How Argo can help getting more ocean observations in high latitudes

Birgit Klein on behalf of the ERIC
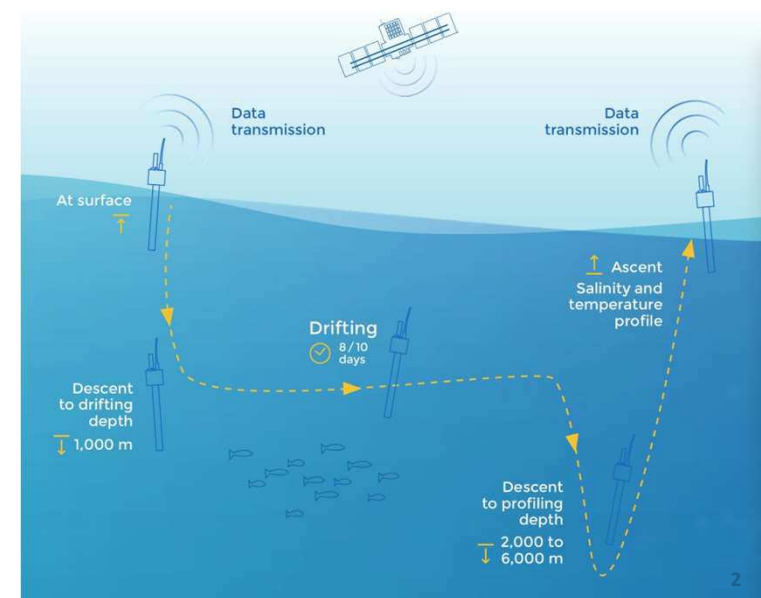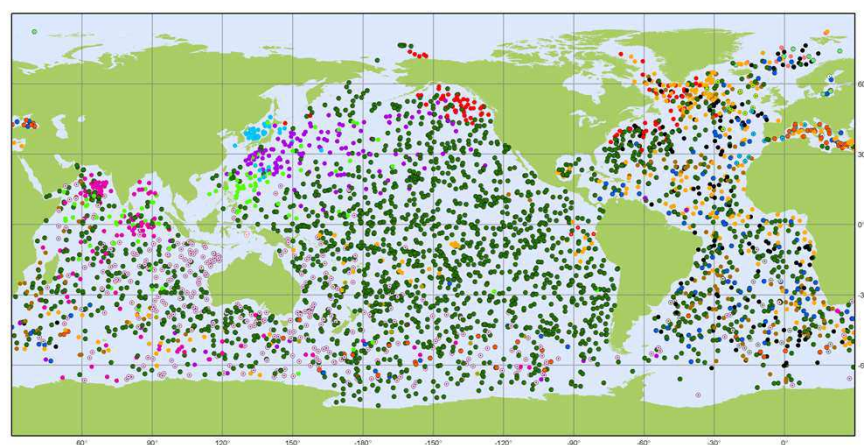**Based on work of Katrin Latarius, Noé Poffa , Tero Purokoski**

Euro-Argo: The European contribution to the global Argo ocean observation network

Argo: a global *in situ* observing system

- About 4000 autonomous profiling floats are measuring ocean temperature and salinity up to 2000 m depth, all over the globe

- The Argo network delivers essential data both for climate change research and for ocean analysis and forecasting systems
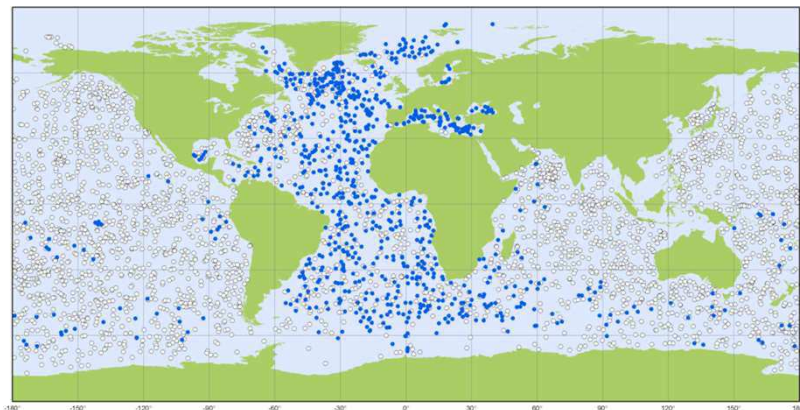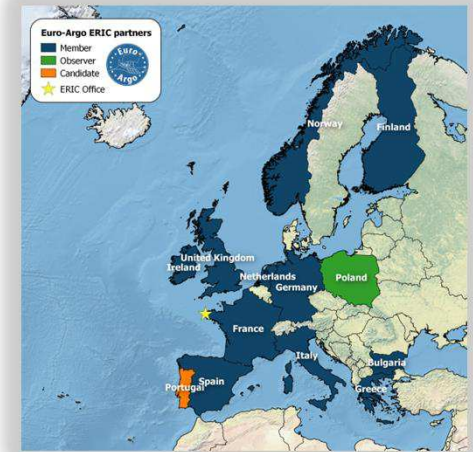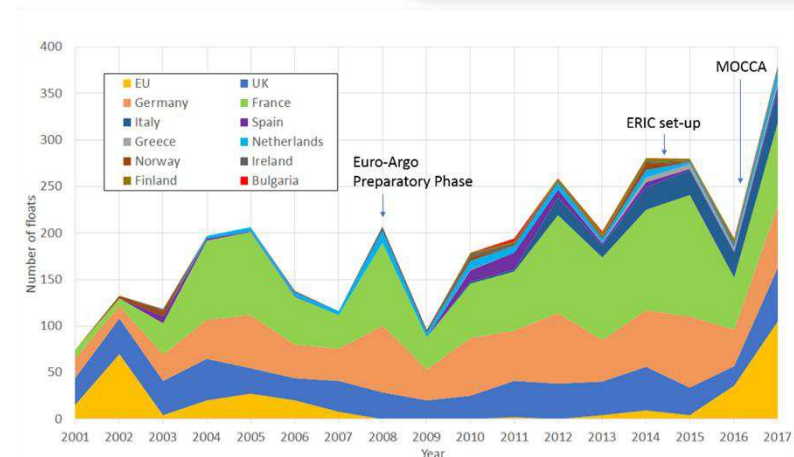

