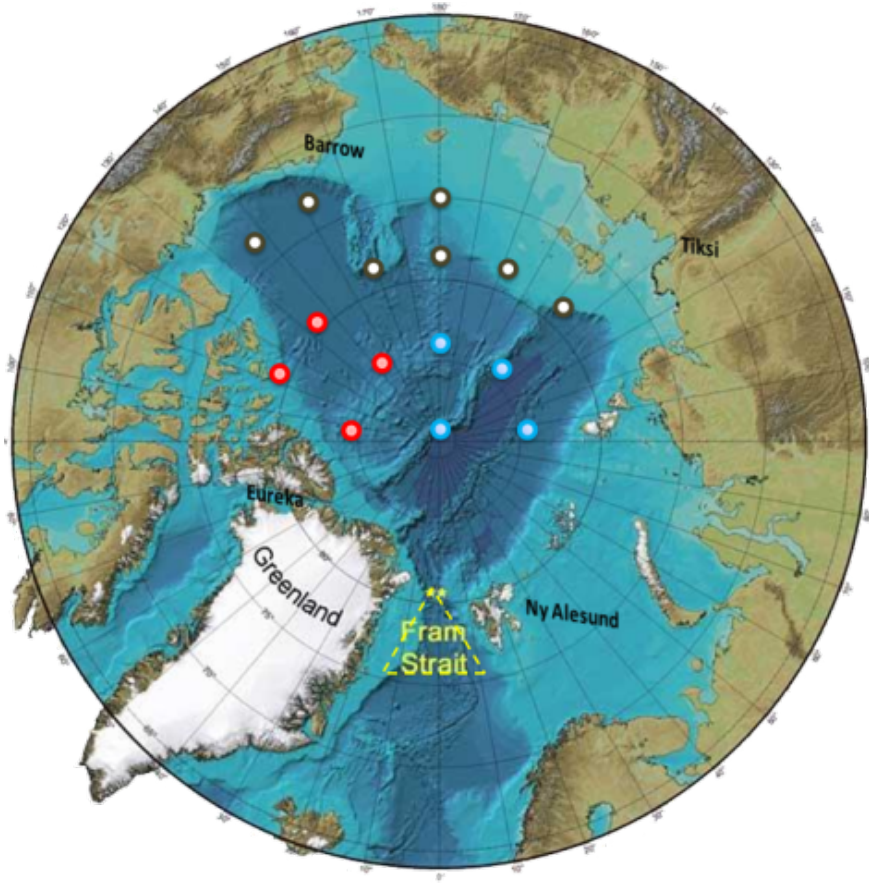
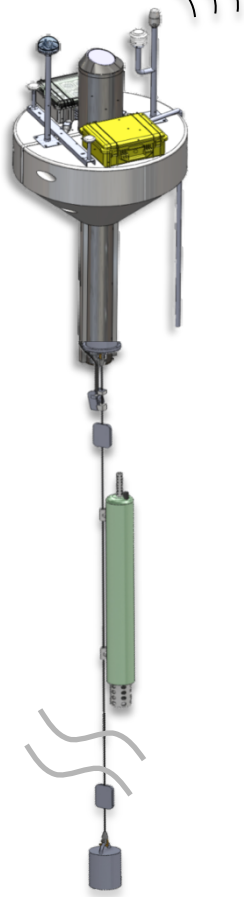
EQUIPEX **ANR-10-EQPX-32-01**

