

International Arctic Buoy Programme

Buoys on Ice for Science and Operations

Chairman's and Coordinator's Report for DBCP 25th Session

Tim Goos - Chairman IABP
Environment Canada

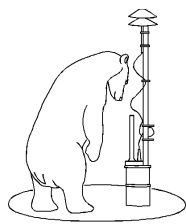
Ignatius Rigor - Coordinator IABP
Polar Science Center, University of Washington

Prepared by Edward Hudson, Tim Goos and Ignatius Rigor



photos courtesy Donald G. Barton

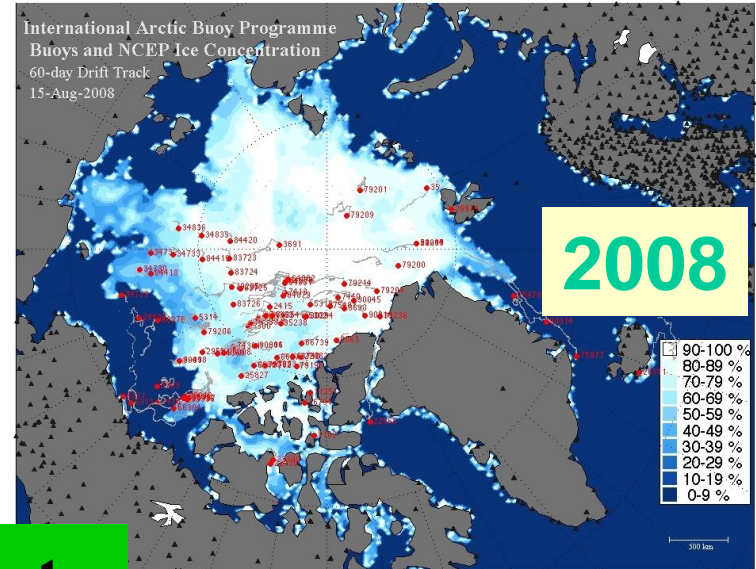
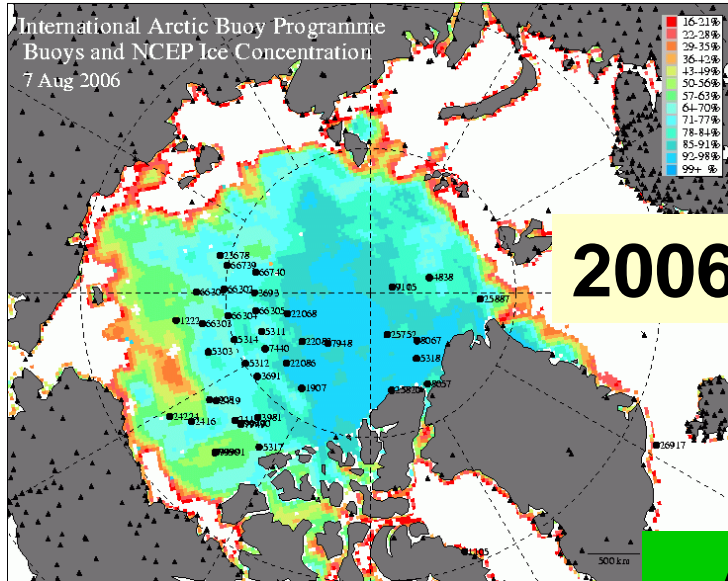
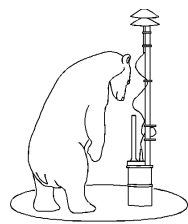
Status of IABP August 2009



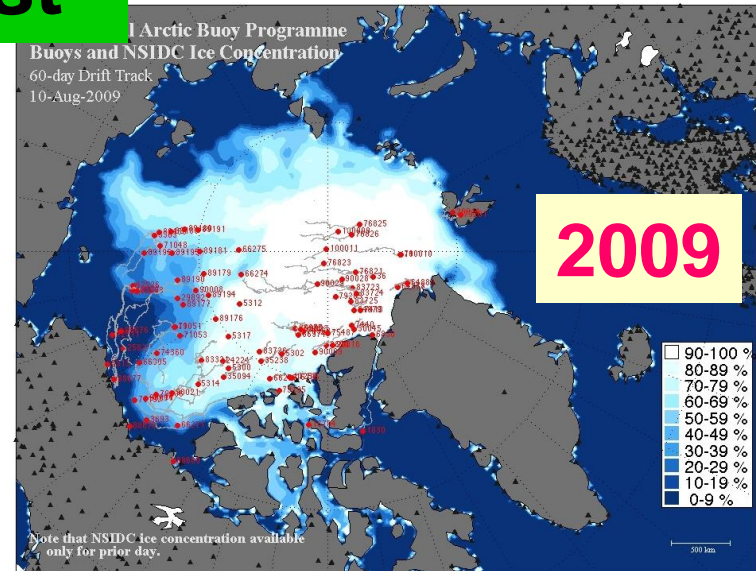
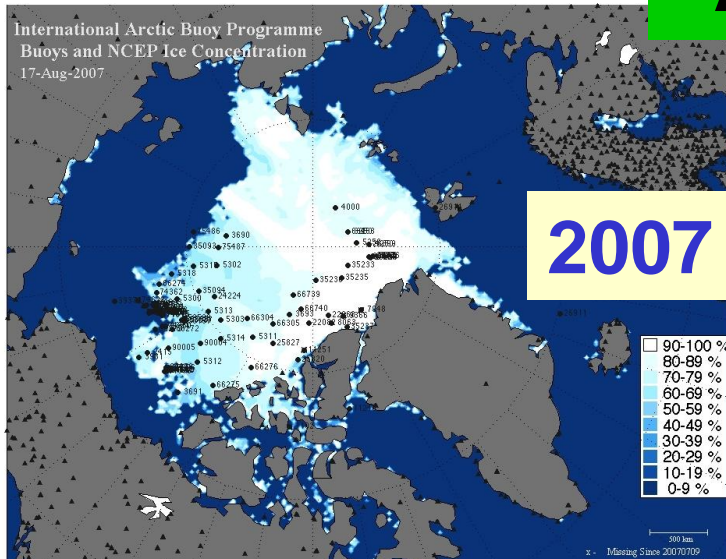
- The number of buoys in the Arctic increased significantly during the International Polar Years (March 2007 – March 2009)
- There continues to be several ice thickness and oceanographic buoys in the array
- Number of buoys on the Eurasian side of the pole remains low
- Many of the buoys on the basin are now "southern, blue water" buoys such as SVP buoys whereas even 5 years ago, only "white water" (ice) buoys were used.

