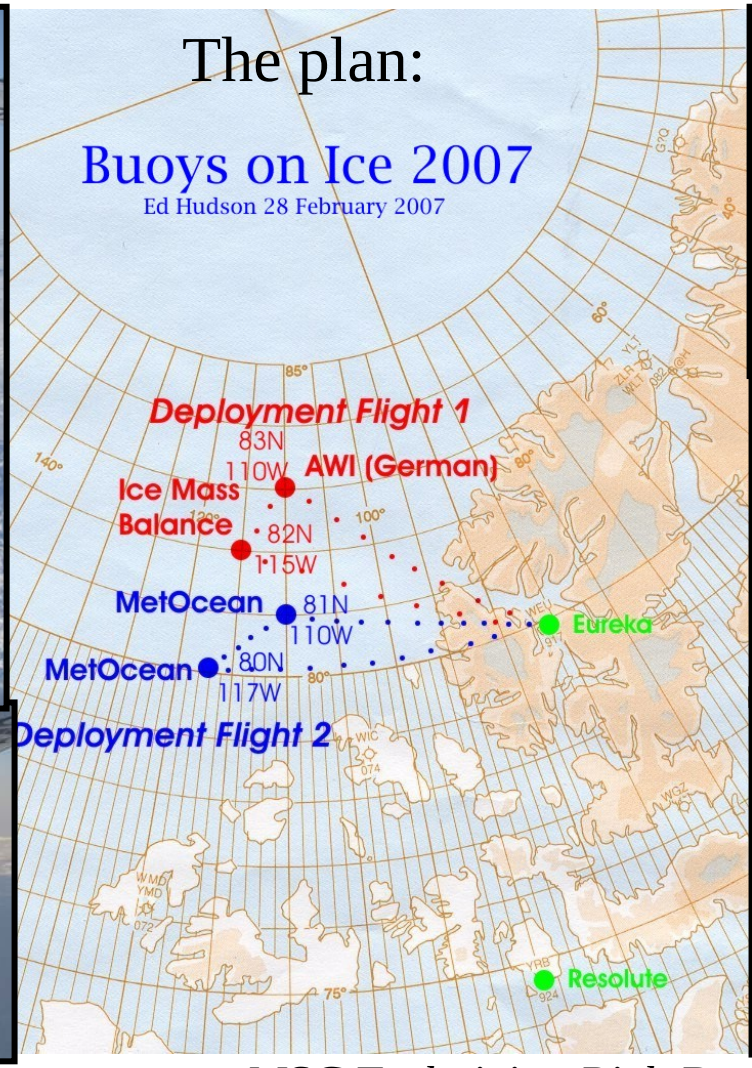
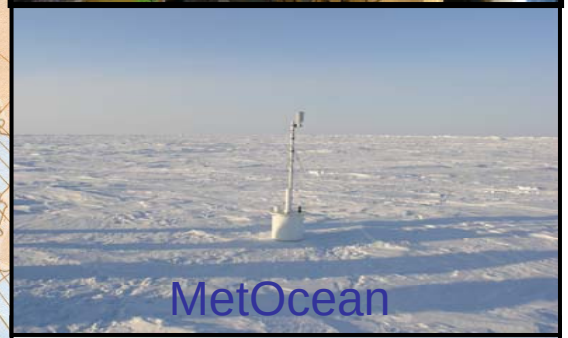
Enhancements of the Arctic Buoys for the International Polar Year

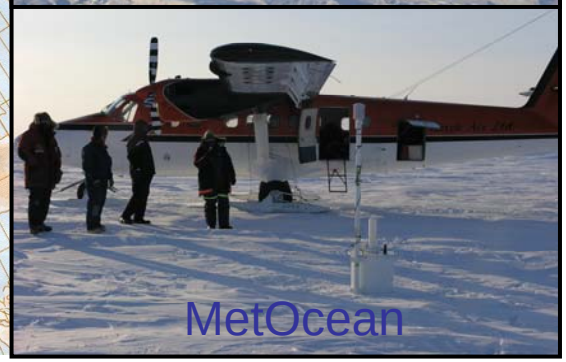
Buoy deployment by the ice breaker USCG Healy

Buoys-on-Ice 2007 a success: Deployment flights 26 and 29 March

- Flying hours funded by Polar Continental Shelf Project
- Buoys provide by US National Ice Centre / University of Washington Polar Science Center and Alfred Wegener Institute, Germany





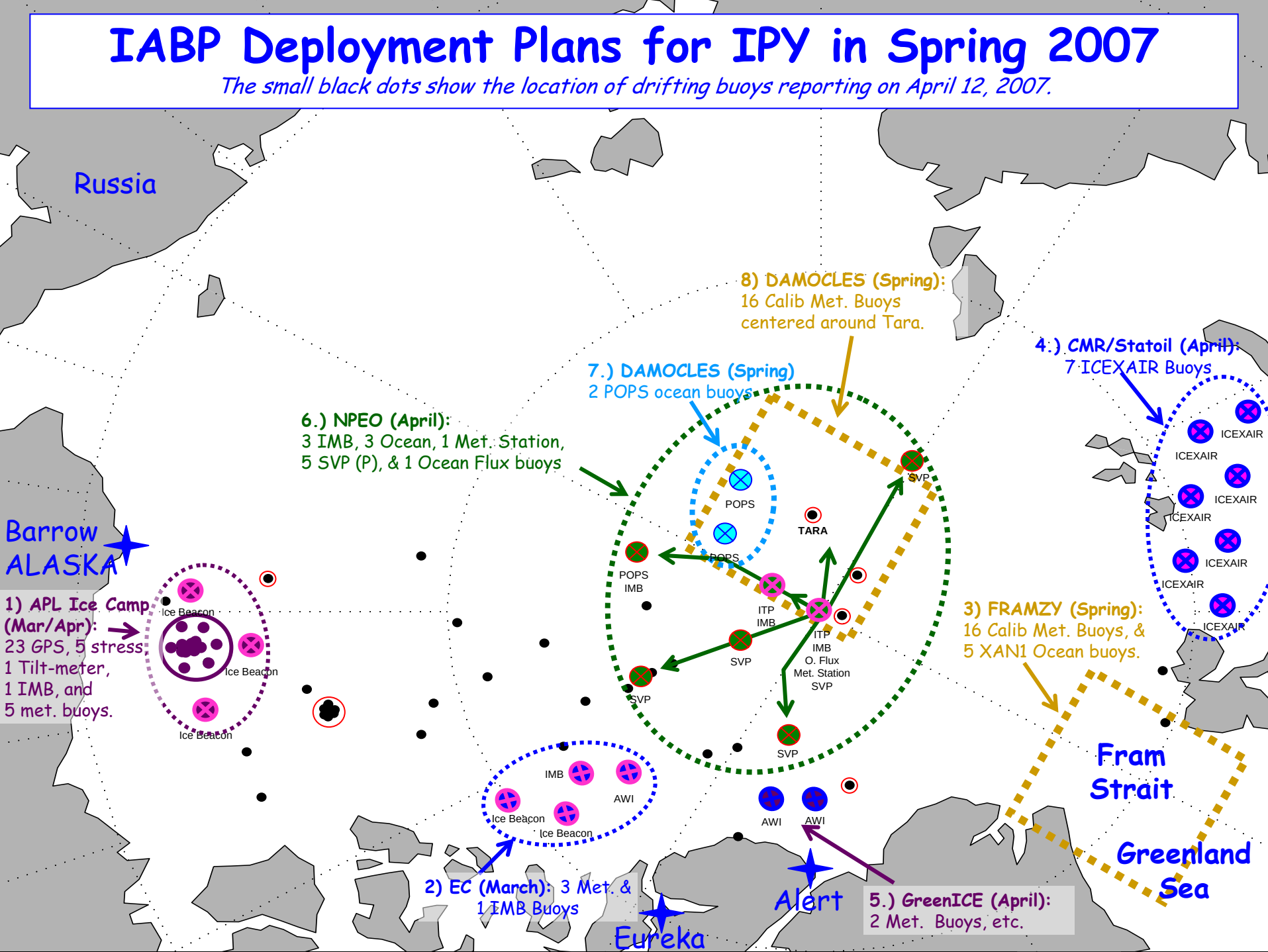


Photos courtesy MSC Technician Rich Devall

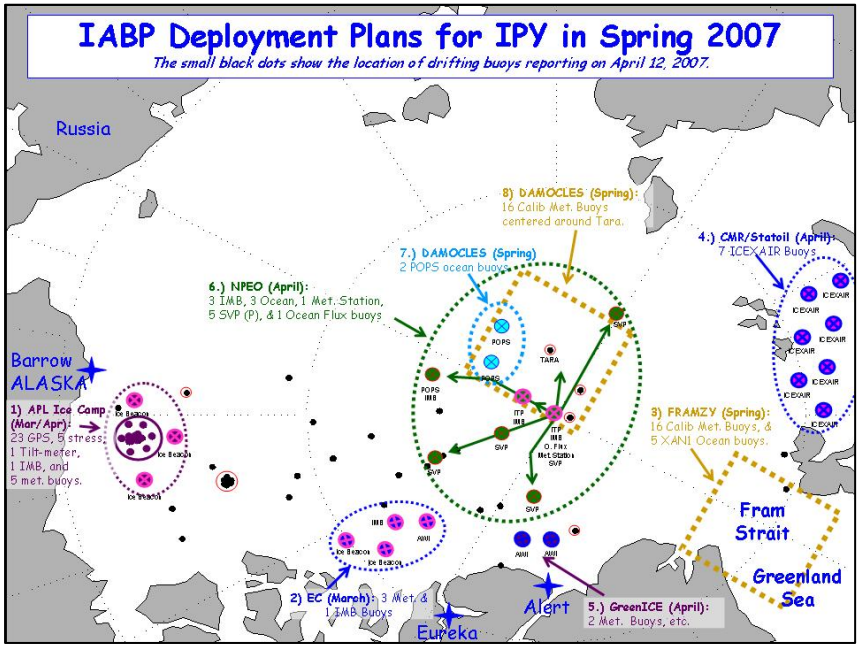
Parachute Deployment by Norwegian Air Force

