

Observations in Sea Ice for Operations and Research

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Madison, Wisconsin

June 10–12, 2013
Objective:

Establish an array of meteorological and oceanographic buoys on sea ice,
to study the interaction of sea ice with the atmosphere and ocean,
primarily in the Southern and Arctic Seas.



MetOcean Ice Beacons (MIB)

These buoys measure SLP, SAT, and SST.



Ice Beacon deployed via helicopter and a sling by the crew of the Polarstern in the Arctic.



Aerial view of ice floe on which the buoy was deployed.

Upper layer Temperature of the Ocean (UpTempO, aka ADOS) Buoys

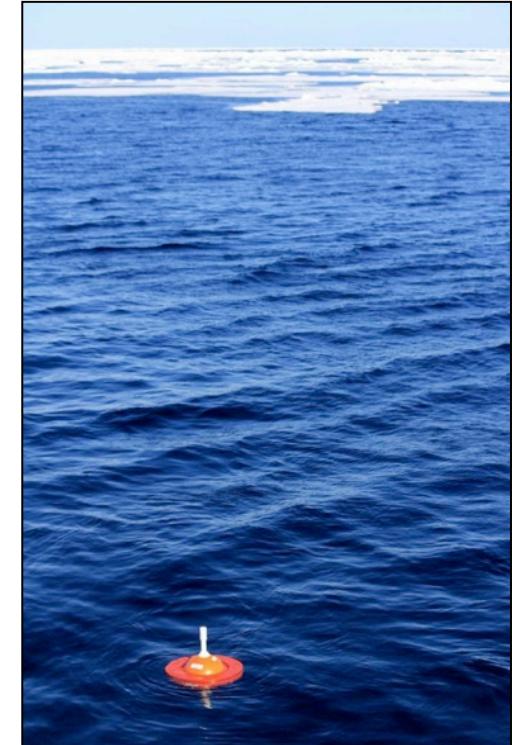
These buoys measure SLP, and upper ocean temperatures.



Preparing the thermistor string for playing through a hole augered into the ice.

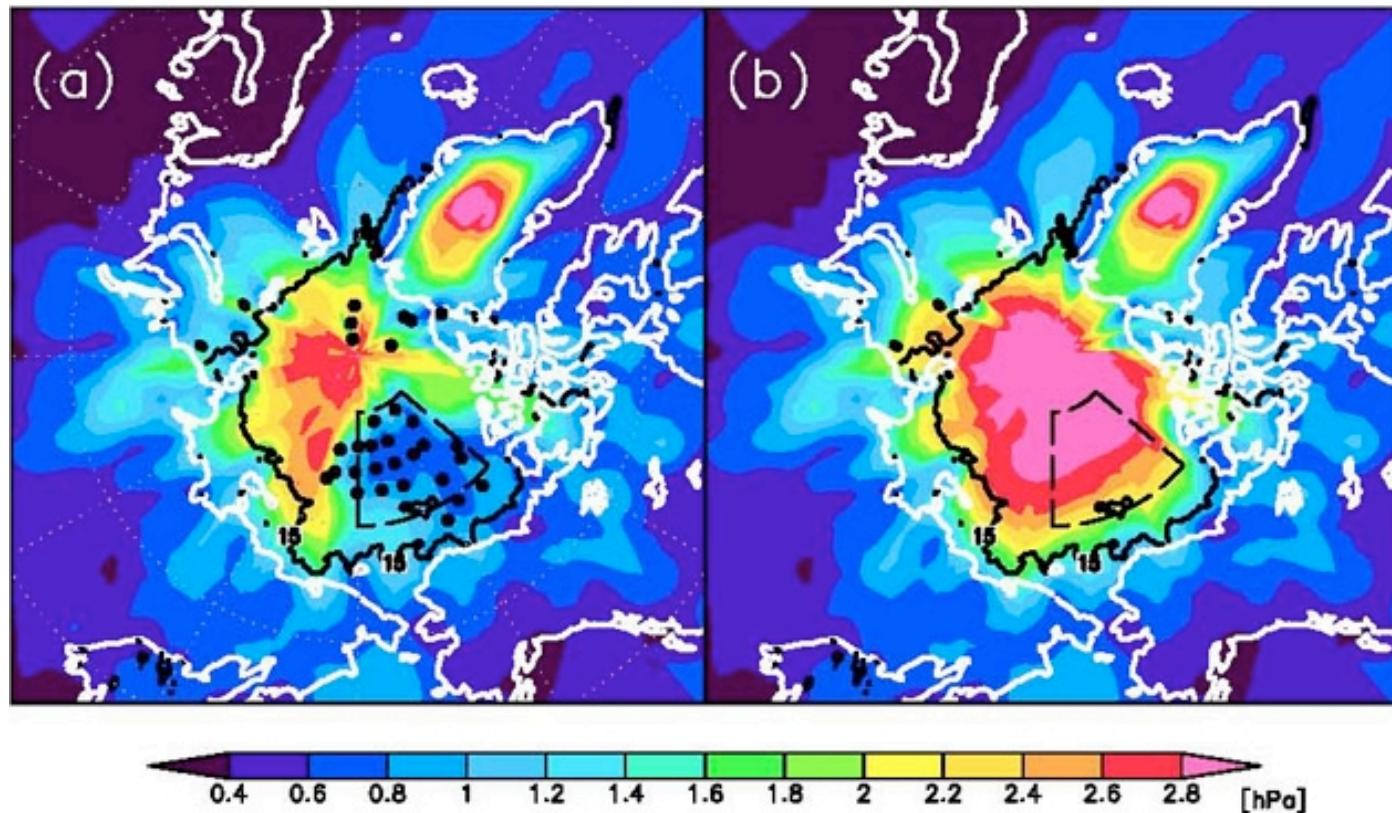


A hole was augered Through which the thermistor string was lowered.



Open Water Deployment in an area of sea ice.

