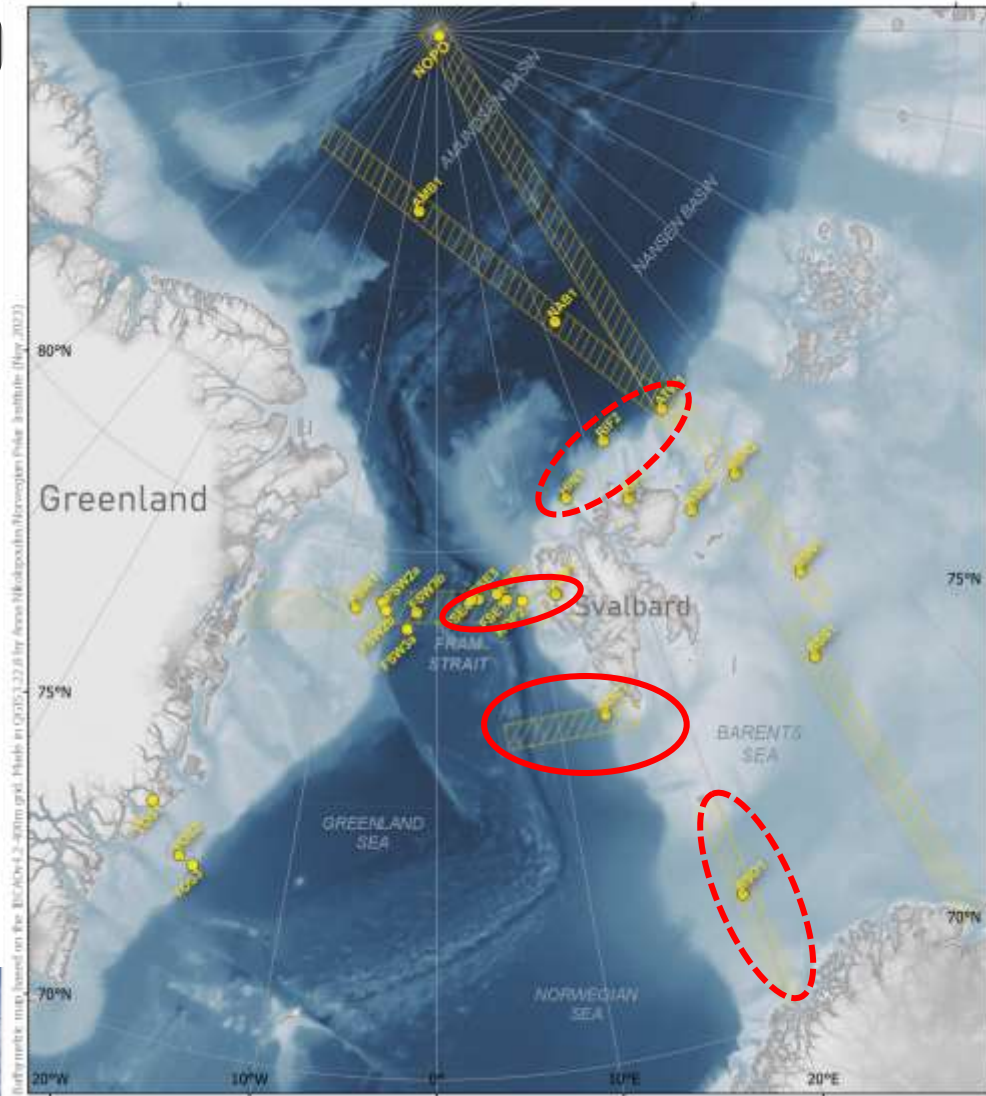
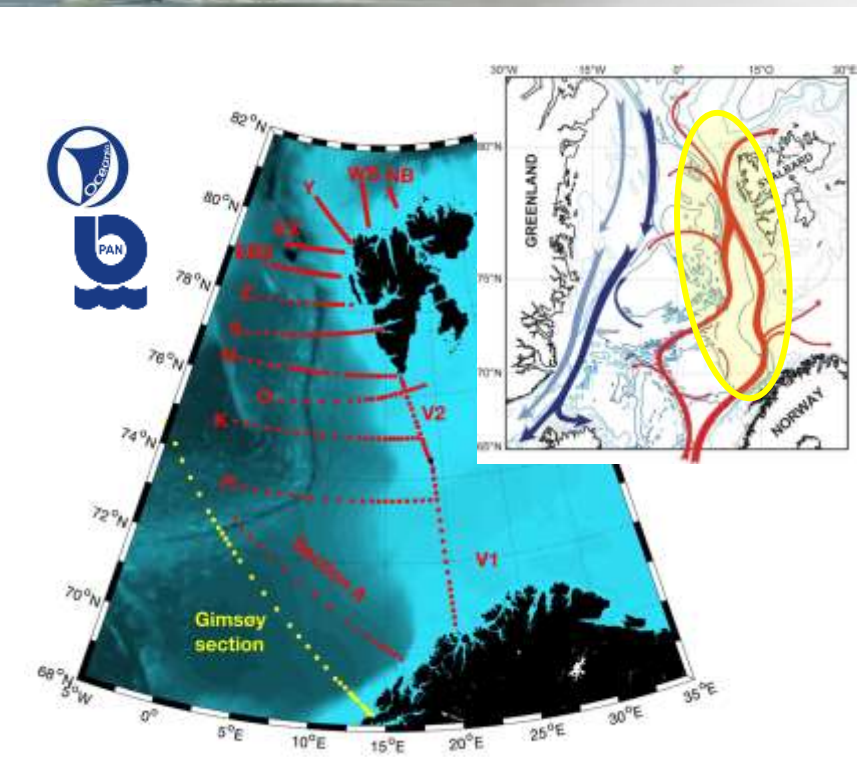
Geographical elements of the A-DBO

