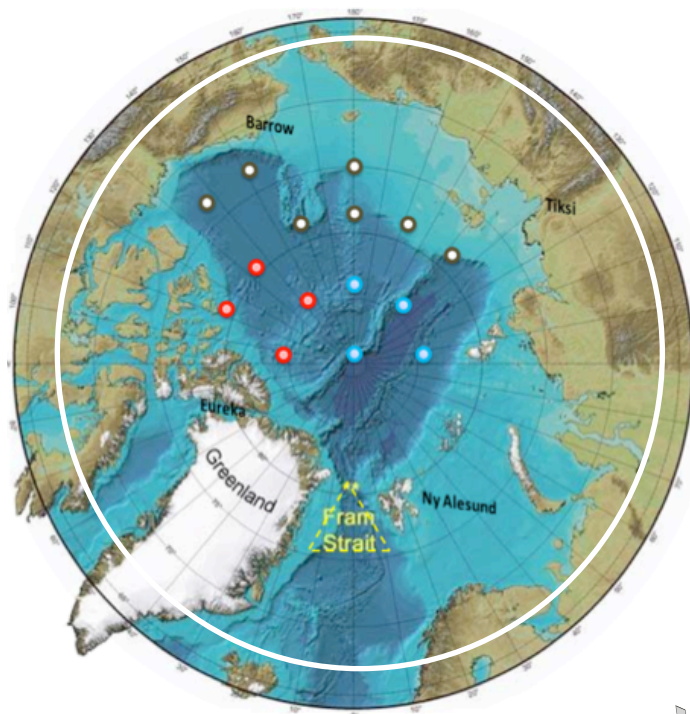
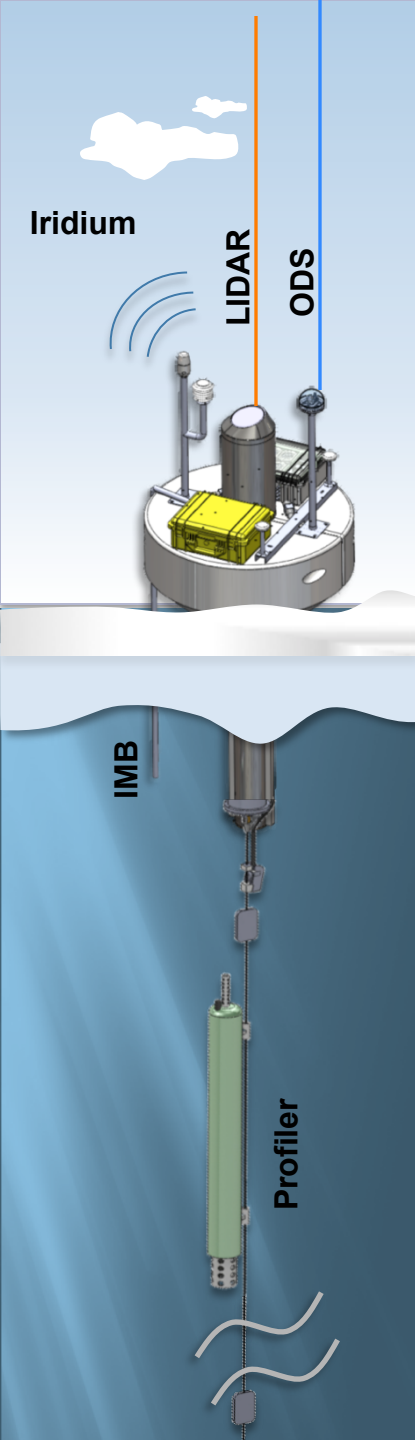
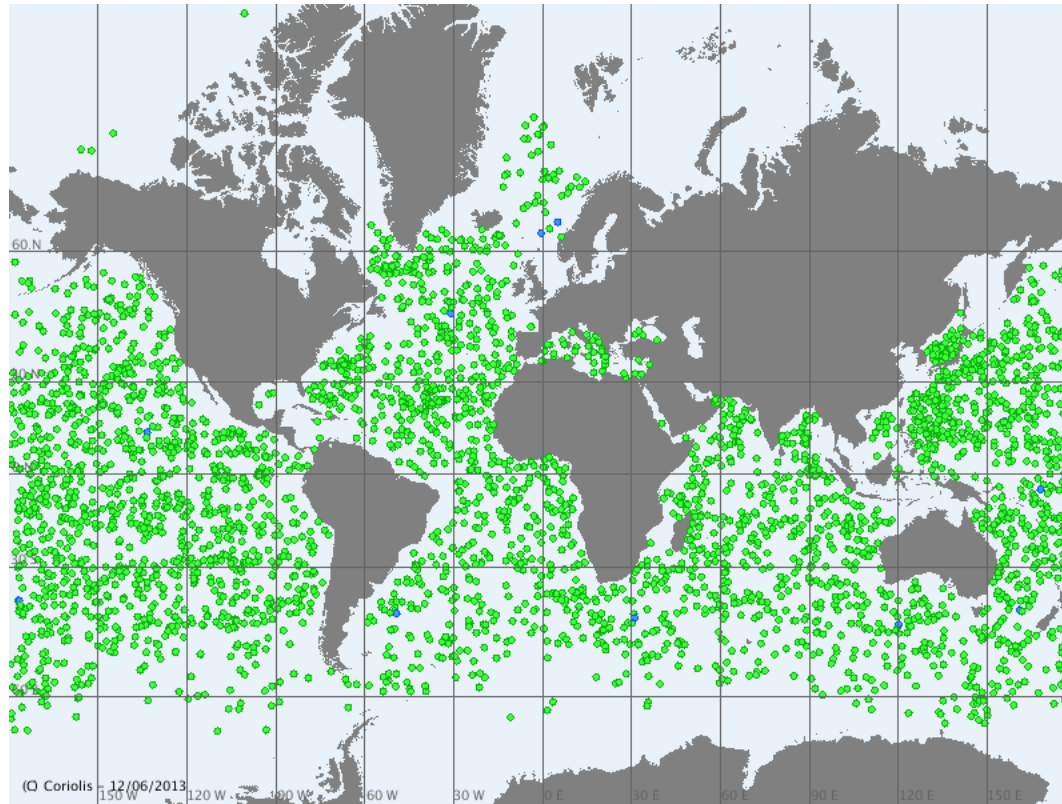
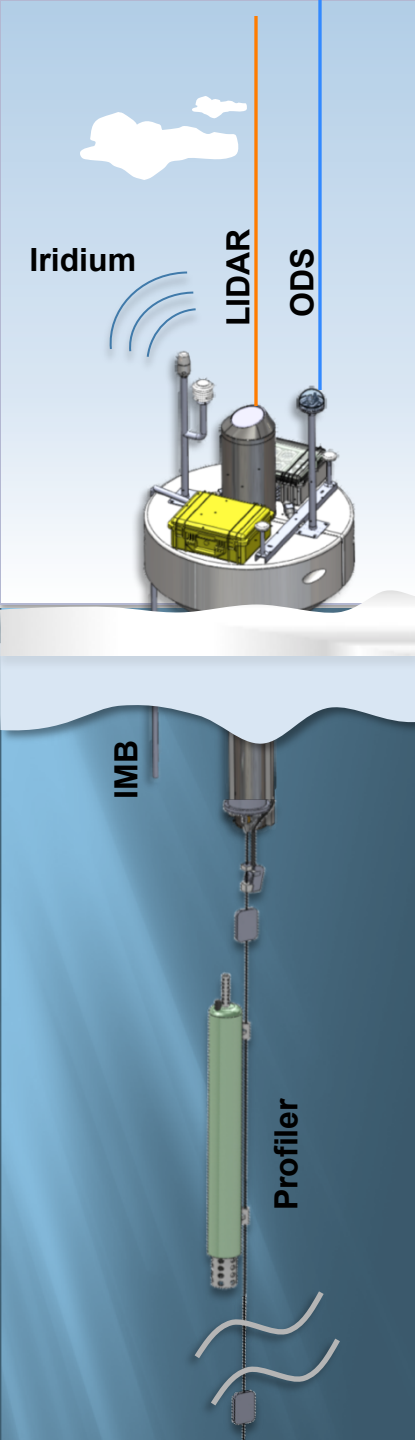


