

The results of new Marlin buoy prototypes evaluation

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DBCP Iridium Pilot Project

SVP-B/Iridium/GPS/RTC drifter (41-cm hall, 92-cm drogue)

ID 512480/WMO 44612

Battery capacity – 90 Ah;

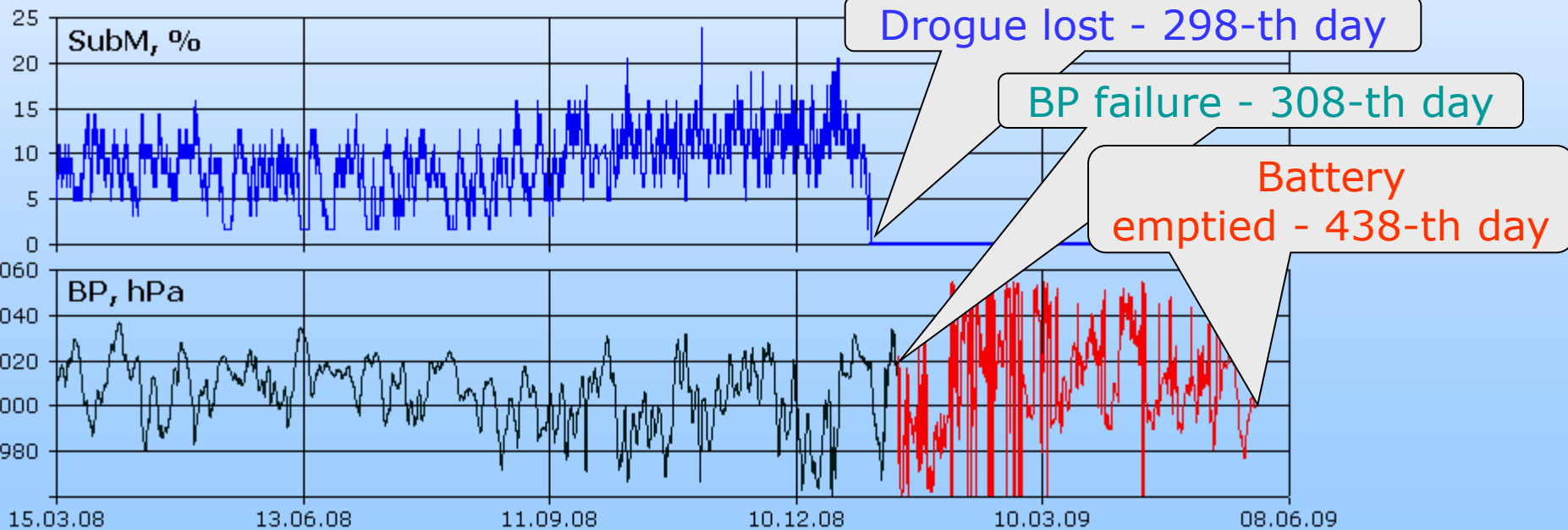
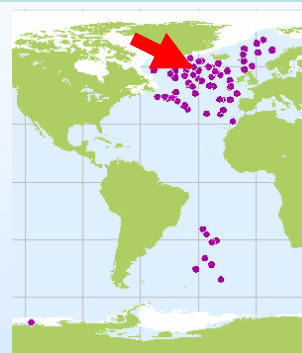
Period of samples – 1 h;

Period of GPS locations -1 h;

Iridium transmission

duration (mean) – 21 s.

15.03.2008 ÷ 09.05.2009



DBCP Iridium Pilot Project

SVP-Bmini/Iridium/GPS/RTC drifter (34-cm hall, 61-cm drogue)

ID 517480/WMO 71512

Battery capacity – 60 Ah;

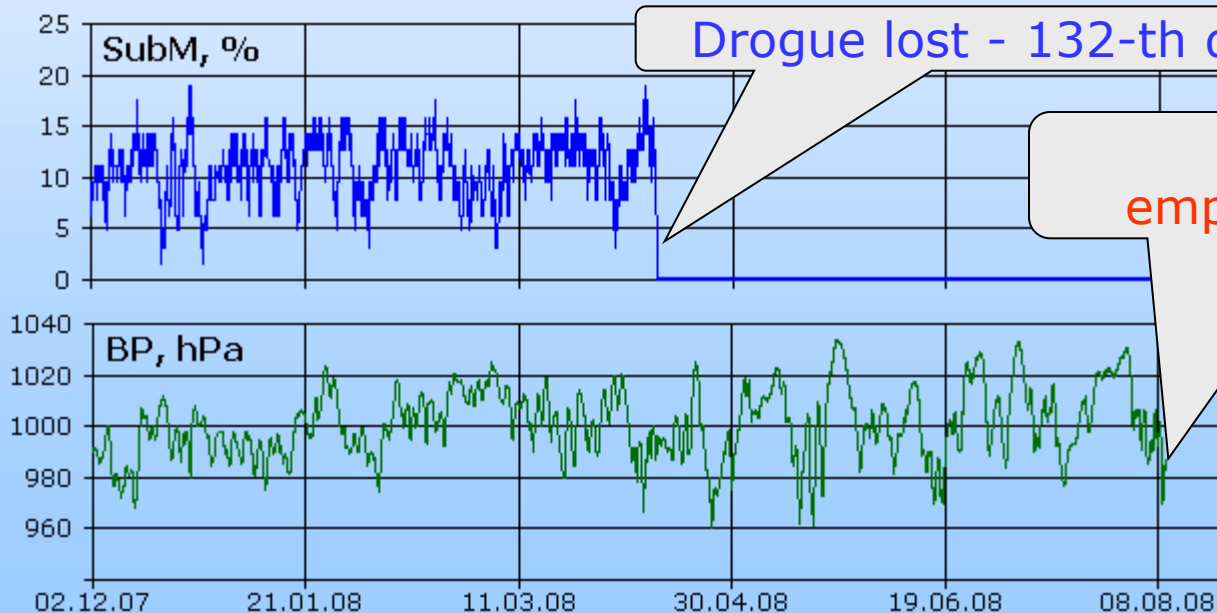
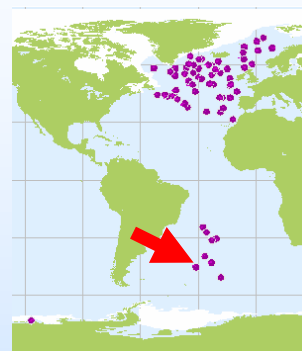
Period of samples – 1 h;

Period GPS locations -1 h;

Iridium transmission

duration (mean) – 21 s.