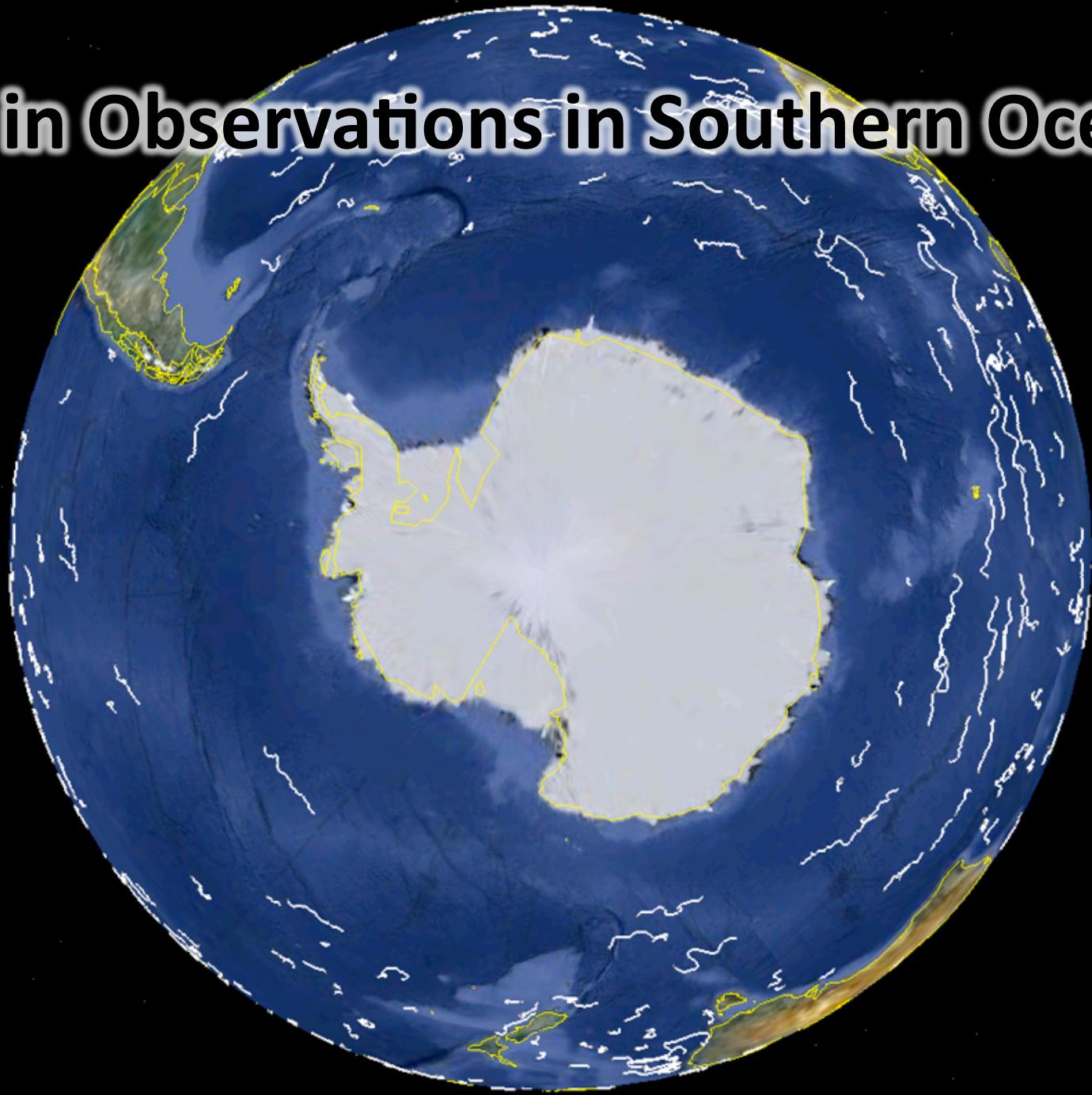
RMS Error of SLP Reanalyses



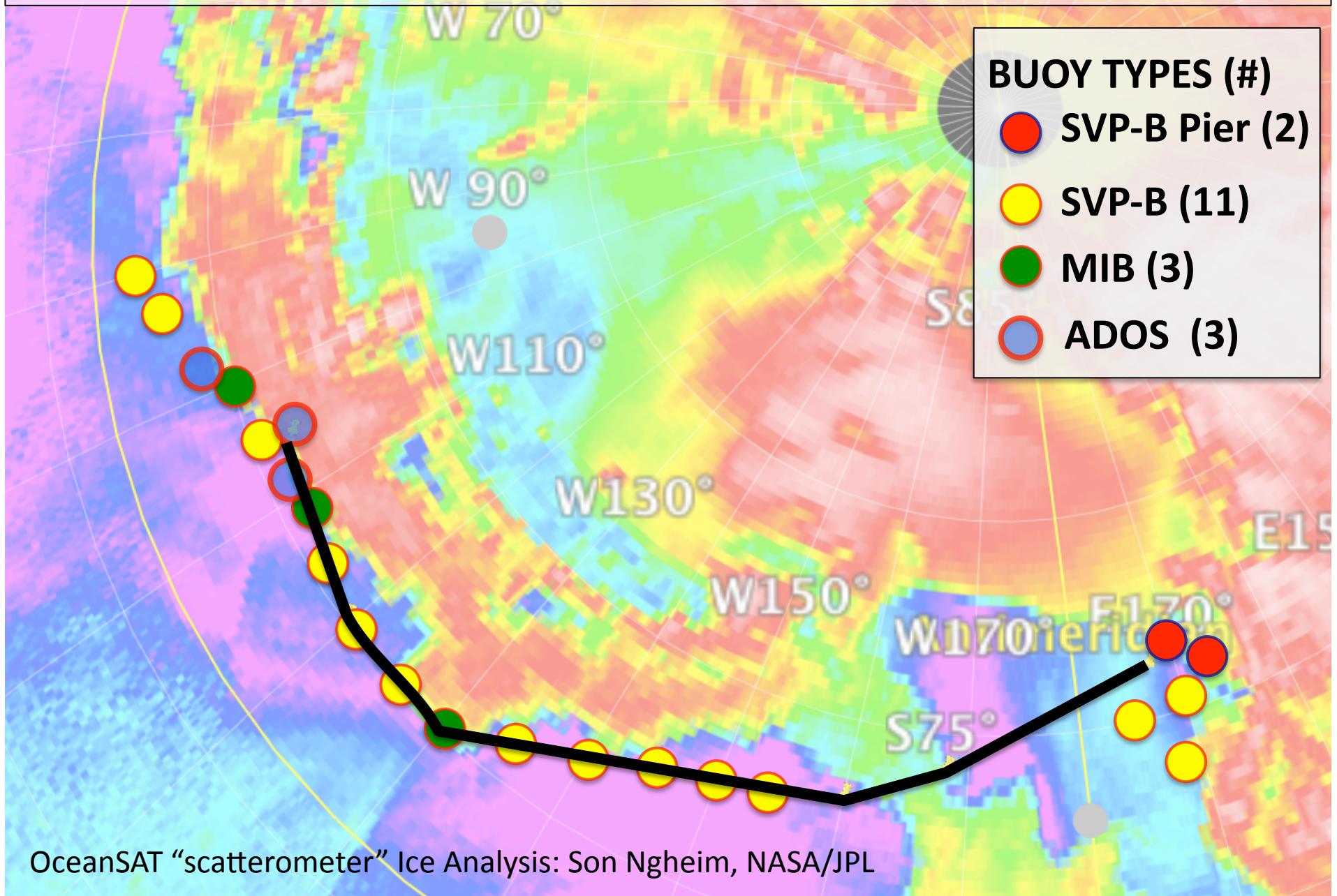
The spread between SLP Reanalyses is low in areas where there are buoy observations (left). The spread increases to cover the whole Arctic when the buoys are removed from the reanalyses (right). The buoy obs. also help constrain of estimates of wind and heat.

(Inoue et al, 2009)

