

Increasing of Effectiveness and Reliability of Data from Drifting buoys

(Evaluation of last prototypes. All data are fixed on 10 Sep 2012)

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Main areas of investigation in 2011 – 2012

Barometric drifters

Argos-2 drifters tracking capabilities

Long-living reliable air pressure samples under rough weather conditions

Increasing of duration to keep the drogue attached

Packaging of a drifter for safety deployment

Argos-3 and Iridium Pilot Projects drifters

Argos-3 drifters

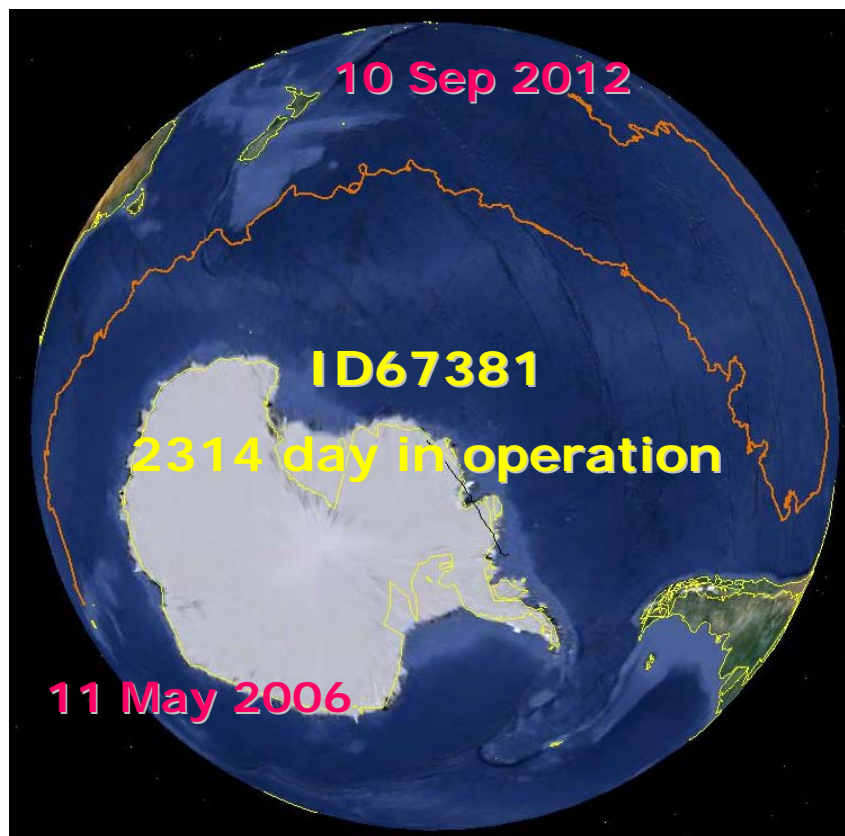
Iridium and Iridium/GPS drifters

New temperature-profiling drifters

Ice micro buoys with parachute deployment

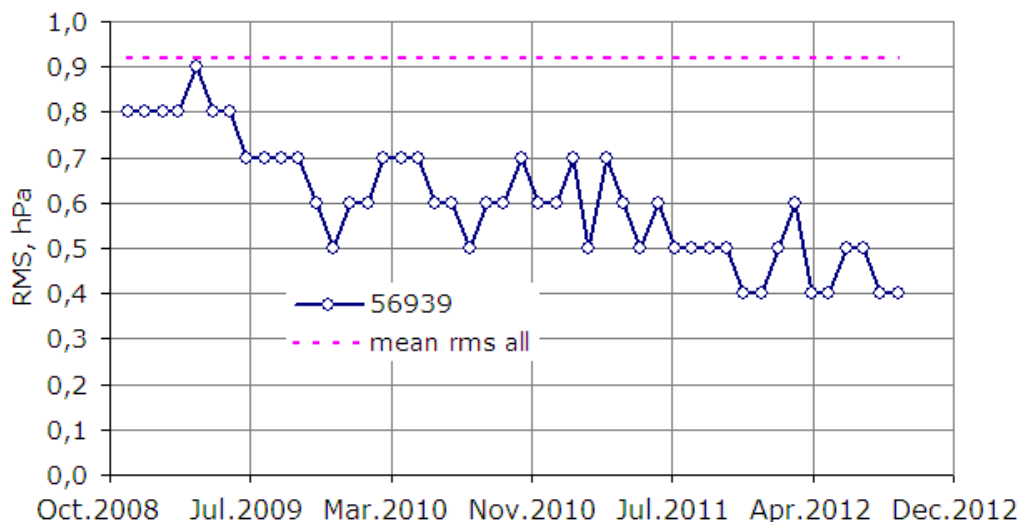
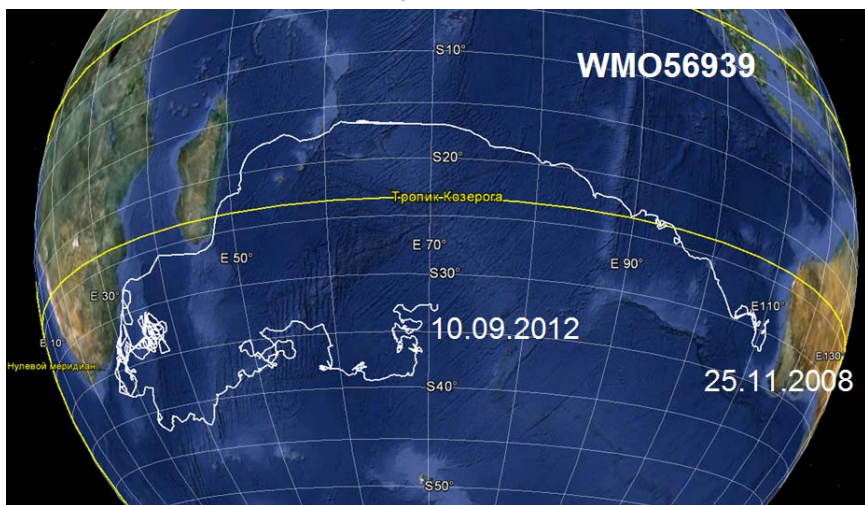
Argos-2 water level measuring device