	2006 7 August	2007 17 August	2008 15 August	2009 9 August
Ocean Profiling POPS or ITP	2	9	7	11
Ice Mass Balance	6	8	9	5
Surface air temperature and surface air pressure	27	33	30	25
Surface air temperature	2	1	1	1
Surface air pressure	2	8	20	40
Position only	4	30	23	6
Russian manned station			NP 35	NP 36
Total Numbers of buoys	43	89	91	89

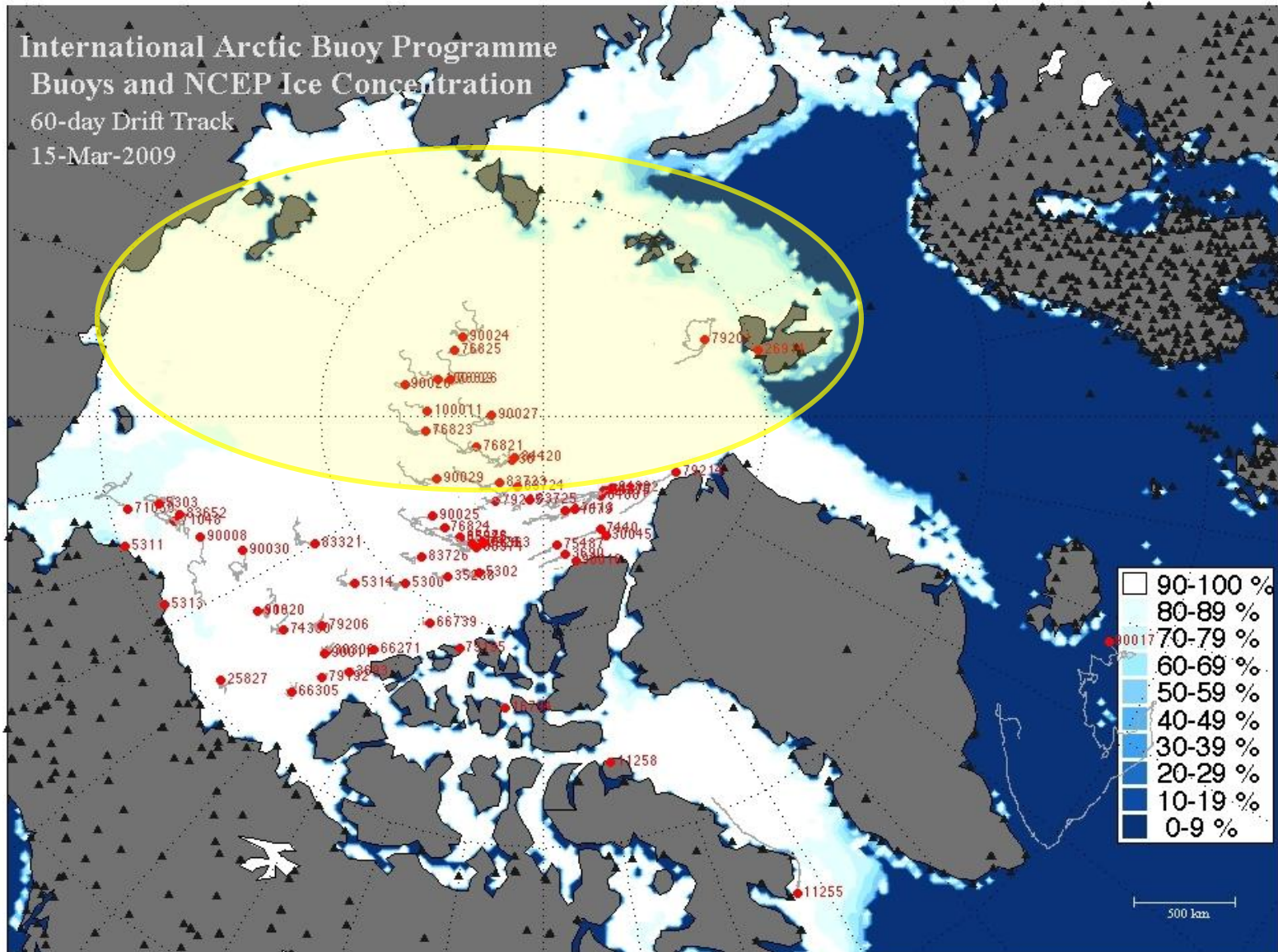
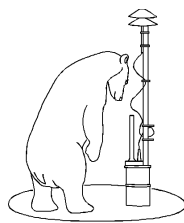
Number of buoys in 2009 remains high as result of and/or in support of International Polar Year activity