IAOOS 2011-2019

Ice Atmosphere Arctic Ocean Observing System





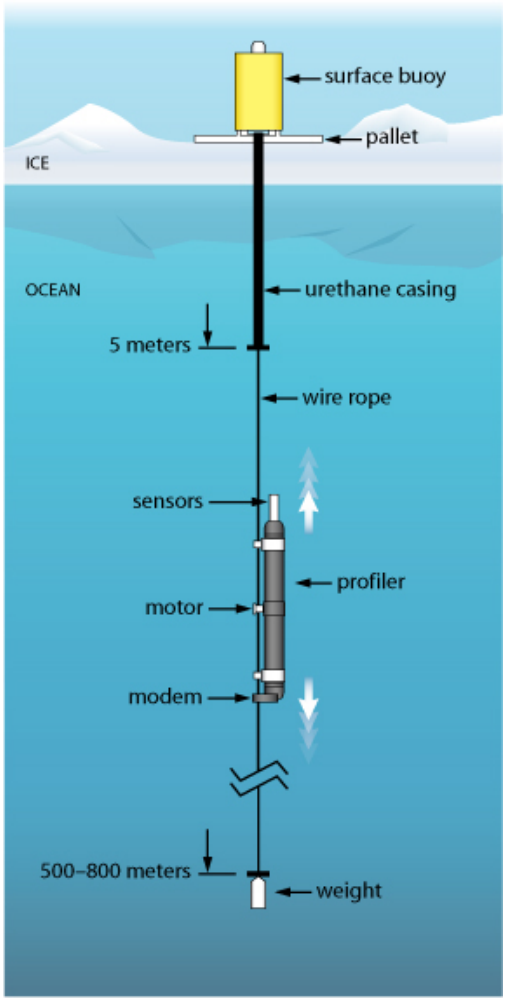
PI: C. Provost LOCEAN, J. Pelon LATMOS

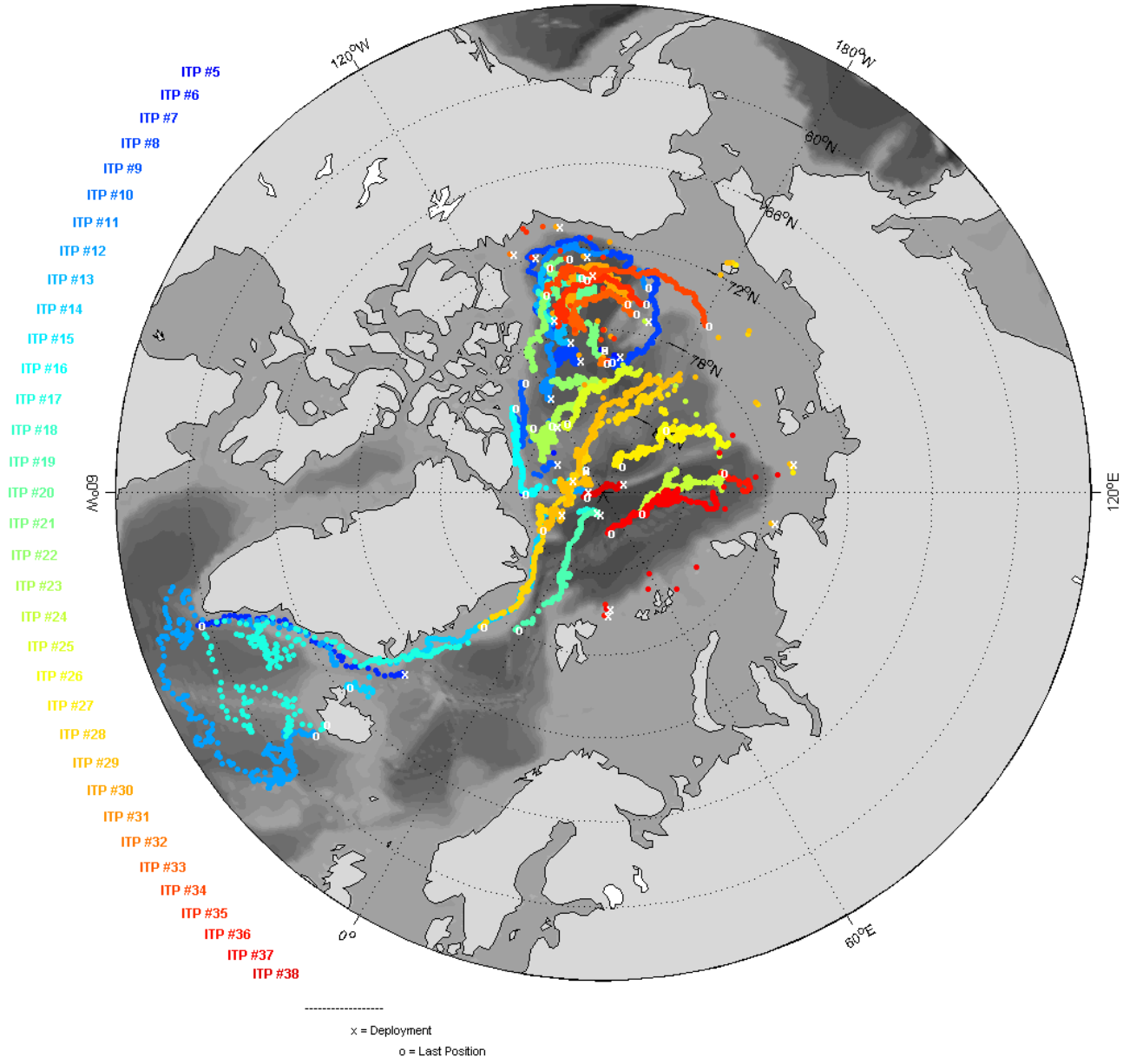
http://www.iaoos-equipex.upmc.fr/

IAOOS
Ice - Atmosphere - Arctic Ocean Observing System

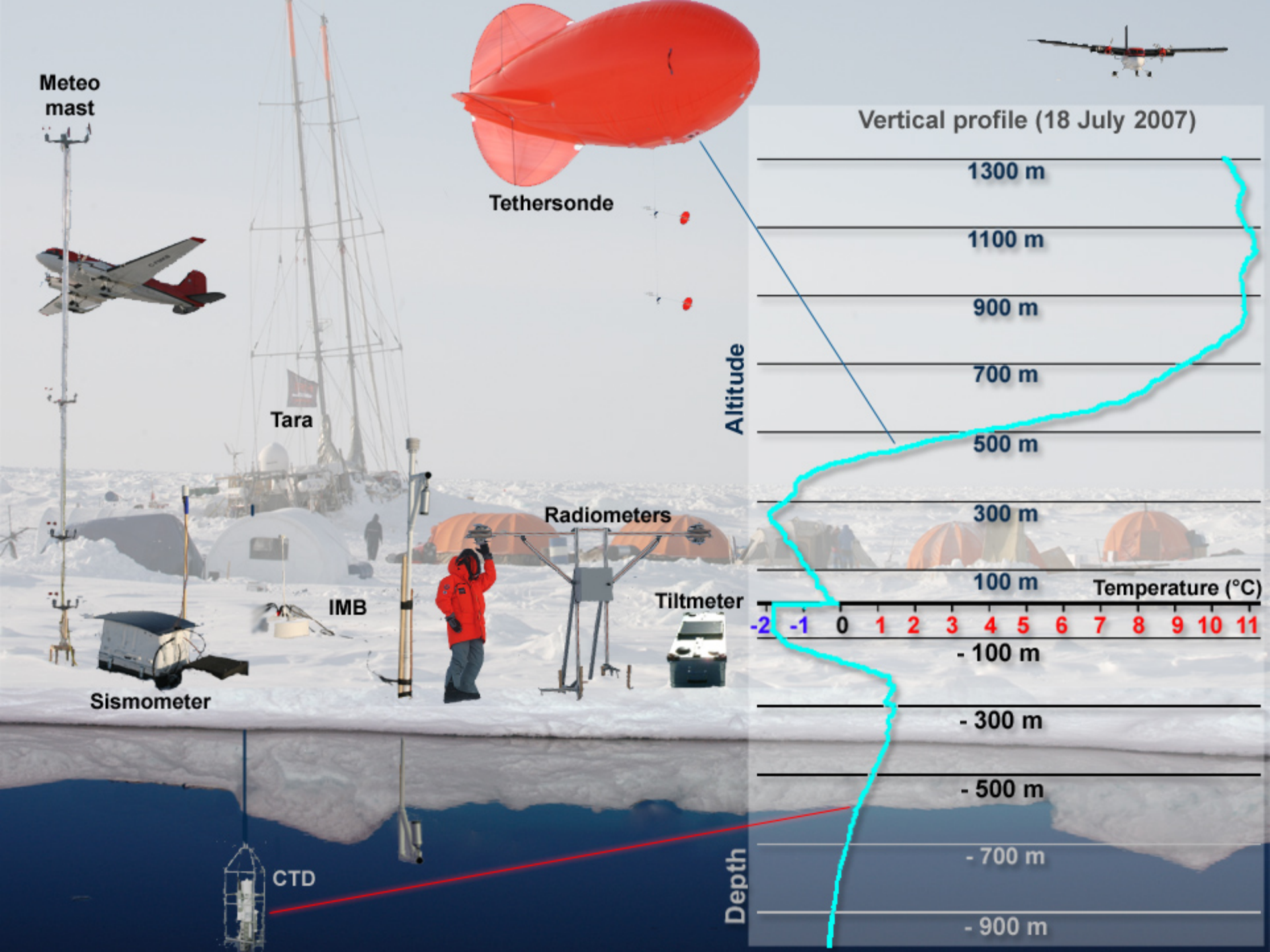
34 ITP

Ice Tethered Profilers
2006 – 2010 IPY

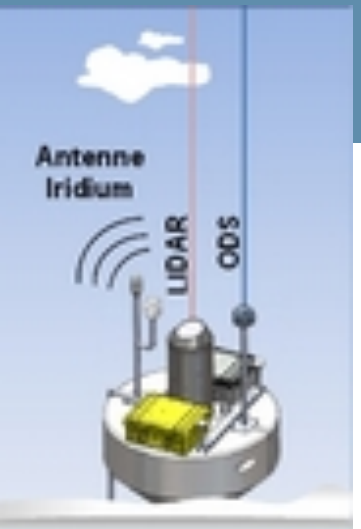


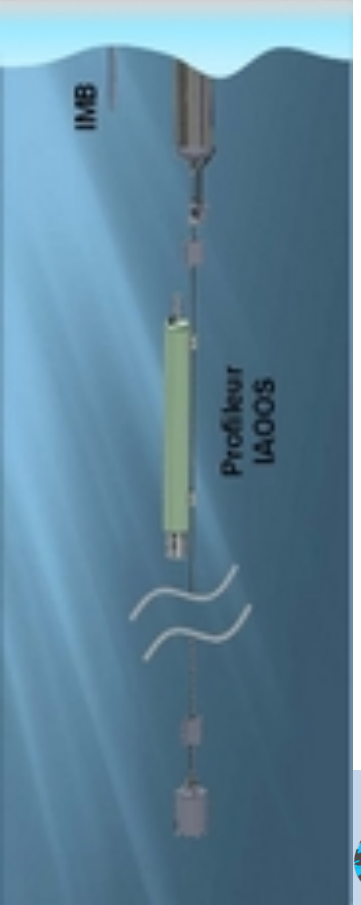