Capability of Argos-2 drifters, operating under continuous mode, for tracking of surface currents



ID	WMO	Depl.	Owner	AP failure	Tracking	
					Days	Years
67381	56631	11 May 06	BOM	848	2314	6,3
67379	56532	06 Dec 06	BOM	564	2105	5,8

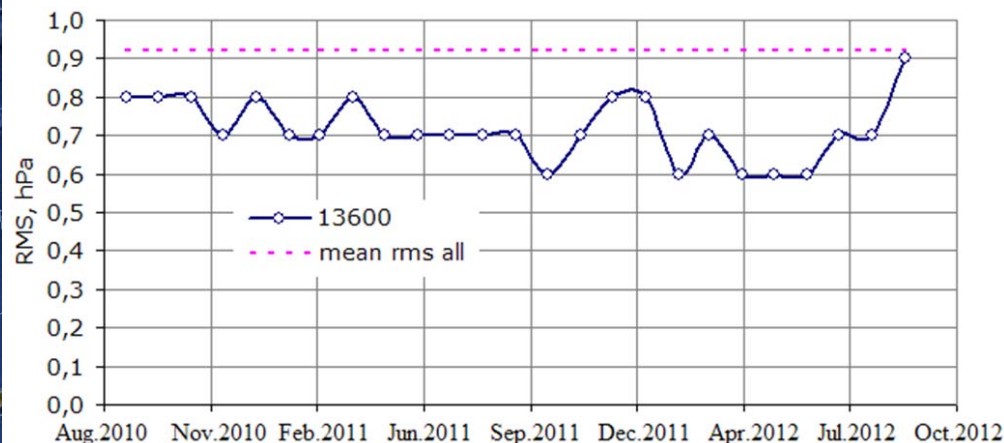
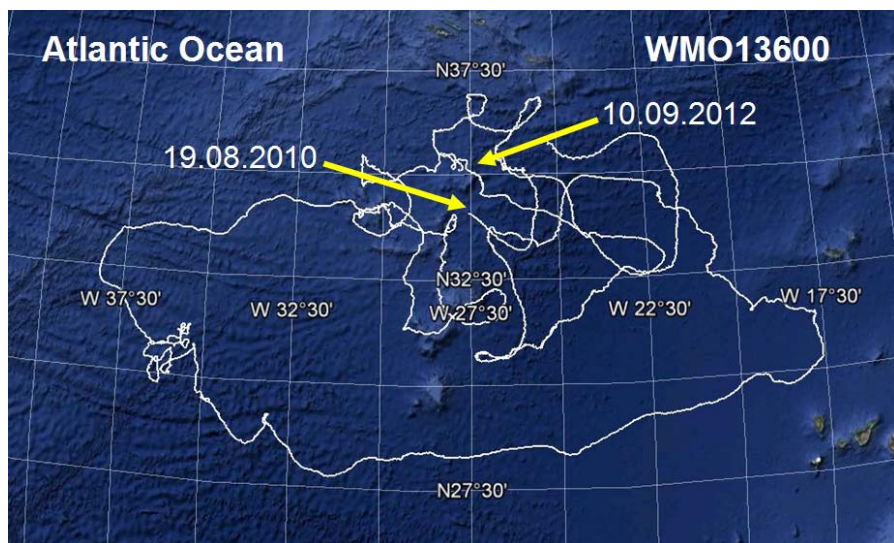
Duration and Quality of AP measurements by SVP-B buoys (41-cm hull and 92-cm OD Holey Sock)