Argo

National contributions - 3909 Operational Floats
Latest location of operational floats (data distributed within the last 30 days)

January 2019

ARGENTINA (1)	EUROPE (123)	INDIA (124)	KENYA (1)	PERU (3)	USA (2194)
AUSTRALIA (354)	FINLAND (2)	INDONESIA (2)	MEXICO (1)	POLAND (9)	
BRAZIL (3)	FRANCE (266)	IRELAND (11)	NETHERLANDS (24)	KOREA, REPUBLIC OF (45)	
CANADA (92)	GERMANY (161)	ITALY (62)	NEW ZEALAND (11)	SPAIN (16)	
CHINA (97)	GREECE (3)	JAPAN (149)	NORWAY (9)	UK (146)	

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Data transmission

At surface

Descent to drifting depth ↓ 1,000 m

Drifting ⊘ 8 / 10 days

Descent to profiling depth ↓ 2,000 to ↓ 6,000 m

Ascent Salinity and temperature profile

Data transmission

2

The Euro-Argo Research Infrastructure

Objective : To coordinate and sustain the European contribution to the global Argo network (1/4 of the network)

- Euro-Argo was part of the 2006 ESFRI Roadmap

- The **Euro-Argo ERIC** (European Research Infrastructure Consortium) **was created in May 2014** and has increased from 9 funding members to 12 members in 2018.

- Euro-Argo is a Landmark in the ESFRI 2018 roadmap

Argo   EuroArgo   January 2019
European contribution to the Argo program via EuroArgo Research Infrastructure
Latest locations of operational profiling floats (data distributed within the last 30 days)

Argo EU (832) Argo non EU (3077)

Generated by www.jcommops.org

Increase of the European contribution to the international network
(number of deployments / year)

High Latitudes

- Argo is a complementary technology to other platforms, like Ice Tethered Platforms (ITP) in the Arctic, sea mammals, vessels and mooring in Arctic and Antarctic areas

- Technology has been proven in Weddell Sea with floats able to stay for a long period under ice located with acoustic sources and is tested in pilot projects in the Arctic and Nordic Seas:

  - Tests occurring in Barent Sea, north of Svalbard, in the Baltic Sea and Baffin Bay (NAOS project)

  - First promising results of Ice Sensing Algorithm definition for the Barents Sea and north of Svalbarf