The Ice-Tethered Profiler data are collected and made available by the ITP program based at the Woods Hole Oceanographic Institution (http://www.whoi.edu/itp).
(35146 profiles by Nov 6 2011)

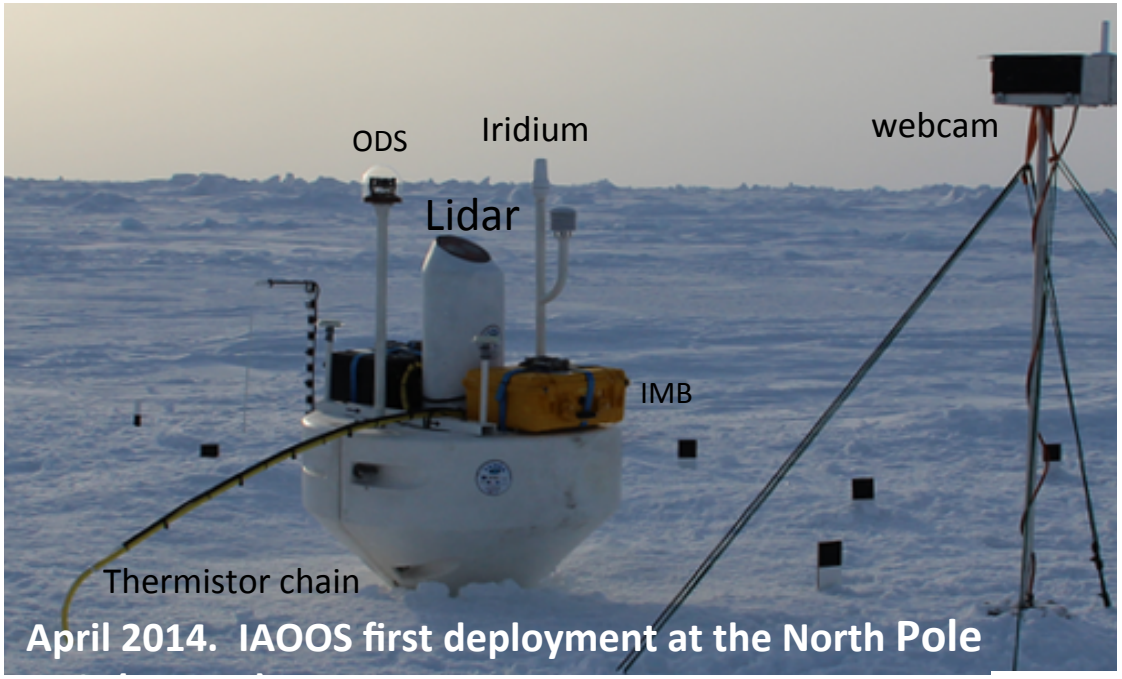

Meteo mast
Tethersonde
Tara
Radiometers
IMB
Tiltmeter
Sismometer
CTD
Vertical profile (18 July 2007)
Altitude
1300 m
1100 m
900 m
700 m
500 m
300 m
100 m
Temperature (°C)
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11
- 100 m
- 300 m
- 500 m
- 700 m
- 900 m
Depth

IAOOS (ice, atmosphere, ocean)