IABP Deployment Plans for IPY in Spring 2007

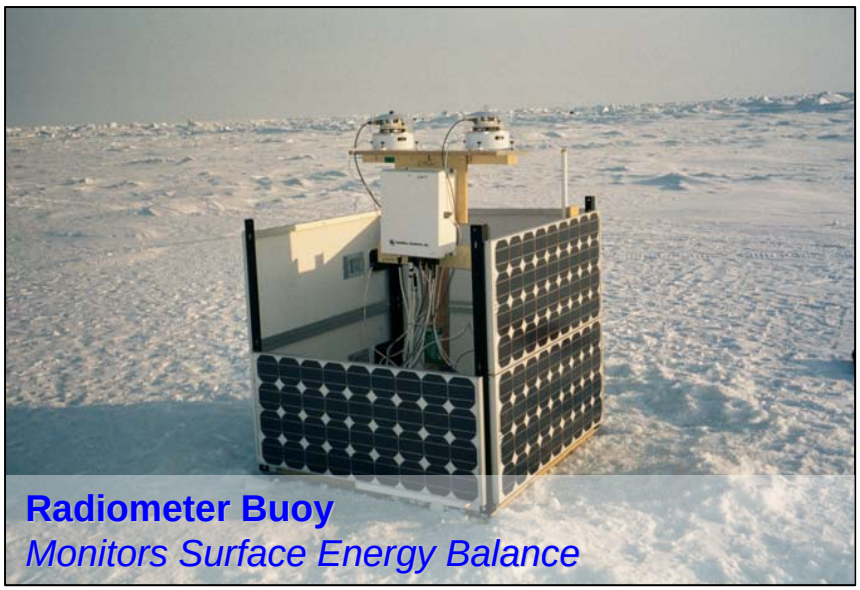
The small black dots show the location of drifting buoys reporting on April 12, 2007.