02.12.2007 ÷ 10.08.2008



Battery
emptied - 252-th day

DBCP Iridium Pilot Project

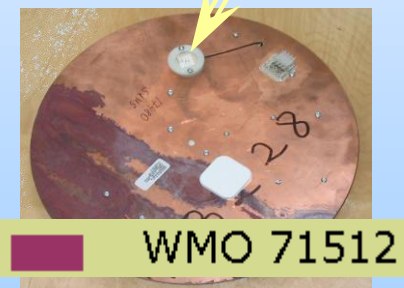
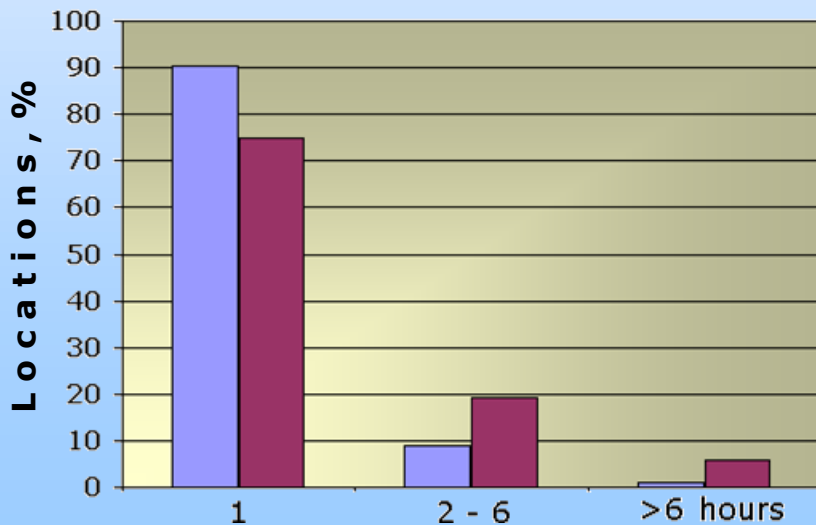
Compare of SVP-B/RTC/GPS mini drifters with cocked antennas.

GPS-locations gaps depending on SubM (rough sea surface)

SVP-Bmini/Iridium/GPS drifters **WMO 14532** & **WMO 71512**.

GPS receiver – *Trimble Lassen iQ*.

Intervals between consecutive locations



Mean(SubM) ~ 11 %

Missing locations:

WMO 14532 ~ 16 %

WMO 71512 ~ 47 %

Argos SVP-BTC80 temperature-profiling drifter

ID 49678/WMO 62505

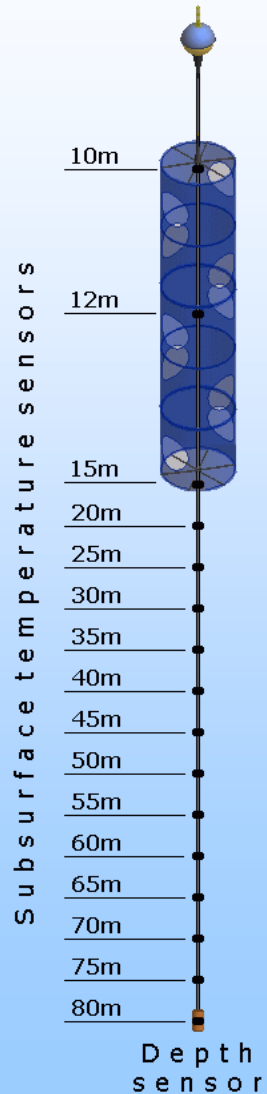
Battery capacity – 60 Ah

Period of samples – 1 h

Deployment on 15 June 08

Updatings:

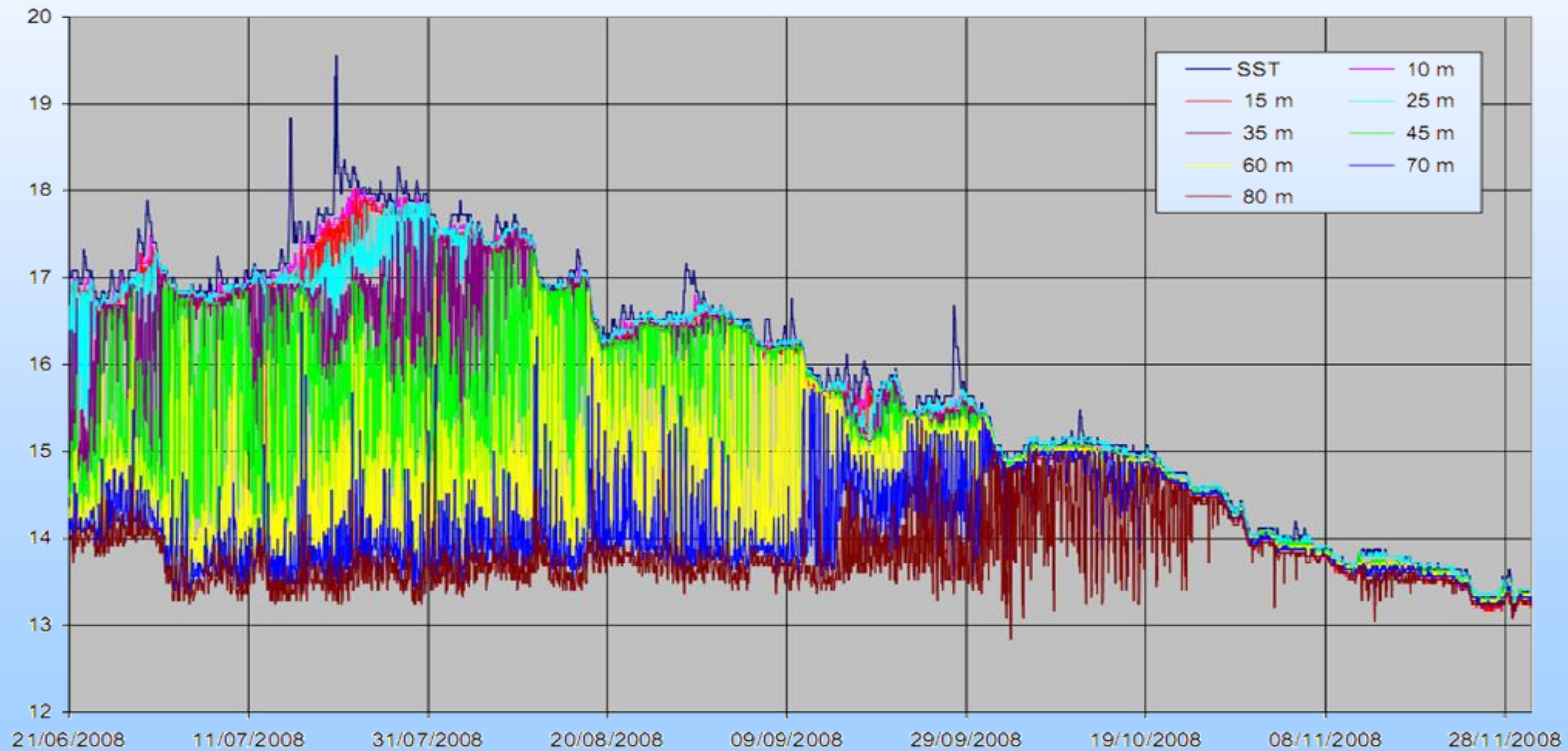
- Barometric port with vertical orientation of membrane
- Real-time clock to have samples at round hours
- DBCP-M2 compatible format
- Strengthened of tether connection with hub
- Upper and bottom rings with strengthened plastic tubes
- Modernization of chain design



Argos SVP-BTC80 temperature-profiling drifter

LifeTime:

Drogue/thermoline lost - 314-th day (on 25-th April 09)

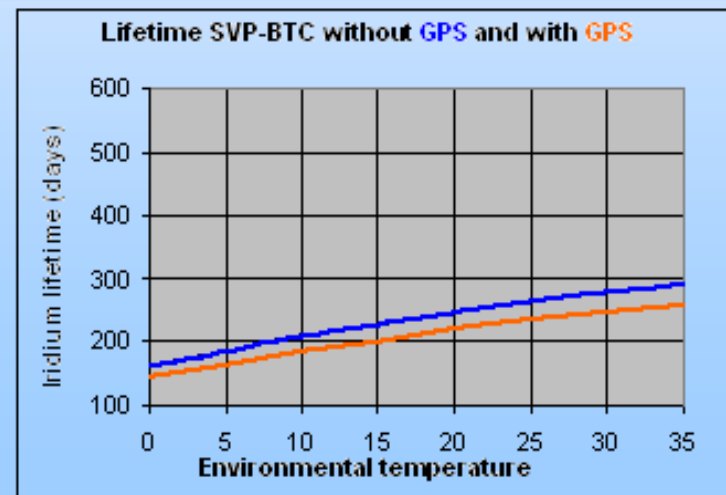
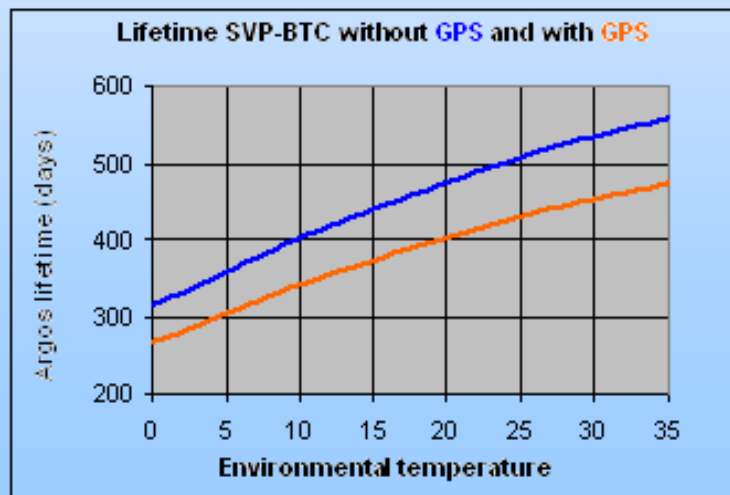


DBCP Iridium Pilot Project

2008 vs. 2009 SVP-BTC80 drifters

Parameters	2008 prototype	2009 prototype
Name	SVP-BTC80/RTC	SVP-BTC80/RTC/GPS
Data link	Argos-2	Iridium
Data format	DBCP-M2 +	Version 4.0 +
Real Time Clock (RTC)	Factory installed watch with quartz synchronization	Inserted watch with GPS synchronization
Processing of Tzi probes depths	By buoy operator. Transfer: Tz1 to Tz16 temperatures; D – depth at the end of chain	Inside a buoy. Transfer of pair: Tzi - Dzi
GPS receiver	Trimble Navigation, Lassen iQ	Tyco, A1080
Period of samples	60 min	30 min