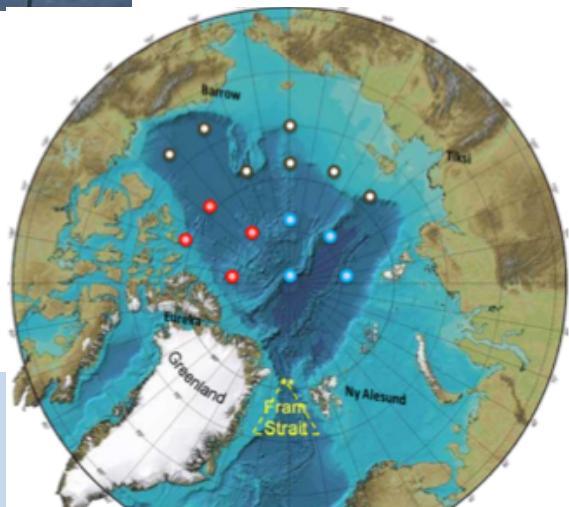


- Development& Tests **2012, 2013, 2014, 2015**



April 2014. IAOOS first deployment at the North Pole

- Full IAOOS Array deployment
  - **2016-2019**



IAOOS
Ice - Atmosphere - Arctic Ocean Observing System

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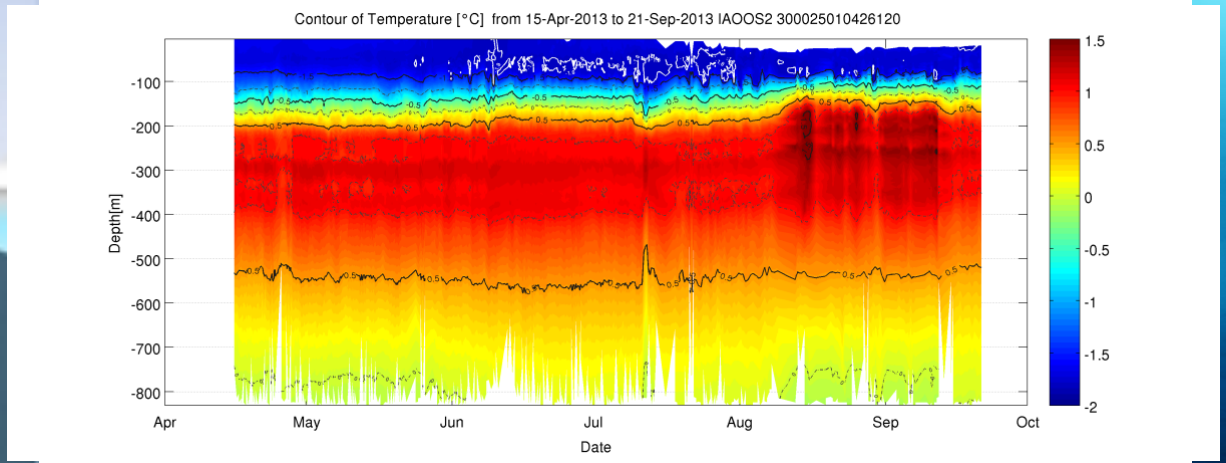
INVESTISSEMENTS D'AVENIR
ANR-10-EQPX-32-01

IAOOS
CTD ARGO-like Ocean Profilers
15 April – 21 September 2013



Sensor load (coll. with FP7 Ice-Arc)
On board the underwater Ocean profiler:

CTD-Dissolved Oxygen

Bio-optics–Rem A pack * (tested)

Nitrates (development)

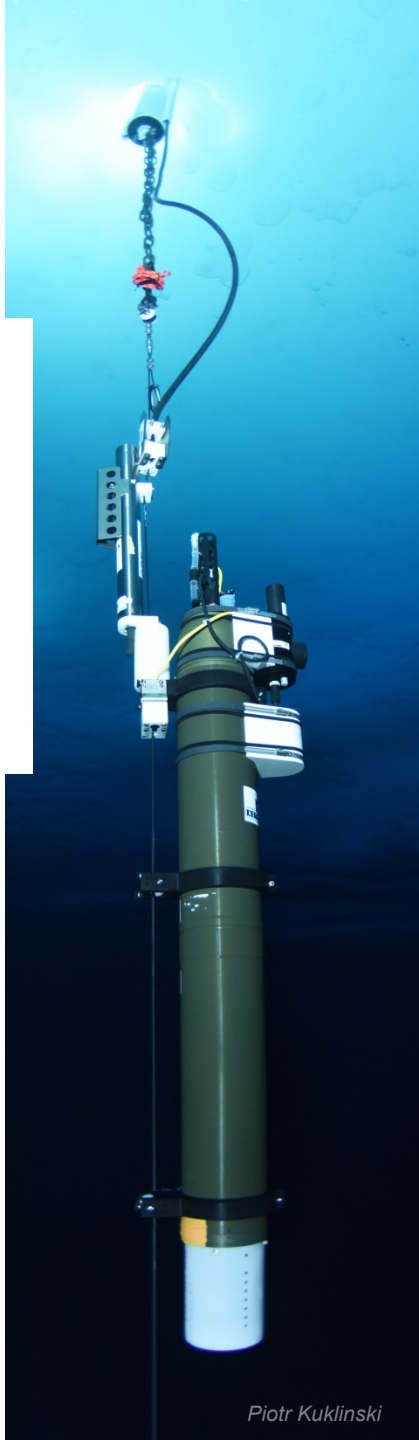
pH (development)

Aquascat (development)

below sea-ice (on board the surface buoy)

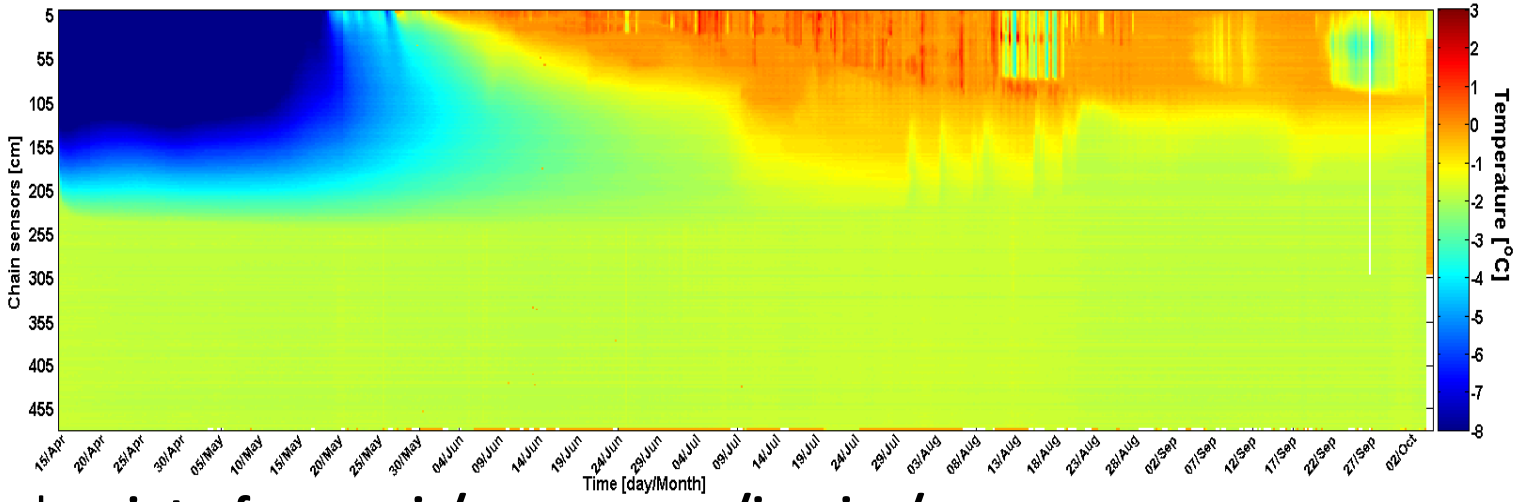
pCO2+pH (development)