  - Collaboration opportunities within INTAROS project for underwater positioning (acoustic sources)
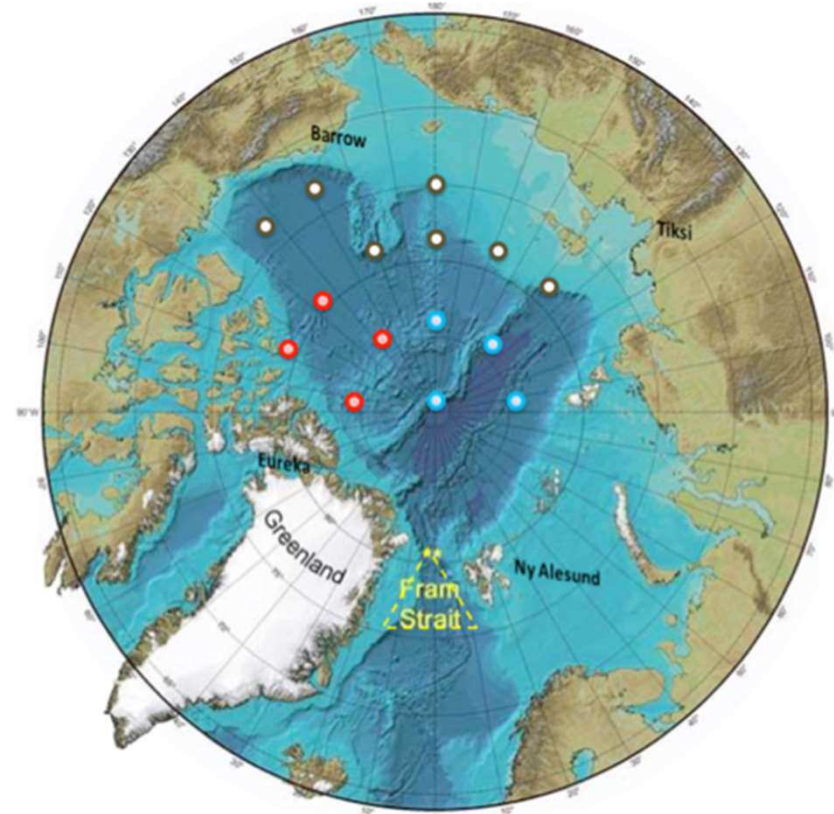
High Latitudes: ice-thethered buoys
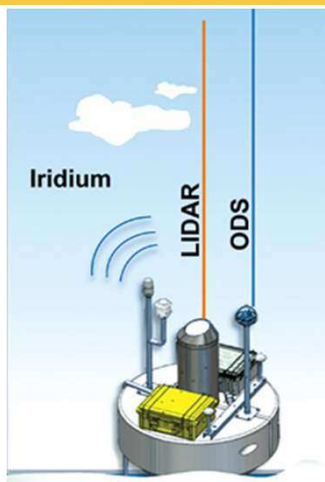
French **IAOOS** project: Ice Atmosphere Ocean Observing System
9 year project : Feb 2011- Dec 2019

Deploy and maintain an integrated observing system providing simultaneous observations of the ocean, ice and lower atmosphere in real time in the Arctic

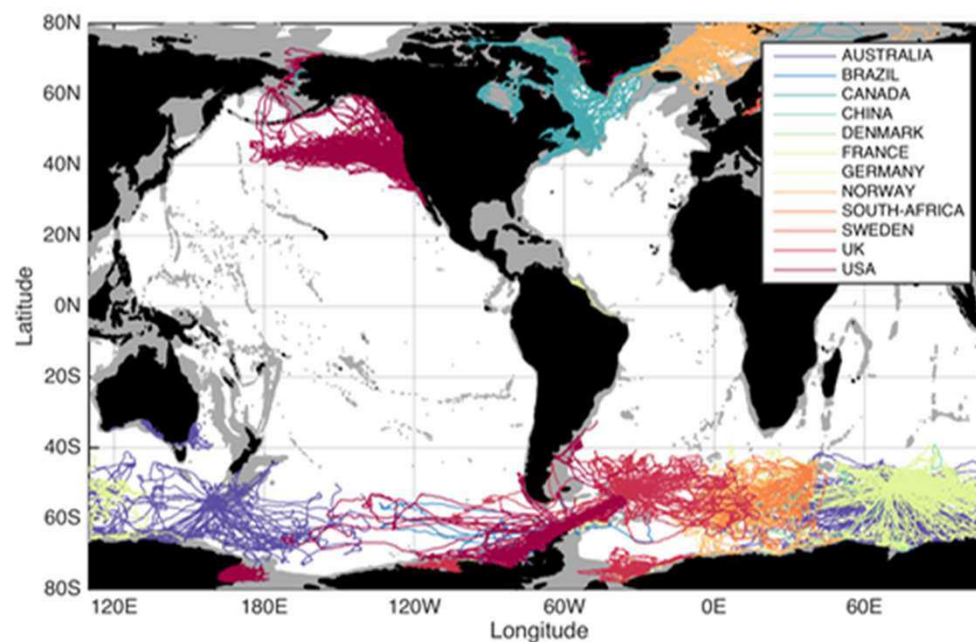http://www.iaoos-equipex.upmc.fr/fr/expedition.html