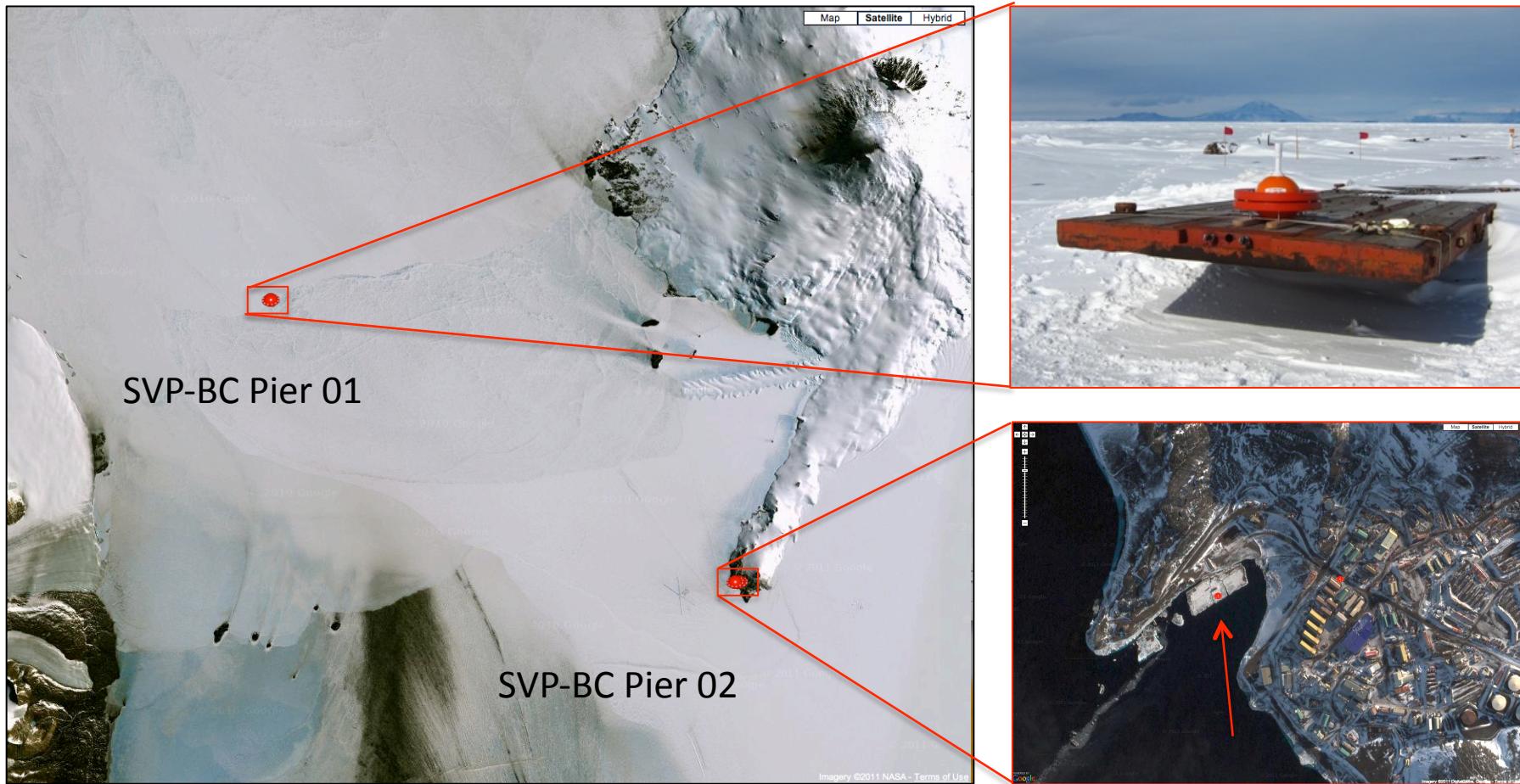
Gap in Observations in Southern Ocean



N.B. Palmer Cruise Track Feb. 2012



SVP-B (SLP, surface temperature, GPS) Deployed On McMurdo Ice Piers

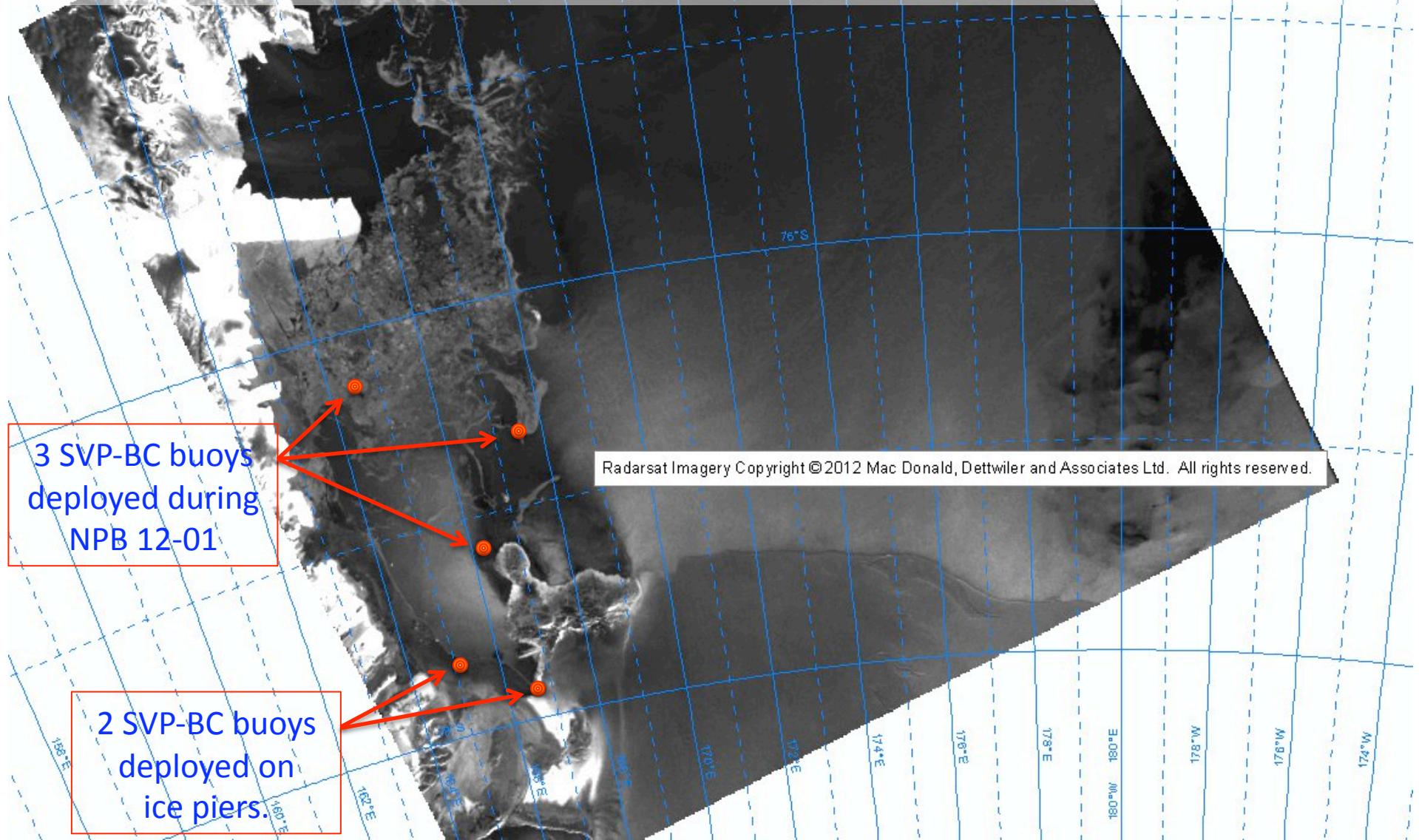


SVP-BC Buoy Deployed On Ice by NPB

This buoy measures SLP, and Surface Temperature



SVP-BC Buoys Deployed on Piers and during NPB 12-01 Overlaid on RadarSat Image from National Ice Center (Feb. 2, 2012)