* Radiometer (3 λ), Photosynthetic Active Radiation (400 –700 nm), Chlorophyll fluorescence, CDOM fluorescence, Backscattering detector (700nm)

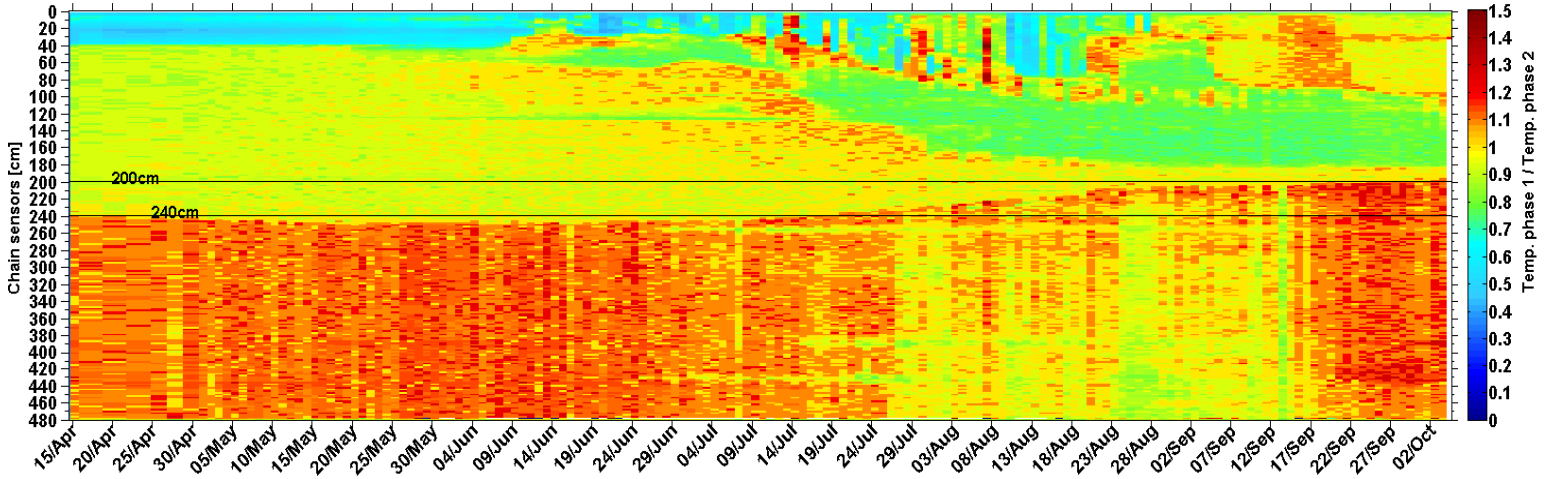


IMB SAMS : April – Sept. 2013. North Pole – Fram Strait

- Passive mode>>**Temperature**: air,**snow, ice and upper ocean**



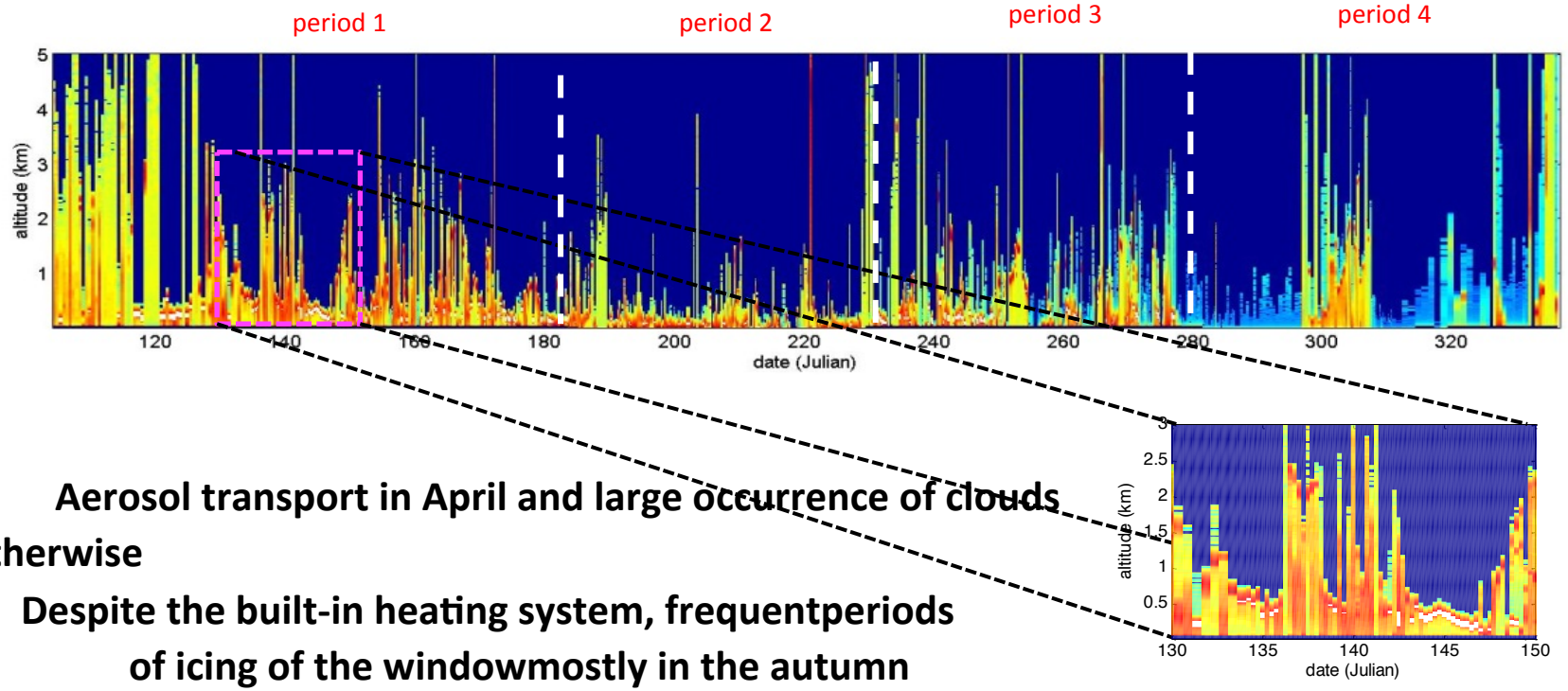
- Active mode>>**interfaces: air/snow, snow/ice, ice/ocean**