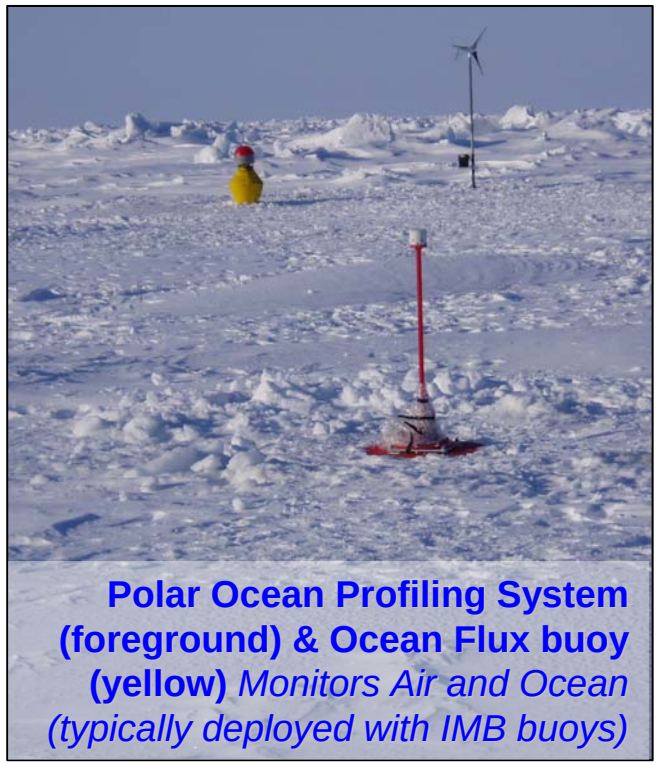
North Pole Environmental Observatory



Ice Mass Balance buoy
Monitors Air and Sea Ice

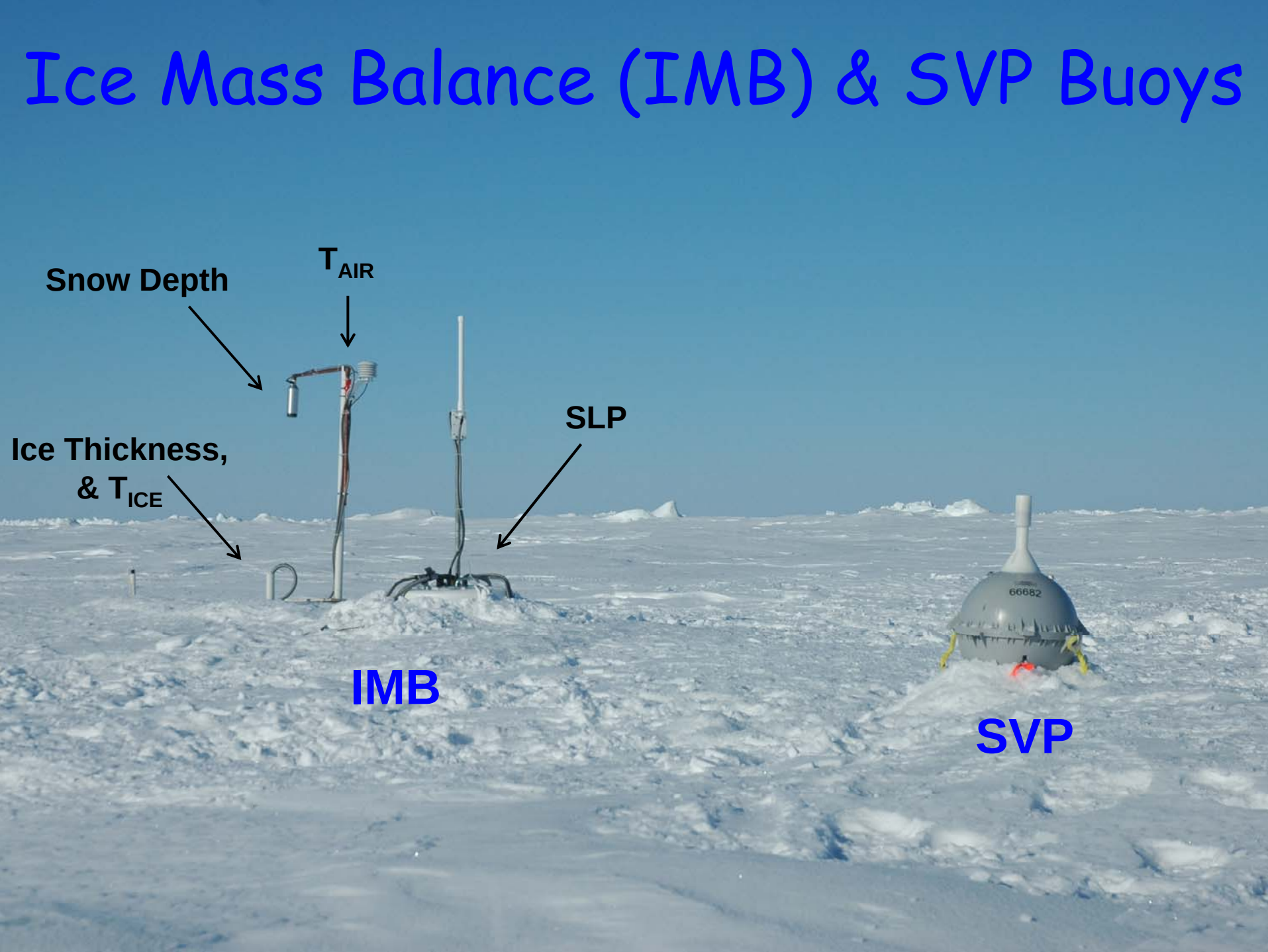


Radiometer Buoy
Monitors Surface Energy Balance

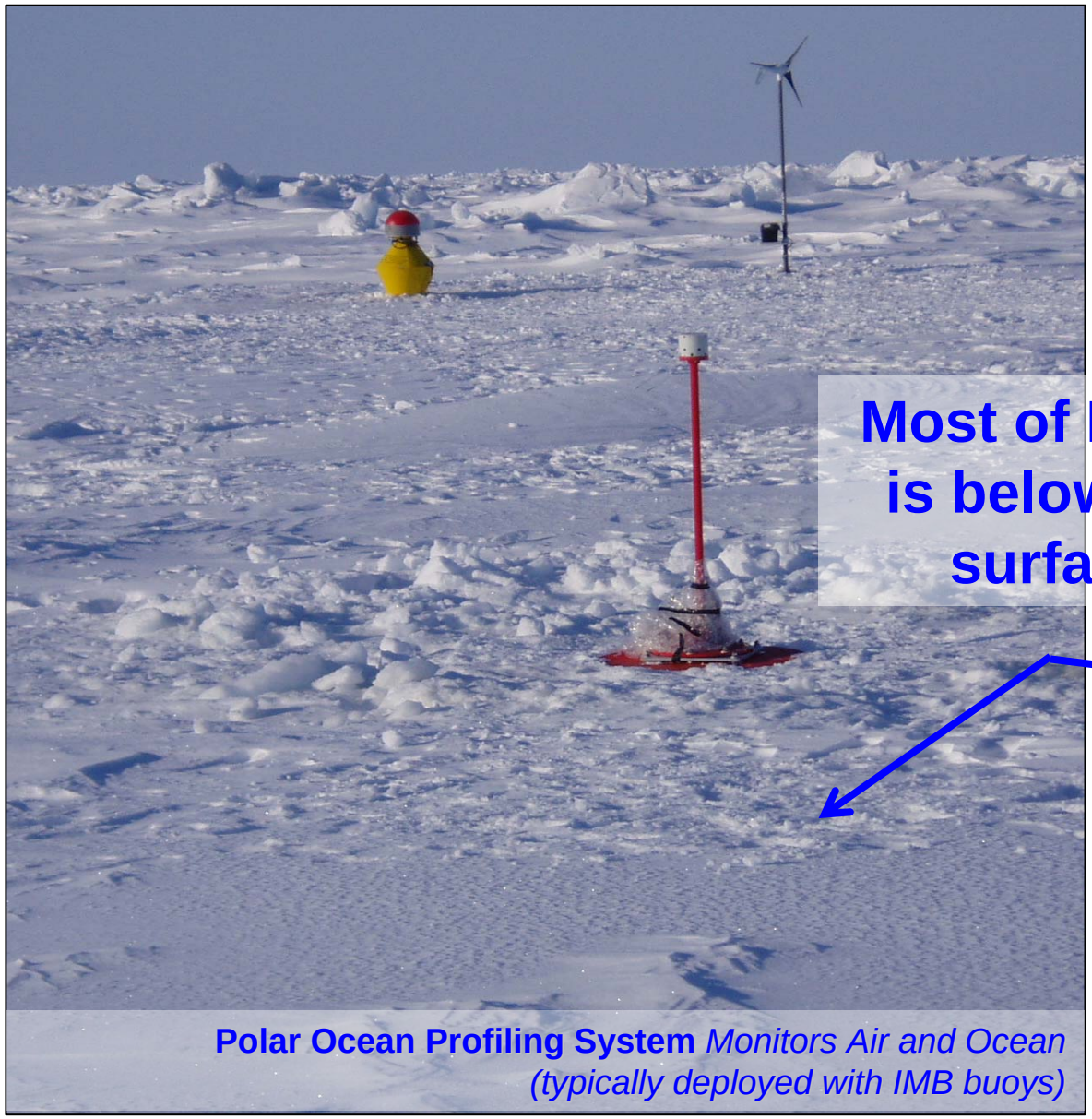


Polar Ocean Profiling System (foreground) & Ocean Flux buoy (yellow) *Monitors Air and Ocean (typically deployed with IMB buoys)*

Ice Mass Balance (IMB) & SVP Buoys

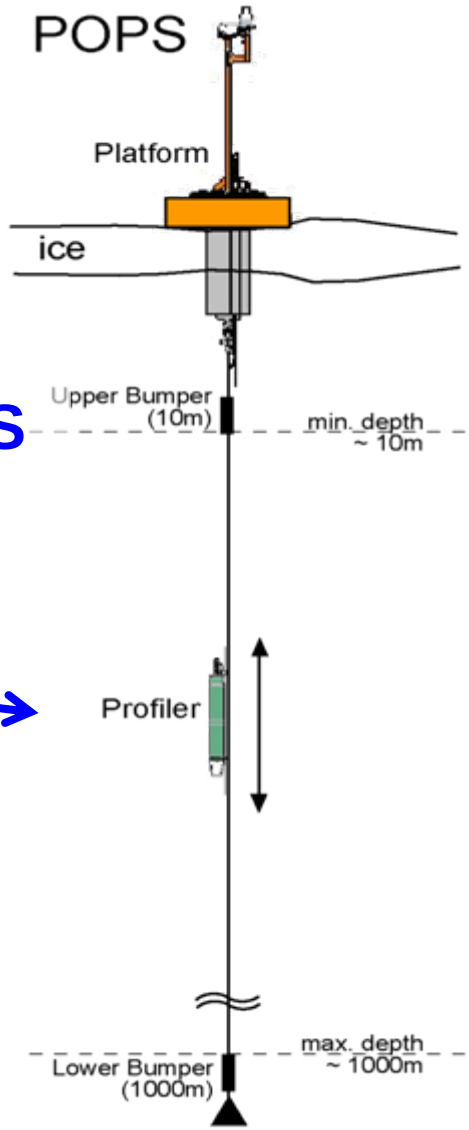


Polar Ocean Profiling System (Metocean)



Polar Ocean Profiling System *Monitors Air and Ocean (typically deployed with IMB buoys)*

Most of POPS is below the surface

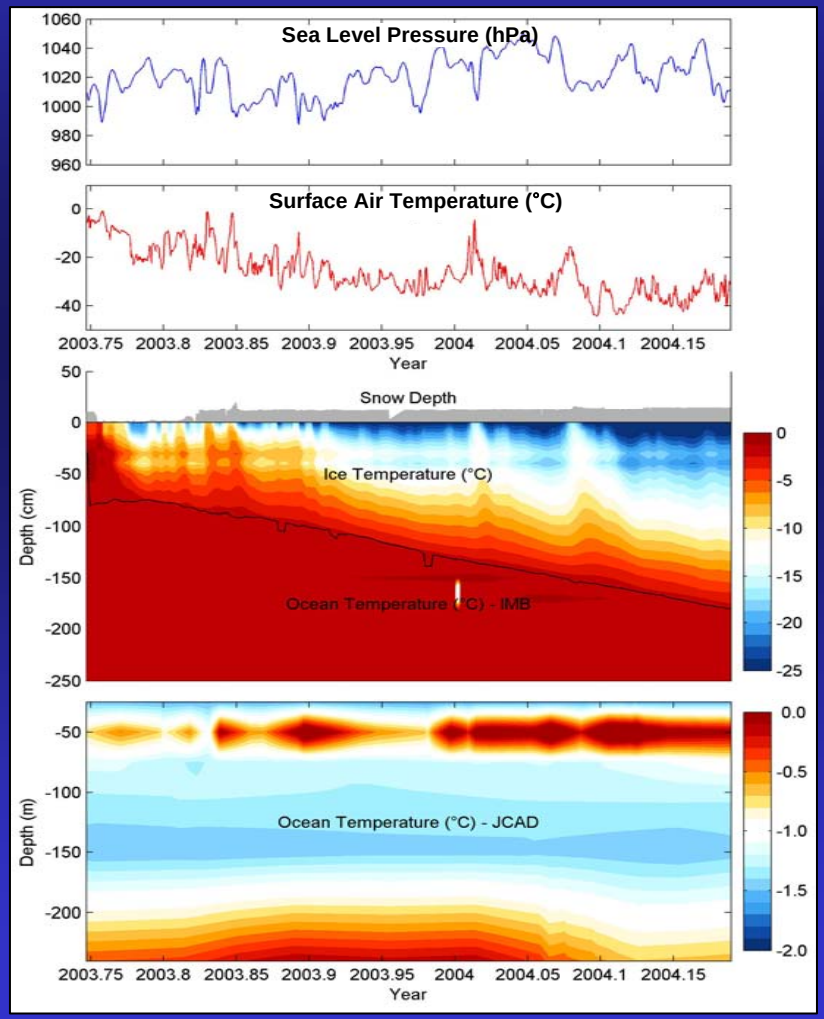


Ice Mass Balance & Ocean Buoy

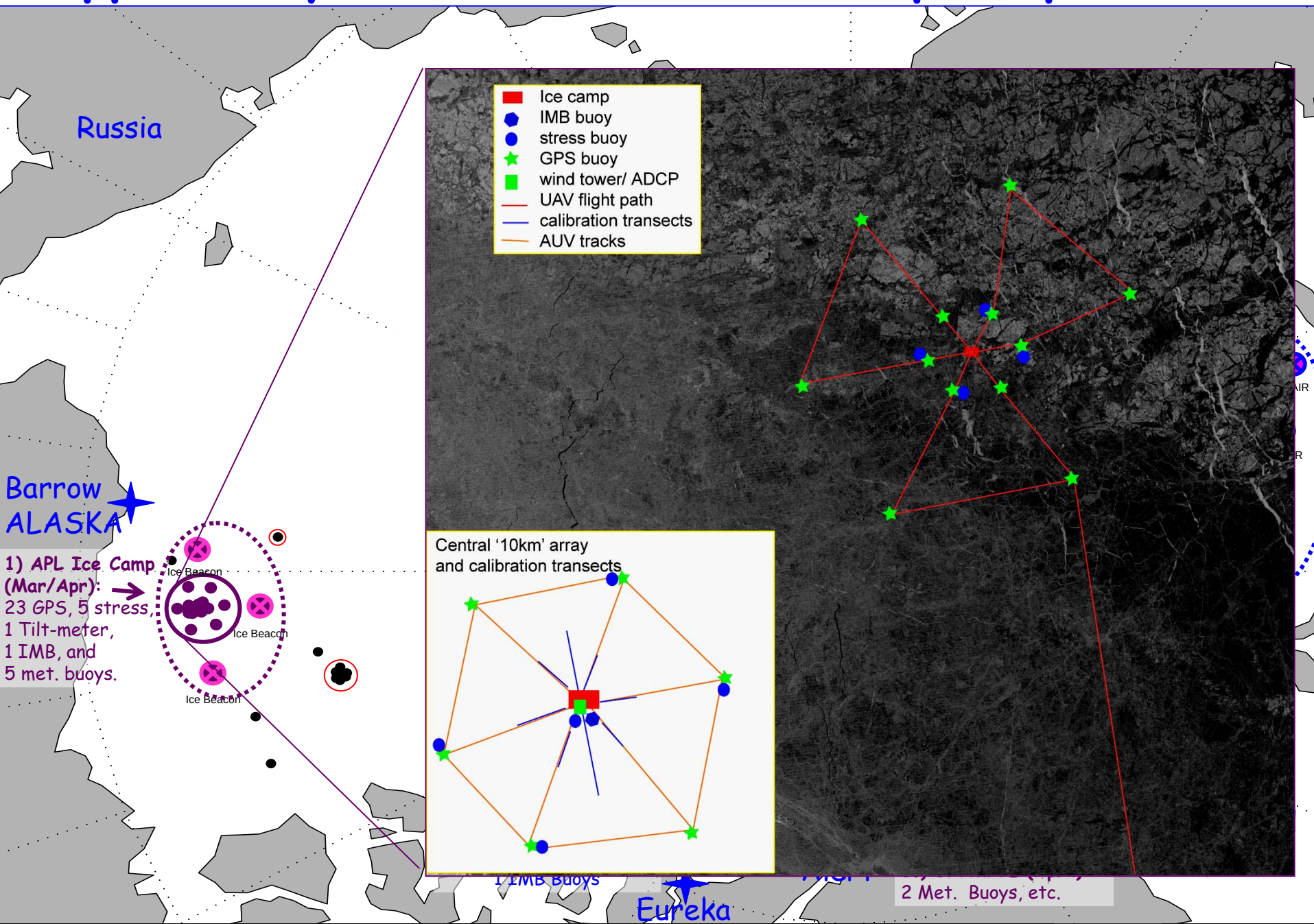
Coordination

- **Enhanced value and impact**
- **Other drifting buoys: profiles of atmospheric, ice and upper ocean properties**
- **Moored ice profiling sonar: Eulerian and Lagranian perspectives**
- **Submarine and helicopter surveys: temporal link**

IMB and Ocean Buoy



Applied Physics Lab (APL) Ice Camp – April 2007



Applied Physics Lab (APL) Ice Camp – April 2007

Russia

Barrow
ALASKA

1) APL Ice Camp (Mar/Apr):
23 GPS, 5 stress,
1 Tilt-meter,
1 IMB, and
5 met. buoys.