August



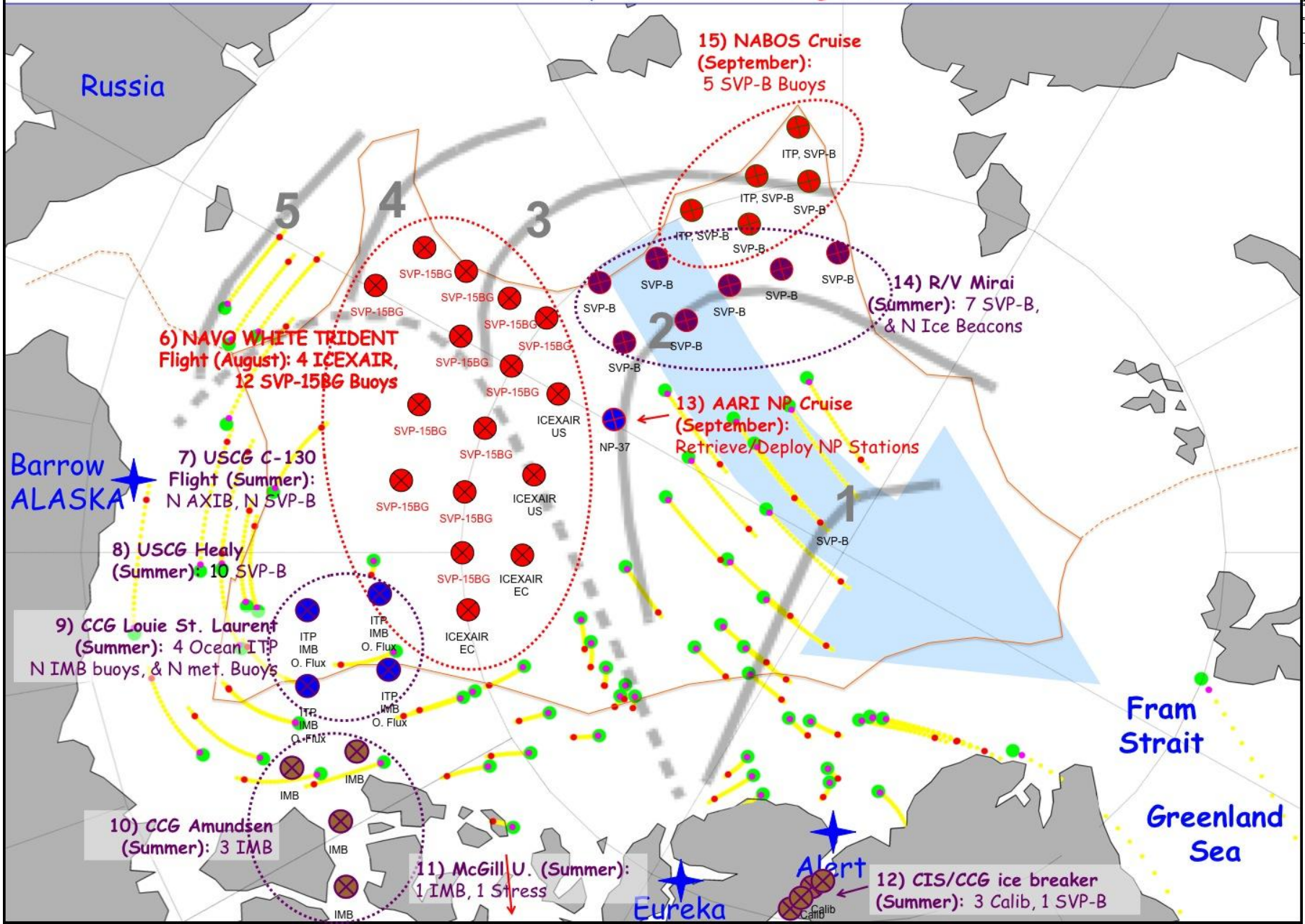
Number of buoys on the Eurasian side of the pole remains low



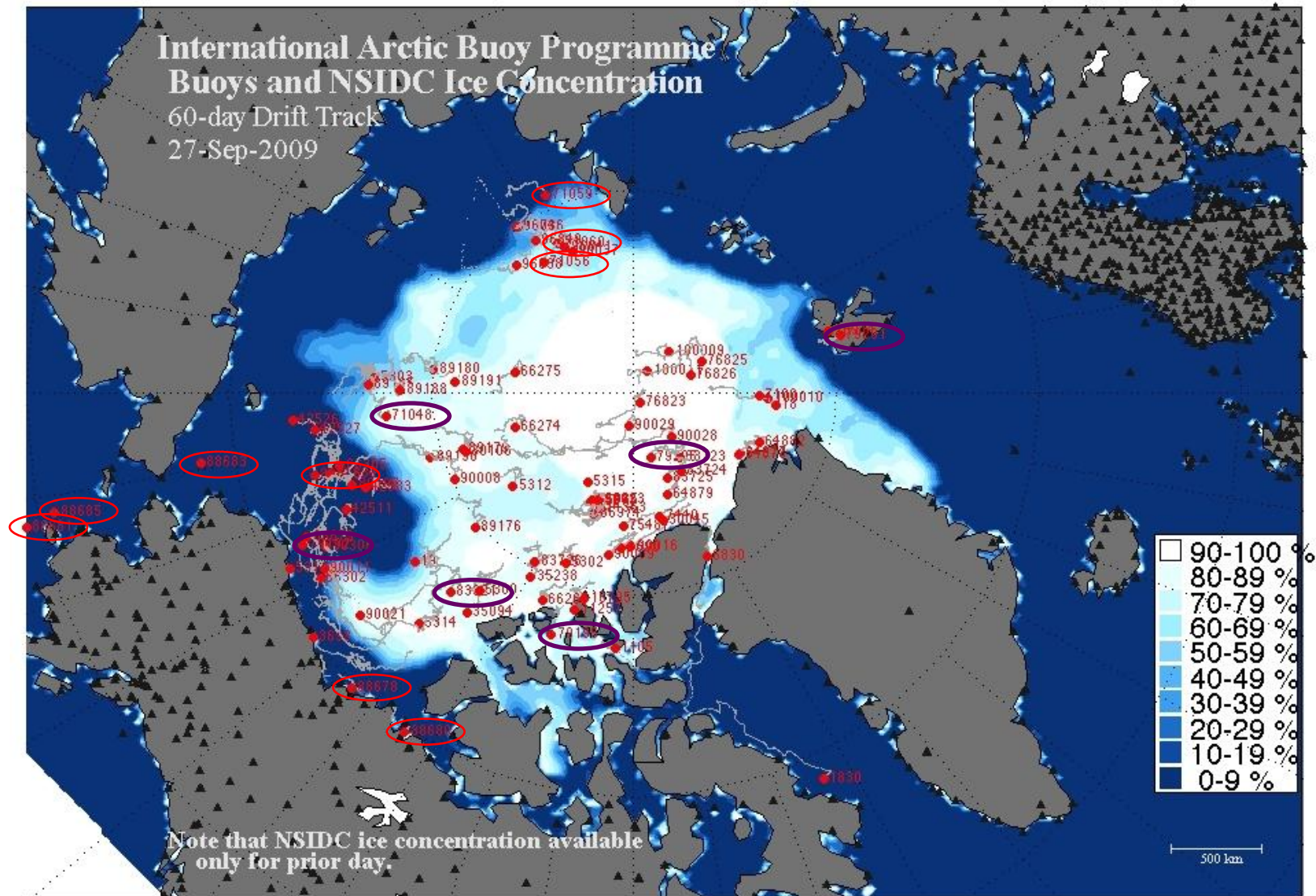
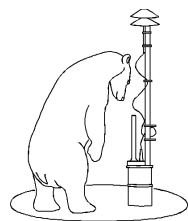
IABP Deployment Plans for Summer 2009

The small green dots show the location of drifting buoys reporting April 2, 2009.