http://www.iaoos-equipex.upmc.fr/
Courtesy Christine Provost

High Latitudes: Sea mammals

MEOP stands for "Marine Mammals Exploring the Oceans Pole to Pole".
- Trajectory data is useful to assess how animals respond in their foraging behavior
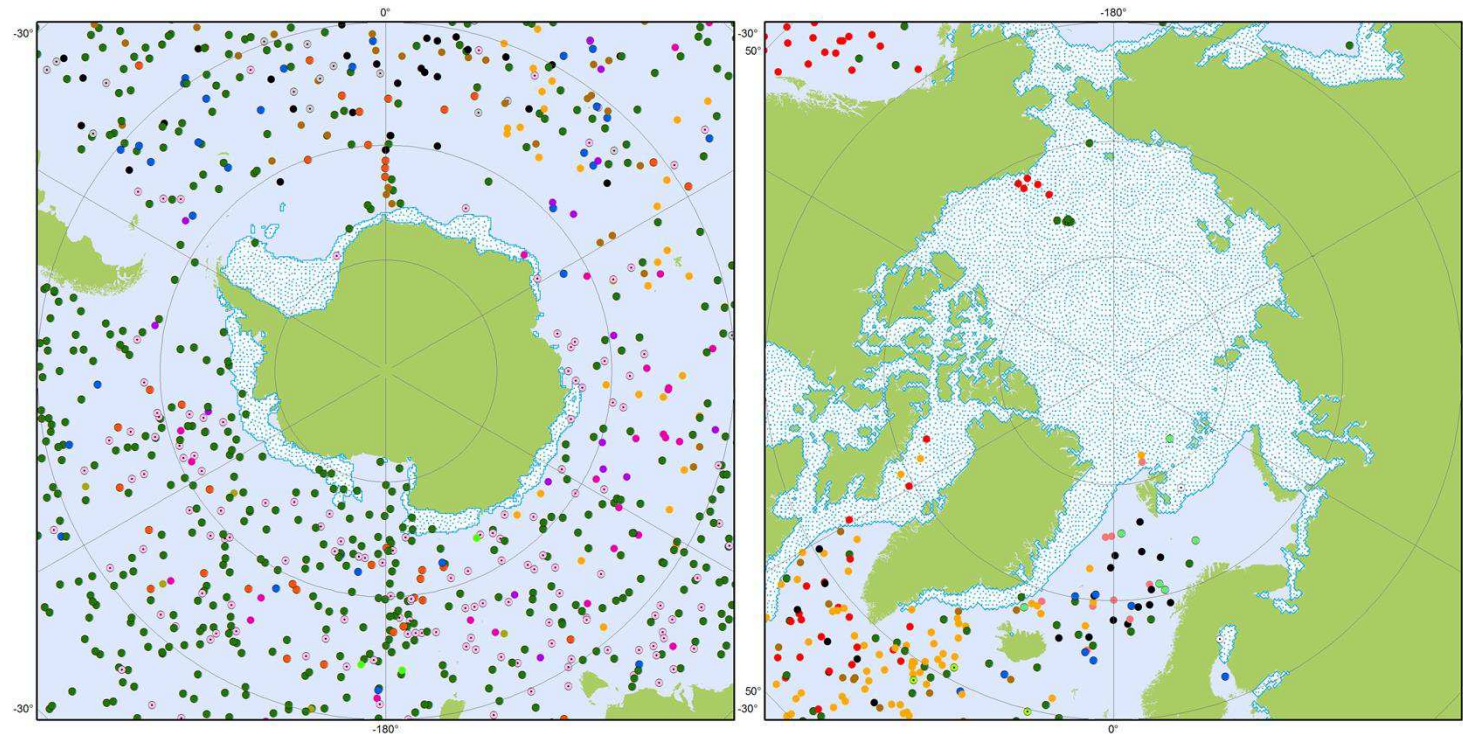- CTD data are useful to study changes in hydrographic properties in the oean

MEOP-CTD dataset : 543735 profiles, 188 deployments, 1273 tags

http://www.meop.net/

Argo

National contributions

Latest location of operational floats (data distributed within the last 30 days)

February 2019

AUSTRALIA (148)   FRANCE (33)   JAPAN (15)
BRAZIL (1)   GERMANY (32)   NETHERLANDS (17)
CHINA (3)   INDIA (28)   NEW ZEALAND (5)
EUROPE (31)   ITALY (38)   UK (35)
USA (478)

CANADA (44)   FRANCE (63)   NORWAY (9)
EUROPE (8)   GERMANY (21)   POLAND (6)
FINLAND (2)   IRELAND (3)   UK (13)
USA (40)

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Southern Ocean is reasonably well covered with Argo floats:
Ice protection is established and working well

Few floats in the Arctic:
Complicated water mass structures , need to develop an adapted Ice Sensing Algorithm

3 mechanisms to detect ice :
- ISA (Ice sensing algorithm)
- Satellite mask (GPS & Iridium)
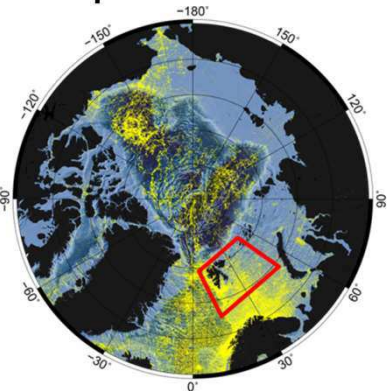- Ascent hanging (= pressure evolution = grounding during ascent phase