Focal Areas and Key sampling sites:

- Build on a selection of standard positions for **long-term national monitoring programs** (IOPAN/Poland, NPI and IMR/Norway, AWI/Germany, OGS/Italy),
- *Data time series for 10-30+ years*
- Mainly physical and chemical parameters (but improved coverage of ecosystem parameters in recent years!)
- Encompasses both open-ocean and fjord/coastal environments (Rijpfjorden, Kongsfjorden, Young Sound, ...)



AREX (IOPAN, s/y Oceania) vs ADBO



Depth metric map based on the Bathymetry 400m grid. Plots at 0.05° x 0.05° by Arco Hydrographic Norwegian Polar Institute (May 2013)

- Suggested ADBO Key Sampling Sites
- ▬ Suggested A-DBO sampling 'corridors'

* Since 2017 the Norwegian Gimsey section (data courtesy Kjell-Arne Mørk, IMR) replaced the IOPAN section A



ADBO "working cycle"



Summer cruise activities

- A-DBO dedicated sampling
- Supplementary sampling programs



Autumn A-DBO Meeting

- Provisional results from recent sampling
- Metadata + parameter files update
- Cruise planning of upcoming seasons
- Preparing regional scientific outputs, and their dissemination



Spring all-DBO meeting (ASSW)

- Regional results in a pan-Arctic perspective
- Preparing pan-Arctic scientific outputs, and their dissemination
- Long-term planning
- Link to parallel pan-Arctic processes