Theoretical lifetime



DBCP Iridium Pilot Project

Trimble Lassen iQ GPS vs. Tyco A1080 GPS

	Trimble Lassen iQ*	Tyco A1080*
Chipset	Trimble	SiRF Star III
Channels	12	20
Sensitivity	- 141 dBm	- 159 dBm
Hot start	13 s	1 s
Warm start	42 s	32 s
Cold start	84 s	35 s
Reacquisition	2 s	0.1 s

* Manufacturer's data

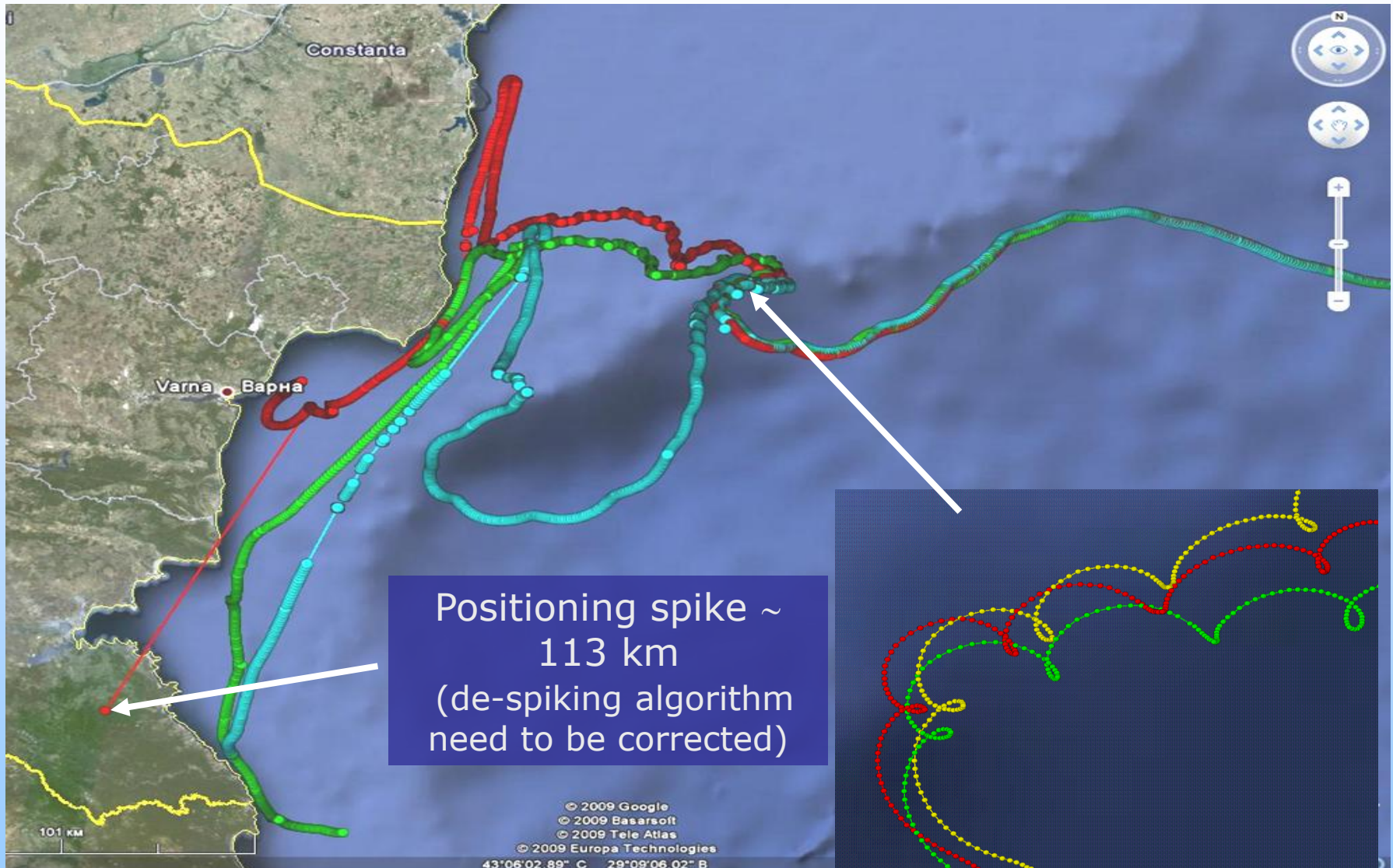
- To evaluate the parameters of Tyco GPS in comparison with Trimble GPS, both receivers were tested under wave imitation conditions. The Tyco A1080 receiver provides essentially better localizations recovery even when very long immersions took place.
- Original low-power de-spiking algorithm has been developed to have 30-min GPS samples with RMSE ~ 16 m