Ice Beacon

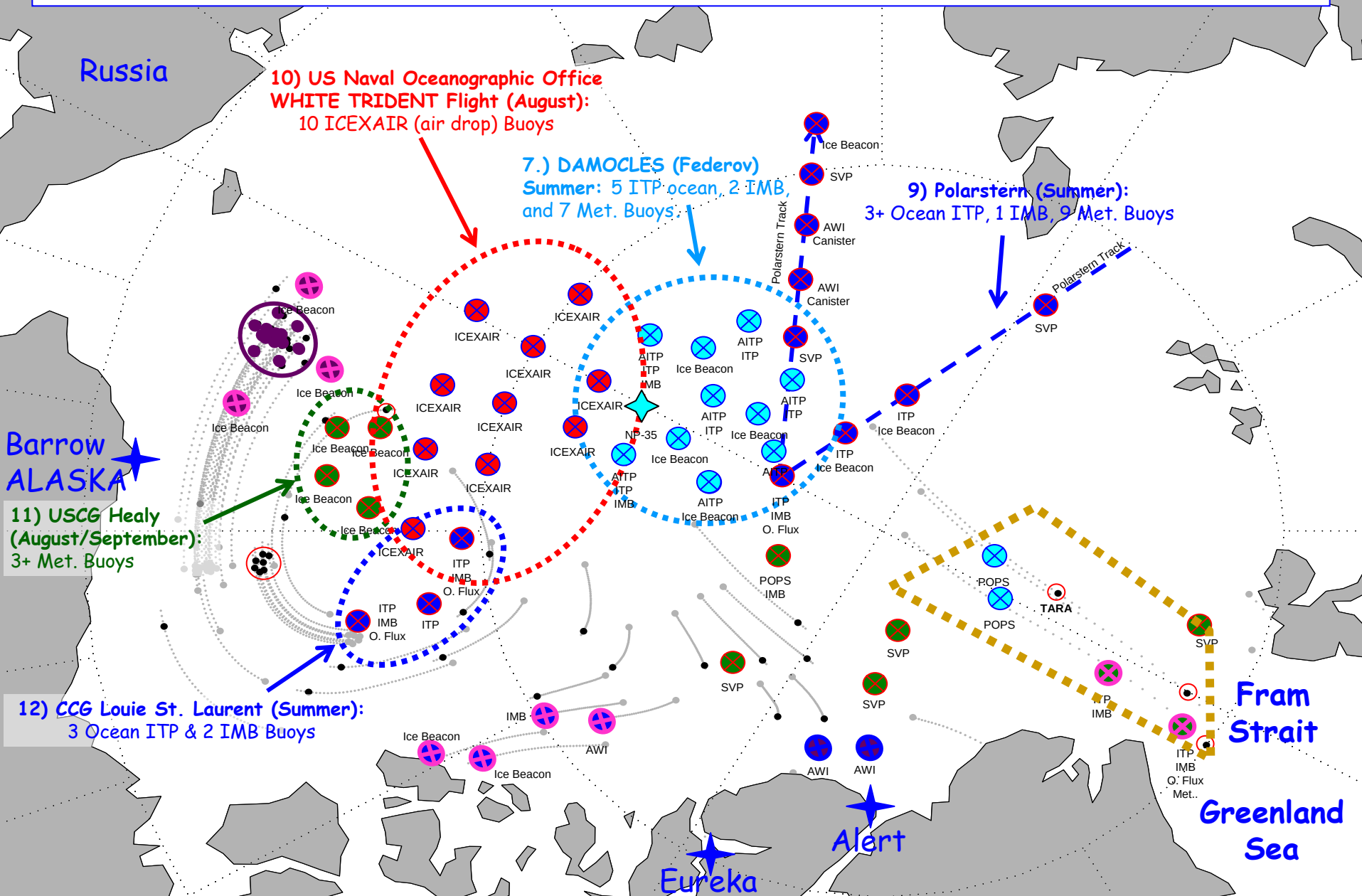
Ice Beacon

Ice Beacon

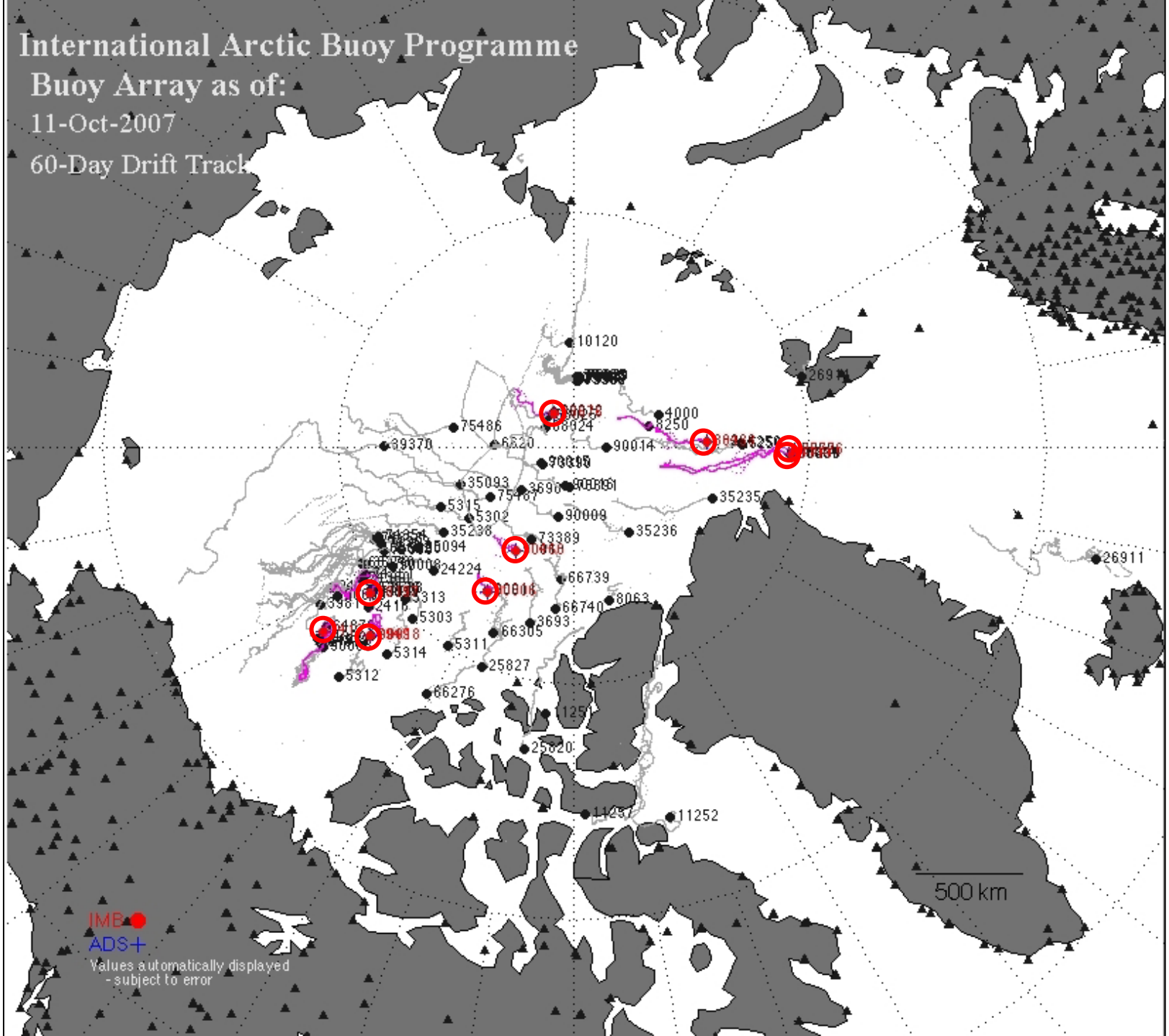
Eureka

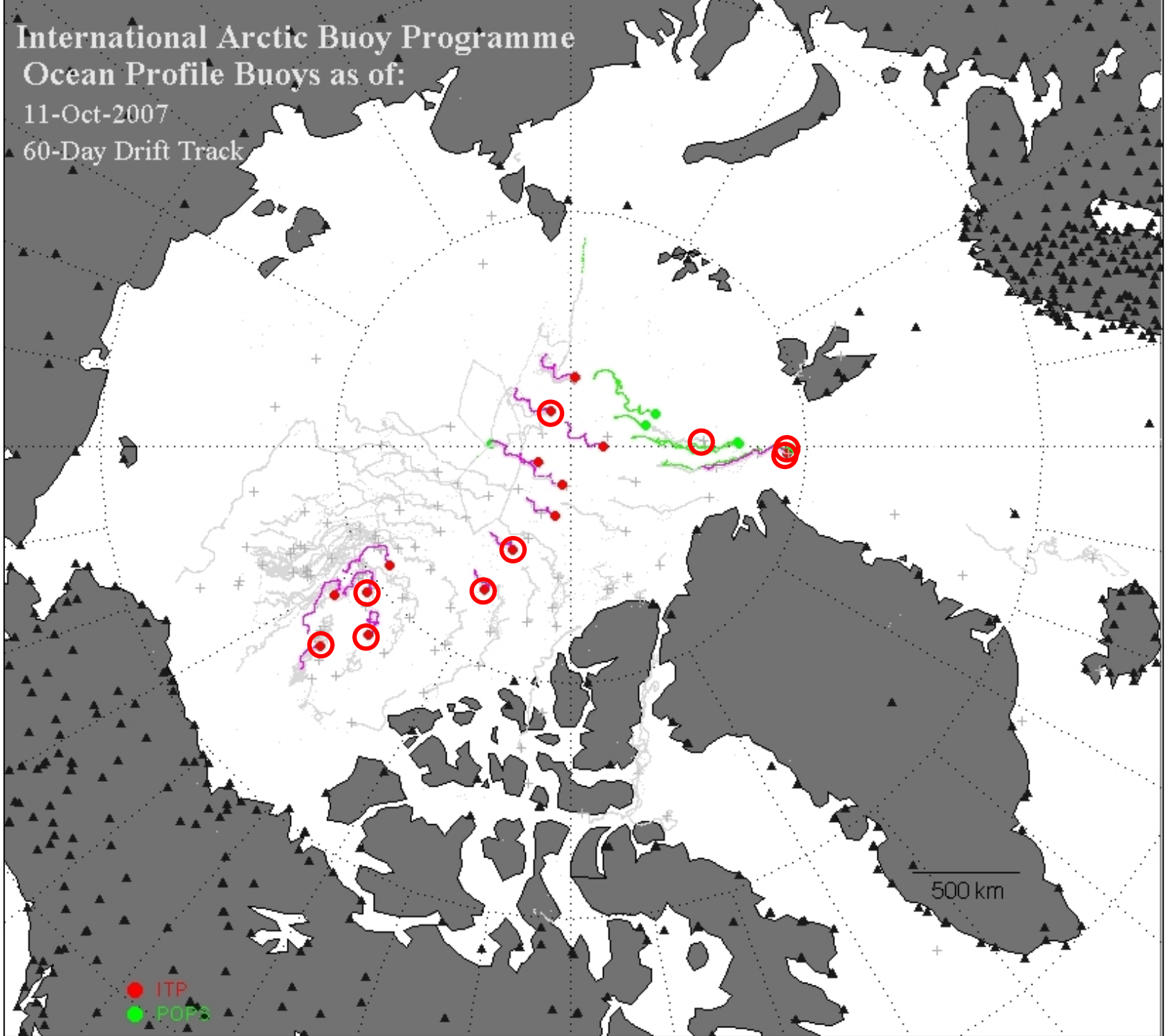
IABP Deployment Plans for IPY in Summer 2007

Summer deployments are noted by dotted circles. The projected drift of buoys deployed during Spring 2007 and buoys reporting on April 12, 2007 (black dots with grey drift tracks) are also shown.



CCG Louie St. Laurent Deployments

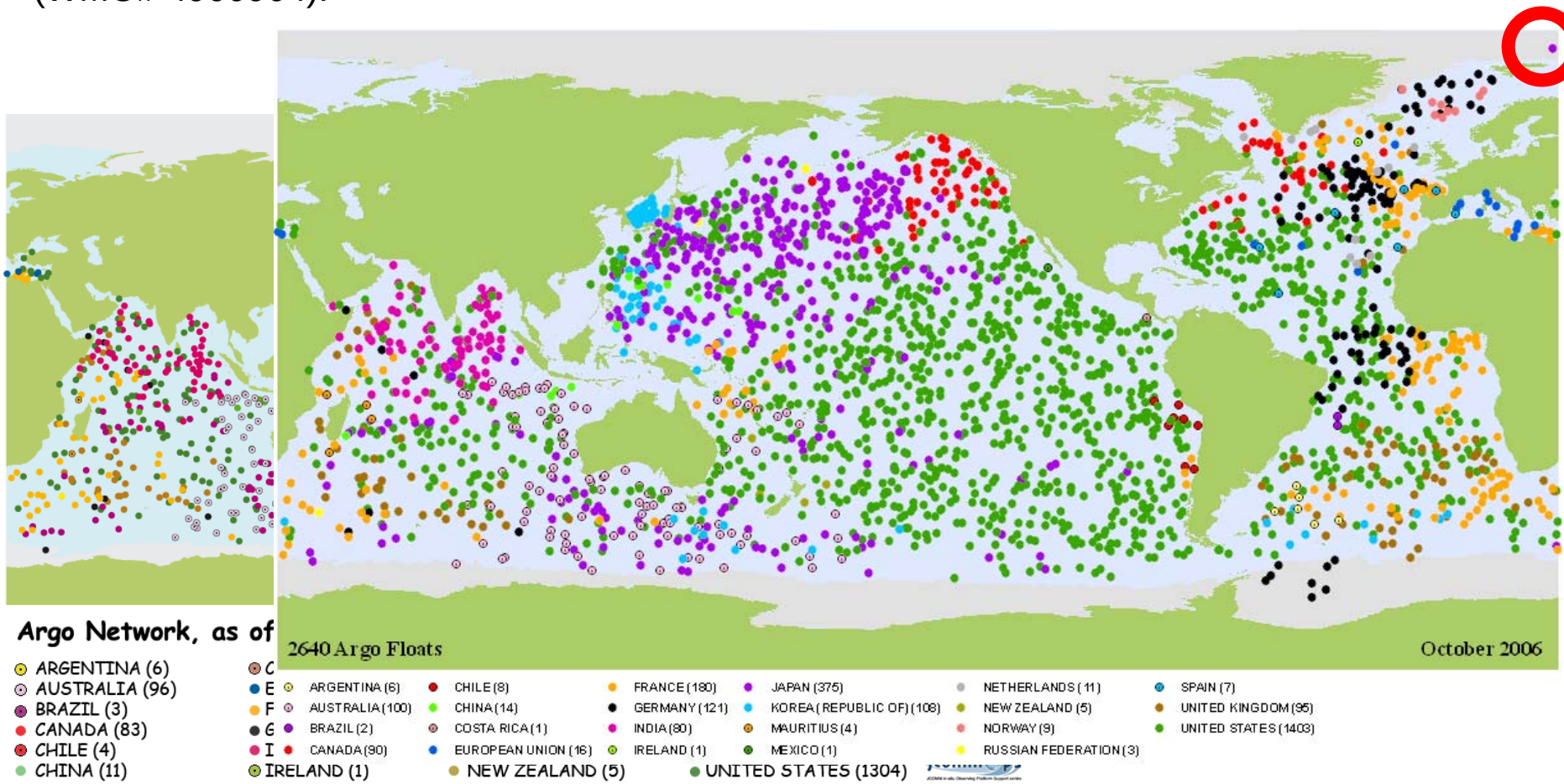