# ARGO Floats in the Arctic: Contribution of the IAOOS project

Euroargo - June 2013



# ARGO



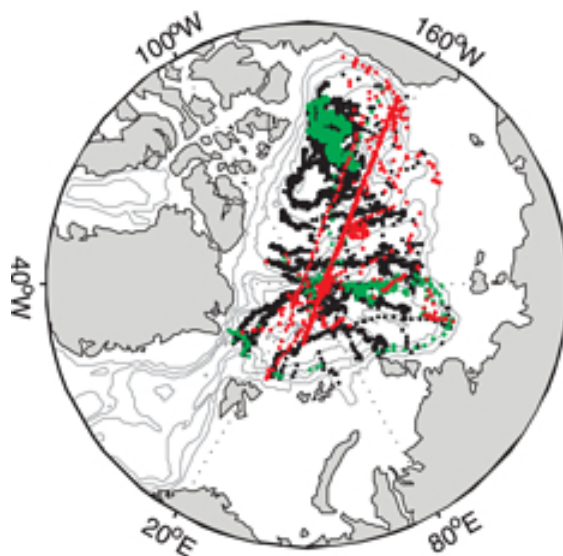
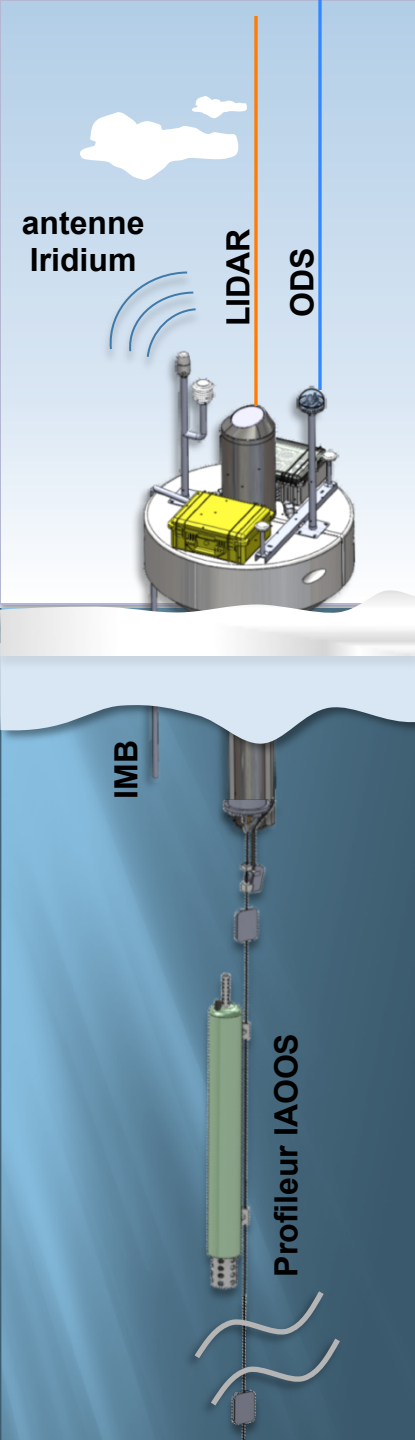
**T, S profiles Last 30 days    source: Coriolis**  
**3000 floats 1 profile/ 10 days**



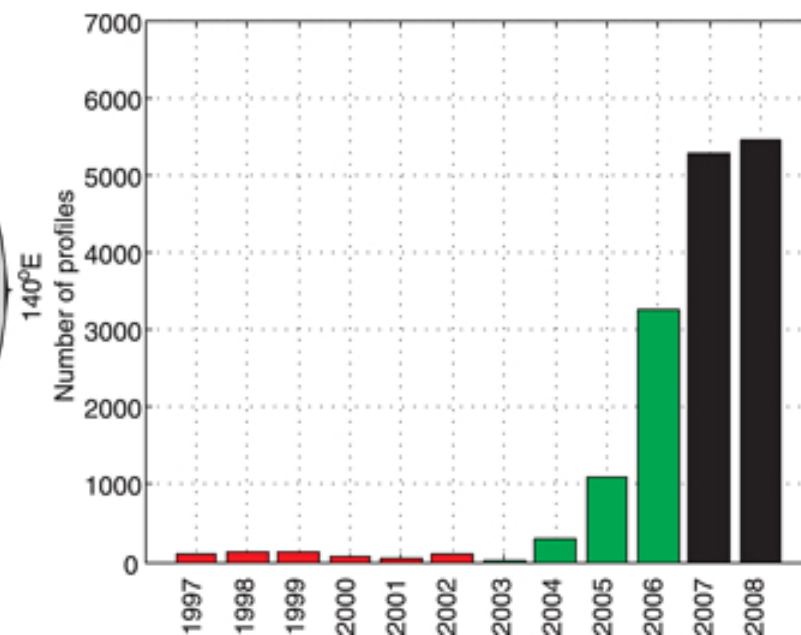
# OCEAN

ANR-10-EPX-32-01

Arctic ocean ice-covered – at least half of the year  
solution ITP Ice Tethered Platform  
Big success IPY, EU Damocles...

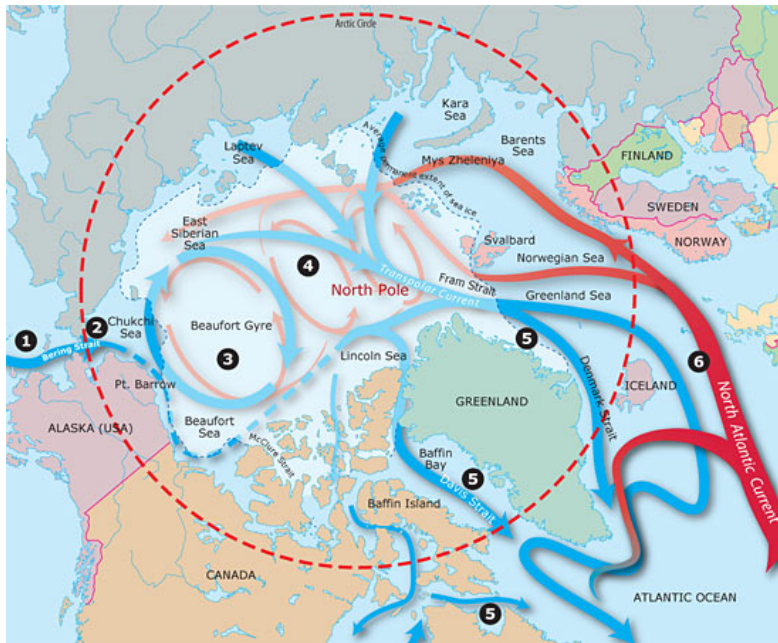


T S profiles spatial distribution



number of profiles per year

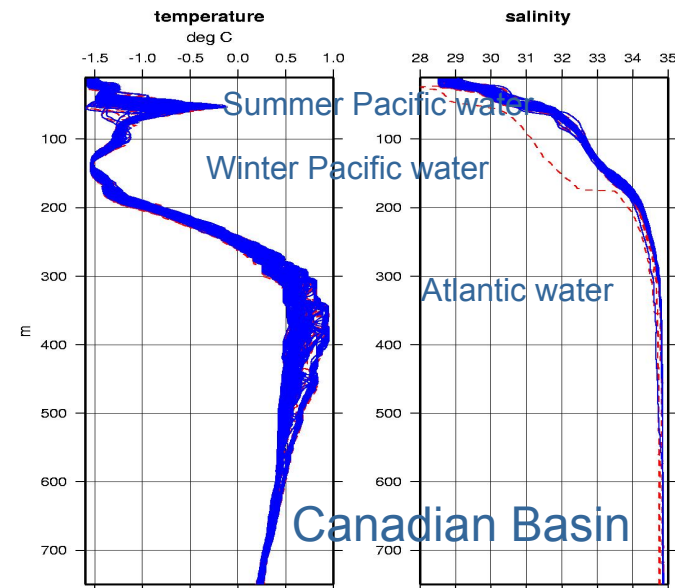
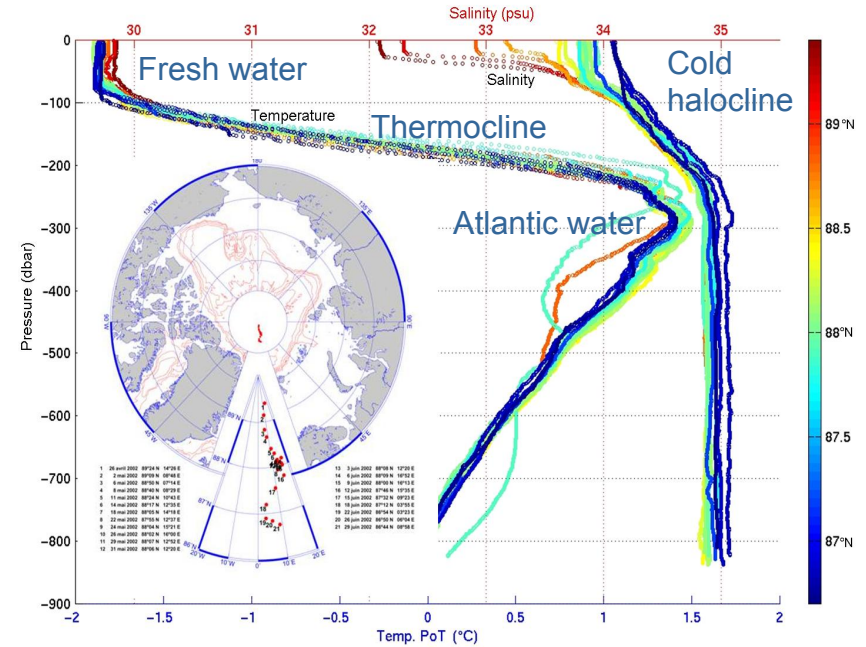
Bourgain and Gascard, 2012



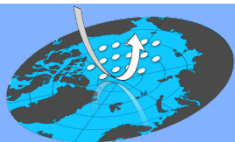
Circulation in the Arctic ocean  
(WHOI site)