Both receivers were installed inside this float



DBCP Iridium Pilot Project

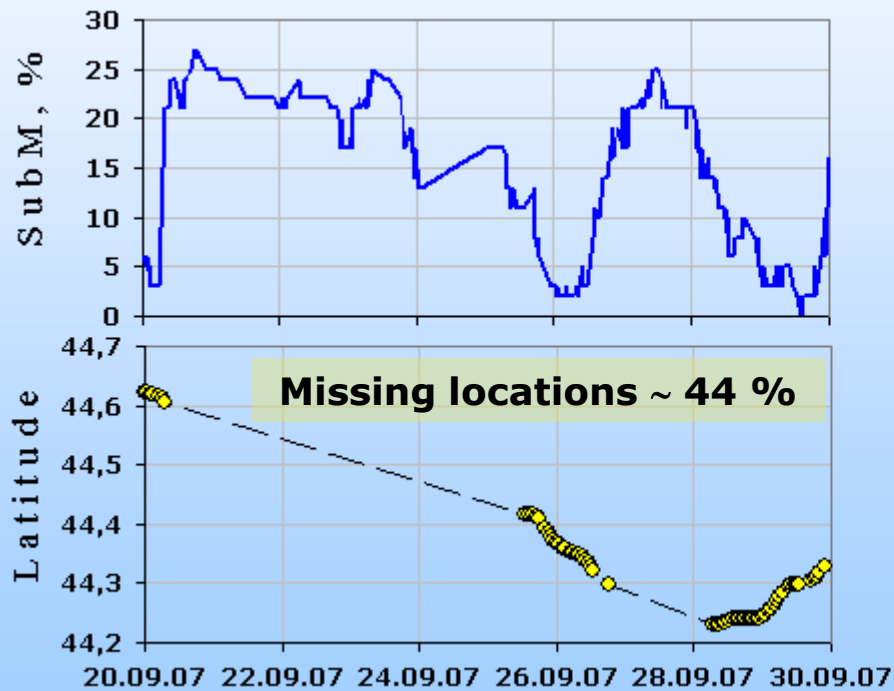
3 SVP-BTC80/RTC/GPS drifters were deployed in the Black Sea on 03.08.09