Development of ISA for the Arctic through Euro Argo ERIC:
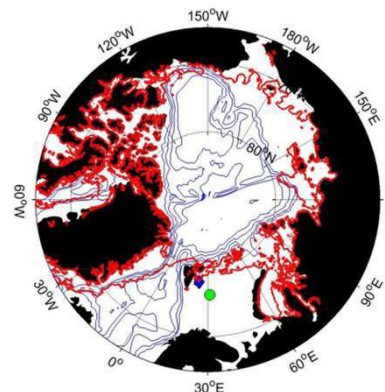- Needs definiton of threshold temperatures and layer depth of detection
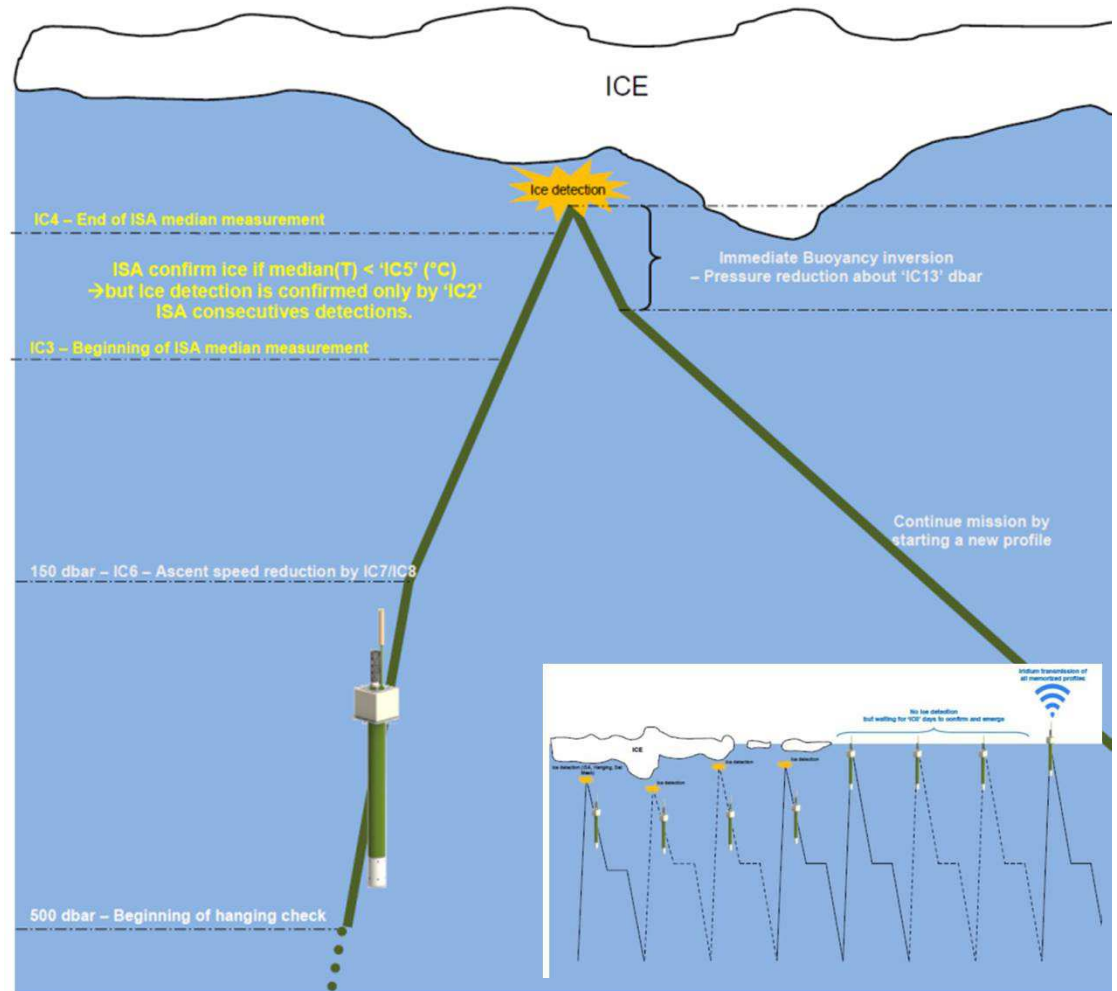
Work carried out in EU project MOCCA: Classify hydrographic data in the Arctic Ocean and subpolar areas with help of ice edge information , here example Barent Sea
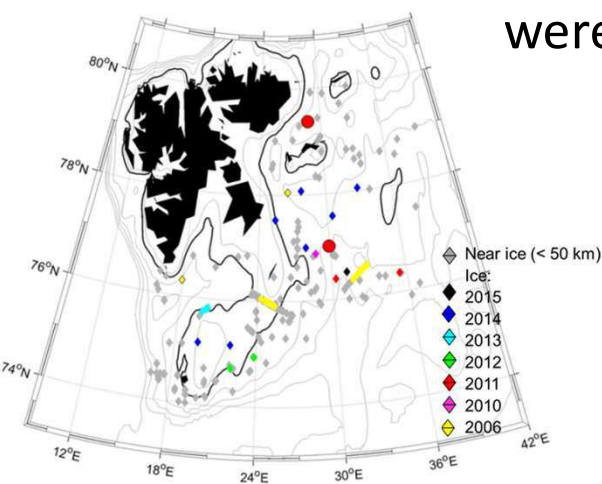