Water mass distribution

Ocean – heat content  
Stratification : halocline  
Fresh water content



*Damocles*



**IAOOS**

Ice • Atmosphere • Arctic Ocean Observing System

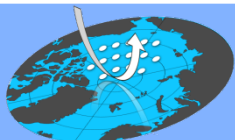
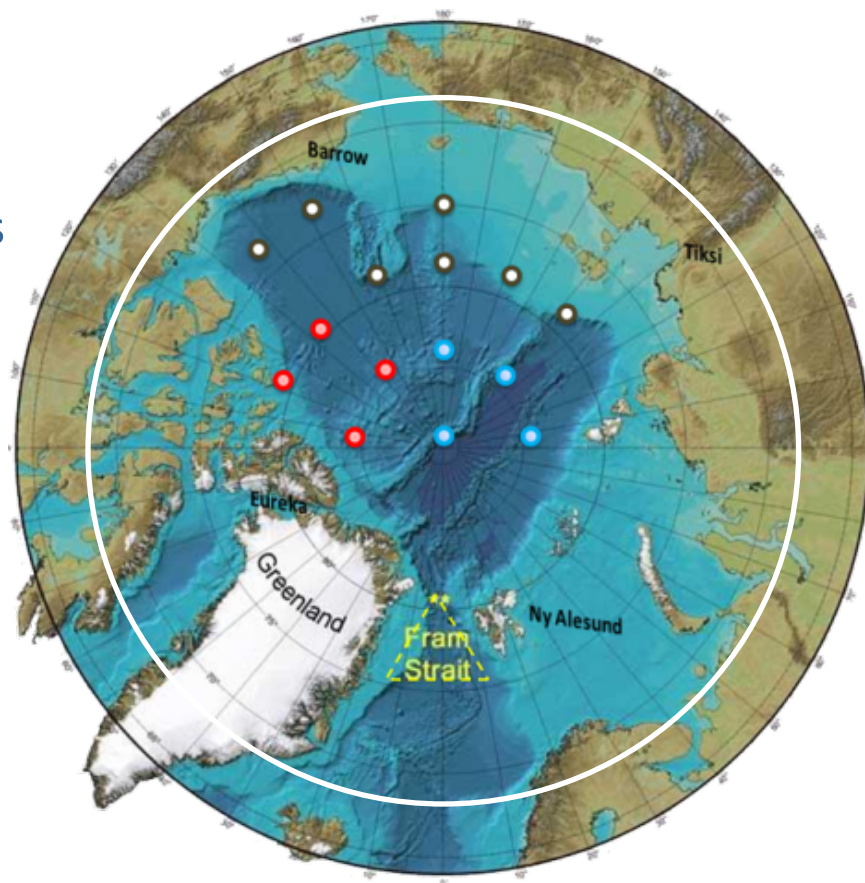


# IAOOS project: Ice Atmosphere Ocean Observing System

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

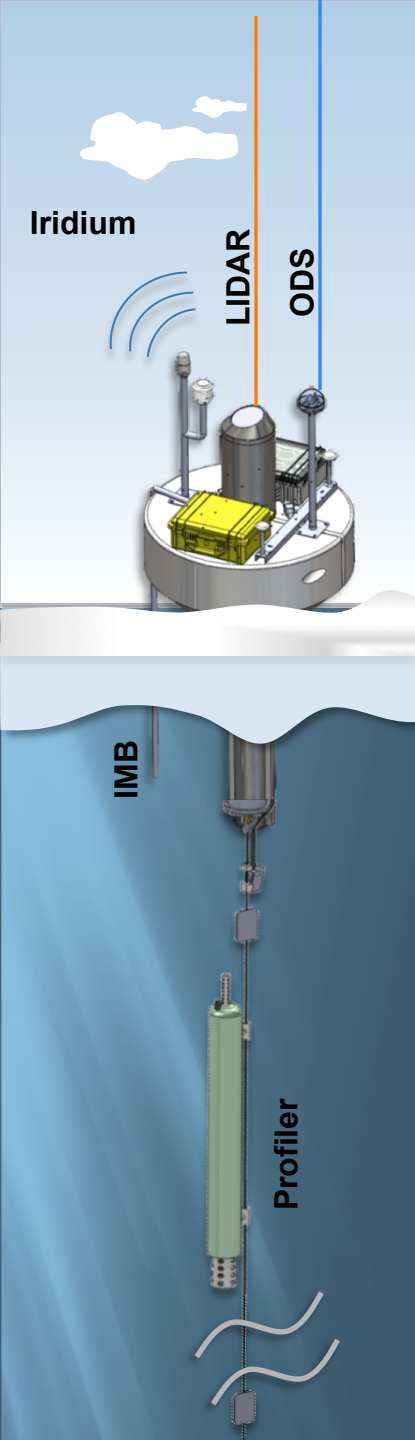
- Complementary to satellite observations
- Better understanding of interactions
- feed operational models
- Improve predicting capabilities



**IAOOS**

Ice - Atmosphere - Arctic Ocean Observing System





**Observing system** : array of 15 autonomous drifting platforms ocean ice atmosphere operating during 5 years.

Autonomy : 2 years

>>> **total 40 platforms.**

**≠ maturity instruments**

**Ocean ice** : *improve reliability (LOCEAN)*

- \* ice :IMB from SAMS string of thermistors and heaters 5 m
- Ocean profiler: 7 – 800m NKE

**Atmosphere** ( development) **(LATMOS J. Pelon)**

- Microlidars - T, conso, f optical window
- ODS Optical depth sensor

**Integration (DT-INSU M. Calzas)**

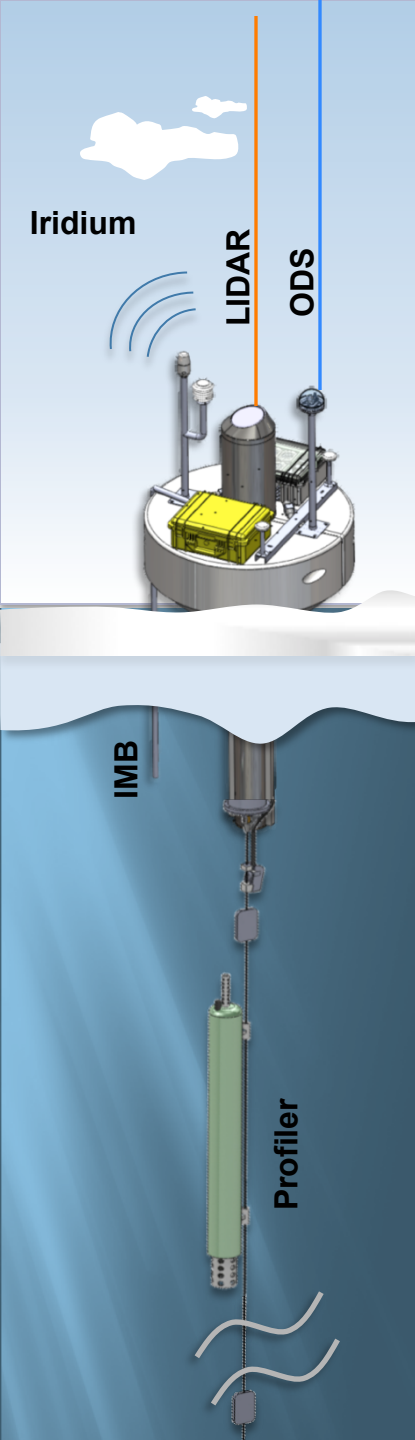
**communication- reception – data centres(IPEV & ICARE)**

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



**IAOOS**

Ice - Atmosphere - Arctic Ocean Observing System



- **Ice and ocean measurements :**

building upon technological developments and experience

acquired during the 4th IPY, EU project Damocles, EU-project ACOBAR :

- Ice Mass Balance: IMB- **SAMS**  
6 m long chain- thermistors and heaters- 2 cm resolution  
(air, snow, ice, upper ocean)
- Ocean profilers: 7 - 800m **NKE**  
Argo technology

### **Specific developments for IA00S:**

- thinner tube wall (> more batteries)
- frictionless gliding system
- Communication with surface buoy through inductive link- Rudics
- HF (1 to 2 profiles / day)
- autonomy

<http://www.ia00s-equipex.upmc.fr/>



**IA00S**

Ice - Atmosphere - Arctic Ocean Observing System

## **Planning** : technological development (3 years)- array deployment.2014

**2012:** - 1 ocean platform (acoustic: ACOBAR)- ice deployed in April at the North Pole, retrieved in October Fram Strait 6 month drift.