International Arctic Buoy Programme
Buoy Array as of:
11-Oct-2007
60-Day Drift Track
10120
75486
4000
8250
39370
6820
90014
35093
75467
5315
5302
90009
35235
35236
73389
35094
24224
66739
5313
66740
8063
5303
3693
66305
5311
5314
25827
5312
66276
25820
11252
26911
500 km
IMB
ADS
Values automatically displayed
- subject to error


International Arctic Buoy Programme
Ocean Profile Buoys as of:
11-Oct-2007
60-Day Drift Track
500 km
ITP
POPS

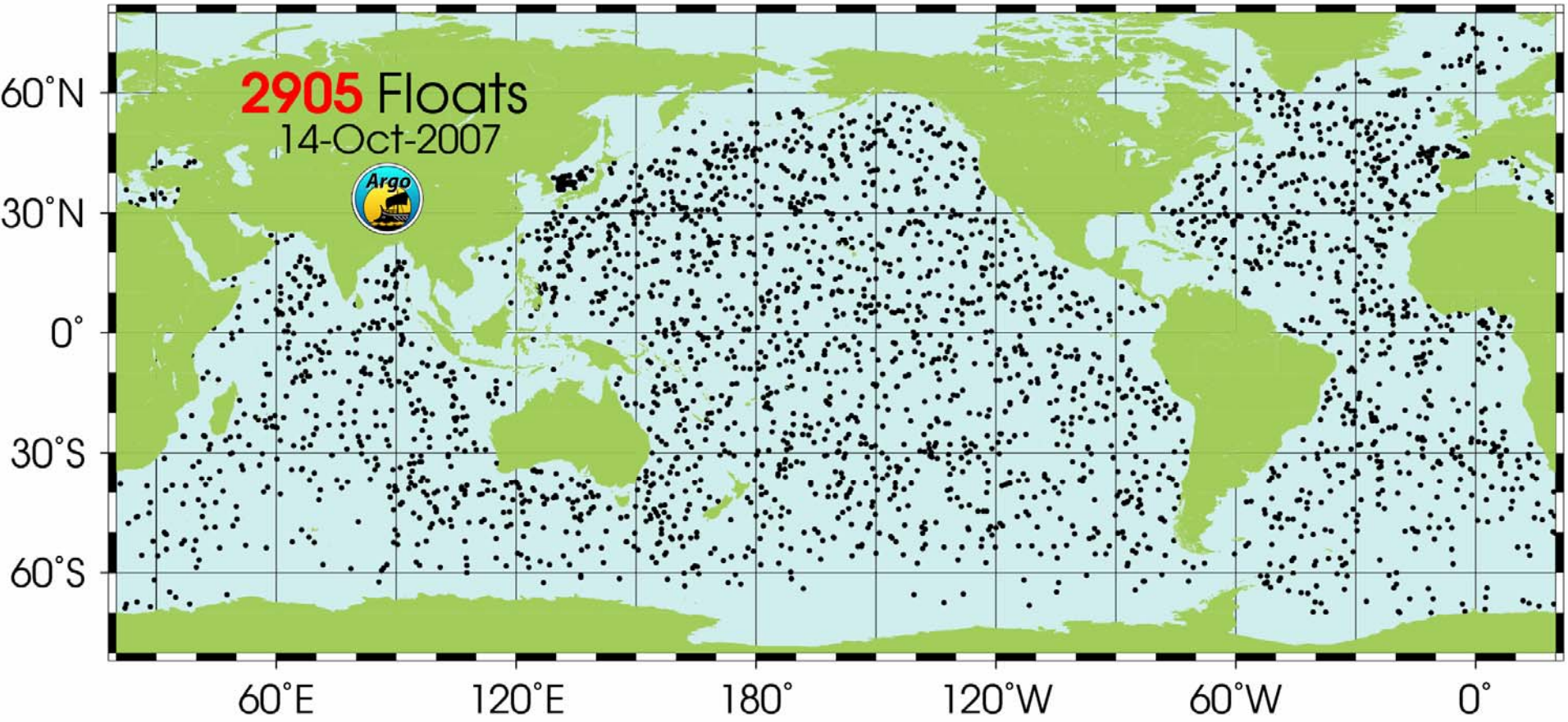
Polar Ocean Profiling System (POPS)