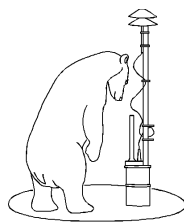
The red dots show the expected locations on August 15, 2009.



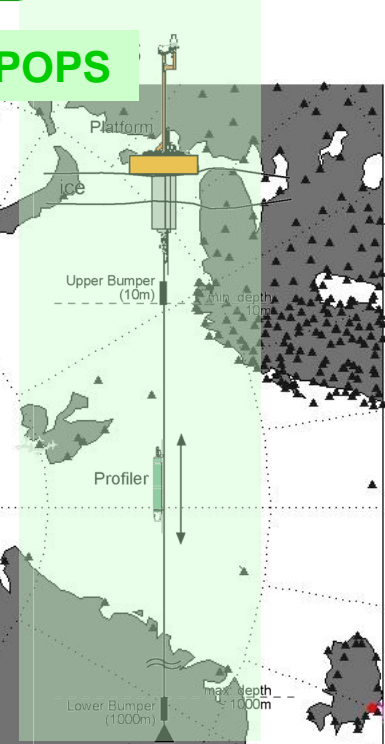
SVP- B Upgrades have been a significant help to fill the holes!



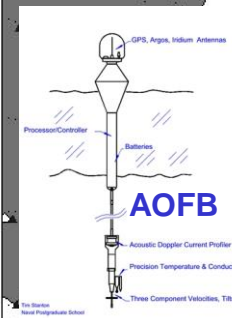
Several ice thickness and oceanographic buoys in the array



POPS

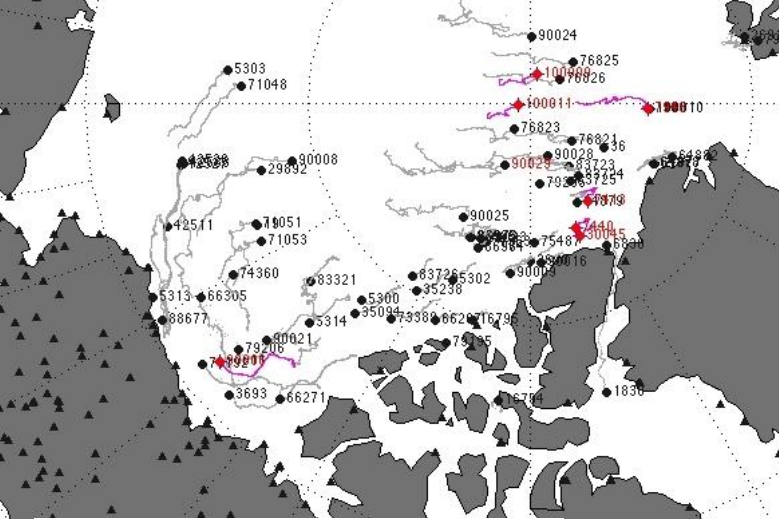
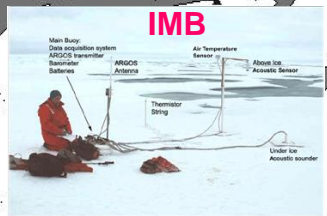


International Arctic Buoy Programme
Ocean Profile Buoys as of:
03-Aug-2009
60-Day Drift Track



- AOFB** = Autonomous Ocean Flux Buoy
- ITP** = Ice Tethered Profile
- POPS** = Polar Ocean Profiling

International Arctic Buoy Programme
Buoy Array as of:
03-Aug-2009
60-Day Drift Track



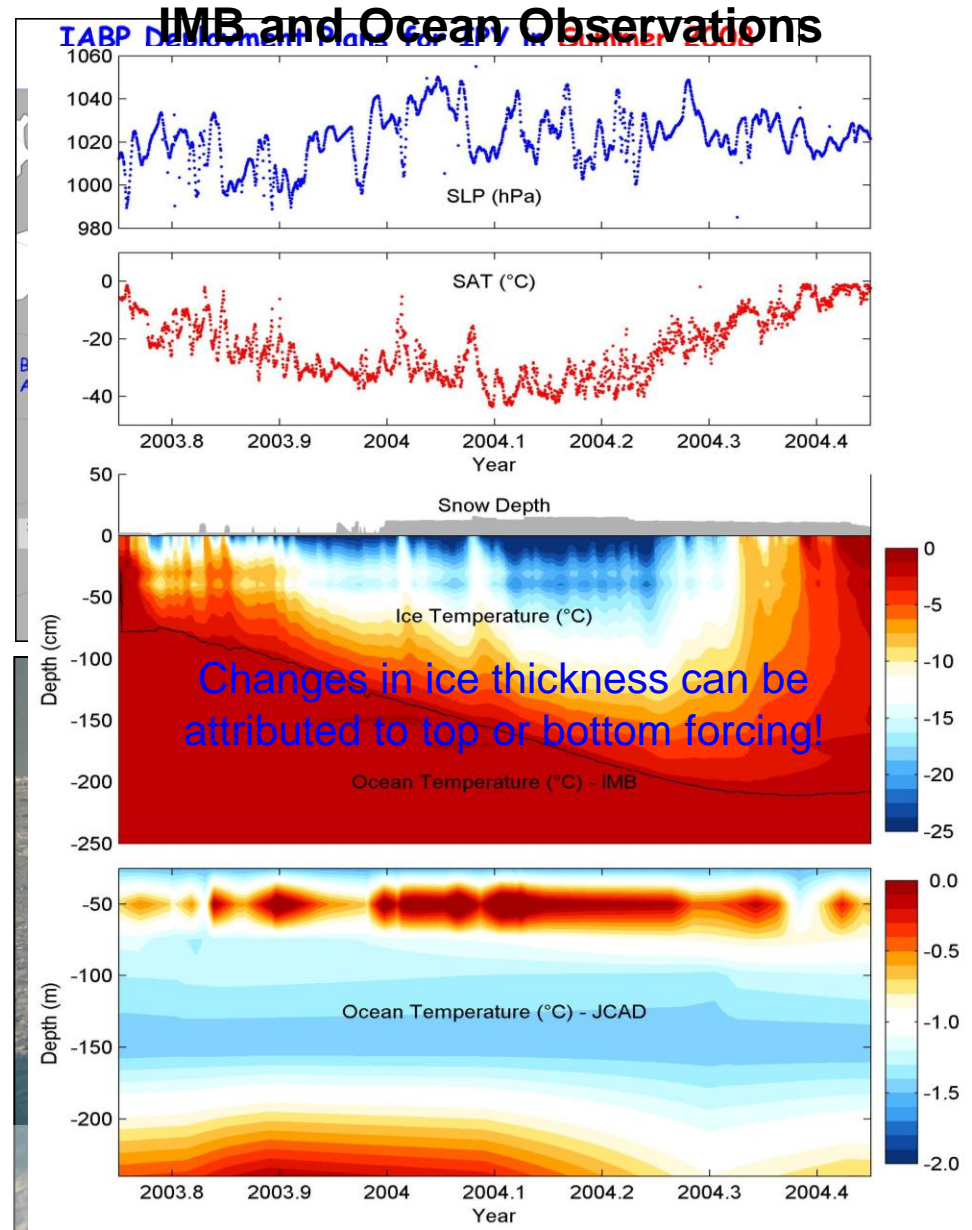
- IMB** = Ice Mass Balance
- ADS** = Automated Drifting Station