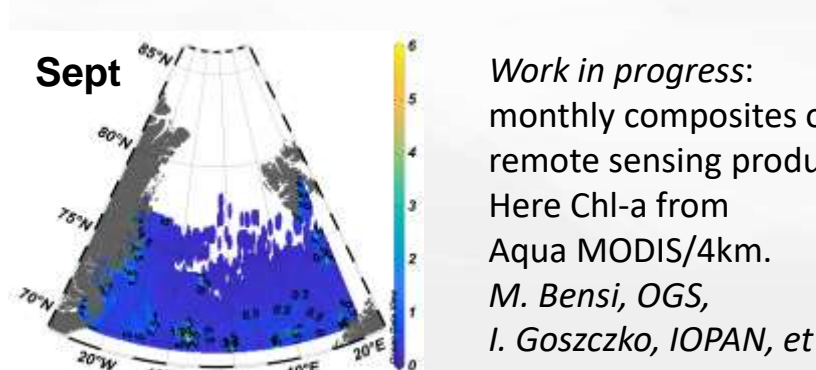
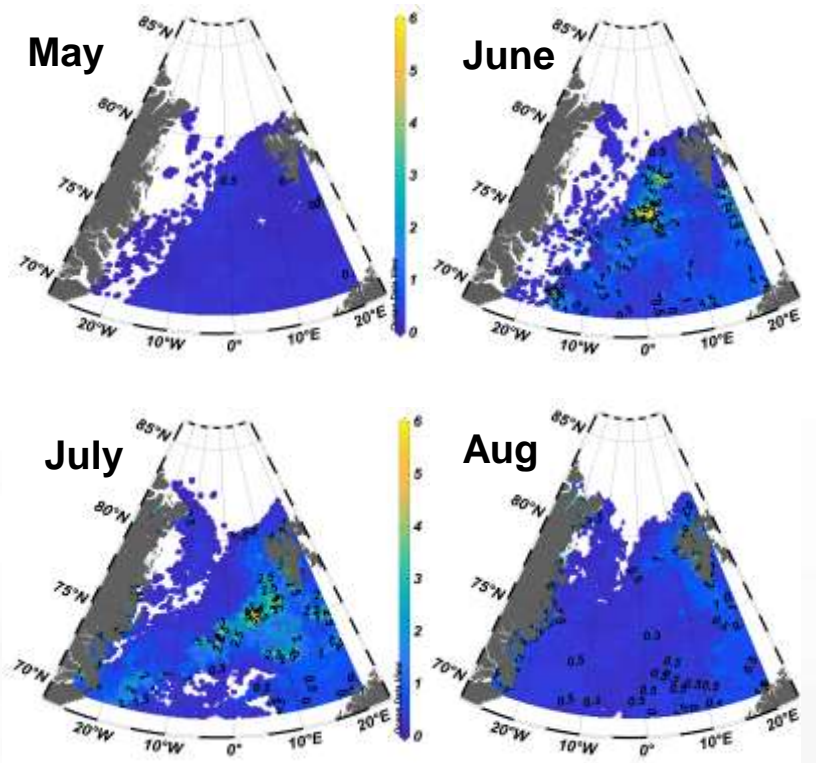
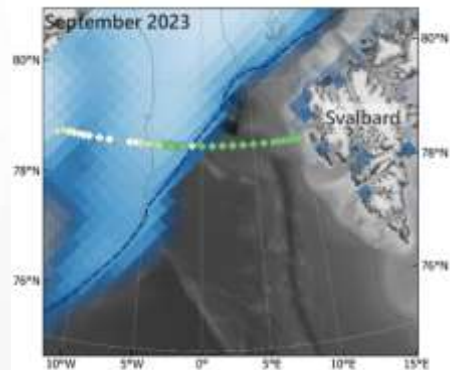
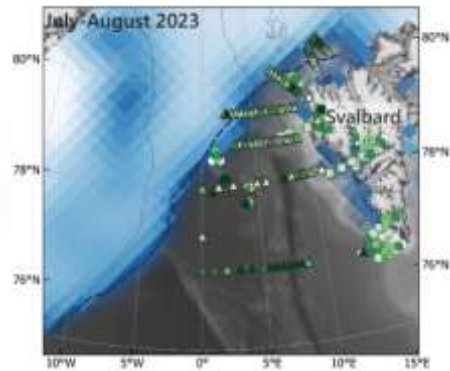
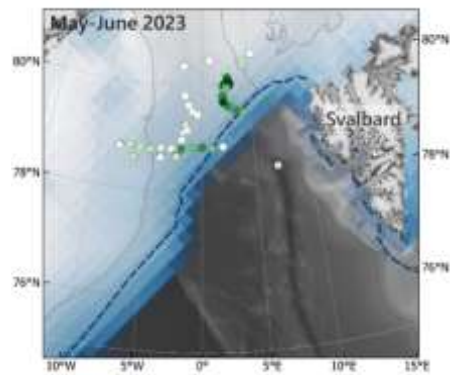
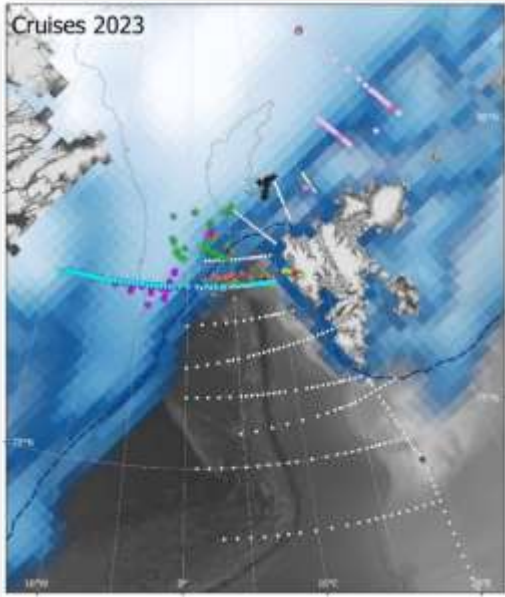
Regular
Work Group meetings



- Data syntheses
- Cruise preparations
- Science presentations, Outreach
- Periodic assessments (every 3rd year?)



Sampling in alternative
seasons



Work in progress:
distribution and timing of
Chl-max from *in situ*
observations.
A. Nikolopoulos, NPI,
J. Muchowski, SU,
A. Strzelewicz, IOPAN, et al.

Work in progress:
monthly composites of
remote sensing products.
Here Chl-a from
Aqua MODIS/4km.
M. Bensi, OGS,
I. Goszczko, IOPAN, et al.