Oct.2008 Jul.2009 Mar.2010 Nov.2010 Jul.2011 Apr.2012 Dec.2012

ID	WMO	Telemet.	Depl.	Owner	Failure of buoy		AP duration, days	RMS mean, hPa
					Date	Days		
84146	56939	Argos-2	25.11.08	BOM	in operation		1385	0,6
49678	62505	Argos-2	15.06.08	M-Fr.	18.08.11	1159 (bat)	1159	0,7
84147	56943	Argos-2	04.01.09	BOM	19.08.11	957 (beach)	957	0,9
84152	56941	Argos-2	13.01.09	BOM	13.08.11	942 (beach)	942	0,7
	16551	Irid/GPS	13.04.10	SAWS	in operation		881	0,7
	17526	Irid/GPS	15.11.09	SAWS	in operation		1030	0,8
	17572	Iridium	15.12.09	SAWS	in operation		1000	0,8

Duration and Quality of AP measurements by SVP-B mini buoys (34-cm hull and 61-cm OD Holey Sock)



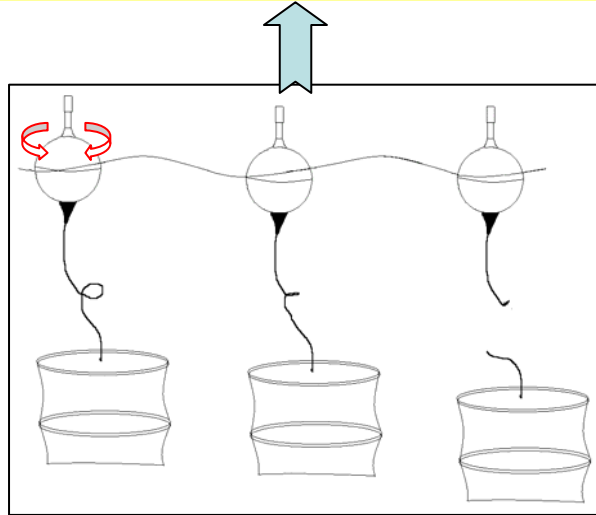
ID	WMO	Telemet.	Depl.	Owner	Failure of buoy		AP duration, days	RMS mean, hPa
					Date	Days		
43869	13600	Argos-2	19.08.10	NOAA		in operation	753	0,7
43877	55614	Argos-2	23.08.10	NOAA		in operation	749	0,9
43878	15501	Argos-2	26.08.10	NOAA		in operation	746	0,9
41803	55962	Argos-3	30.09.10	A3 PP		in operation	711	0,6*

* Sometimes for buoys in the Tasman Sea the AP samples had data scattered, when too rough weather conditions took place

Updating of the SVP-B's design to keep drogue attached longer

Creation of a loop at lower end of tether when deployment with following loss of drogue on 30-60 day

Fixing of tether in clips



"Wire connection" and drogue able to work more than 1 year



The drogue cleaned from 1-year biology fouling

Loss of drogue on 250-350 day after deployment as a result a float's rotation with rupture of tether below float

Swivel below float

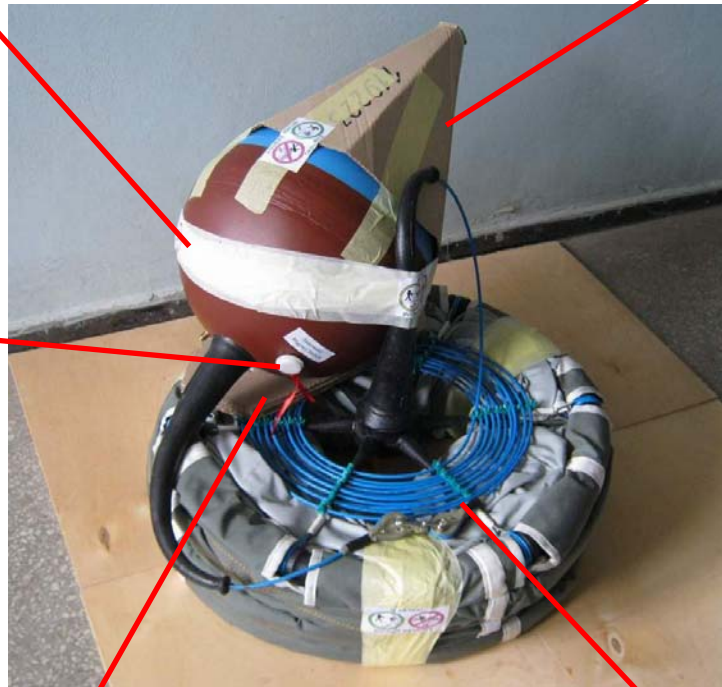


Updating of the automatic deployable SVP-B buoy design to get the buoys safety deployed

Attachment of float to lower carrot with paper tape

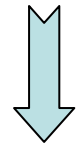
Cartoon cap to avoid damage of baroport or inquiry of servicemen

Magnet switch for automatic activation after drop to water (optional)



Placing of float in hole of cartoon pallet to avoid a rolling of float

Setting of tether in clips to fix location of rope



Recommendations to use the SVP-B and SVP-B mini drifters

SVP-B had successful trail drops under following conditions: $V_{\text{ship}} = 8$ Knots, $H_{\text{drop}} = 5$ m, $V_{\text{wind}} = 44$ knots, $H_{\text{wave}} = 6-7$ m.