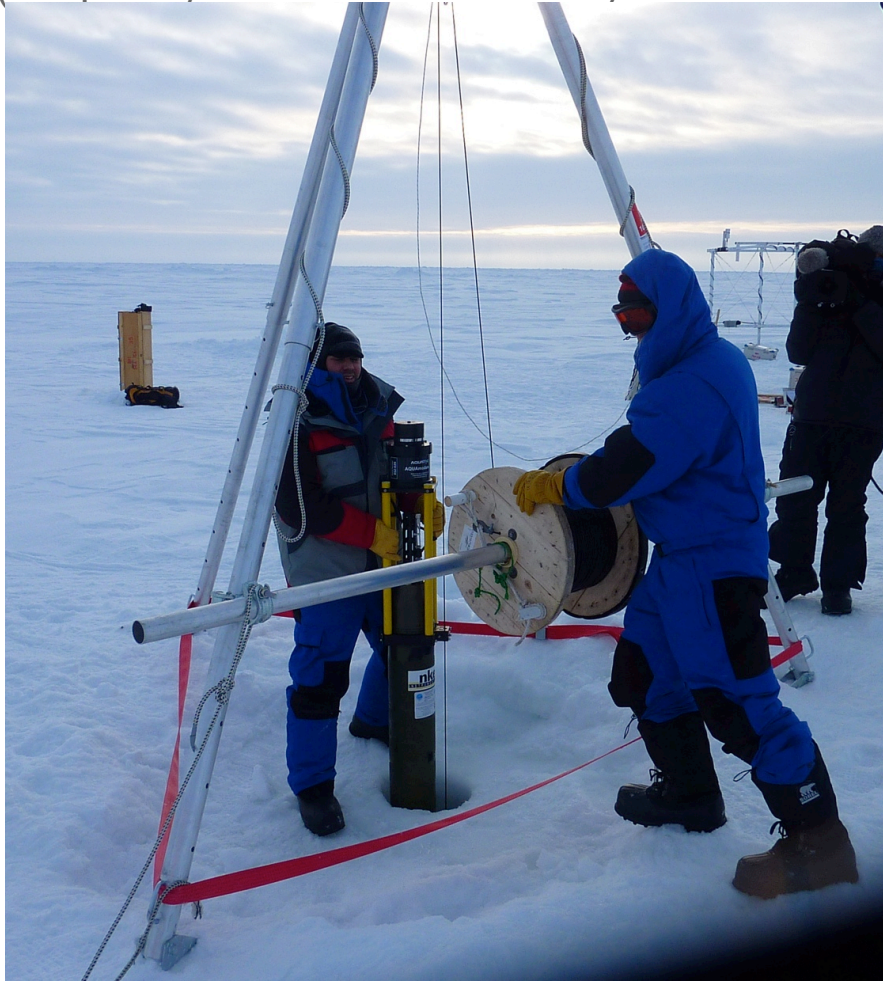
- IAOOS profiler specifications – Negotiation with NKE  
2 prototypes + 13 profilers/ year during 3 years

**2013:** -2 prototypes profilers (mars, mai) (tested Ifremer pool, water-filled quarry)  
- 3 platforms installed at the North Pole in April 2013 (2 ACOBAR, 1 IAOOS)  
- Recovery cruise in Fram Strait in September KV Svalbard.

**collaboration LOCEAN, DT- INSU Brest, IPEV, NKE**

# April 2012: - IAOOS/ACOBAR

Ocean—ice platform deployed at the North Pole  
(temporary russian base Barneo)



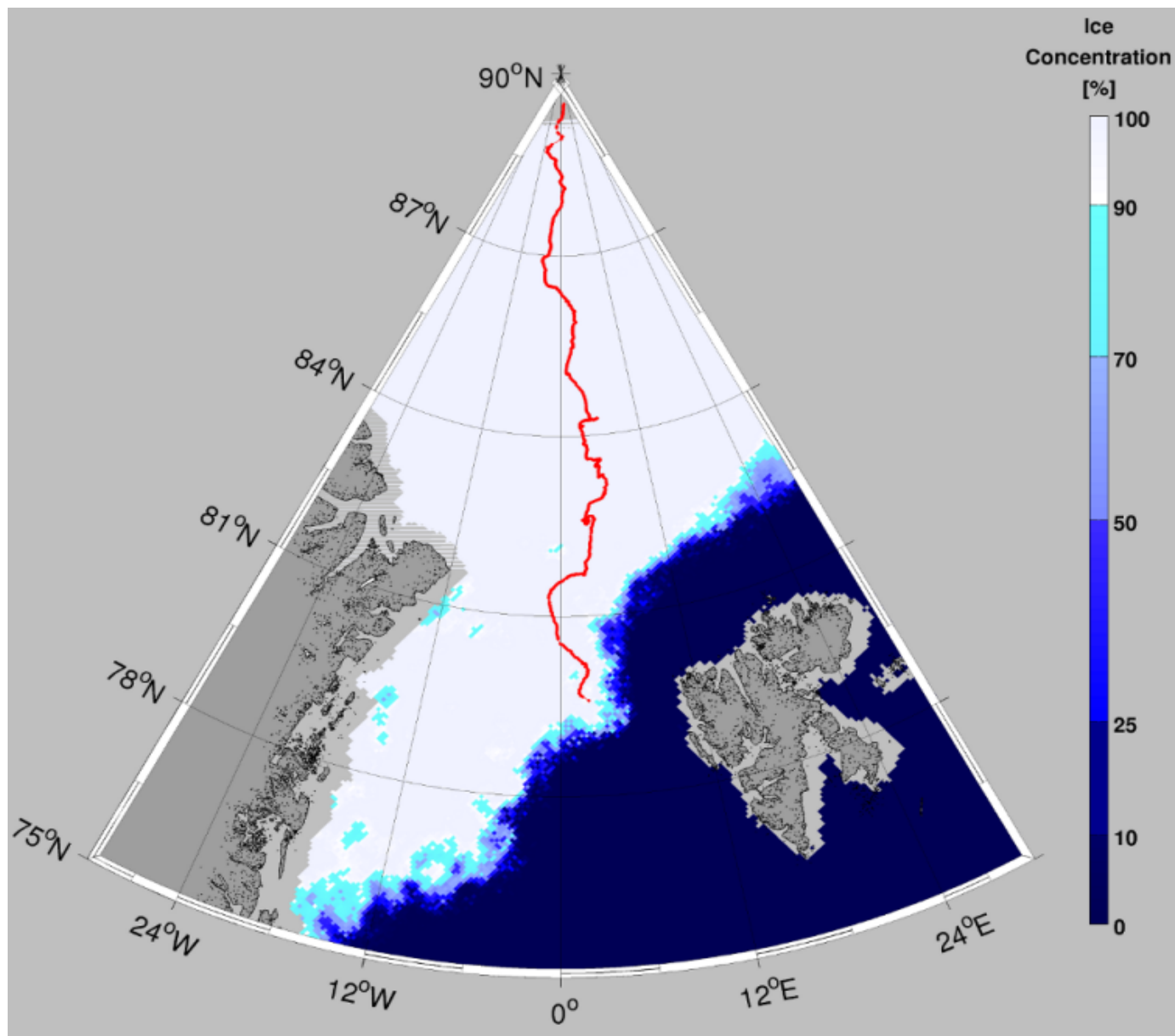
<http://www.iaoos-equipex.upmc.fr/fr/expedition.html>