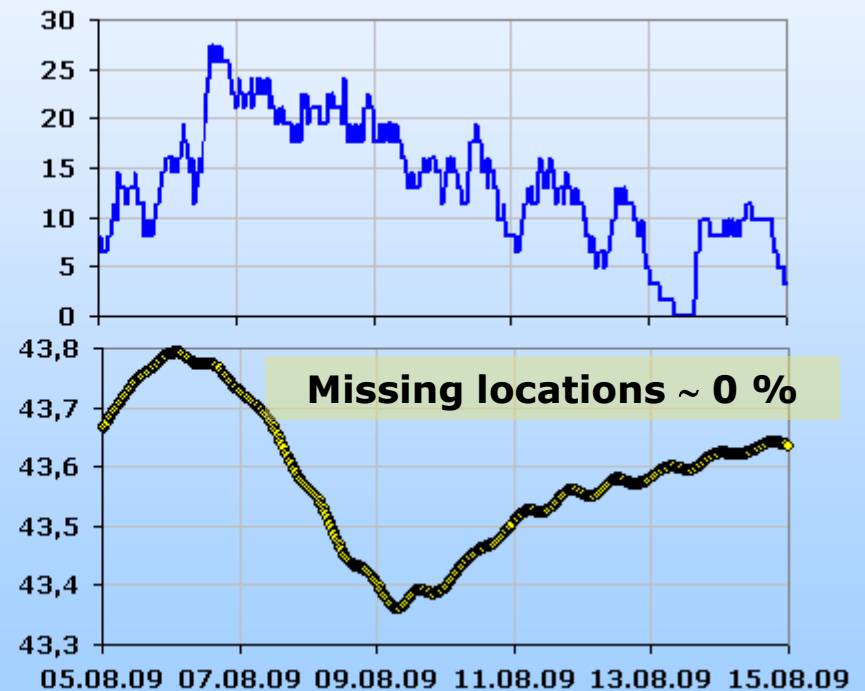
DBCP Iridium Pilot Project

Deep-water compare of SVP-BTC80 drifters with different GPS

SVP-BTC80 ID33137 (Black Sea, 2007)
GPS Trimble Lassen iQ



ID630410/WMO61690 (Black Sea, 2009)
GPS Tyco A1080

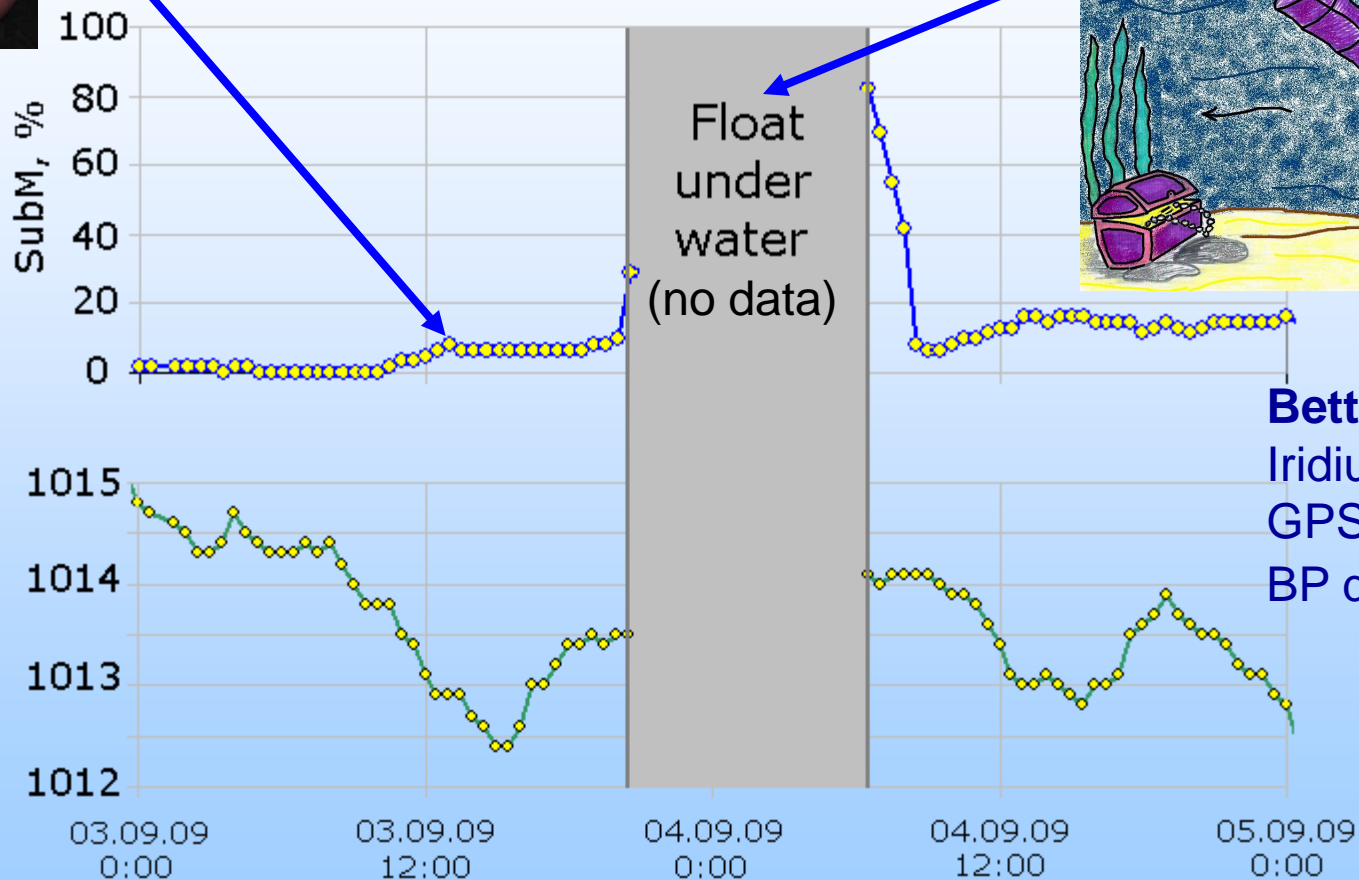
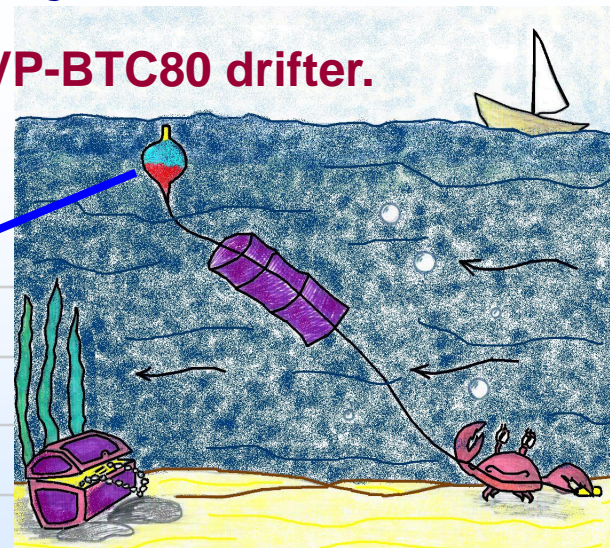


DBCP Iridium Pilot Project

Shallow water in the Black Sea. SVP-BTC80 drifter.



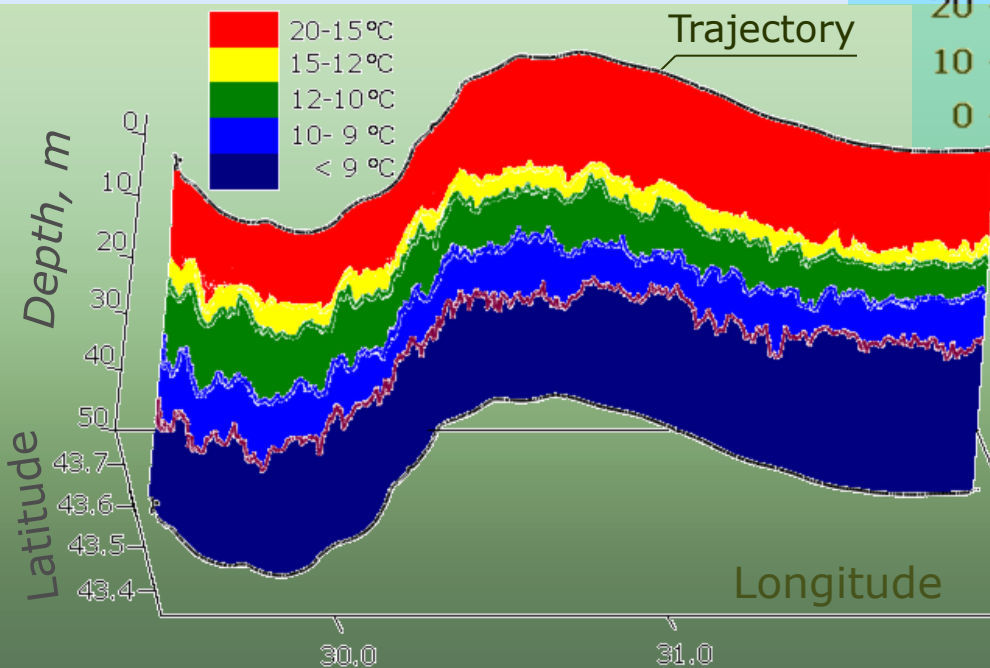
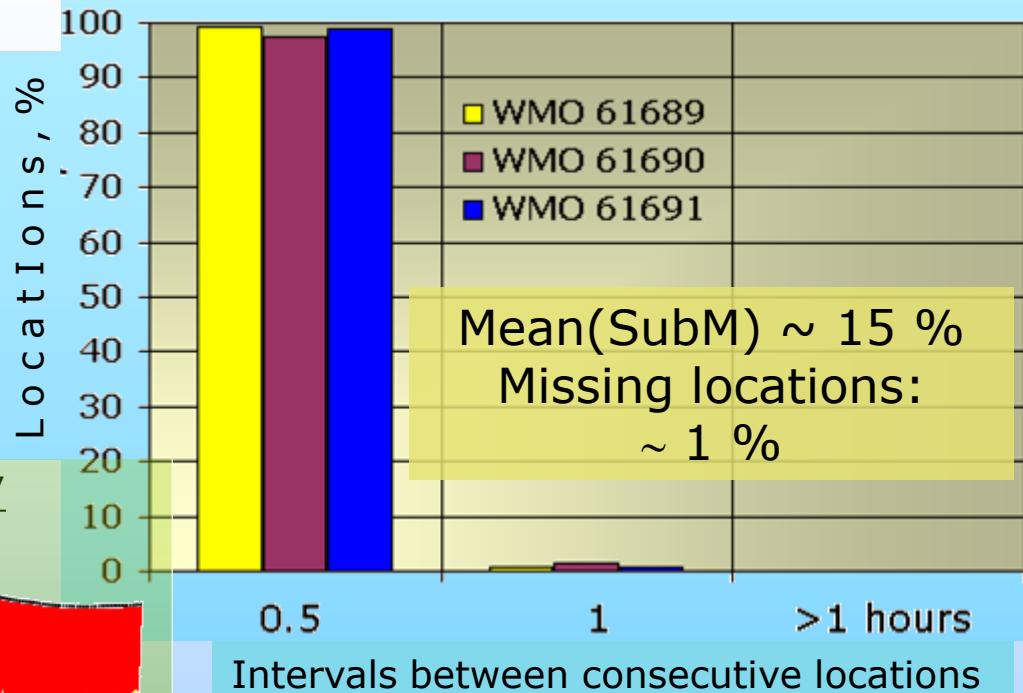
SVP-BTC80 WMO 61690