SVP-B long-living drifters with reliable AP data under any weather conditions can be used in difficult of access South Ocean

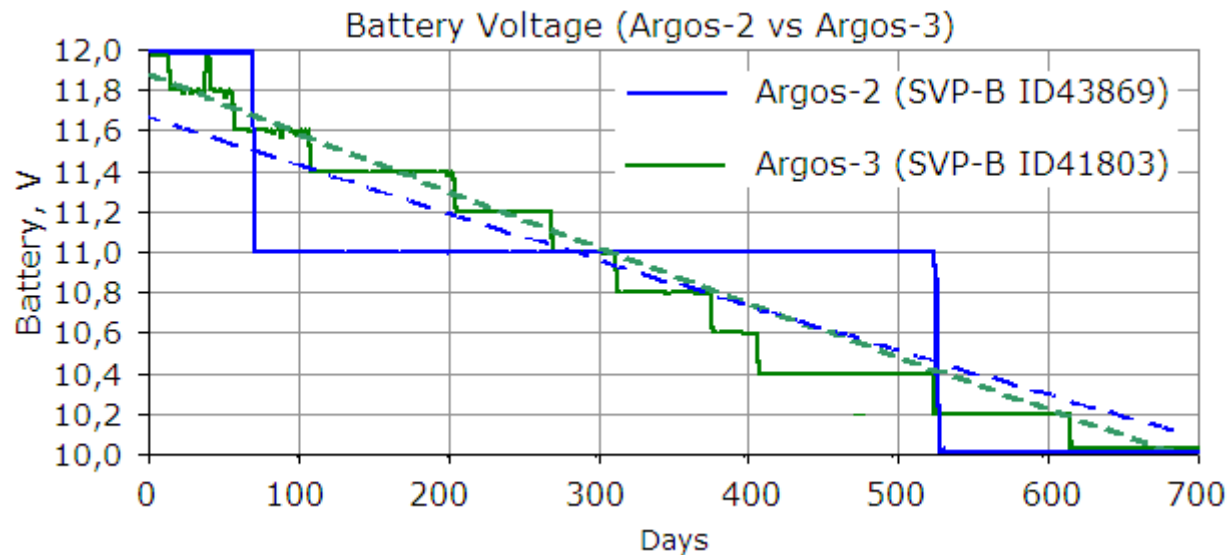
More than 30 SVP-B mini were successfully deployed, when: $V_{\text{ship}} \sim 20$ Knots, $H_{\text{drop}} \sim 20$ m.

SVP-B mini drifters with shortened lifetime can be deployed in central areas of the Ocean by ships of opportunity