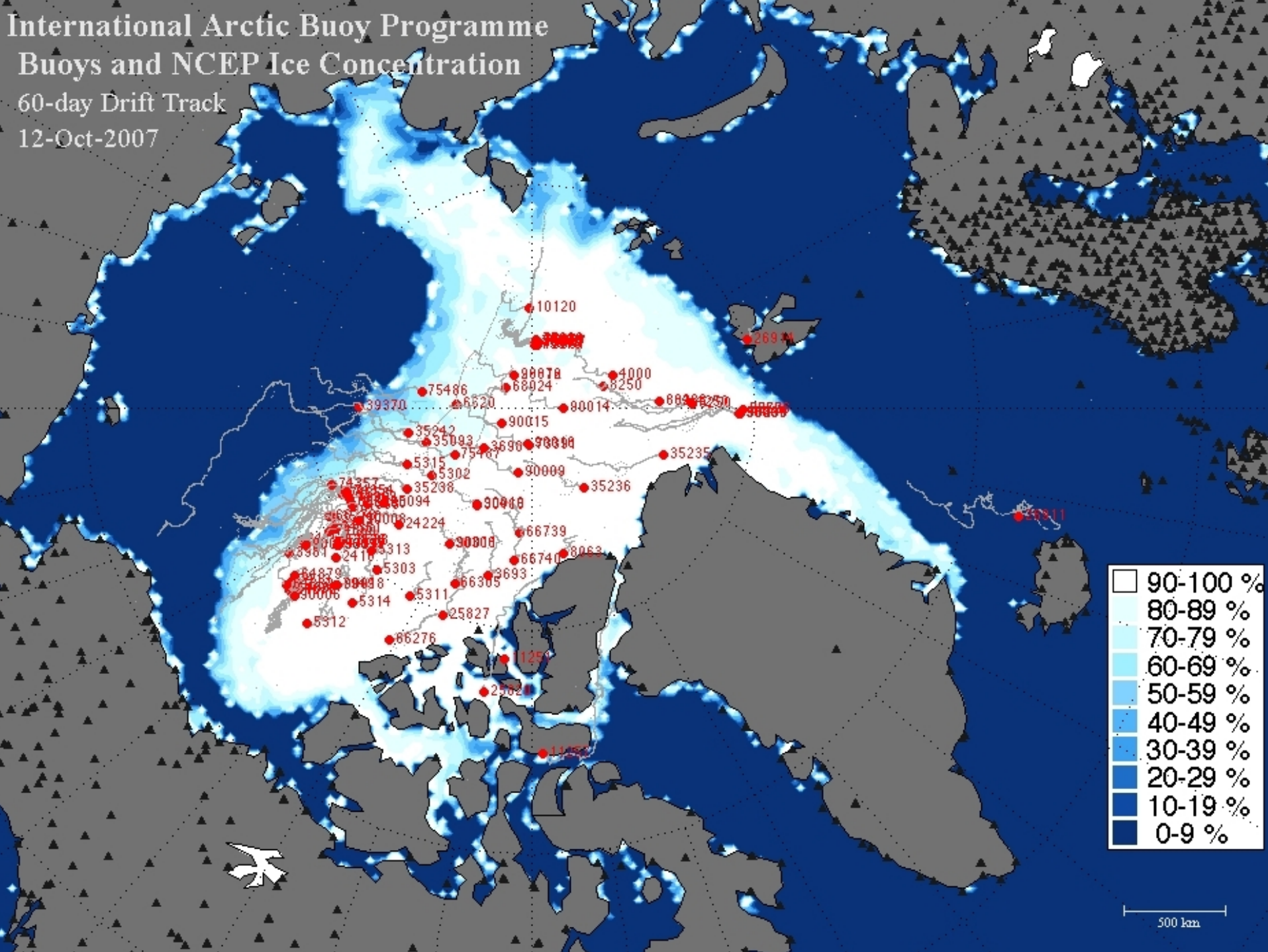
First POPS operation for the NPEO 2006

After confirming whether the POPS had worked well for a month, we began distributing POPS data to Global Telecommunication System (GTS). These data are the first Argo profiling data sent from the Arctic Ocean. You can take the POPS ocean data from the Argo web site (WMO# 4900904).



IABP Ocean Obs on GTS?

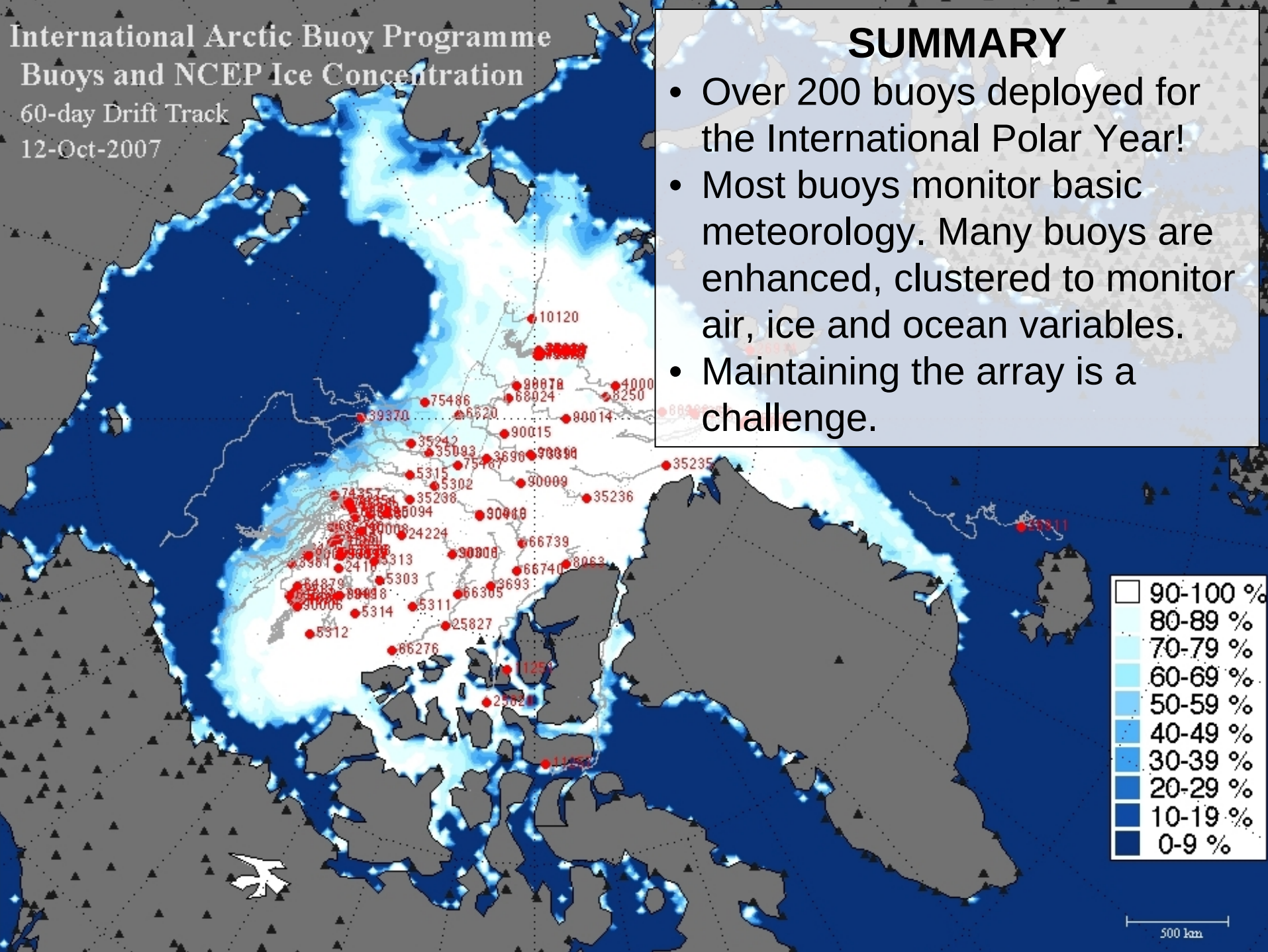



International Arctic Buoy Programme
Buoys and NCEP Ice Concentration
60-day Drift Track
12-Oct-2007
90-100 %
80-89 %
70-79 %
60-69 %
50-59 %
40-49 %
30-39 %
20-29 %
10-19 %
0-9 %
500 km

NOAA SBIR - Inexpensive Airborne Expendable Ice Buoys (AXIB)