**IAOOS**  
Ice • Atmosphere • Arctic Ocean Observing System

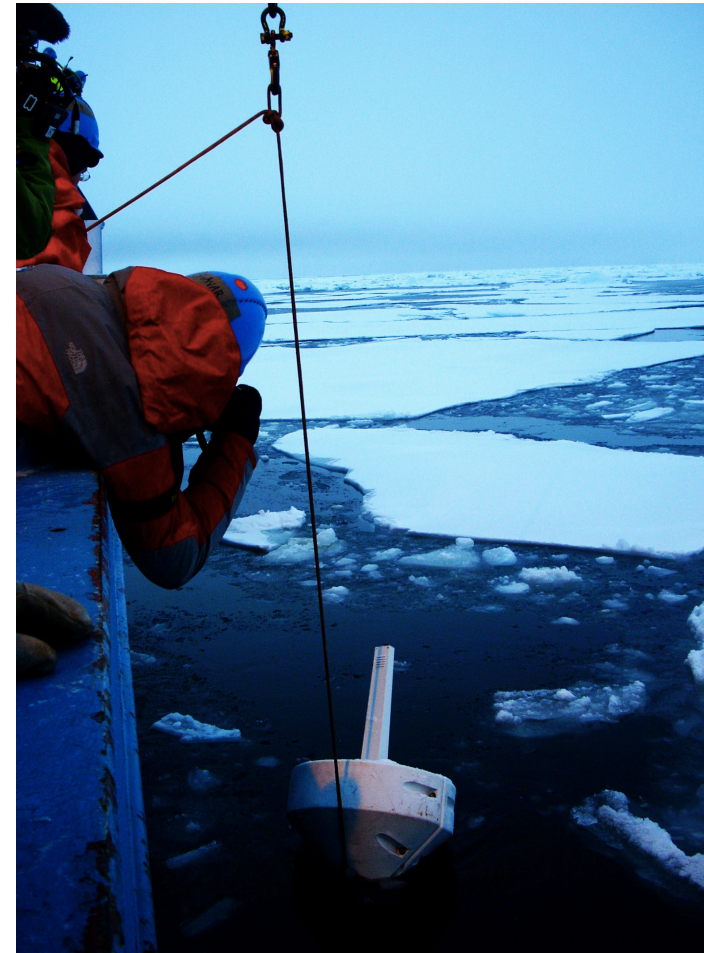


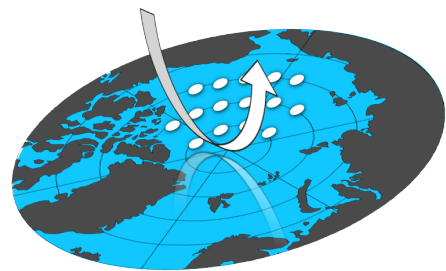
ANR-10-EQPX-32-01



**6-month drift - 1100 km – Fram Strait RV Lance**

**Fram Strait  
Octobre 2012  
RV Lance**

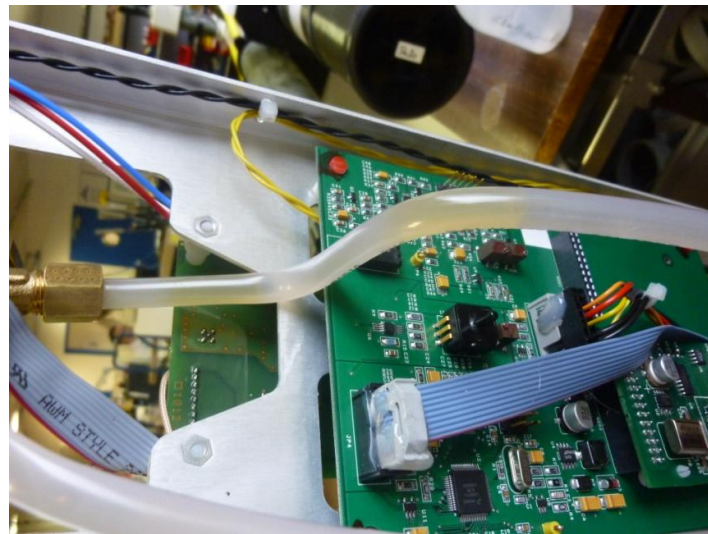




# IAOOS

Ice - Atmosphere - Arctic Ocean Observing System

- Dead batteries after 55 days. Why?
- Holes in the external bladder



Why holes?  
Protected bladder

After investigations:  
talc, mold

**>> improving float reliability**

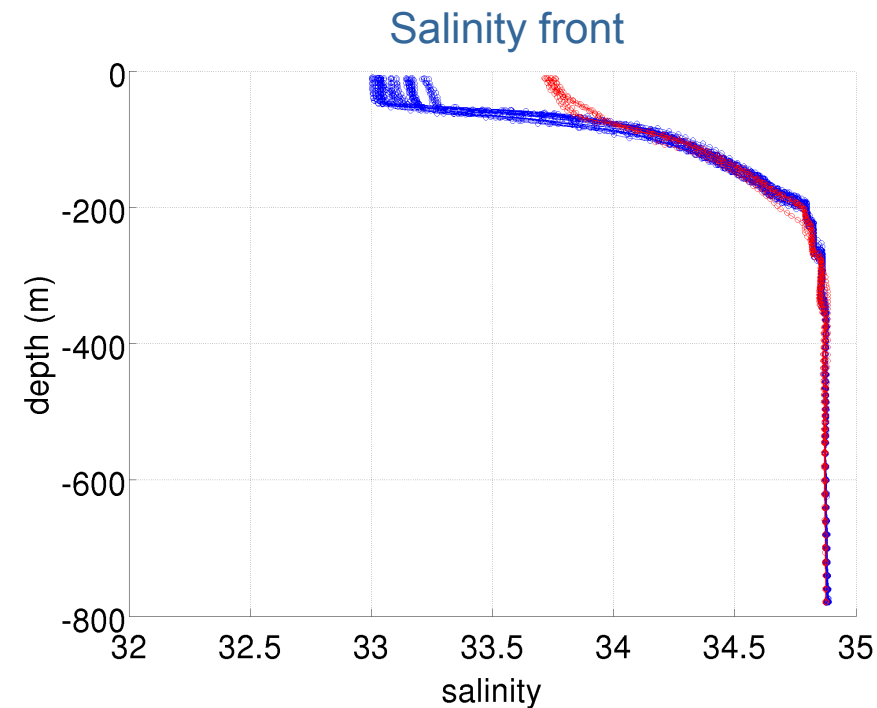


( communication pb)

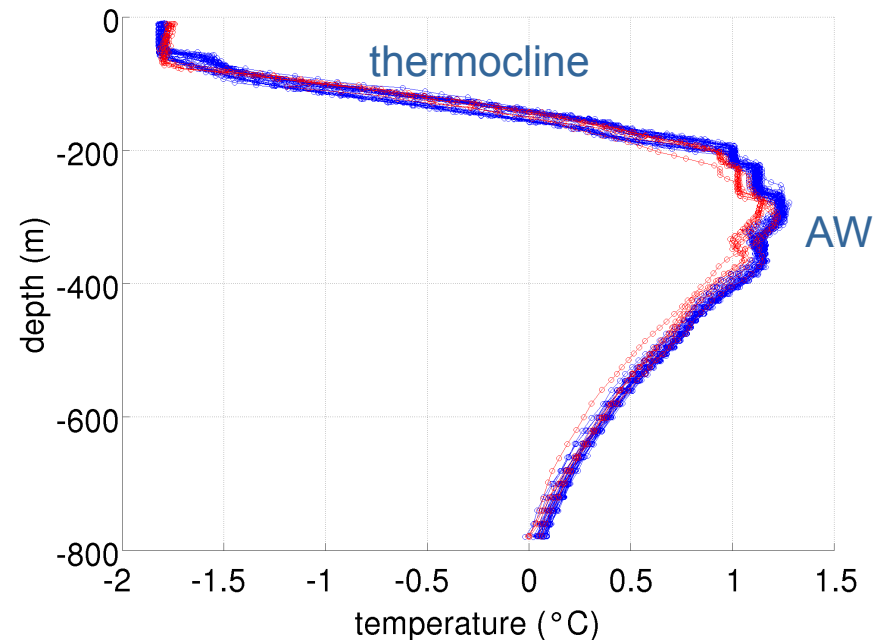
Platform retrieved >> data retrieved

Profiler worked properly until battery death 55 days - 39 profiles

## Salinity

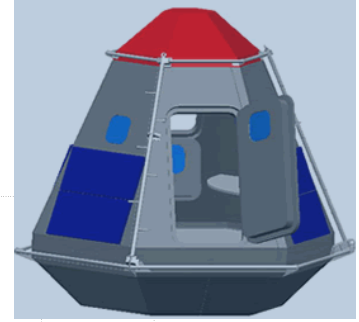
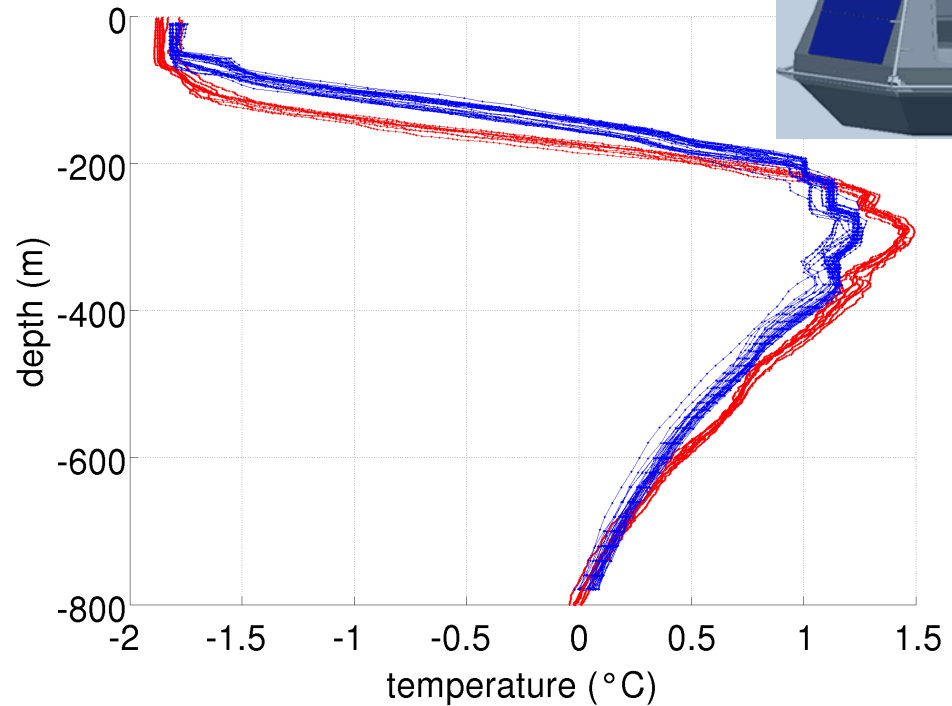
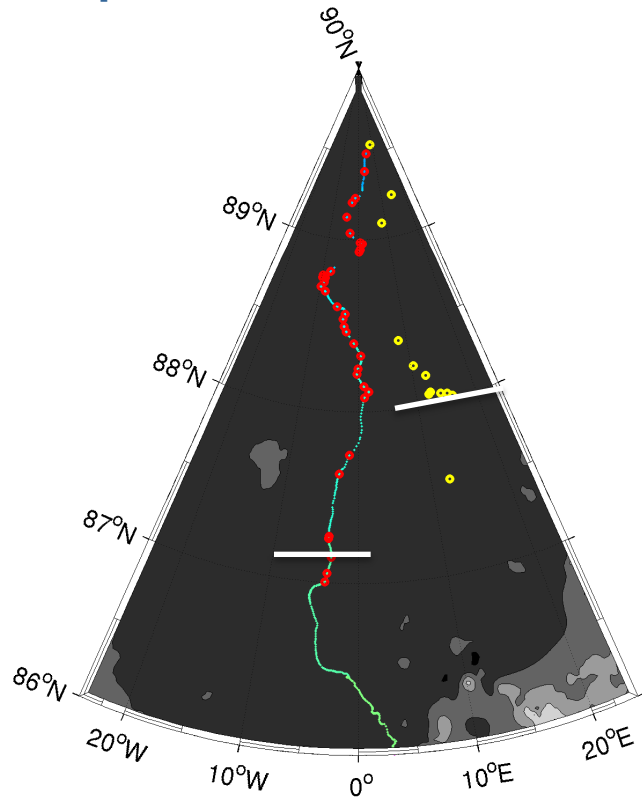