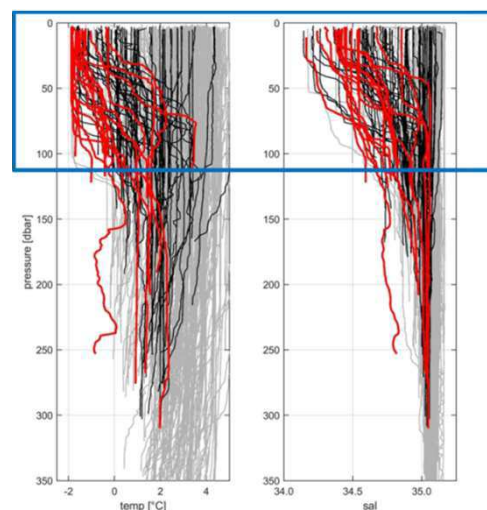Hydrographic profiles from **UDASH** (Behrendt et al., 2017) for the region of interest were compiled…

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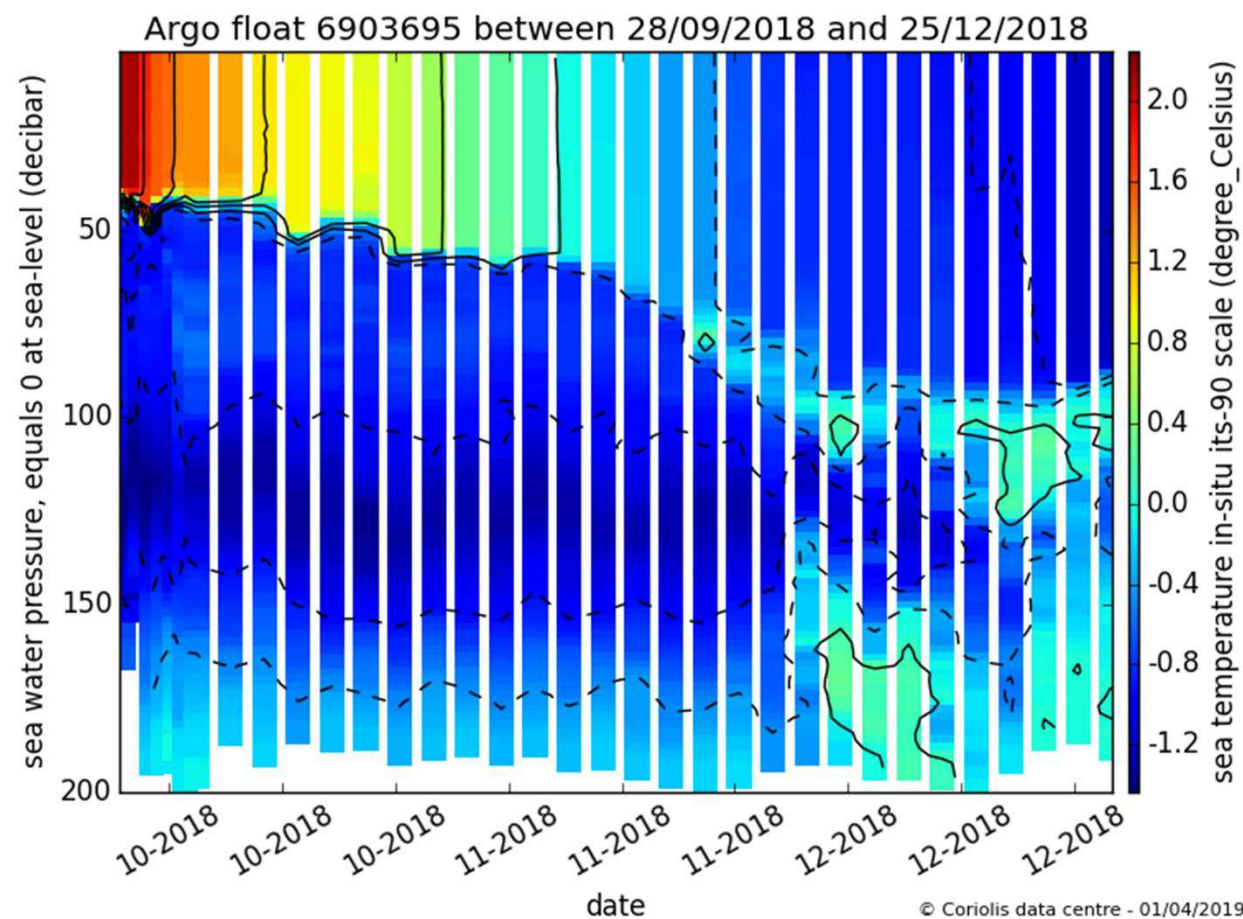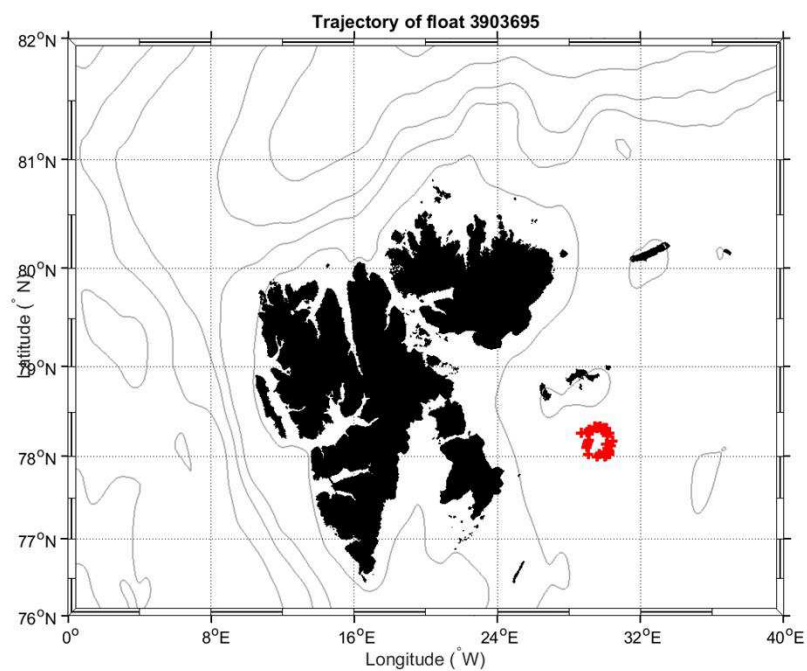and combined with **MASIE** ice information