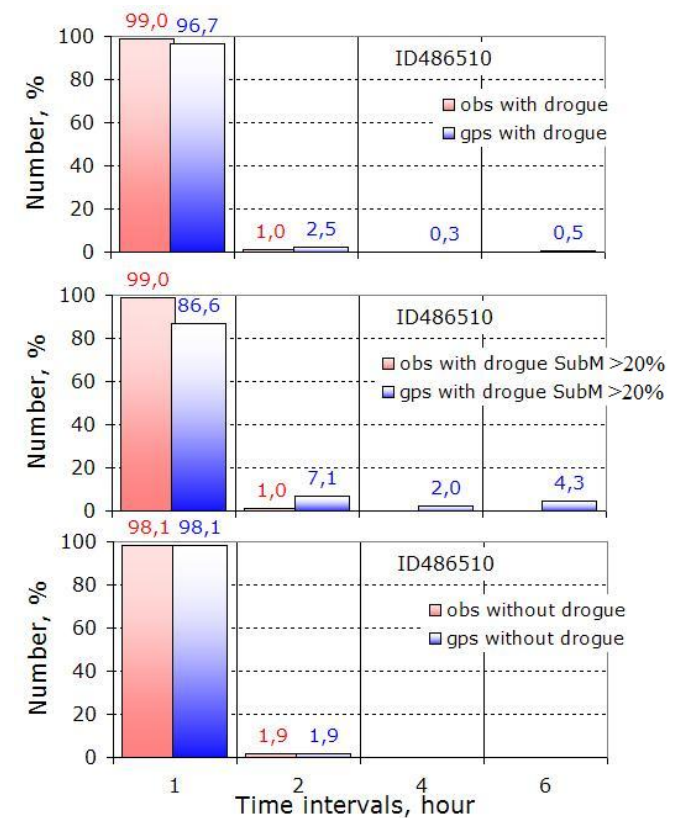
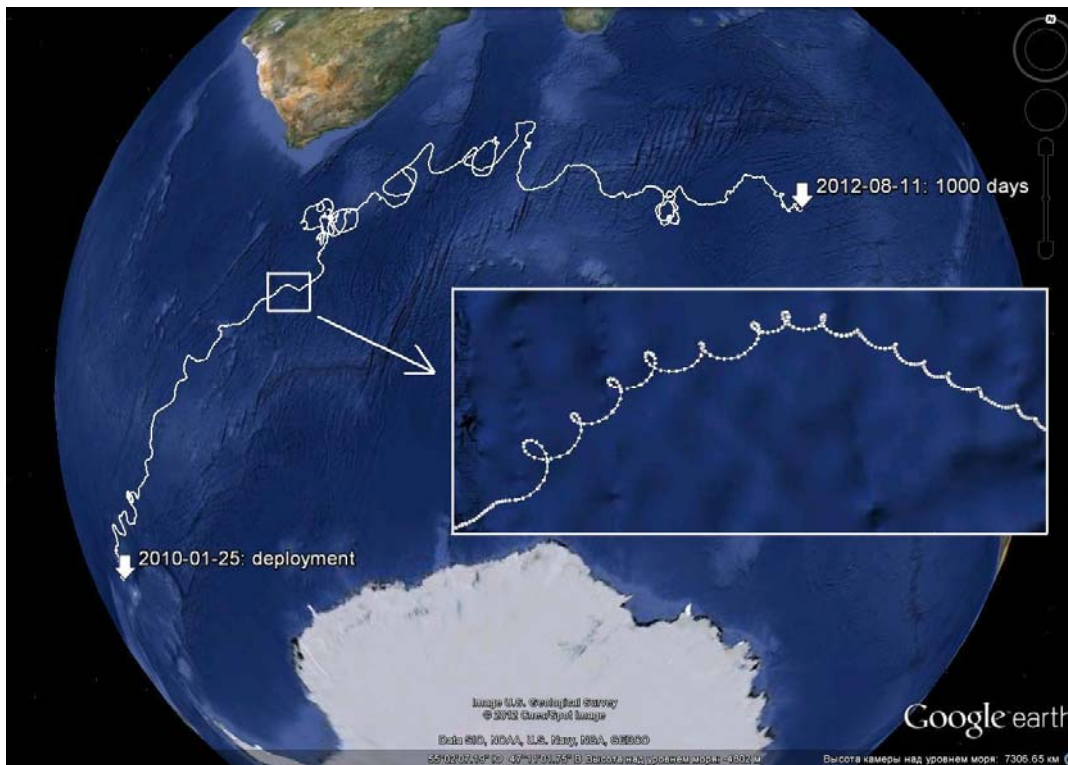
Evaluation of the Argos-3 PP SVP-B mini drifters in the Tasman Sea

ID	WMO	Depl.	Beaching		Re-deployment		Last location	Days (total)
			Date	Days	Date	Days		
41803	55962	30.09.10					in operation	711
41882	55963	01.10.10	16.07.11	288	04.02.12	219	re-deployed	507
42957	55961	31.10.10					21.03.12	507
42961	55644	02.09.10	19.11.11	443	04.02.12	219	re-deployed	662
42973	55645	02.09.10	12.12.11	466			12.12.11	466



Evaluation of the Iridium PP 3-d prototype SVP-B drifters in the South Ocean

WMO	GPS	Depl.	Drogue loss	Status	Days
17526	hourly	15.11.09	562	In oper.	1030
16551	hourly	13.04.10	587	In oper.	881
17572	no	15.12.09	124	In oper.	1000
14602	no	14.12.11	94	In oper.	231



Ice temperature-profiling drifter for study the thermodynamic variability in polar areas

Parameters

Depth: 80 m (max.)

Location of T sensors: user's requirements

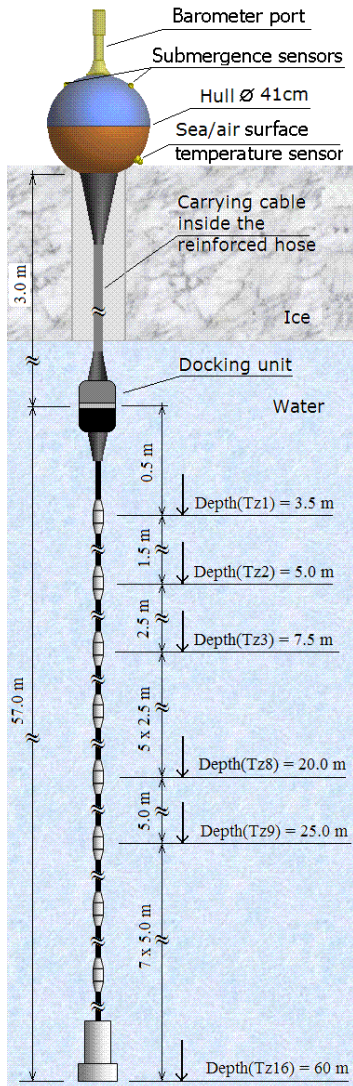
Minimum distance between T sensors: 1 m

Period of samples: 1 hour (optional)