- **Sea-Ice freeboard/draft: IMB + ULS**

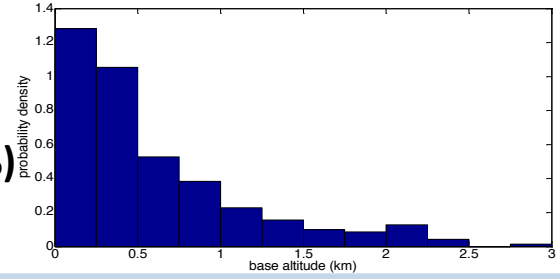
2014 drift : microLIDAR first results

- Set of profiles obtainedduringBarneo 2014 : 4 periodsdepending on buoy tilt

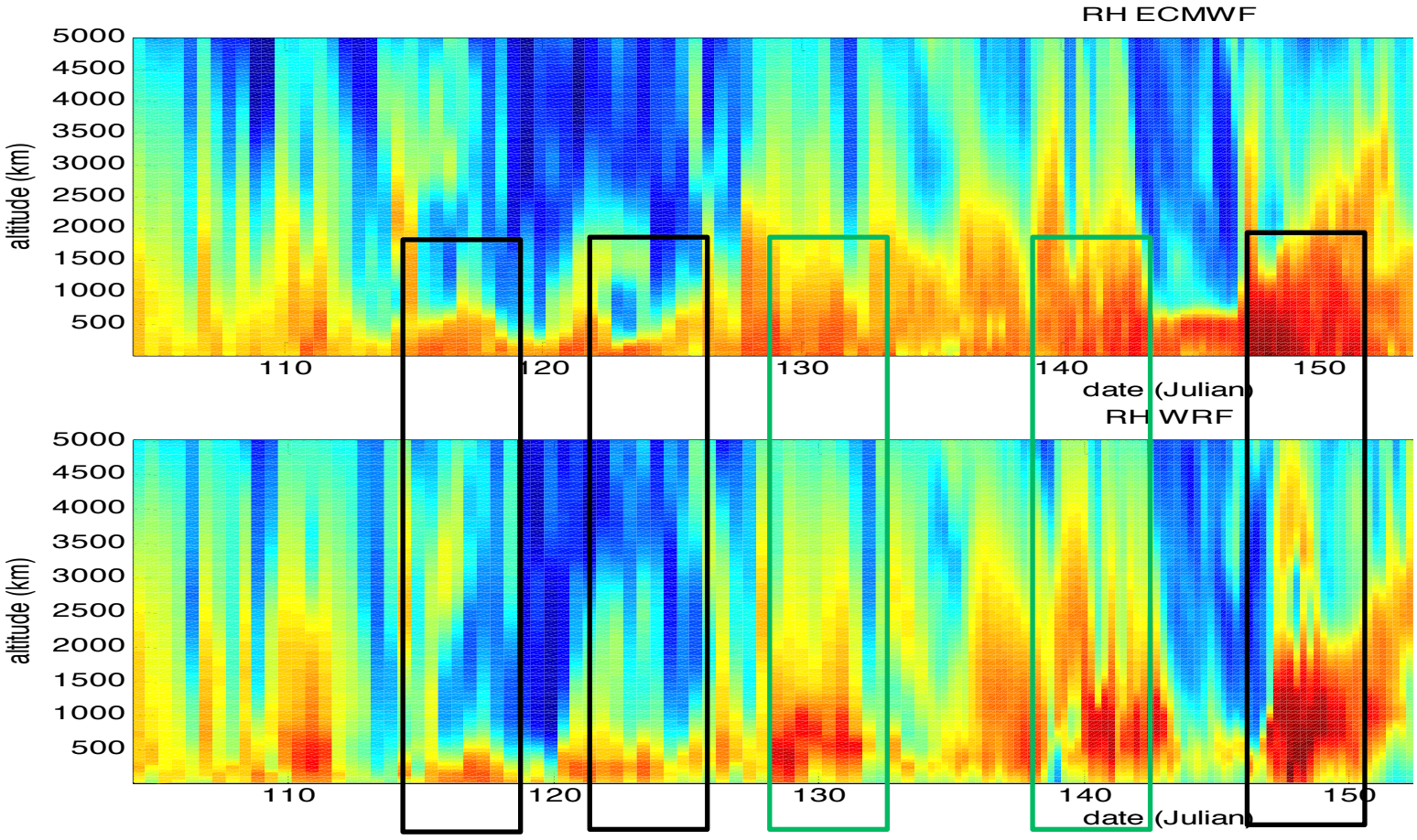


- Aerosol transport in April and large occurrence of clouds otherwise
- Despite the built-in heating system, frequentperiods of icing of the windowmostly in the autumn

- Cloudiness monitoring stilleasilyfeasible (signal threshold) :
  - high occurrence of verylow dense clouds below 1 km (~60%) (largerthanfrompreviouscampaign (SHEBA))



Humidity (ERA-I and WRF/GFS)