Cruises 2024 *(map in the making...)*



GEOEO 2024
5 Aug- 17 Sep
M. Jakobsson & N. Kirchner, SU

AWI HAUSGARTEN 2024
PS143-1/2
7 Jun – 6 Aug
Katja Metfies, AWI

NPI Fram Strait 2024
12 Aug – 28 Aug
Laura de Steur, NPI

AWI & NPI Kongsfjorden
Weekly sampling! May-Aug
Clara Hoppe, AWI & Allison Bailey, NPI

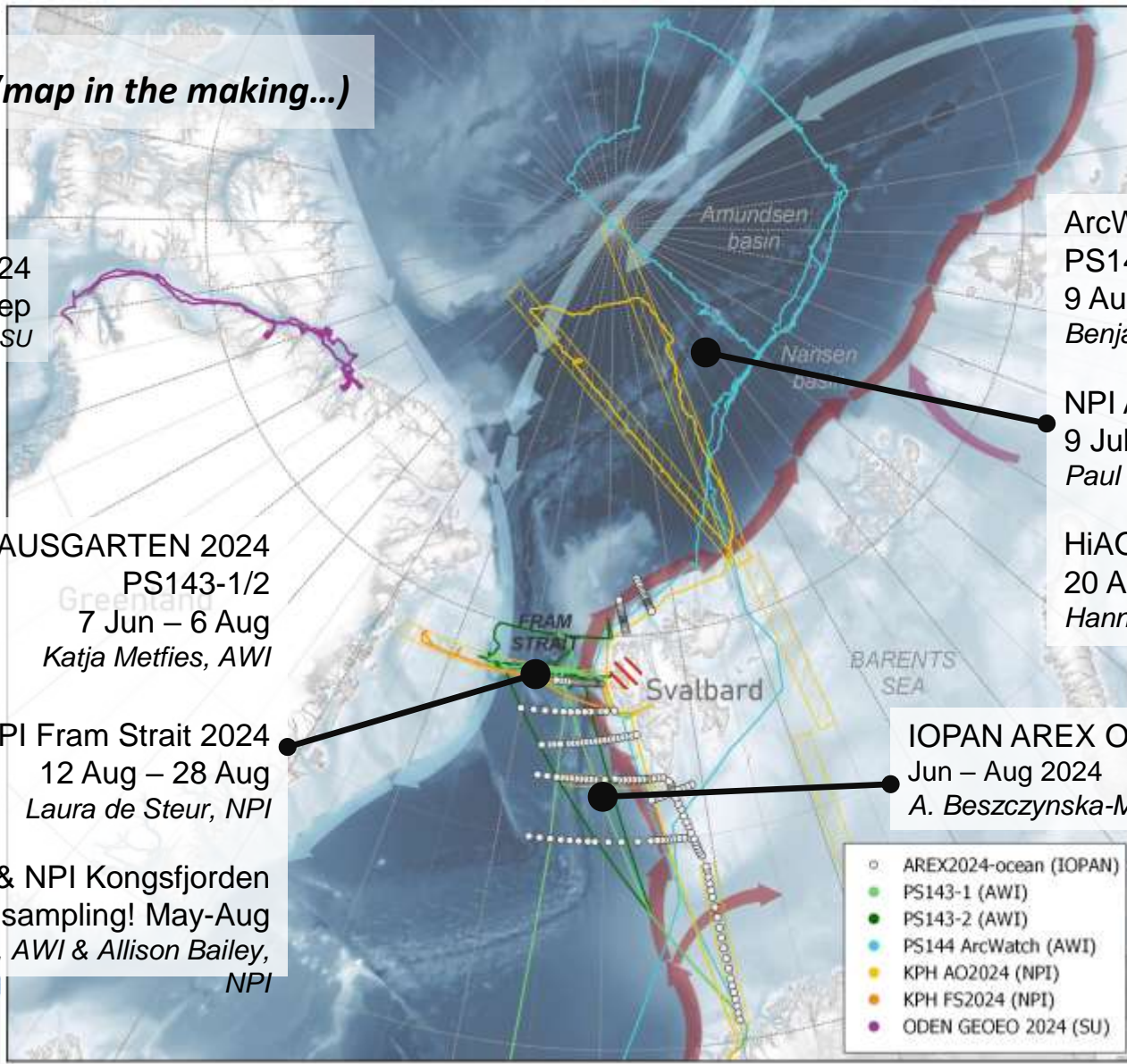
ArcWatch (TransArc3)
PS144
9 Aug – 13 Oct
Benjamin Rabe, AWI

NPI Arctic Ocean 2024
9 Jul – 11 Aug
Paul Dodd, NPI

HiAOOS 2024
20 Aug – 25 Sep
Hanne Sagen, NERSC

IOPAN AREX Ocean & Fjords
Jun – Aug 2024
A. Beszczynska-Möller et al., IOPAN

- AREX2024-ocean (IOPAN)
- PS143-1 (AWI)
- PS143-2 (AWI)
- PS144 ArcWatch (AWI)
- KPH AO2024 (NPI)
- KPH FS2024 (NPI)
- ODEN GEOEO 2024 (SU)



Thank you for your attention!

<https://arcticpassion.eu/adbo/>

<https://dbo.cbl.umces.edu/about.html>