Drifting Buoy Obs. on GTS – April 2012

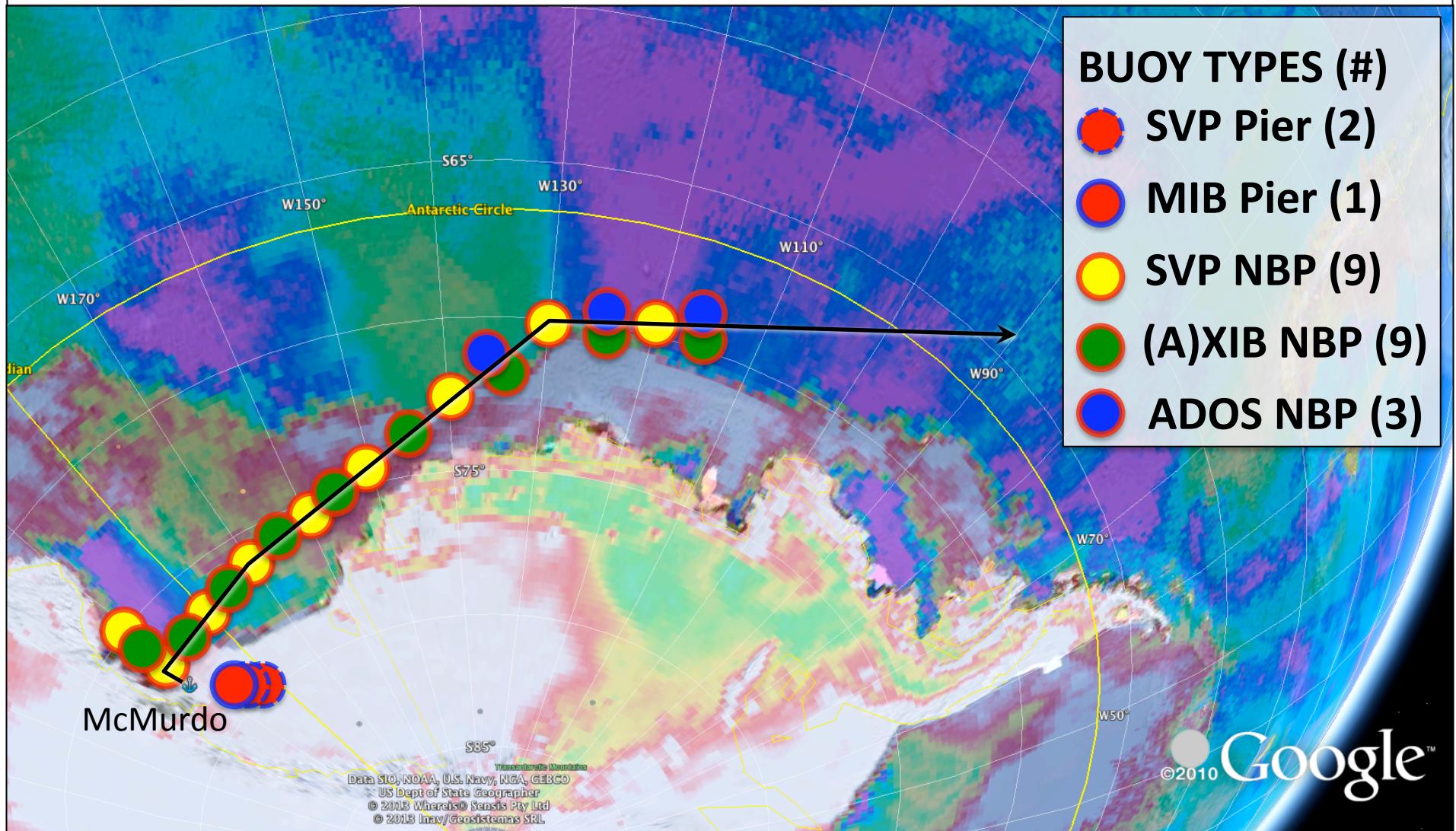
<http://isdm.gc.ca/isdm-gdsi/drib-bder/KML/MonthlyKML-eng.htm>



Antarctic Drifting Buoys

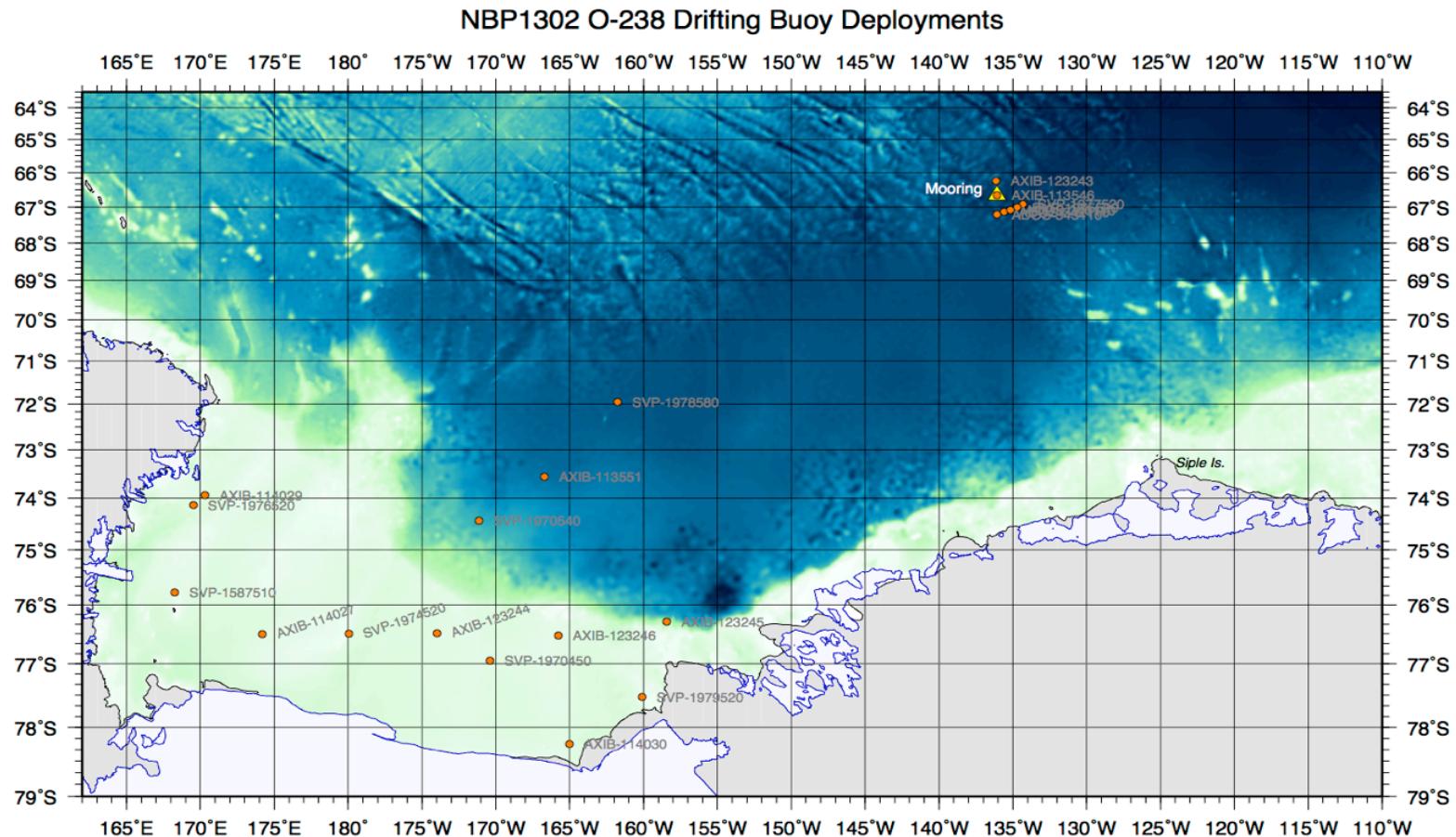
Deployment Plans 2012-13

(Tentative Feb. 19, 2013 version; depending on ice conditions)