North Pole Environmental Observatory

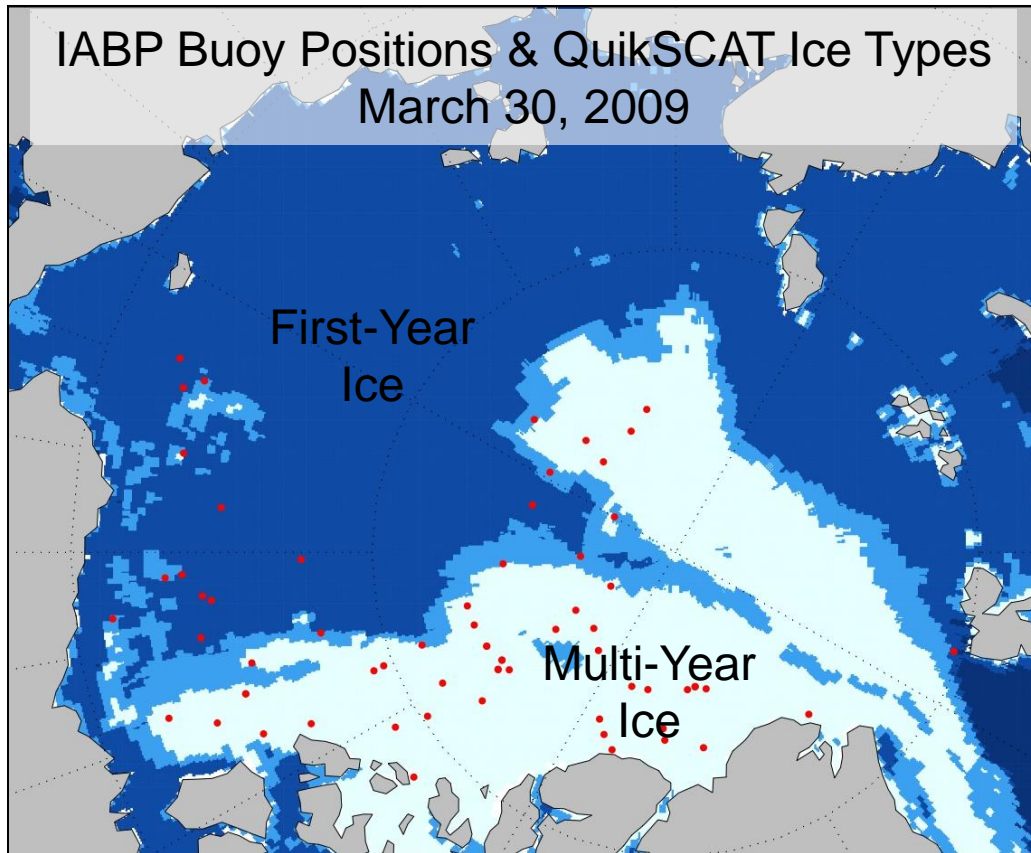
A PSC/APL Contribution to the International Arctic Buoy Program



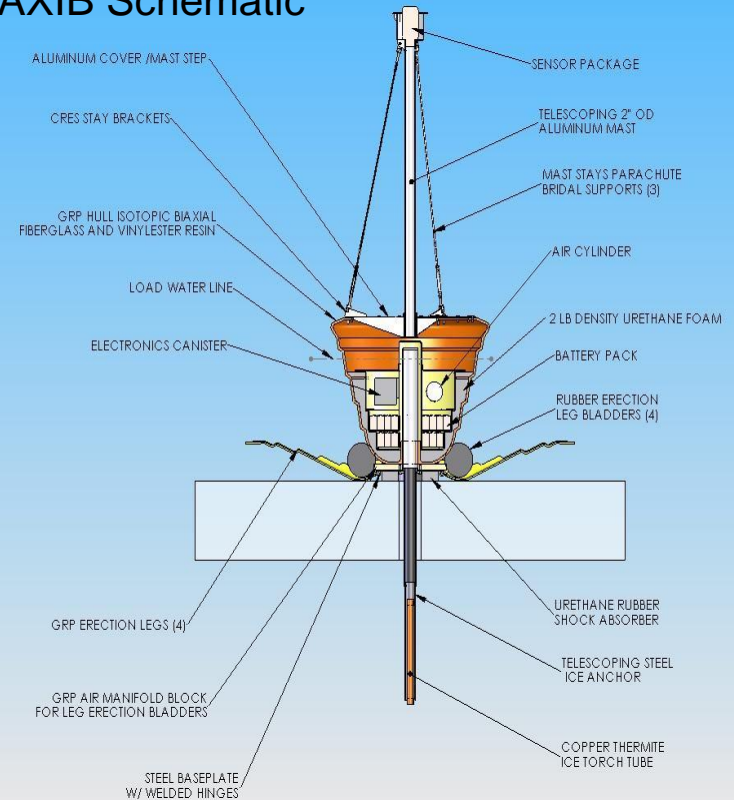
Polar Ocean Profiling System (foreground) & Ocean Flux buoy (yellow) Monitors Air and Ocean (typically deployed with IMB buoys)