## Temperature



**39 profiles:** red profiles to the south of the surface salinity front (87.2°N)  
halocline -thermocline  
Atlantic water AW

# Comparison to Polar Observer data JL Etienne 2002



yellow: profiles Apr- May 2012  
red: profiles Apr-May 2002  
white: surface salinity front

Temperature red: 2002 blue: 2012

## Changements observés:

- ◆ surface salinity front moved to the south
- ◆ 2012 thermocline closer to the surface
- ◆ Colder Atlantic Water-0.3°C)

- **Barneo 2013**

- 2 ACOBAR platforms 10 km apart initially

- 1 IAOOS (ice – ocean - atmospheric structure)

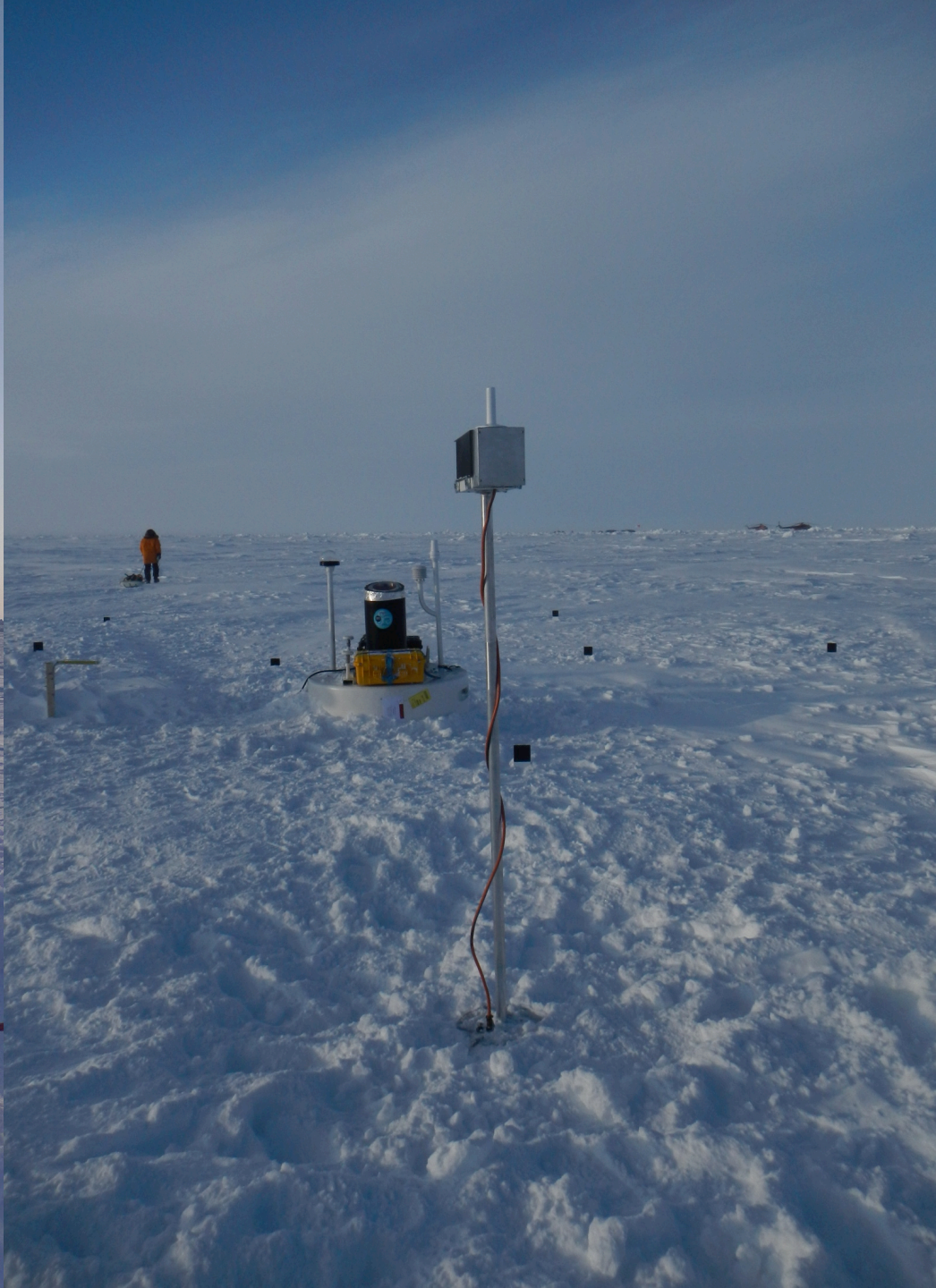
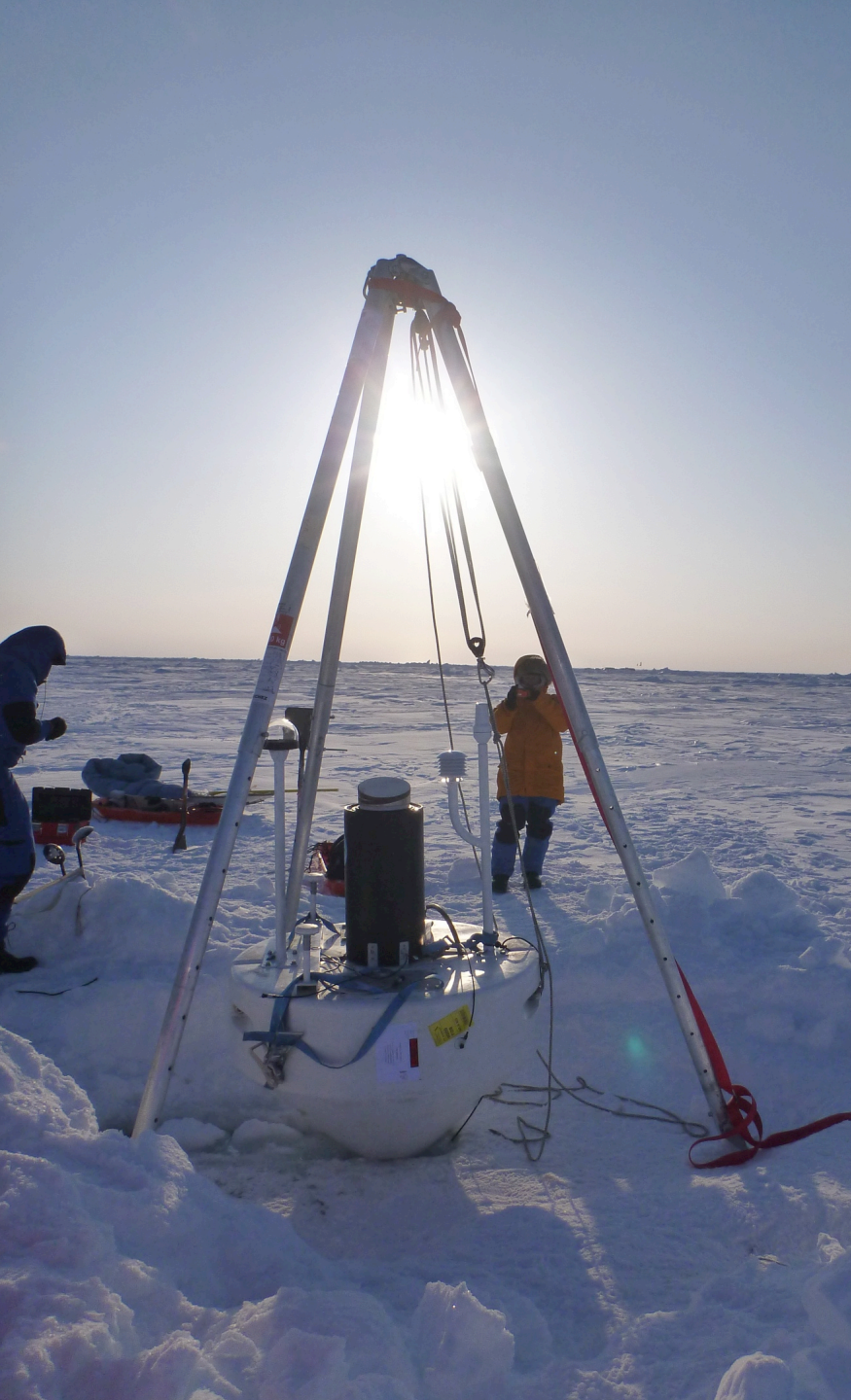
CTD-DO high resolution in the vertical (5 layers) - 2 profiles per day