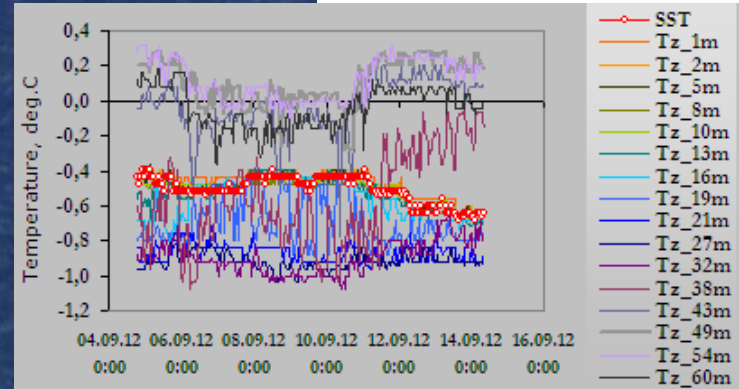
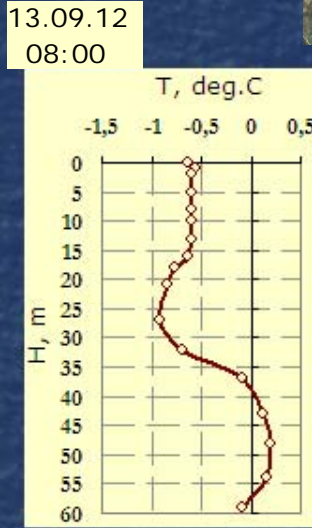
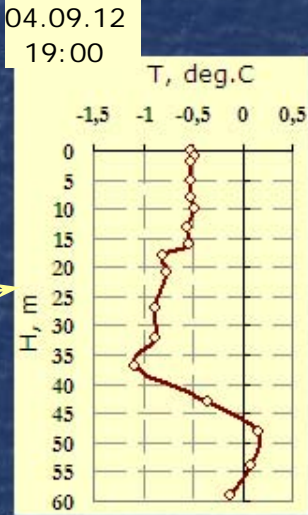