From profiles in ice and near ice (< 50 km) typical conditions for ice sensing are derived.

**ISA:
temperature treshold: -1.0 °C in depth range 20-10 dbar**

Courtesy Katrin Latarius

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High Latitudes: Pilot deployments

Trajectory of float 3903695

Argo float 6903695 between 28/09/2018 and 25/12/2018

Courtesy Tero Purokoski

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High Latitudes: Pilot deployments

- Ice detection example : WMO 6902729 (North Svalbard area):
  □ ISA set to -1.6°C between 10 and 40 dbars
  □ Float under Ice (in and out) from April to October 2018

Courtesy Noé Poffa

Profile depth set to 500 m to avoid too many groundings
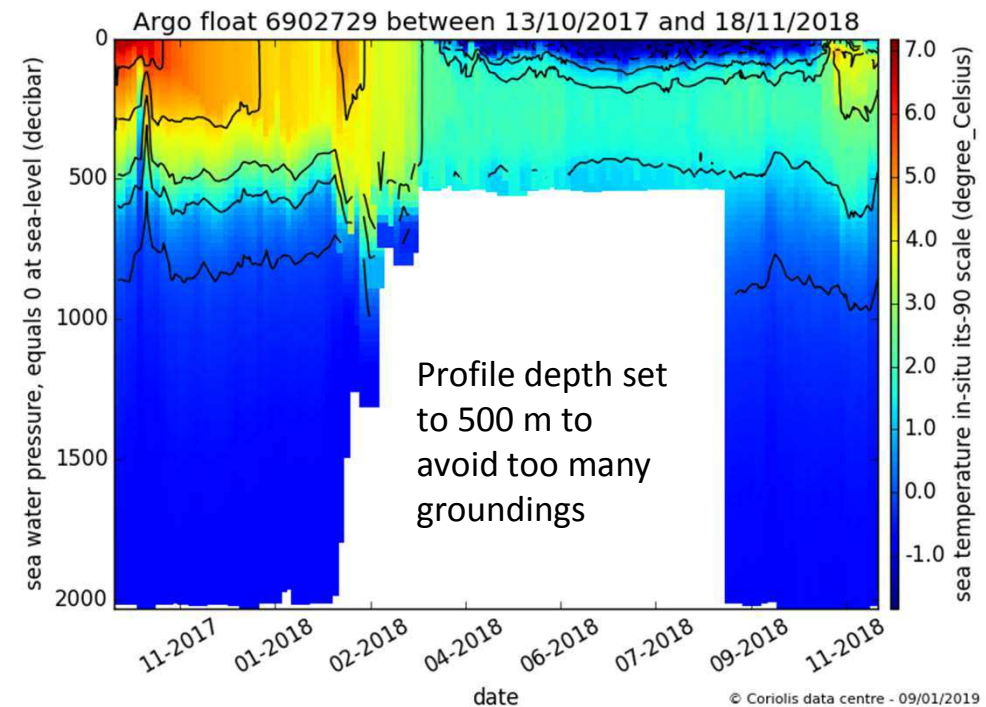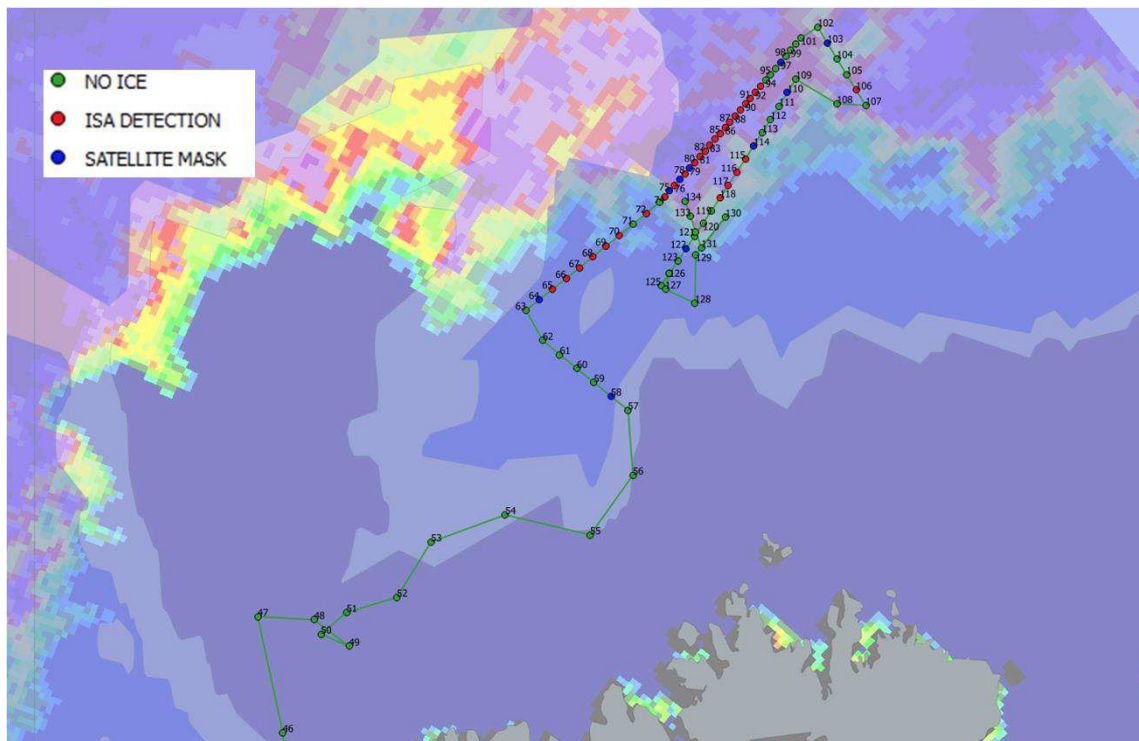
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Float trajectory and AMSR-2 image from 09/09/2018 (cycle #111) –Under ice positions extrapolated
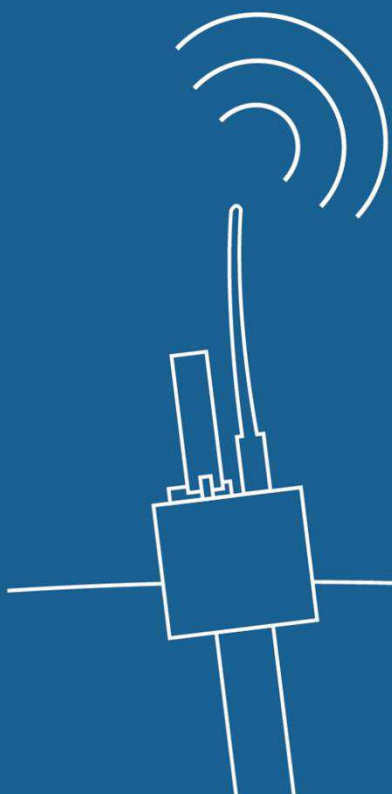
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