Airborne eXpendable Ice Buoys (AXIB)



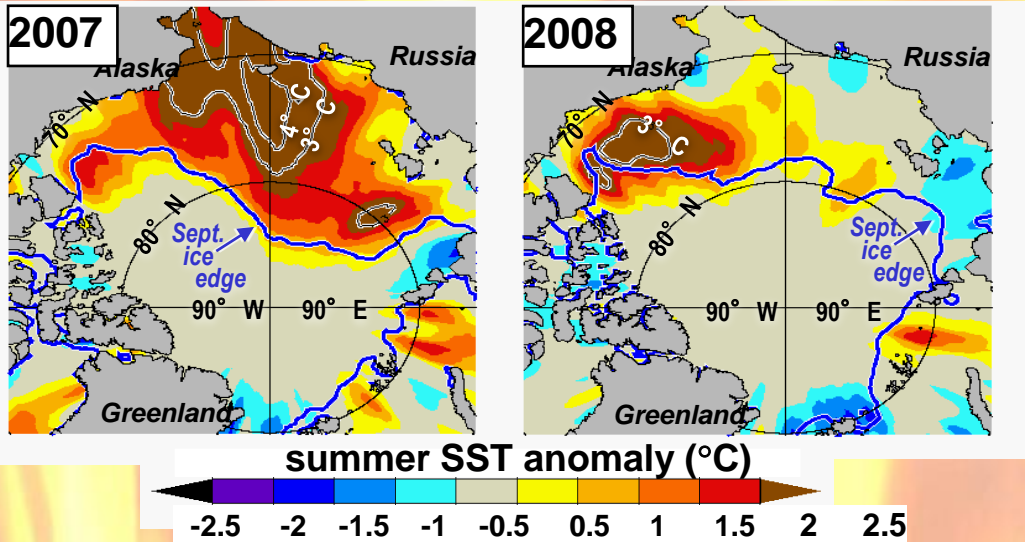
AXIB Schematic



- Low cost aircraft dropable buoy (with surface deployment capability)
- Sensors /measurements include air and ocean temperature, surface pressure, GPS location, and Argos transmitter.
- Capable of operation in ice and open water through freeze/thaw cycles.
- Prototypes were deployed from the during summers of 2008 and 2009.

UpTempO:

Measuring the Upper Layer Temperature of the Arctic Ocean



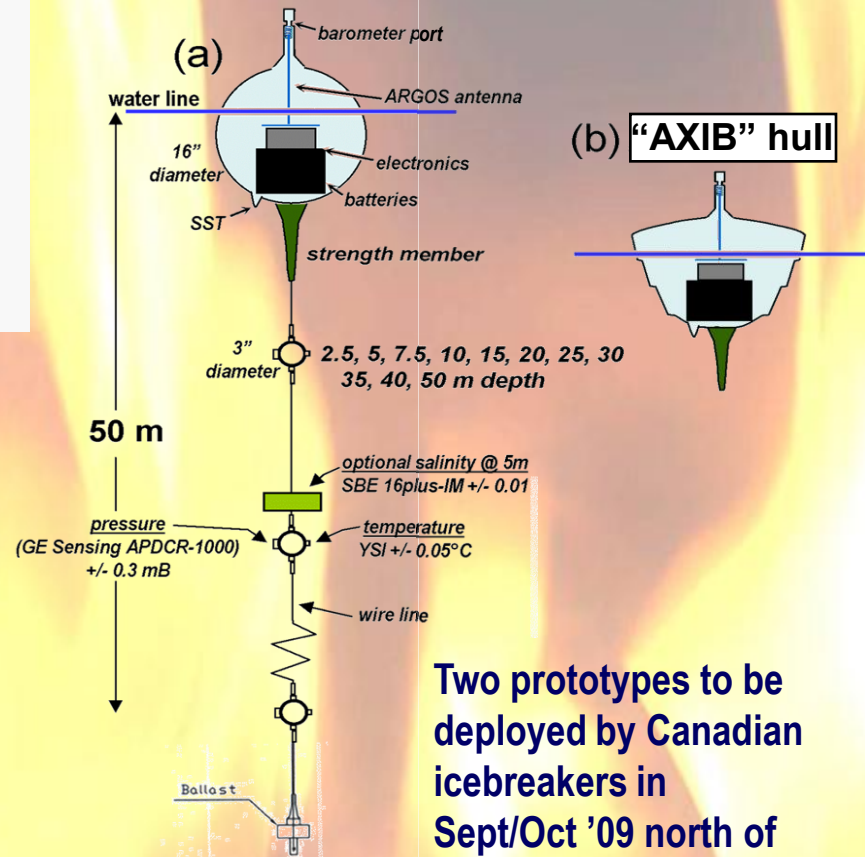
Satellite (AVHRR) SST anomalies (relative to 1982-2006 mean, from R. Reynolds data, NCDC)

This is historically unprecedented warming!

OK, but what is the evolution below the surface of:

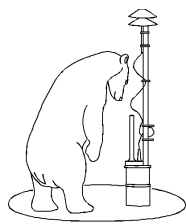
- summer upper ocean **heating**?
- fall upper ocean **cooling**?