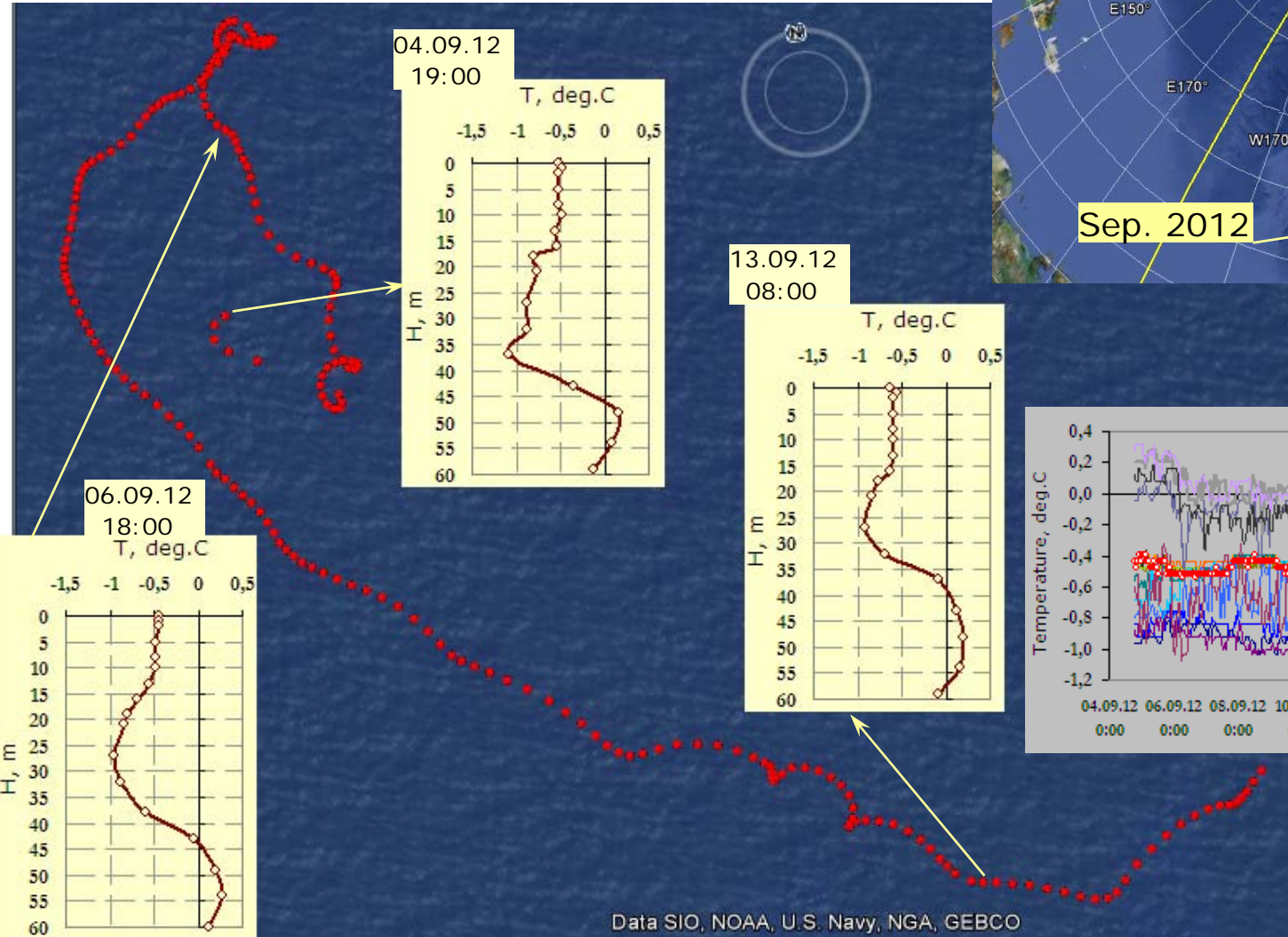
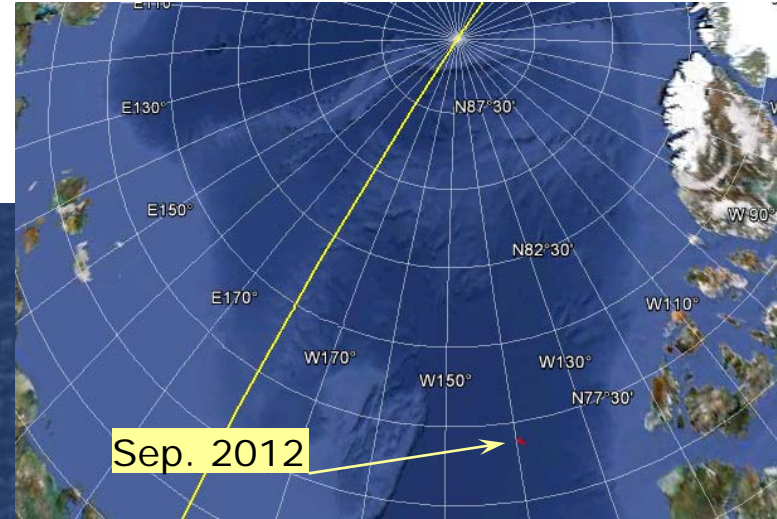
Accuracy: 0,1°C