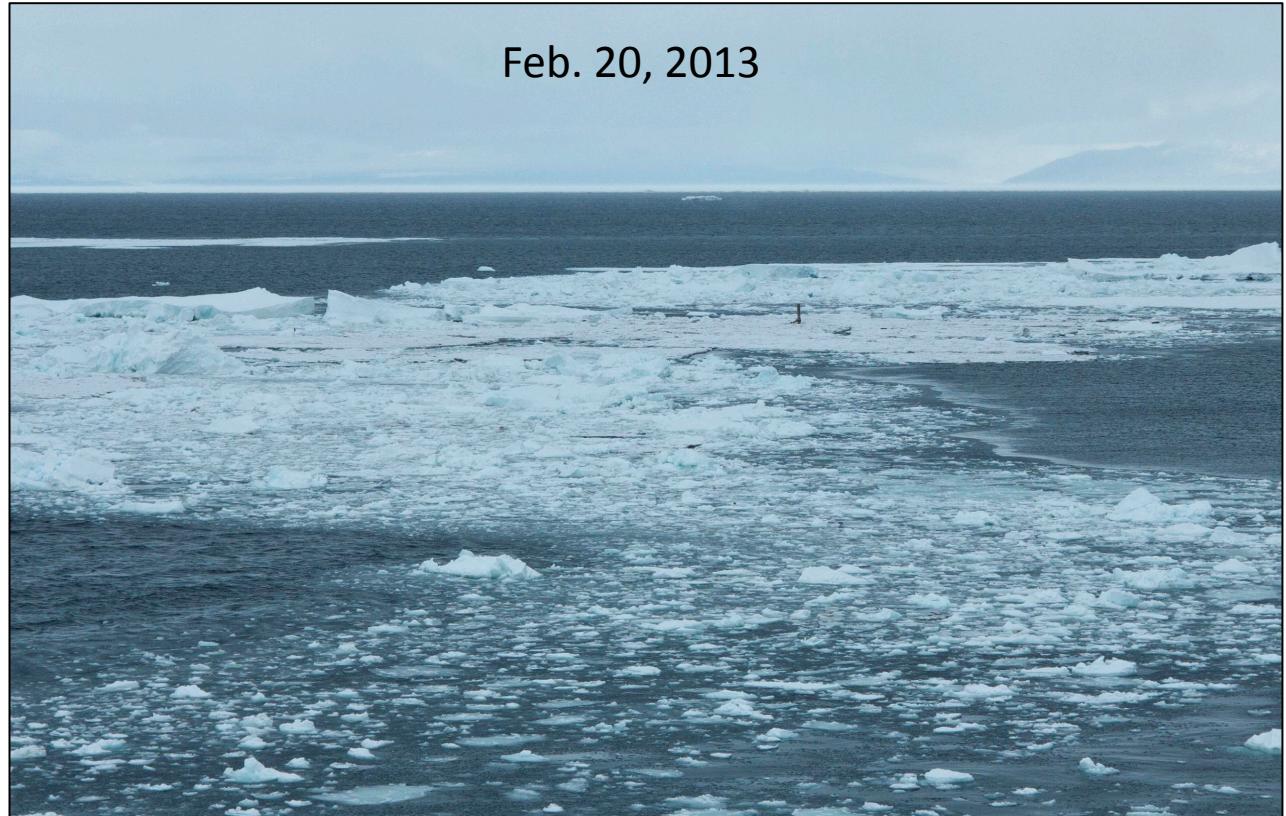
Antarctic Drifting Buoys

Deployment Plans 2012-13



We would like to “eaves drop” in the planning of the cruises to avoid surprises, and optimize buoy selection for particular science missions.

MetOcean Ice Beacon (MIB: SLP, Ta, GPS) Deployed on old McMurdo Ice Pier



Deployed on old pier on Feb. 8, 2013, pier broke up on Feb. 20, 2013.

SVP-B (SLP, Ts, GPS) Deployed On McMurdo Ice Pier



Antarctic Drifting Buoys

SVP-BC



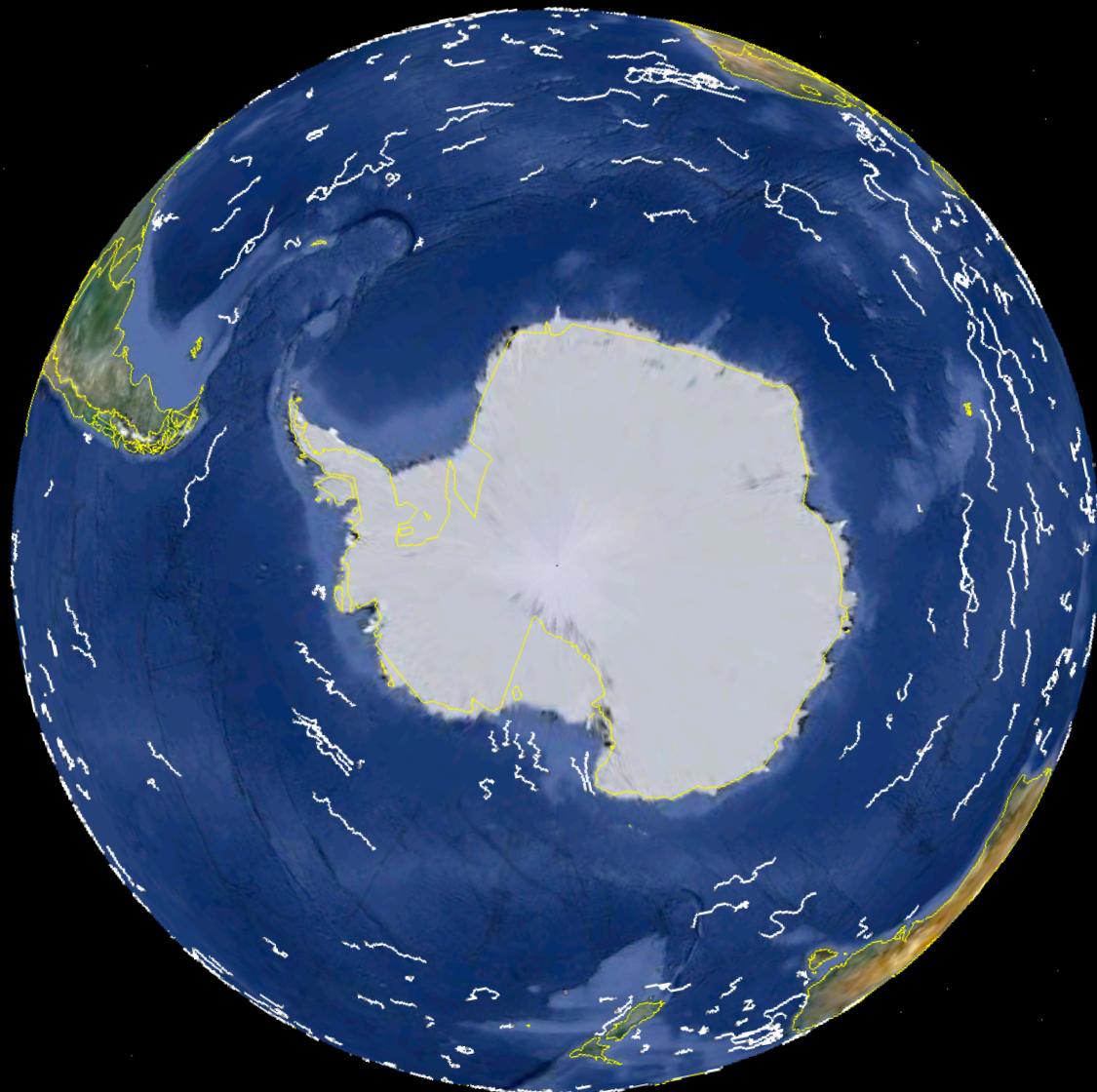
Antarctic Drifting Buoys

Expendable Ice Beacon (XIB)