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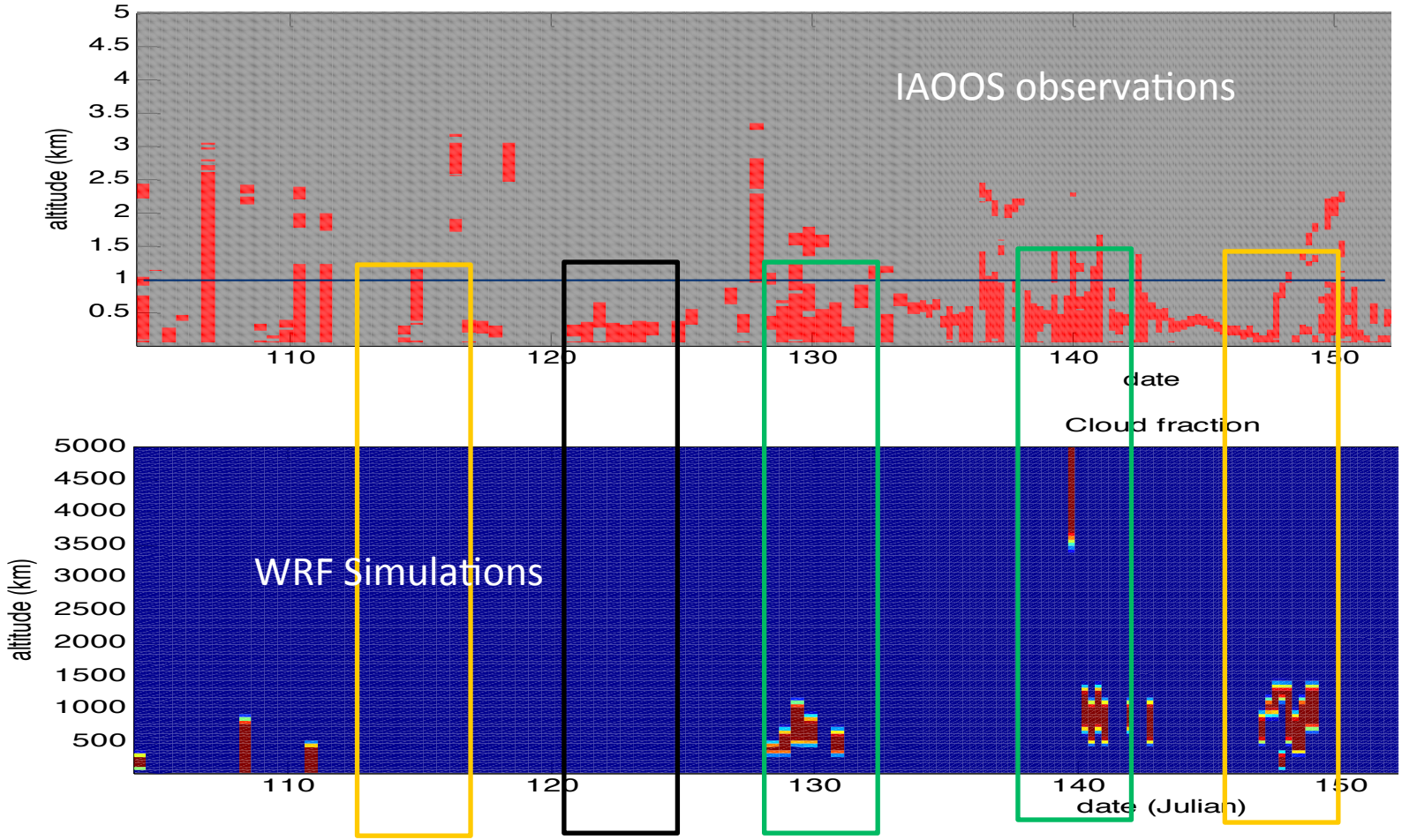
OK

Atmospheric Simulations (WRF)
Cloud fraction (April-June 2014)