DBCP Iridium Pilot Project

Total results for SVP-BTC80 drifters in the Black Sea deep-water area.

Distribution of intervals between consecutive locations.
SVP-BTC80/Iridium/RTC/GPS.
GPS receiver – *Tyco, A1080*

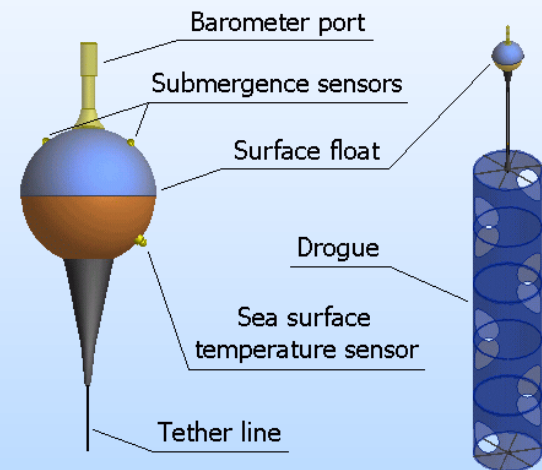


Temperature profiles (isotherms) in upper layer along trajectory
SVP-BTC80/Iridium/GPS drifter
ID630380/WMO61690 (August 2009.)
Period of samples – 30 min.

DBCP Iridium Pilot Project

2 Iridium SVP-B/RTC/GPS drifters with GPS Tyco A1080 receivers have been built for SAWS with goal to evaluate this receiver capabilities for SVP-B drifter

Iridium SVP-B/RTC/GPS drifter

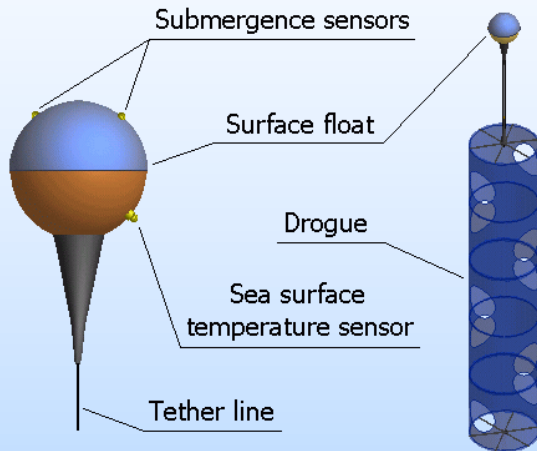


DBCP Argos-3 Pilot Project

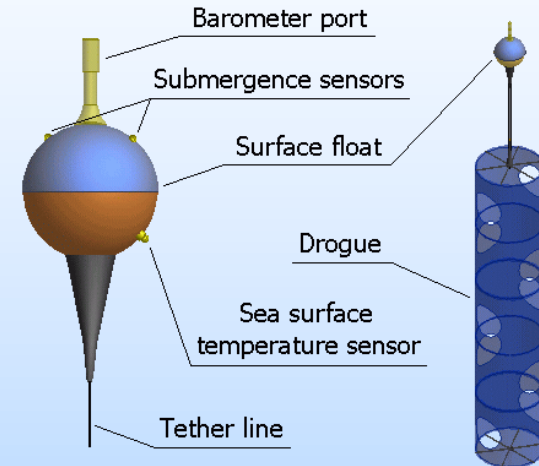
1 SVP/RTC and 1 SVP-B/RTC drifters (34-cm hall, 61-cm OD drogue)

Argos-3 SVP/RTC drifter

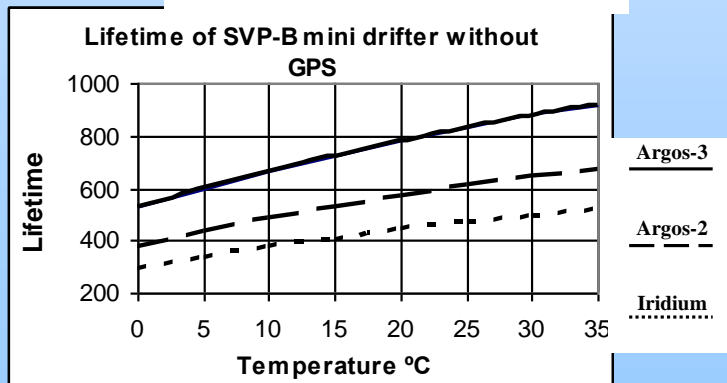
Argos-3 SVP-B/RTC drifter



Buoys with PMT were dry tested under different modes to provide optimum conditions in managing of data transmissions and using of Argos-3 benefits