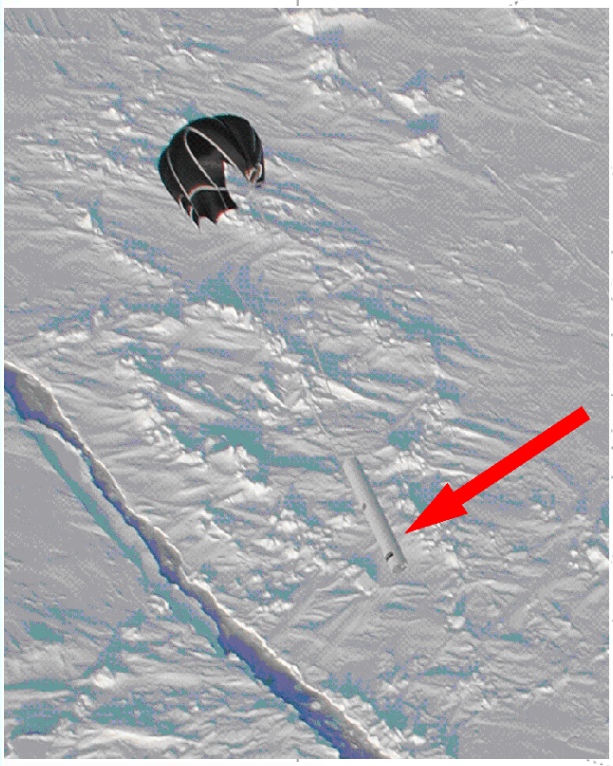
- Provides a low cost aircraft droppable seasonal buoy (with also surface deployment capability)
- Sensors/measurements include surface air temperature, surface pressure, GPS location, and Argos transmitter
- Operation in ice and open water through freeze/thaw cycles
- LBI, Inc. submitting proposal for phase II SBIR funding

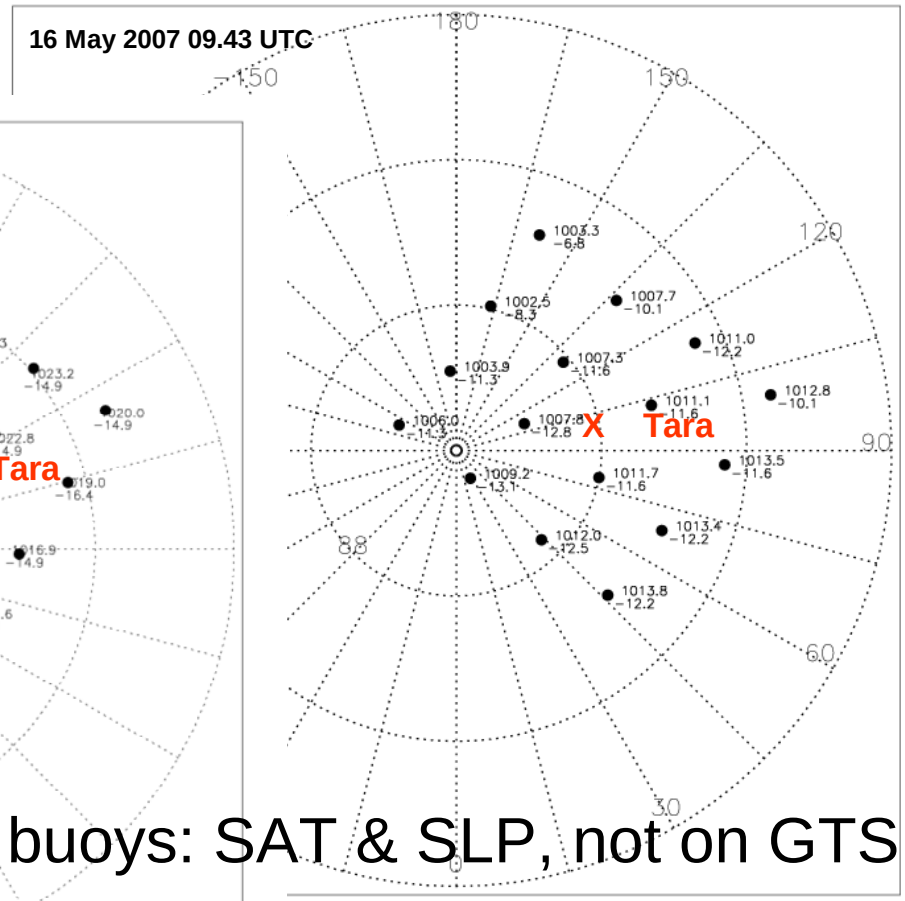
Provide alternatives to White Trident C-130 drops over MYI


International Arctic Buoy Programme
Buoys and NCEP Ice Concentration
60-day Drift Track
12-Oct-2007
SUMMARY
• Over 200 buoys deployed for the International Polar Year!
• Most buoys monitor basic meteorology. Many buoys are enhanced, clustered to monitor air, ice and ocean variables.
• Maintaining the array is a challenge.
90-100 %
80-89 %
70-79 %
60-69 %
50-59 %
40-49 %
30-39 %
20-29 %
10-19 %
0-9 %
500 km

END

Damocles met buoy array & more deployments



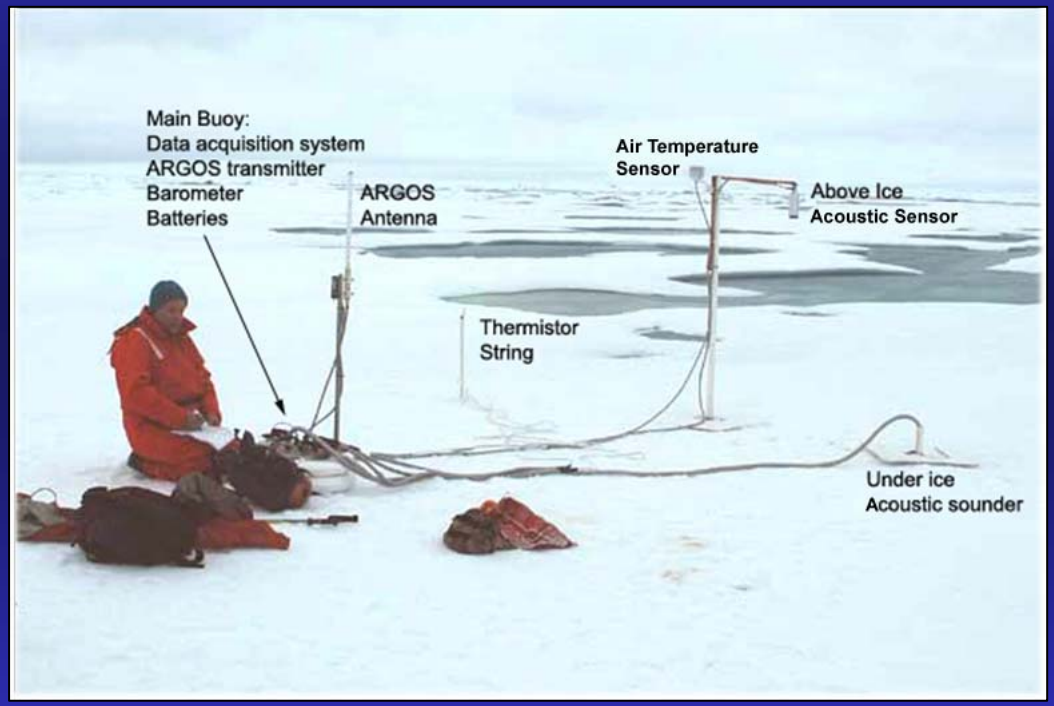


16 CALIB buoys: SAT & SLP, not on GTS

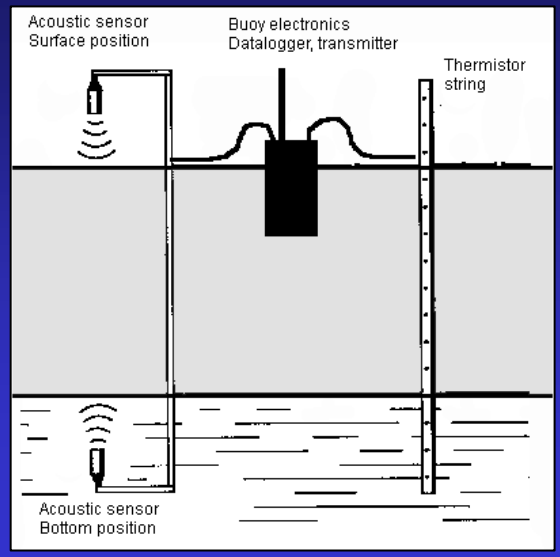
Other deployments:
Metocean POP: 86.09N, 133.28E, April 26, 2007
Metocean POP: at TARA, 88N, 130E April 27, 2007
IMB: 88N and 130E, April 24, 2007
Tiltmeter: 89.30N, 130E, plus one north of Greenland


N359EH

Ice Mass Balance Buoy (IMB)



- Installed in the ice cover
- 3-year battery life
- Autonomous
- Measures change in mass balance
- Identifies associated driving force: Atmospheric or oceanic



Air Craft: Environment Canada

DOC/NOAA AXIB SBIR

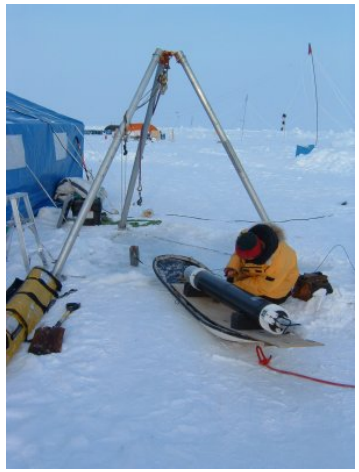
- **Small Business Innovation Research (SBIR) Inexpensive Airborne Expendable Ice Buoys (AXIB)**
  - **To provide a low cost aircraft droppable buoy (with also surface deployment capability)**
  - **Sensors/measurements include surface air temperature, surface pressure, GPS location, and Argos transmitter**
  - **Operation in ice and open water through freeze/thaw cycles**
  - **SBIR Phase II Proposal in review.**

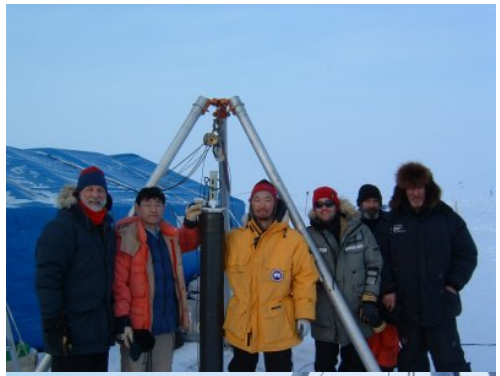
Polar Ocean Profiling System (POPS)