Time-lapse camera to observe Lidar & ODS optical windows +  
environnement



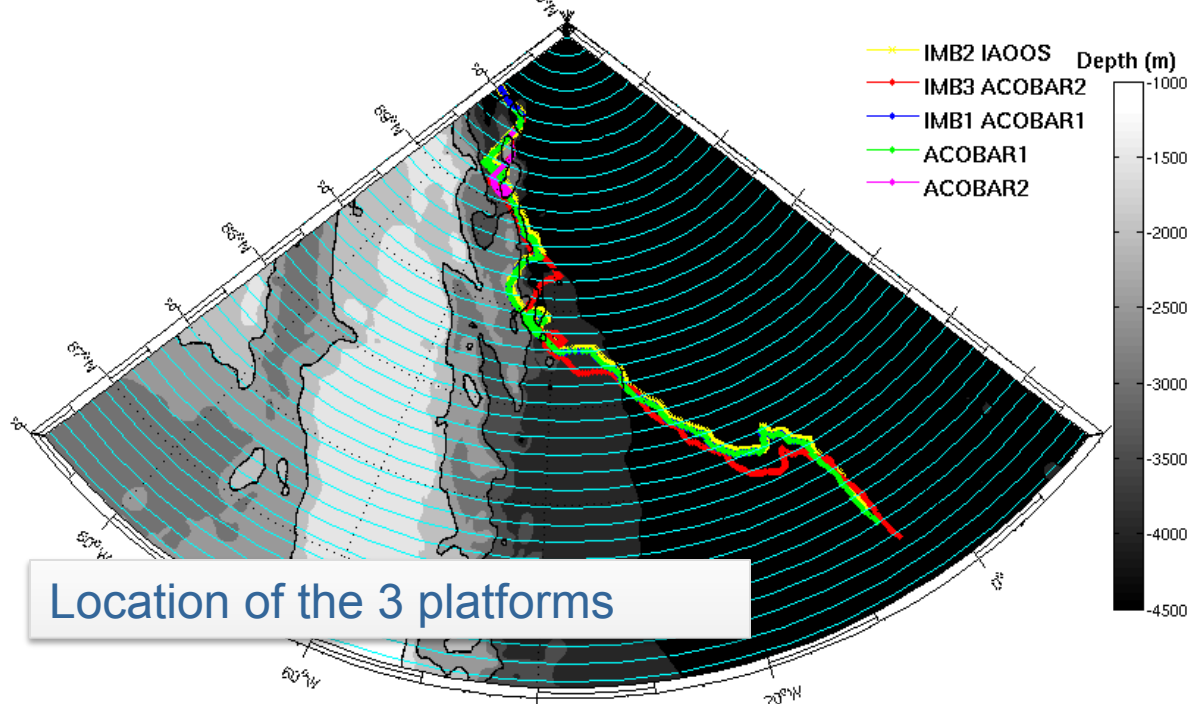
April 14 2013



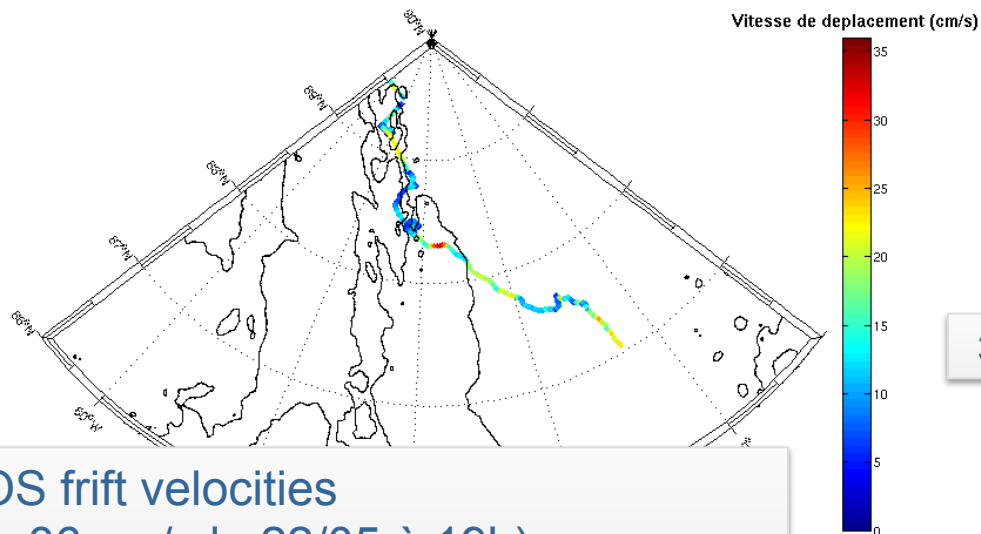




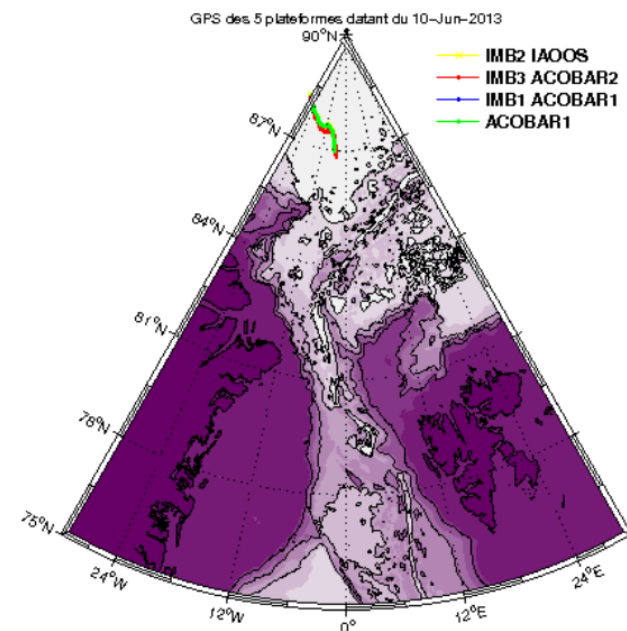
April 16 2013



Location of the 3 platforms



IAOOS drift velocities  
(max 36 cm/s le 22/05 à 19h)



3 platforms with Fram Strait in sight...



**IAOOS**

Ice • Atmosphere • Arctic Ocean Observing System



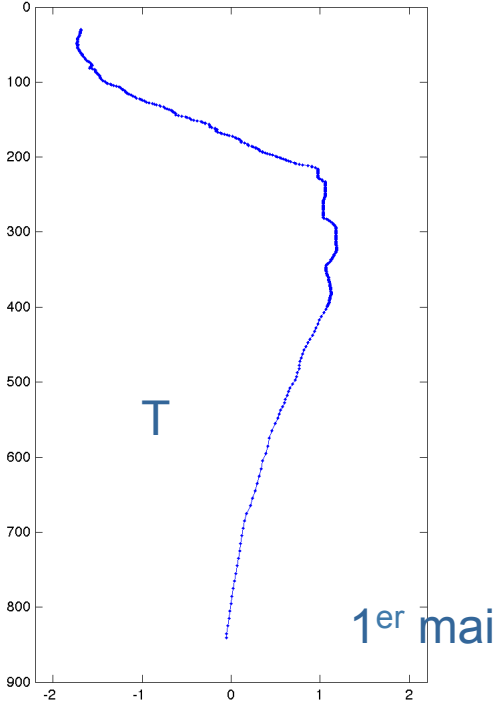
ANR-10-EQPX-32-01

- Number of pump actions per profile :  
IAOOS < 15      Acobar 1 = 26

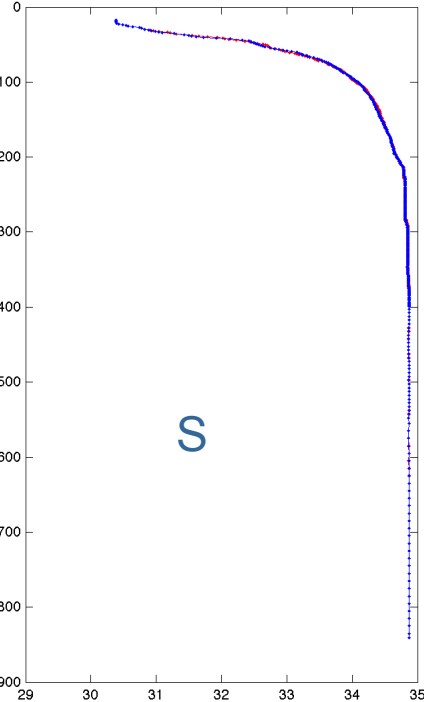
Acobar 2 = 30

- ACOBAR: 1 profile 36 h, T et S 100 points
- IAOOS : T, S, DO, 2 profiles /24 h, vertical resolution T, S, DO 450 points