Resolution: 0,04°C

Theoretical lifetime – 12 months at least



Thermoprobe Ice Drifter 240990, deployed on Sep 4, 2012



Ice micro buoys, equipped with parachute system

Use: Ice-flows tracking, oil spills, oceanography

**Aircraft
deployment on
"ice"**



**Helicopter
deployment on
snow**



Parameters

Telemetry: Argos-2

Locations: GPS

Real Time Clock

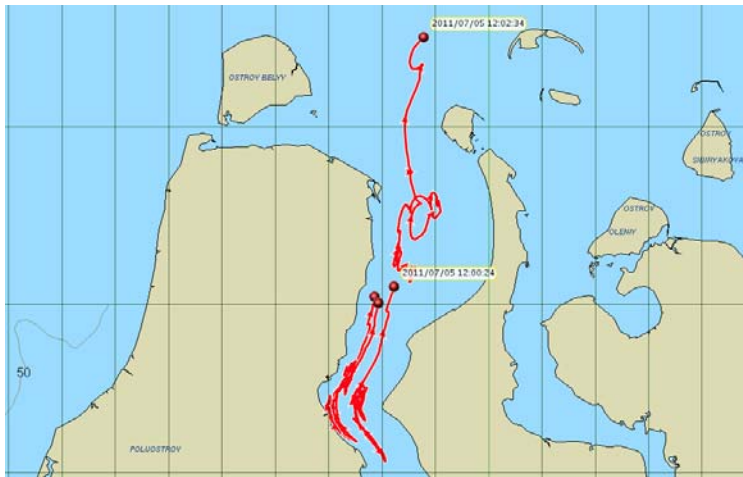
Lifetime: 6 months

Temp: -30 to +50°C

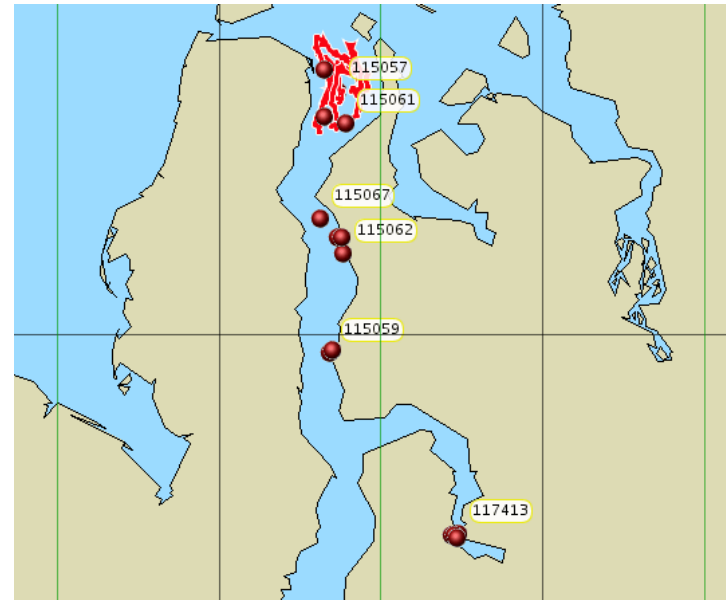


Investigation of floating ice movement in Ob bay in Arctic

Spring-summer 2011
(4 buoys)



Spring-summer 2012
(24 buoys)



Transfer of drifter technology

Argos-2 water level measuring device

Study of underground water depth near gas pipeline
Sakhalin island (Aug 2011- Aug 2012)

Main parameters

Marine applications

Coastal water level

High and low tide

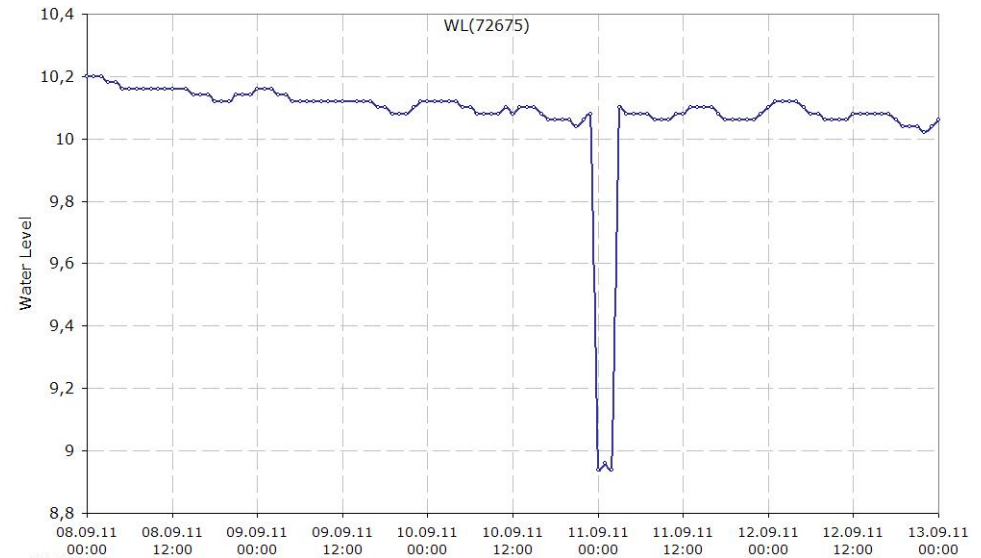
Level of flood

Sensors: Water level, Air pressure, Water temperature, Temperature inside main case, Battery voltage

Water level: 0-100 m with accuracy: 0,1m and resolution: 0,02 m

Operating temperature range: -30 to +50°C

Telemetry: Argos-2 satellite link



Conclusion

1. Argos-2 drifters can provide more than 6-year tracking of its movement.
2. SVP-B drifters have RMS < 0,6-0,7 hPa under any wave-wind conditions of South Ocean right up to full battery depletion or 3 years at least.
3. SVP-B mini drifters have RMS < 0,7-0,9 hPa and lifetime 2 years at least.
4. Long-living SVP-B drifters can be used in difficult of access South Ocean, while SVP-B mini drifters with shorter lifetime– in low latitude by means of deployments from ships of opportunity.
5. “Wire connection” of tether and drogue as a whole are reliable parts of drifter. The problem of fast loss of drogue is rope. Clip fixing of tether and swivel could keep drogue attached longer.
6. One satellite Argos-3 current configuration does not allow to determine completely the system’s capabilities. Preliminary Argos-2 and Argos-3 SVP-B buoys have similar same lifetime.
7. Iridium with hourly GPS SVP-B drifters have 1000 days lifetime at least. Continuity of hourly samples and GPS fixes are near 99% and 90% correspondingly under any weather conditions.
8. Iridium SVP-B buoys without GPS have continuity of hourly samples near 99% under any weather conditions and should provide 3,5-4 years operation at least.
9. Iridium ice prototype of SVP-BTC/RTC/GPS drifter was developed and deployed for trail. The buoy can be used also as marine drifter.
10. The drifter with 20-cm OD hull, equipped with parachute for different applications, was developed and successfully tested from aircraft and helicopter.
11. Argos-2 Water Level Gauge (WJG-100) was developed and successfully tested.



Thanks for your attention