Drifting Buoy Obs. on GTS – April 2013

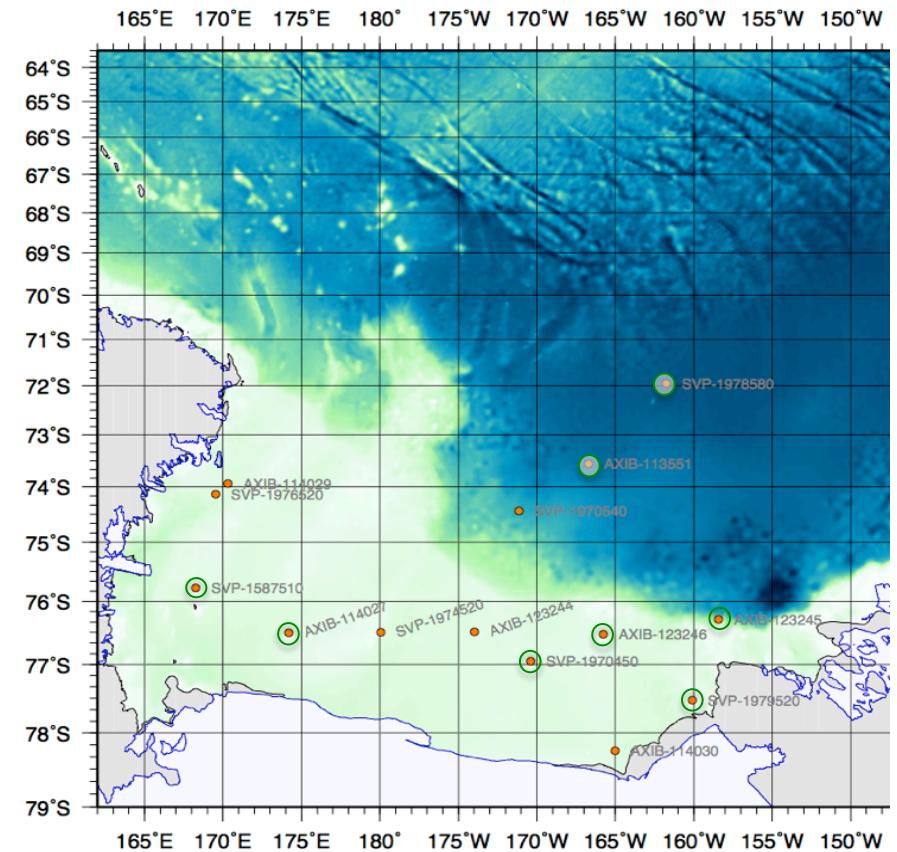
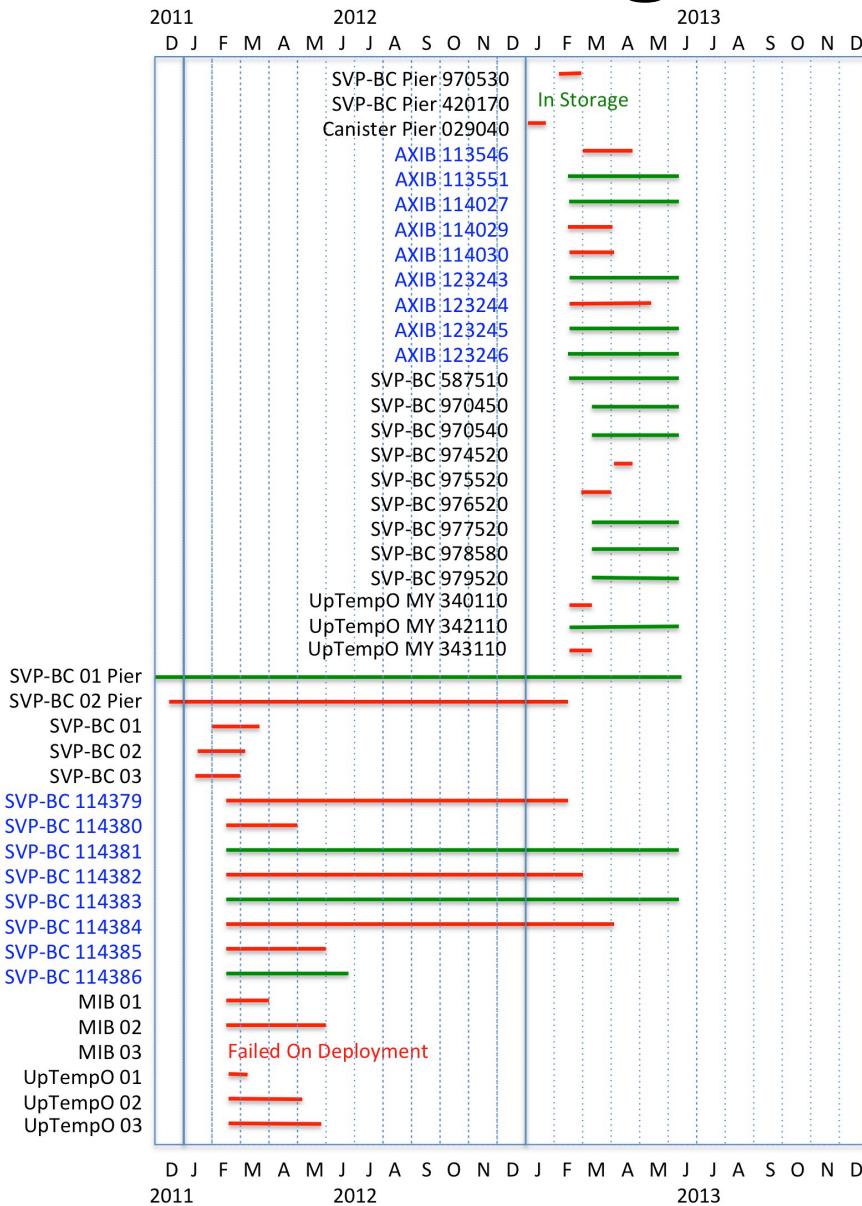
<http://isdm.gc.ca/isdm-gdsi/drib-bder/KML/MonthlyKML-eng.htm>