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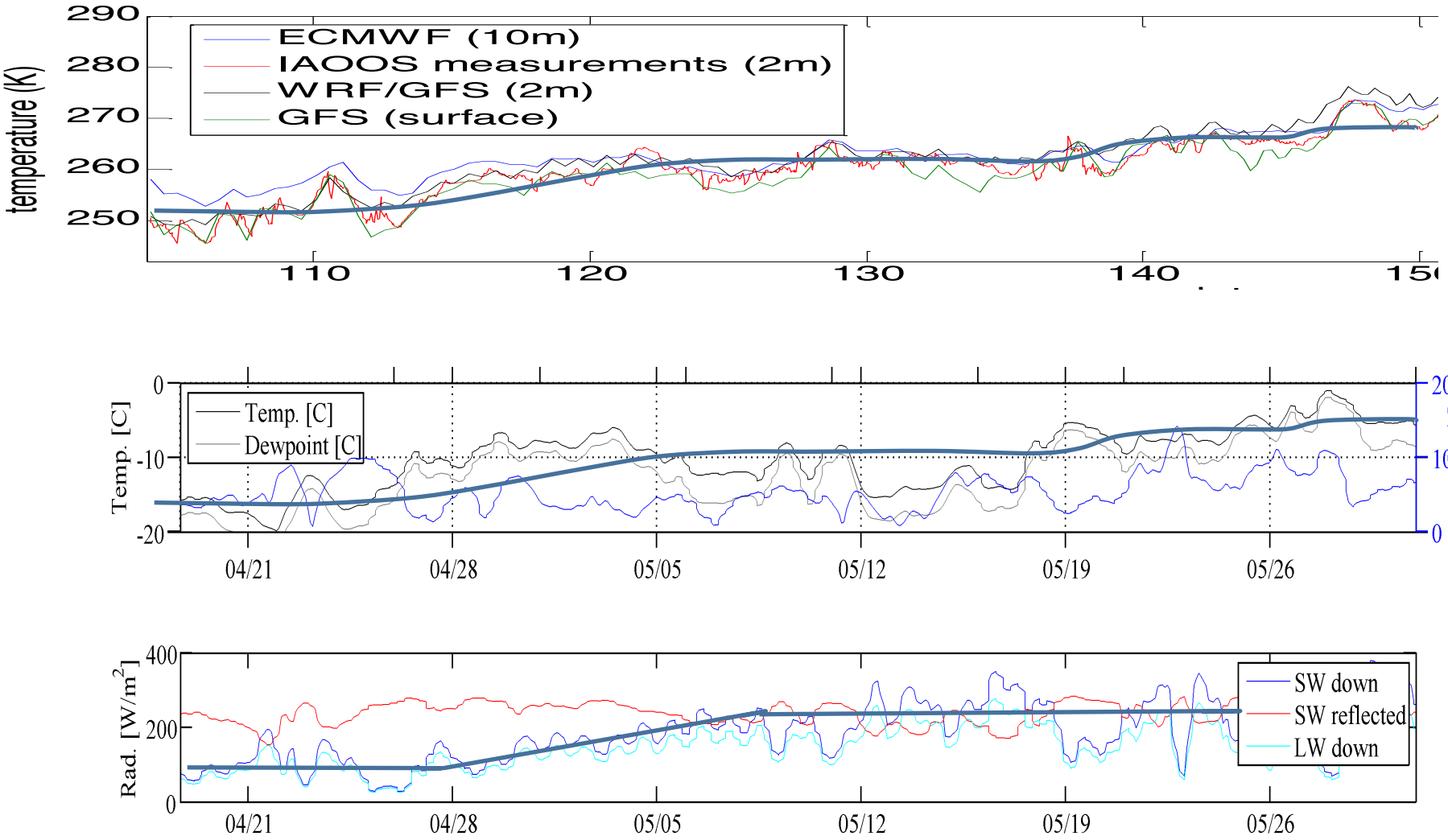
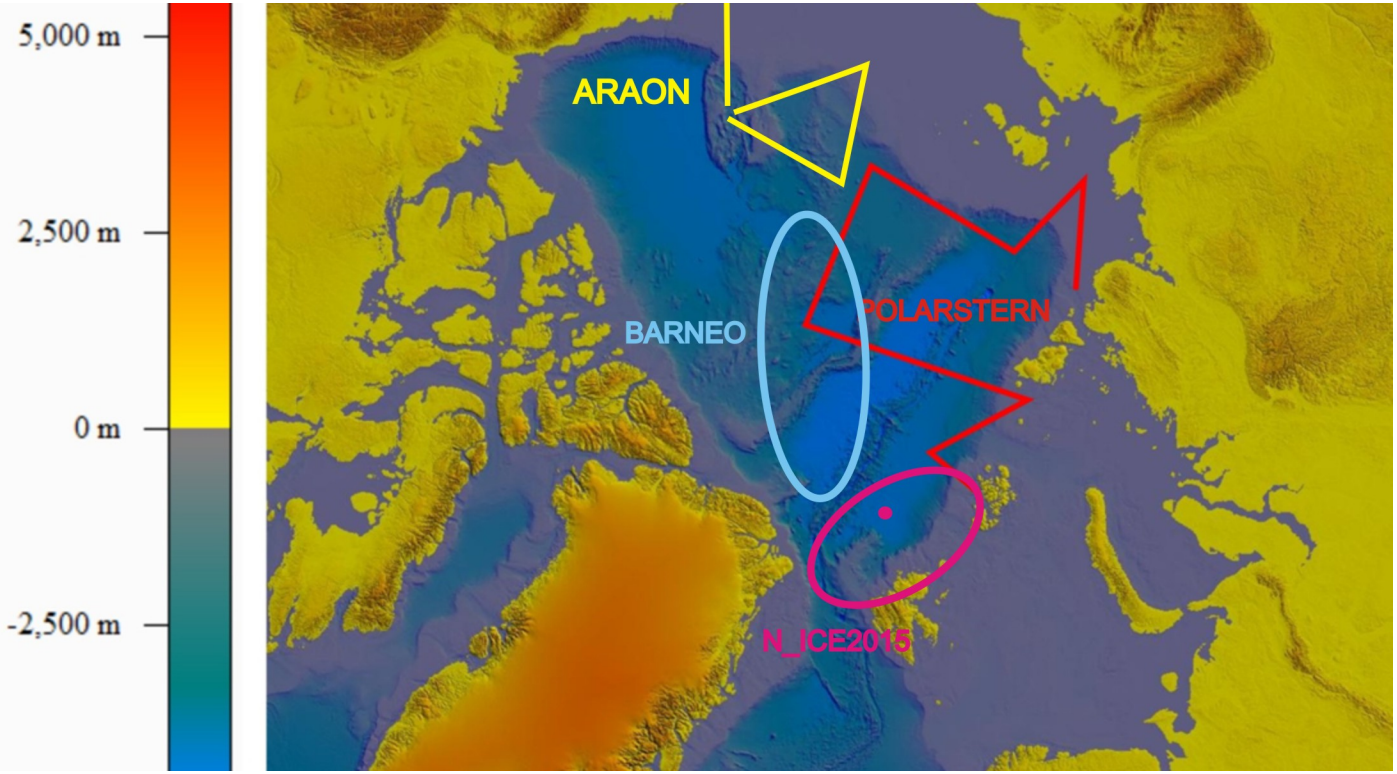
Comparison of Measured/Analyzed Surface Parameters



2015-2016 : starting the IAOOS array deployment



While pursuing technological developments (new sensors, icing, energy, transmission)

IAOOS contributions to YOPP

IAOOS General areas of interest: Atmosphere, sea ice and Ocean Observing for modelling

The atmospheric and oceanic boundary layers
The energy budget of sea ice and snow
Ocean biogeochemistry
Atmospheric chemistry (aerosols)
Clouds

IAOOS Specific areas of interest: process studies for understanding air-sea-ice interactions and parameterisation for modelling

Sea-ice thickness distribution
Sea ice freeboard
Brines release in the ocean and in the atmosphere (frost flowers)
Frazil ice formation (deep ice)
Upper ocean processes
Double diffusive convection in the main ocean thermocline
Mixed phase clouds
Optical depth (atmosphere)

Expectations and Recommendations for YOPP

1/ Strong coordination for air-sea-ice interaction process studies in polar regions? Developing synergies between disciplines.
2/ Optimal definition for key variables (ECV) to be observed and assimilated in models (sampling schemes both in time and space for upper ocean, ice and lower atmosphere) for polar regions
3/ Strong integration between observations and modelling activities in polar oceans
4/ Strong interaction between in situ observations and space observations (ground truth, cal/val etc..) for supporting polar research activities
5/ Strong support for new sensors and new technology development including polar ocean biogeochemistry and atmospheric chemistry
6/ Strong support for autonomous, unattended and automated ice tethered drifting stations
7/ Strong support for international coordinated activities in polar regions
8/ Strong support for dedicated field work experiments (Arctic Drift) aiming at improving understanding of key processes driving weather and climate in polar regions at Pan Arctic (Antarctic) to hemispheric scales
9/ Strong involvment of Arctic local communities in YOPP activities
10/ Strong involvment of young scientists (APECS) in YOPP activities

IAOOS contribution to YOPP

Lagrangian composite daily vertical profiles of ECV throughout the upper ocean, sea-ice and lower atmosphere based on **15 co located atmosphere-ice-ocean observing stations** (the IAOOS platform) deployed in the deep basin of the Arctic Ocean for 4 years (2016-2020)

IAOOS expectation for YOPP

Data sharing for developing **synergies** between oceanographers, meteorologists, glaciologists for process studies and data assimilation in large scale numerical models

How YOPP could help in the process?

IAOOS recommendation to YOPP

YOPP focusing on **linkages** between polar regions and mid latitudes rather than limited to polar issues per se.

Polar research being isolated in the past, is not the case anymore.

Is there an ENSO equivalent for the Northern hemisphere? Emphasizing bipolarity aspect.

What about the trigger hypothesis: The Barents Low, The Greenland High, the Siberian Snow……

Thank you