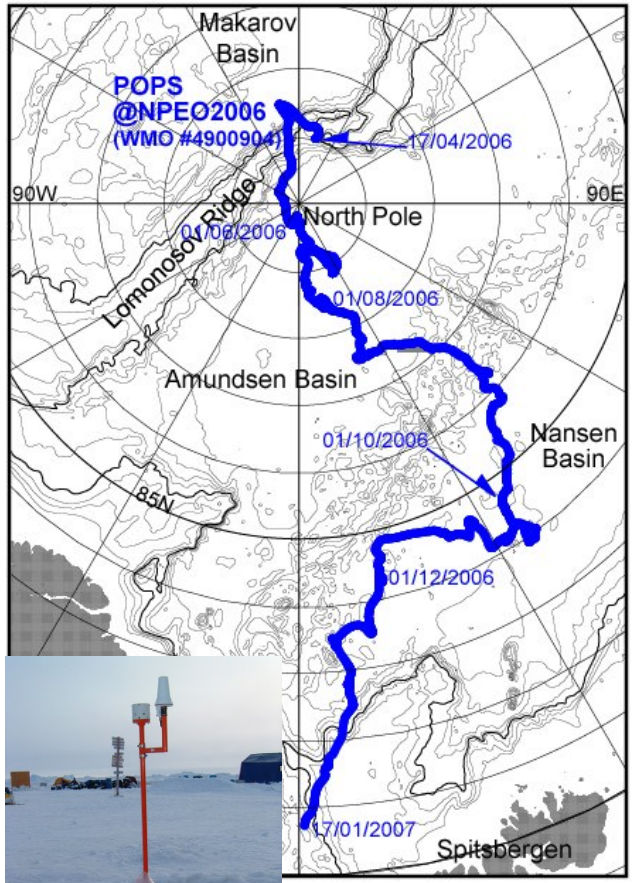
First POPS operation for the NPEO 2006

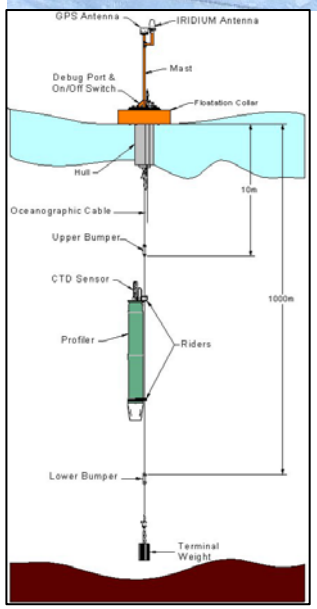
Deployment at the NPEO 2006 on April 17, 2006

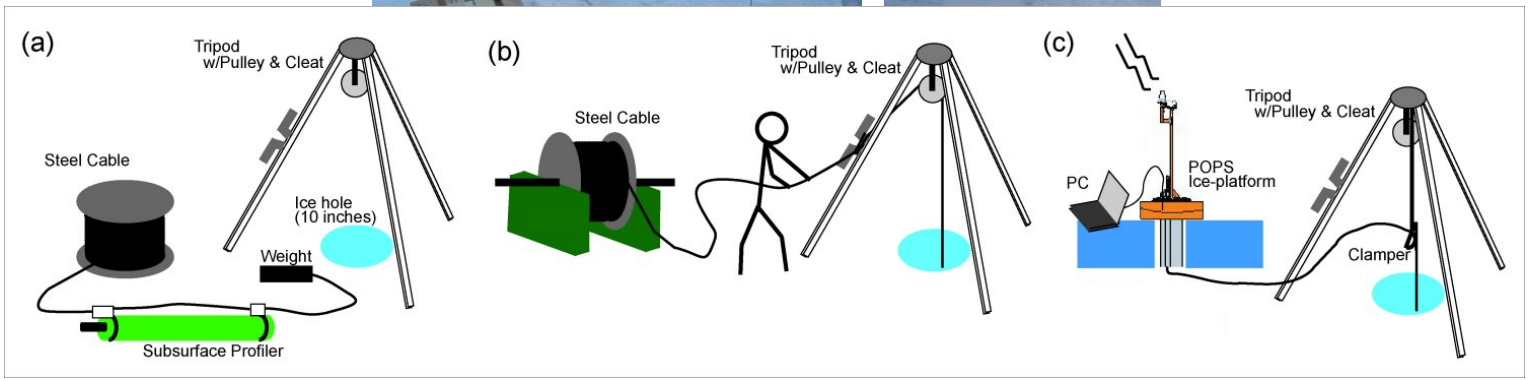
Location: 89.03N, 165.66E, Ice thickness: ~2.0 meter







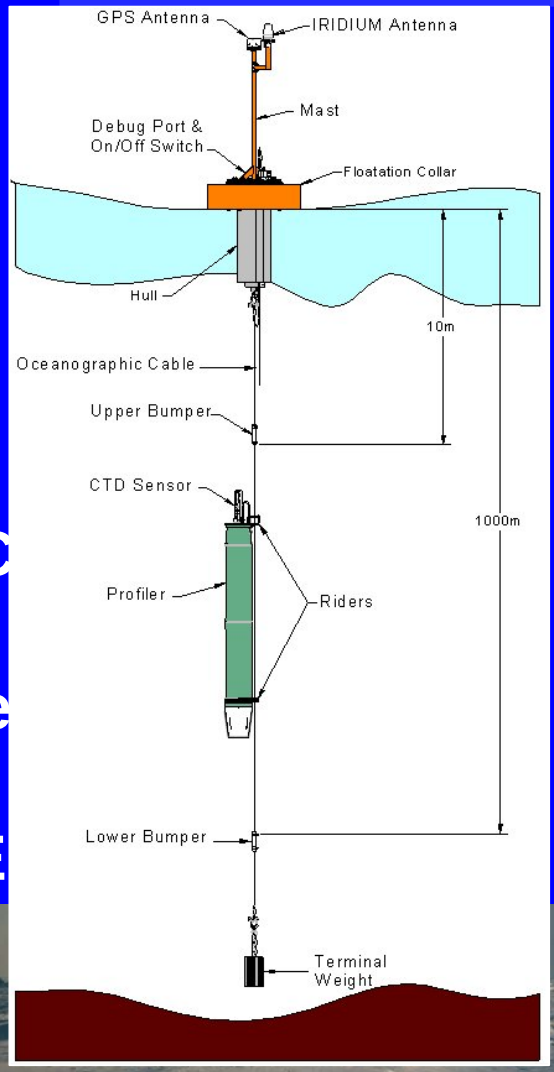


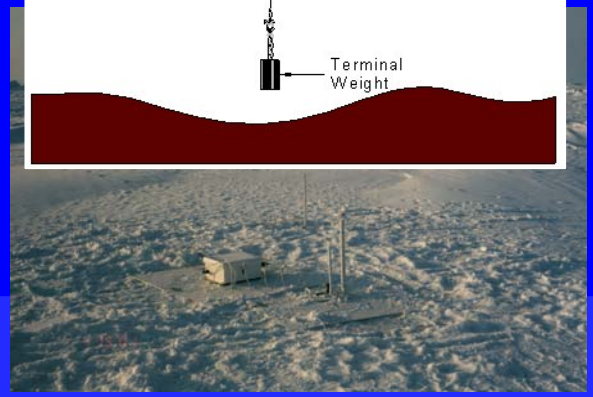


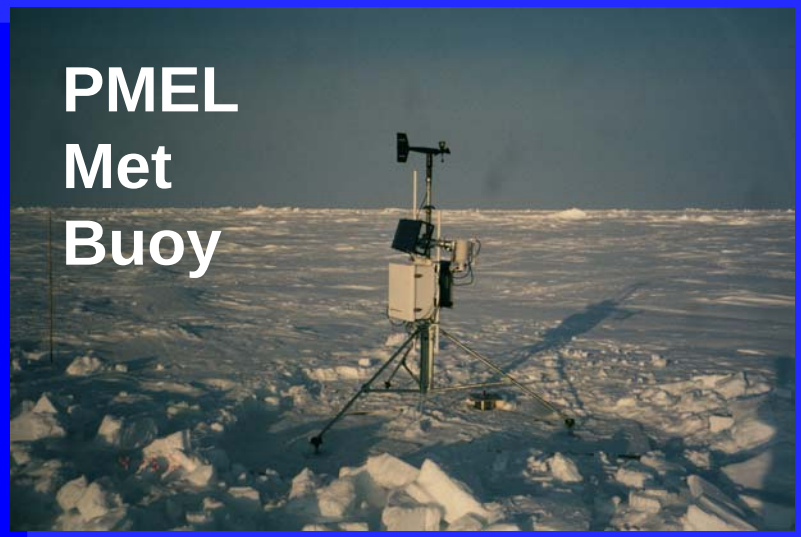
NPEO Automated Drifting Station

JAMSTEC
POPS
Ocean/Me
Buoy

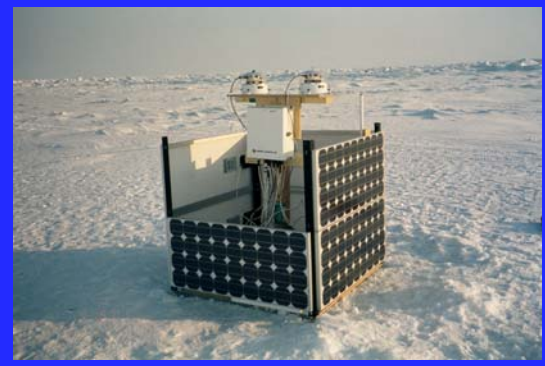
CRREL/PME
Ice Mass
Buoy







PMEL
Radiometer
Buoy



Takazawa, Shimada, Overland, Perovich,
Richter-Menge, McPhee

GPS Buoy (Ice Dynamics)

Applied Physics Lab (APL) Ice Camp – April 2007

Russia

Barrow
ALASKA

1) APL Ice Camp (Mar/Apr):
23 GPS, 5 stress,
1 Tilt-meter,
1 IMB, and
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Ice Beacon

Ice Beacon

Ice Beacon

Eureka