Drifting Buoy Obs. on GTS – May 2013

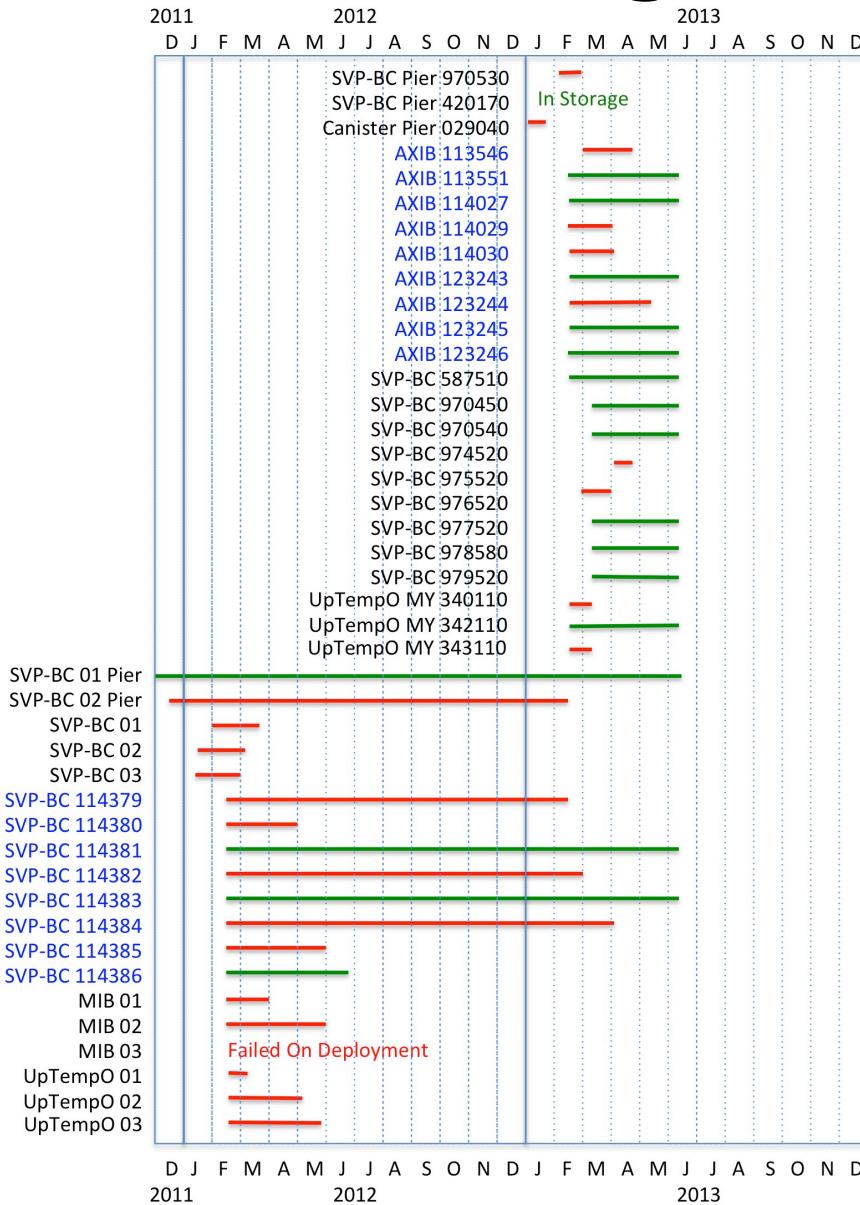
ECMWF BUOY STATISTICS												
ALL STATISTICS ARE FOR DATA WITH GROSS ERRORS EXCLUDED												
Date,	WMO #,	Sns,	Orig,C,Cntr#,	Lat	Long,	Rcei,	Acpt	GE#,	Bias#,	SD##,	RMS#,	Rate,F
20130515,	48626,	AP,	ALL,S,ECMWF,	-75.1	-159.1,	203	203	0	-0.3	0.8	0.8,	,G
20130515,	48626,	AT,	ALL,S,ECMWF,	-75.1	-159.1,	203	0	1,	-1.2	2.6	2.8,	,G
20130515,	72508,	AP,	ALL,S,ECMWF,	-73.6	-174.8,	48	48	0	-0.5	0.4	0.7,	,G
20130515,	72509,	AP,	ALL,S,ECMWF,	-76.2	-162.3,	210	210	0	-0.6	0.7	0.9,	,G
20130515,	72510,	AP,	ALL,S,ECMWF,	-65.8	-126.9,	155	92	3,	0.0	4.3	4.3,	,G
20130515,	72511,	AP,	ALL,S,ECMWF,	-75.4	-172.1,	210	210	0	-0.5	0.5	0.7,	,G
20130515,	72512,	AP,	ALL,S,ECMWF,	-70.9	-162.1,	210	210	0	-0.3	0.7	0.8,	,G
20130515,	72514,	AP,	ALL,S,ECMWF,	-65.7	-126.0,	182	124	5,	0.9	3.9	4.0,	,G
20130515,	72803,	AP,	ALL,S,ECMWF,	-66.6	-135.7,	210	210	0	0.	0.1	0.5	,G
20130515,	72808,	AP,	ALL,S,ECMWF,	-75.3	-167.1,	210	210	0	-0.1	0.6	0.6,	,G
20130515,	72808,	AT,	ALL,S,ECMWF,	-75.3	-167.1,	210	0	1,	0.3	2.9	2.9,	,G
20130515,	72809,	AP,	ALL,S,ECMWF,	-72.6	-170.4,	210	210	0	0.	0.0	0.7	,G
20130515,	72809,	AT,	ALL,S,ECMWF,	-72.6	-170.4,	210	0	0,	-0.7	2.4	2.5,	,G
20130515,	72811,	AP,	ALL,S,ECMWF,	-65.2	-127.3,	210	210	0	-0.1	0.6	0.6,	,G
20130515,	72811,	AT,	ALL,S,ECMWF,	-65.2	-127.3,	210	0	0,	-0.2	0.6	0.6,	,G
20130515,	73634,	AP,	ALL,S,ECMWF,	-73.6	174.9,	210	210	0	-0.1	0.7	0.7,	,G
20130515,	73634,	AT,	ALL,S,ECMWF,	-73.6	174.9,	210	0	0,	2.2	2.0	3.0,	,G
20130515,	73636,	AP,	ALL,S,ECMWF,	-73.6	172.3,	194	188	0	-0.5	0.9	1.0,	,G
20130515,	73650,	AP,	ALL,S,ECMWF,	-60.1	121.9,	206	0	0,	-0.5	0.7	0.8,	,G

Drifting Buoy Time Lines



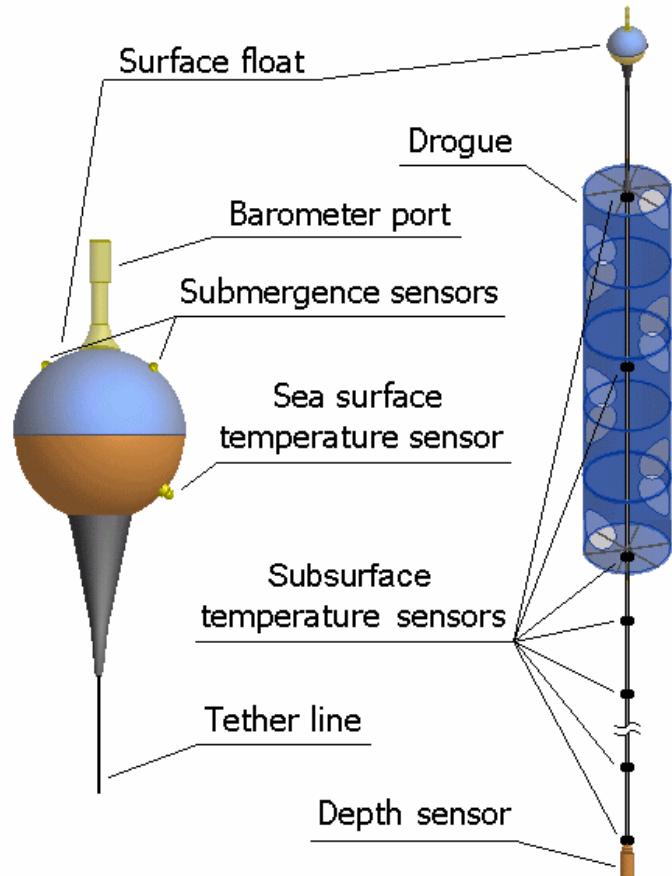
- Argos buoys shown in blue, Iridium in black.
- 2012: Bimodal survival, 3 are still reporting
- 2013: Lost a 7 NPB buoys immediately, and both pier buoys.
- Overall: 15 of 42 Buoys reporting.