Theoretical lifetime

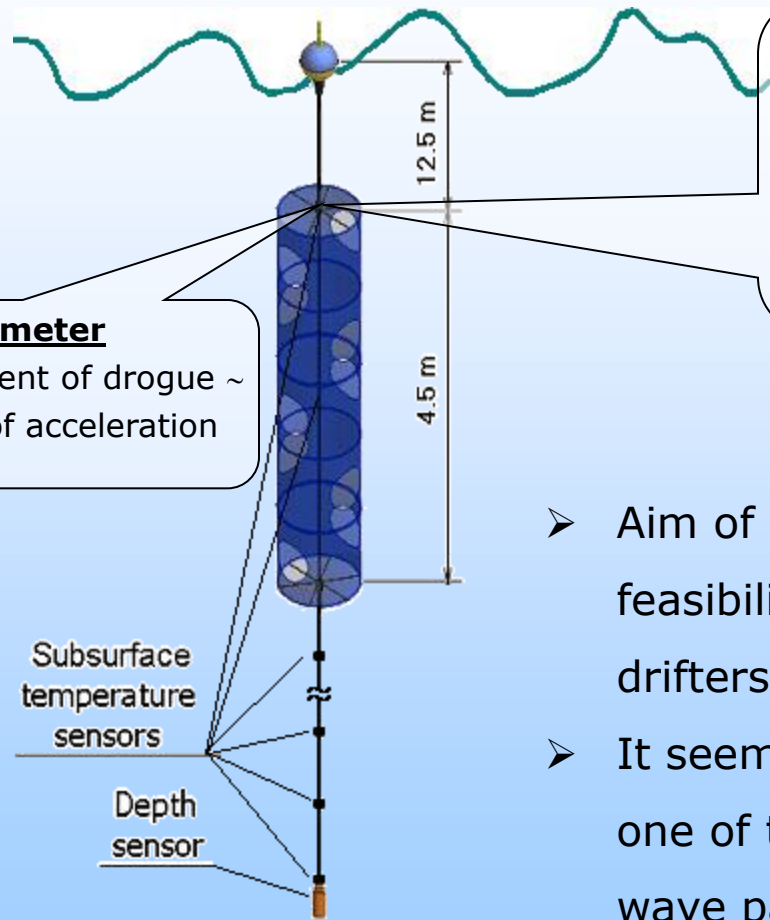


Further plans:

Evaluation of buoys in-situ and development of next prototypes of Argos-3 buoys: SVP/RTC; SVP-B/RTC and buoys with new GPS

DBCP Wave Pilot Project

SVP-BTC80 as a carrier for wave estimating equipment



Accelerometer

Vertical displacement of drogue ~
double integral of acceleration

Pressure sensor

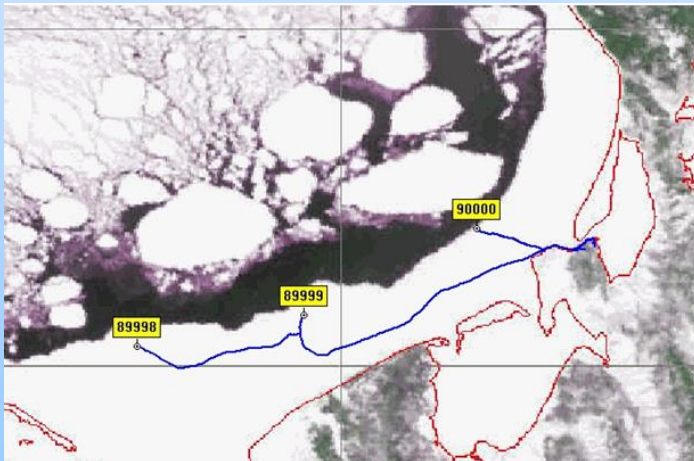
(E.g., 8DP-020, Paroscientific, Inc.:
accuracy 0.01%, resolution 10^{-8}).
Dynamic part of pressure due to the
wave motion (linear wave theory):

$$P_{\text{dyn}} = \rho \cdot A \cdot g \cdot e^{k \cdot z} \cdot \sin(\omega \cdot t)$$

- Aim of the Wave PP: "...Evaluate feasibility of wave measurement from drifters..."
- It seems that SVP-BTC80 drifter could be one of the way to estimate the surface wave parameters by drogued drifter.

Argos/GPS ice buoys

Study of fast ice movement near Sakhalin island (2008-2009)



Conclusion

- 1. First prototype of Iridium SVP-B drifter with 1-hour GPS samples showed 438-day operational lifetime.**
- 2. GPS synchronization of RTC is better for quality of data.**
- 3. Raising of Iridium and GPS antennas to top of float increases number of contacts and locations when rough sea surface.**
- 4. Third prototype of Iridium drifter provides data transfer as well as GPS locations and BP samples practically without missing in real sea.**
- 5. Updated design of SVP-BTC80 drifter supports the chain lifetime at the level of 10 months.**
- 6. First prototypes of Argos-3 SVP/RTC and SVP-B/RTC drifters have been developed, dry tested and ready for in-situ test.**
- 7. It seems that SVP-BTC80 drifter could be one of the way to estimate the surface wave parameters by drogued drifter.**

Thanks