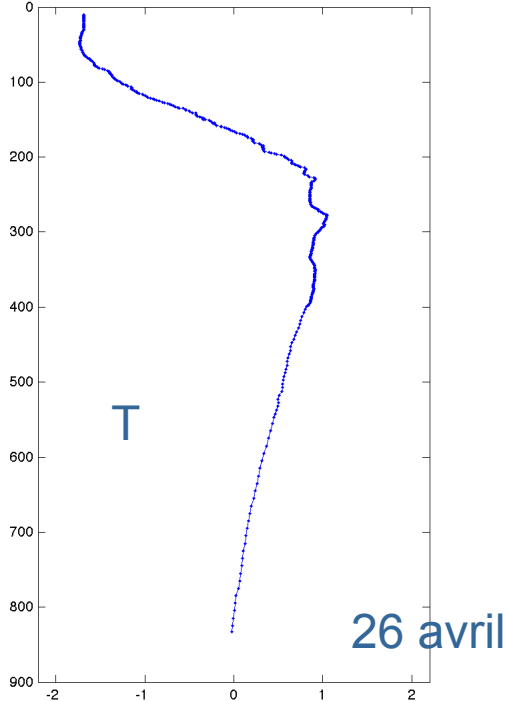
IAOOS: 01-May-2013 06:12:21 - 01-May-2013 20:47:29 Temperature



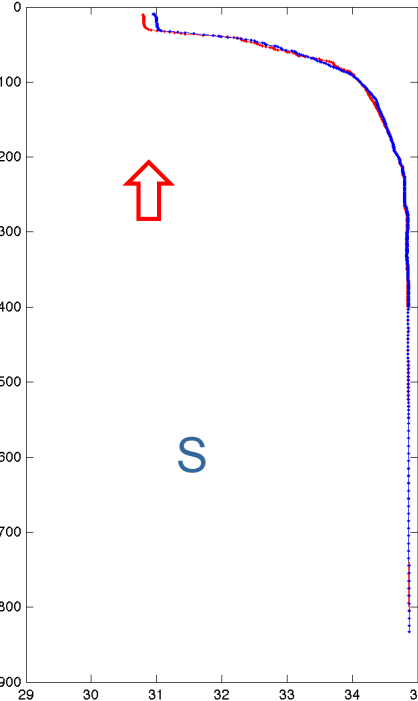
IAOOS: 01-May-2013 06:12:21 - 01-May-2013 20:47:29 Salinity



IAOOS: 26-Apr-2013 06:34:43 - 26-Apr-2013 21:02:24 Temperature

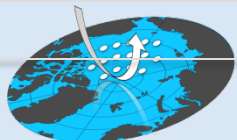


IAOOS: 26-Apr-2013 06:34:43 - 26-Apr-2013 21:02:24 Salinity



red: morning, blue afternoon

DO not calibrated yet (help coll Virginie Thierry)

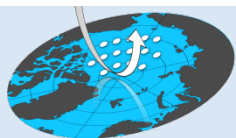
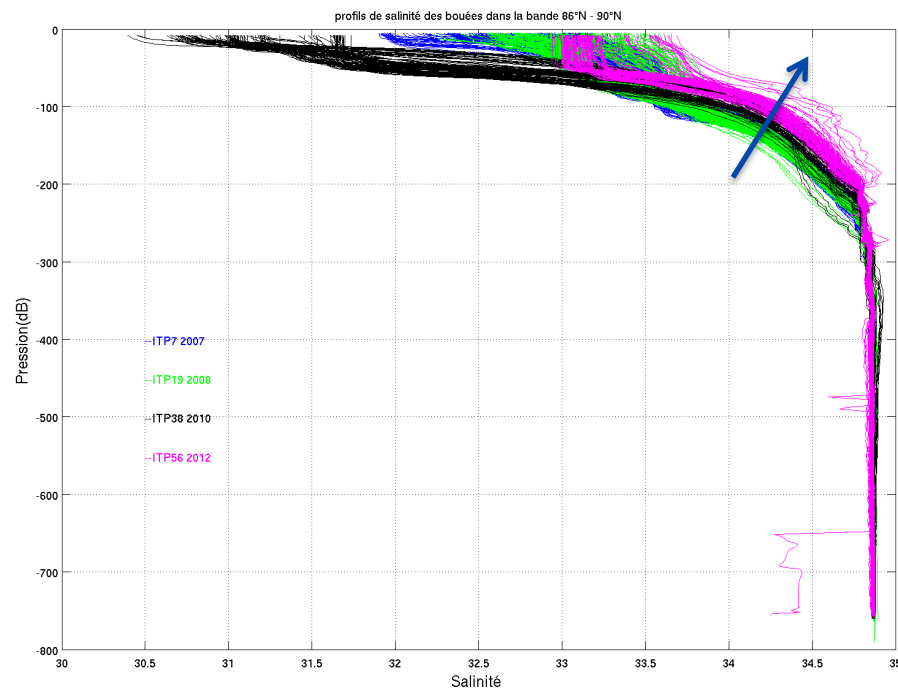
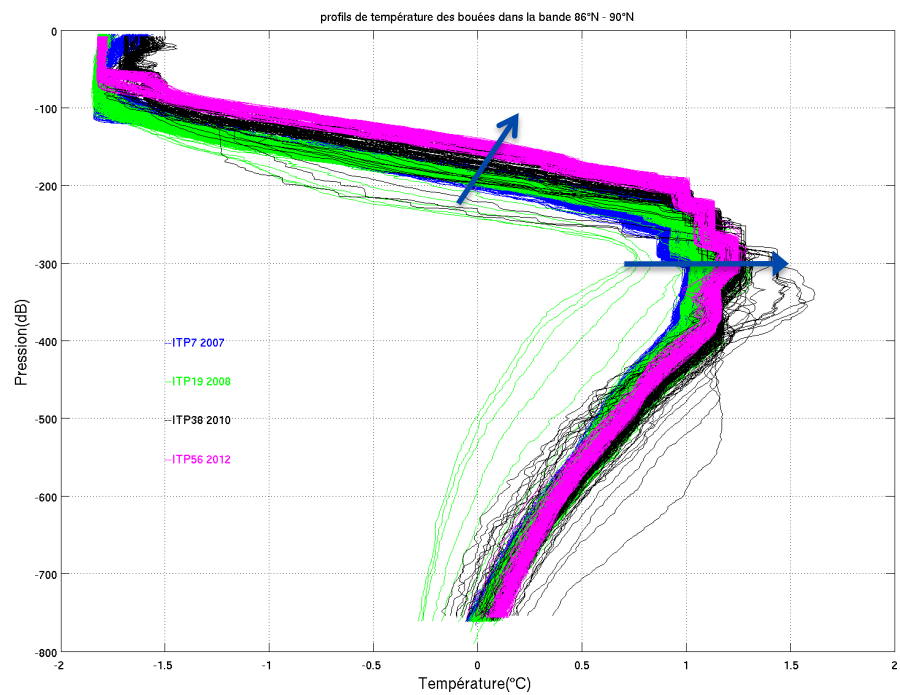
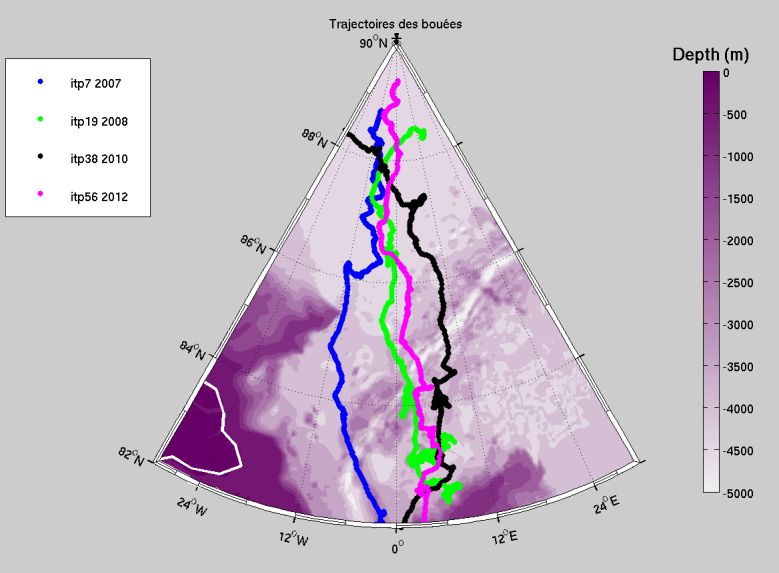


**IAOOS**

Ice • Atmosphere • Arctic Ocean Observing System



ANR-10-EQPX-32-01



**IAOOS**

Ice • Atmosphere • Arctic Ocean Observing System



ANR-10-EQPX-32-01

Webcam June 12 2013 87°N 0°



Thank you !