Drifting Buoy Time Lines

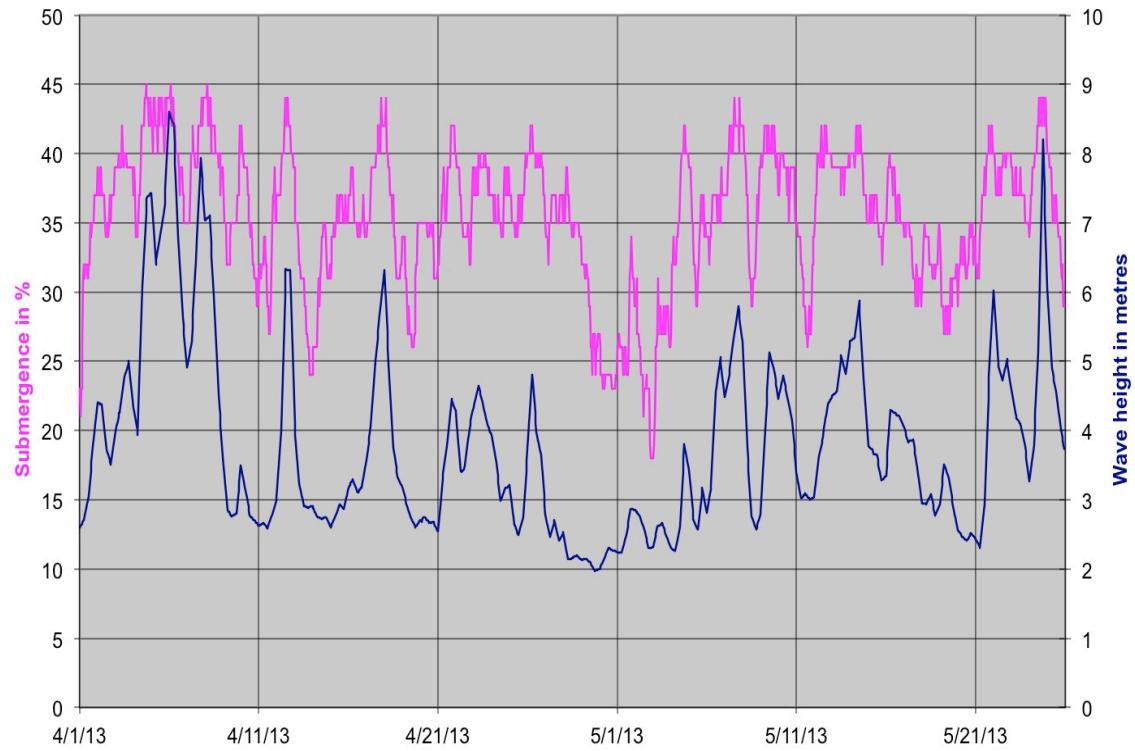


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Wave Heights and Buoy Submergence



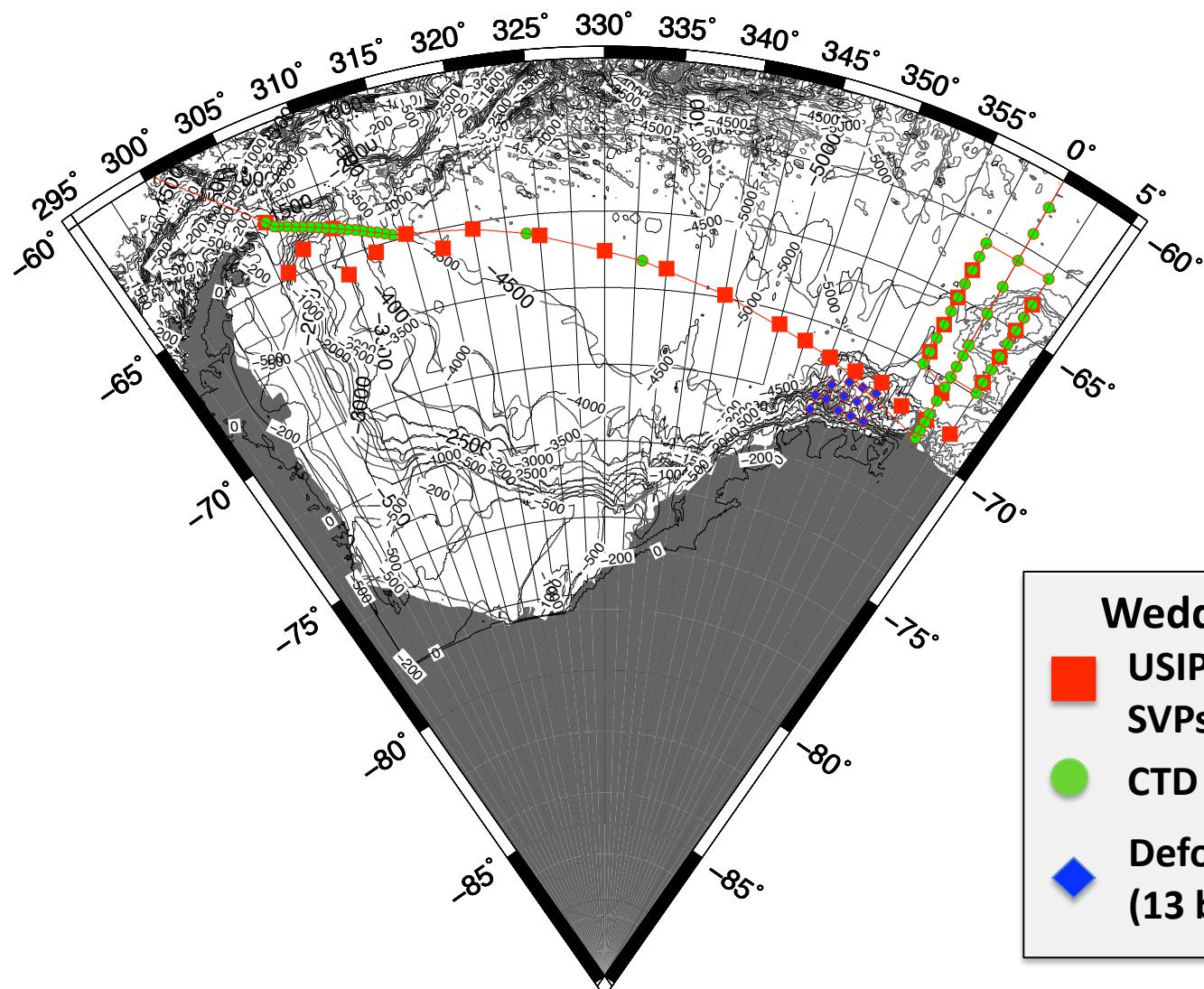
Marlin SVP-BTC drifter IMEI 300234011342110 - WMO 72803/0200803
Submergence and co-located ECMWF wave height data
April and May 2013



- Lost 2 UpTempO/ADOS buoys within a couple weeks due to battery drain as the buoy struggled to obtain GPS fixes.
- Reprogrammed 3rd buoy to only try to get GPS positions for 3 minutes.
- We are working with manufacturers to address submergence issues.

Drifting Buoy Deployment Plans

R/V Polarstern July-August 2013



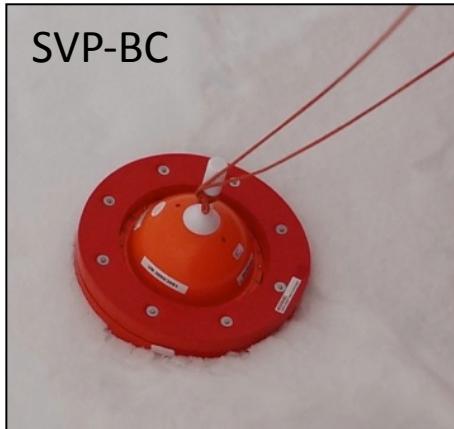
- Weddell Sea**
- USIPAB SVP (30 SVPs)**
- CTD Stations**
- Deformation Array (13 buoys)**

Airborne Expendable Ice Beacon (AXIB)



- Developed by USIABP through a NOAA SBIR.
- Capable of surviving in ice, and open water through freeze/thaw cycles.
- Sensors include air and surface temperature, and surface pressure.

Observations on Sea Ice - Summary



1. Data are posted on GTS, and available from IPAB.apl.washington.edu.

2. 2011 – 2012 Deployments

- First-year of funding (9/1/2011).
- Logistics: McMurdo Helicopters and N.B. Palmer.
- 19 buoys deployed: 3 MIB, 3 UpTempO, 13 SVP-BC.
- 3 SVP-BC currently reporting.

3. 2012 – 2013 Deployments

- First Year deploying “XIB” Sea Ice Buoys.
- Deployed 23 buoys: 9 XIBs, 3 UpTempOs, 10 SVPs, and 1 Ice Canister.
- Logistics
 - Helicopters from McMurdo
 - Amundsen and Ross Seas: N. B. Palmer
 - 12 buoys currently reporting.

Observations on Sea Ice - Summary



XIB

"Seasonal Ice Buoys"

4. Plan to deploy 30 SVP and 13 other buoys from German ice breaker Polarstern in July – August 2013.
5. We would like to “eaves drop” in the planning of the cruises to improve buoy selection and deployments.
6. We welcome suggestions and collaboration.
7. Acknowledgements: NSF, NOAA, & NASA.