UpTempO buoy



Two prototypes to be deployed by Canadian icebreakers in Sept/Oct '09 north of Canada/Alaska

IABP Participants Annual Meeting



Members of the International Arctic Buoy Programme met 24-26 June 2009 in Yokohama, Japan

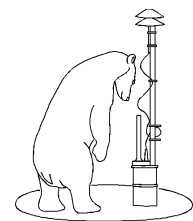
- hosted by JAMSTEC at Yokohama Institution <http://www.jamstec.go.jp/e/index.html>
- 19 attendees representing 12 of the 28 Participants

Discussion / Issues

- **Challenges to sustain IABP network**
 - Increasing area of First-Year Ice and Open Water during summer
 - Deploying buoys in the Eurasian Arctic
- **How does the IABP fit into the Sustained Arctic Observing Network (SAON)?**

IABP Participants believe that the IABP supports a sustained Arctic observing network and see it as the foundation of such a network, since it is the longest, continuously standing observing program for the Arctic.
- **Working with researchers such as those in DAMOCLES programs to obtain data that did not get onto the GTS for the IABP and GTS archives.**
- **Buoys on ice / in water but not on GTS** – Efforts to have all those putting buoys on ice / in water the arctic basin post their data to GTS in real time is ongoing. Many researchers are using Iridium rather than Argos to get their data and that data is not being put on the GTS.

IABP-19 Technical Session



- 1. Metocean's polar product developments**
Tony Chedrawy, Metocean



AXIB in Arctic Water

- Effective operation wide water scope
- Sustained freeze-up during Winter '08-'09
- Continuous operation of sensors and comms
- Deployed overboard from ship

- 2. Airdroppable eXpendable Ice Beacon (AXIB) Update**
Peter Legnos, Lincoln Maritime

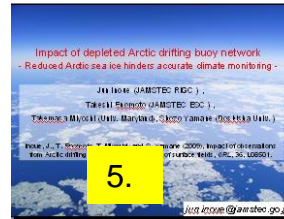
- 3. Argos-3**
Hidefumi Yatomi, Cubic-i / CLS



- 4. Report from R/V Mirai IPY cruise in 2008**
Motoyo Itoh, JAMSTEC

4. Report from R/V Mirai IPY cruise in 2008
Motoyo Itoh, JAMSTEC

- 5. Impact of Depleted Arctic Drifting Buoy Network**
Jun Inoue, JAMSTEC



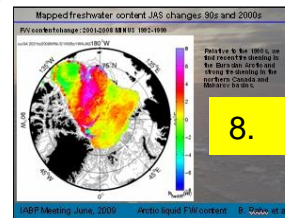
- 6. Ship-borne Electromagnetic Induction Sounding of Sea Ice Thickness in the Arctic during 2003, -2005 and 2008**
Kazu Tateyama, Kitami-IT



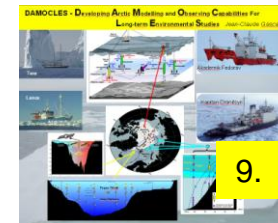
- 7. Report from North Pole Environmental Observatory in April 2009**
Takashi Kikuchi, JAMSTEC



- 8. Freshwater content in the Arctic Ocean revealed by ice-drifting buoys and ship observations**
Takashi Kikuchi, JAMSTEC, for Benjamin Rabe, AWI



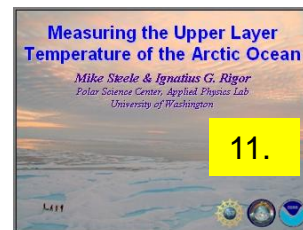
- 9. DAMOCLES and new Hi Tech development such as AITP, ULS floats and gliders.**
Jean-Claude Gascard, UPMC



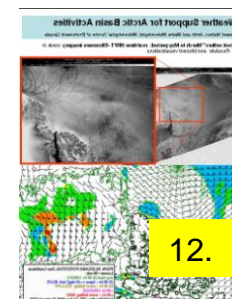
- 10. Outlooks for Summer Sea Ice**
Ignatius Rigor, University of Washington

An Outlook for Summer Sea Ice
Ignatius G. Rigor and many others
Polar Science Center, Applied Physics Lab
University of Washington
Resolving some Uncertainty in our Climate Record

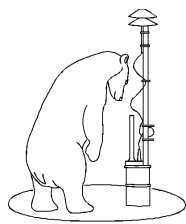
- 11. Measuring the Upper Layer Temperature of the Arctic Ocean**
Ignatius Rigor, University of Washington



- 12. Weather Support for Arctic Basin Activities**
Edward Hudson, Environment Canada



Buoy data improved analysis accuracy locally and over entire Arctic region

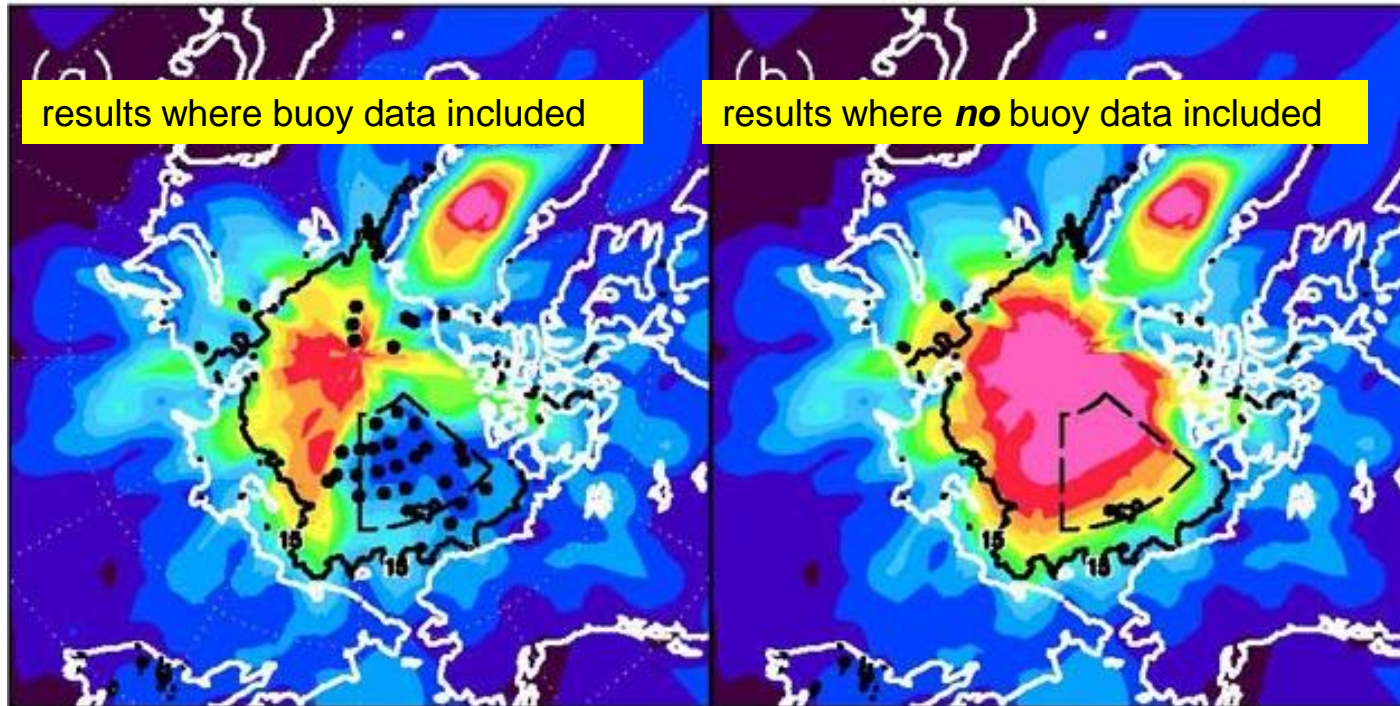


This figure from presentation 5 of the Technical Session *Impact of Depleted Arctic Drifting Buoy Network*, Jun Inoue, JAMSTEC / the paper *Impact of observations from Arctic drifting buoys on the reanalysis of surface fields*, Jun Inoue et al, *Geophysical Research*, Volume 36, 2009, shows value of data from the arctic drifting buoys to produce accurate wind and pressure fields for the arctic basin. The paper can be accessed at http://iabp.apl.washington.edu/research_impactbuoys.html

Analysis ensemble spread of Sea Level Pressure in August 2006.

SLP spread in CTL (AUG2006)

SLP spread in ARC (AUG2006)

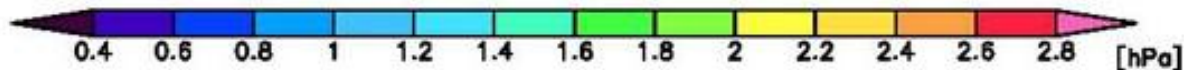


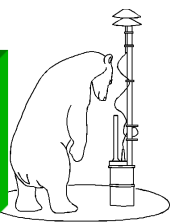
results where buoy data included

results where *no* buoy data included

Dots depict positions of Arctic drifting buoys.

Thick line denotes ice concentration greater than 15%.





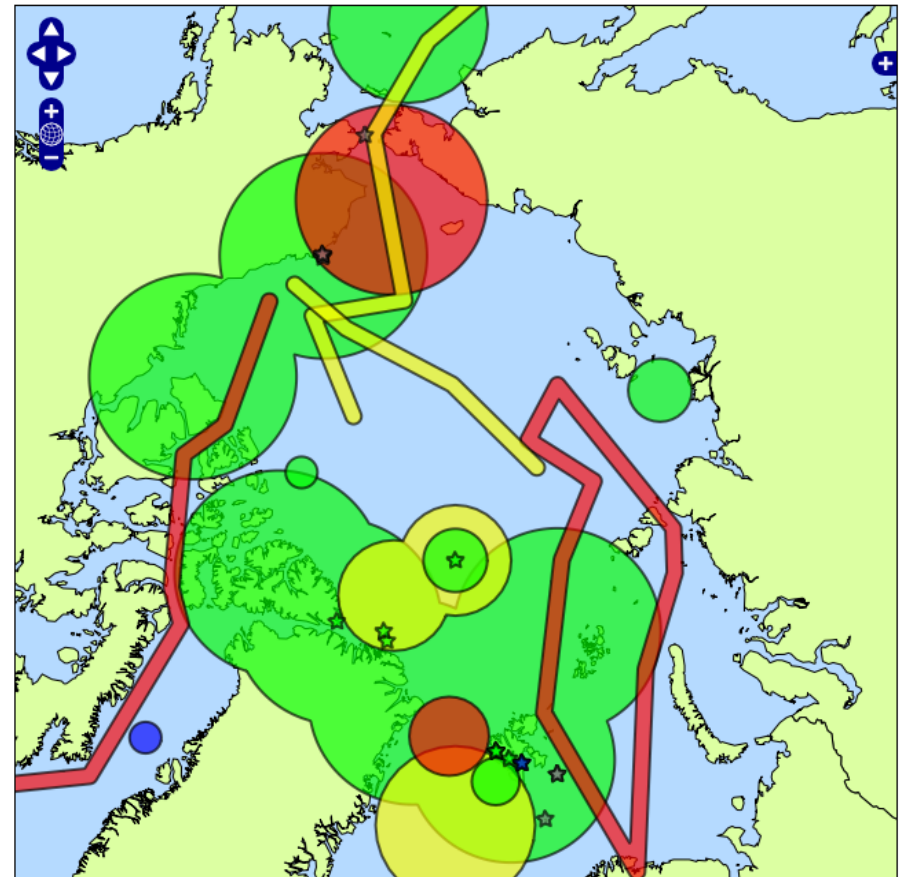
- One-stop shop for Arctic sea ice field planning coordination
- Want to include all expeditions where buoys are to be deployed
- Sponsored by CliC - Hajo Eicken / CliC sea ice working group - and IARC - Jenny Hutchings, website coordinator
- Hope to encourage further collaborations and pave the way for coordinated sea ice data collection

2009 Arctic Expeditions

[2010](#)

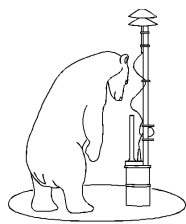
[2011](#)

[2012](#)



Winter  Spring  Summer  Fall  Year-round 

2010



- **Number of buoys may decrease**
but remain higher than 2006
- **Expect to see more buoys that can survive freeze-thaw cycle**
such as AXIB
- **Air deployments will remain integral to program's success**
- **Expect more buoys to use iridium for communication**
in place of Argos