



MetOcean Data Systems

Data Collection & Communication

Iridium SVPs



Agenda

- **MetOcean Introduction**
- **MetOcean Iridium SVPs**
- **Sensors: drogue and HRSST**
- **Iridium firmware**
- **Wrap up**



PROFILE

- **Founded in 1984 -- Dartmouth, NS, CANADA**
- **50+ employees / 24,000 sq. ft. facility / ISO9001 Quality System**
- **Remote data collection and communication products + services**
- **Extensive international design, development & manufacturing expertise**





PRODUCT GROUPS



Buoys & Profilers

- Ocean Drifters, Polar Products, Profiling Floats, Environmental Solutions, Search and Rescue



Beacons & Flashers

- Beacons and Flashers – Radio & Satellite, Surface and Subsurface



Naval Systems

- MASS, SILC, Underwater acoustic applications, engineering services and prototype product development



Tracking & Locating

- Tracking Instrumentation and Systems, Vessel Monitoring Systems (VMS)



Iridium SVP History



- 2002 MetOcean deploys the first Iridium drifter.
- 2005 Mini-drifter design released for manufacture.
- 2006 MetOcean adopts the mini-drifter as our standard.
- 2007 Integration of the 9601 using SBD. Power budget compares favorably with Argos, but location calculation is poor.
- 2008 Addition of GPS shortens life of drifters.
- 2010 Integration of the 9602.
- 2012 MetOcean returns to the full-size drifter and low-power GPS. Performance now matches other SVP.



Lessons learned



- Iridium Doppler calculation insufficiently accurate for GDP and scientific purposes.
- Mini-drifter design has insufficient power capacity and buoyancy for Iridium and GPS.
- Connection time to Iridium is fast, but GPS requires more time at high power to calculate a location.
- GPS acquisition algorithms are developed by trial and error over many buoy deployments. Variables include time-out and retry settings and are correlated to the size and shape of the platform.
- OTA command settings are very useful for speeding up this development.

Power supply

Power supply Size	Buoy type	Capacity (Ah-Hr)	Life (Months)
Alkaline Small	Mini-drifter	54	6 – 8
Alkaline Med.	Argos	81	18 - 24
Alkaline Large	Full size	108	24 – 30
Lithium	Mini-drifter	137	32 – 36



Sensors: Drogue on/off indication

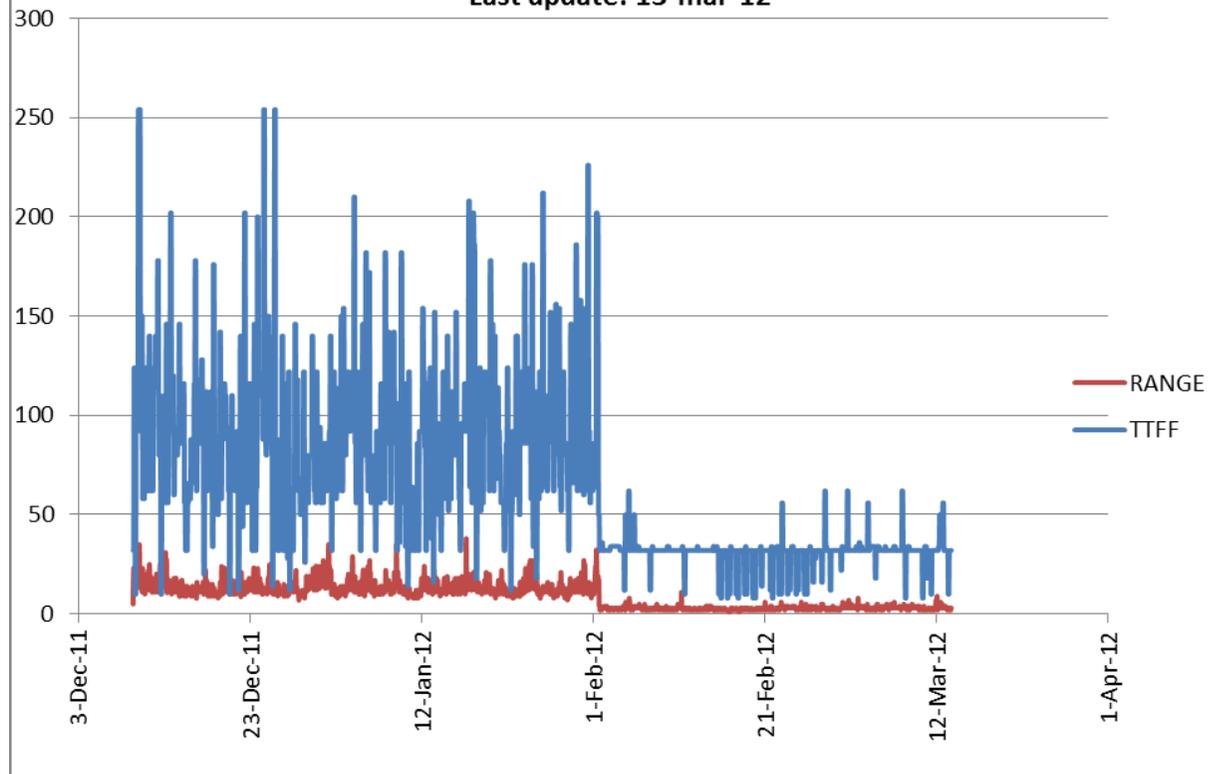
- Submergence sensors tend to show false positives
- Strain gauges are better, but can still be uncertain, especially if the tether is still attached.
- GPS TTFF shows a change in drogue on/off, but is a relative value and not an absolute. It must be used with one of the other parameters and acts as a validation parameter.



Sensors: Drogue on/off indication

133-7510 WMO# 44746 Range to TTFF
correlation

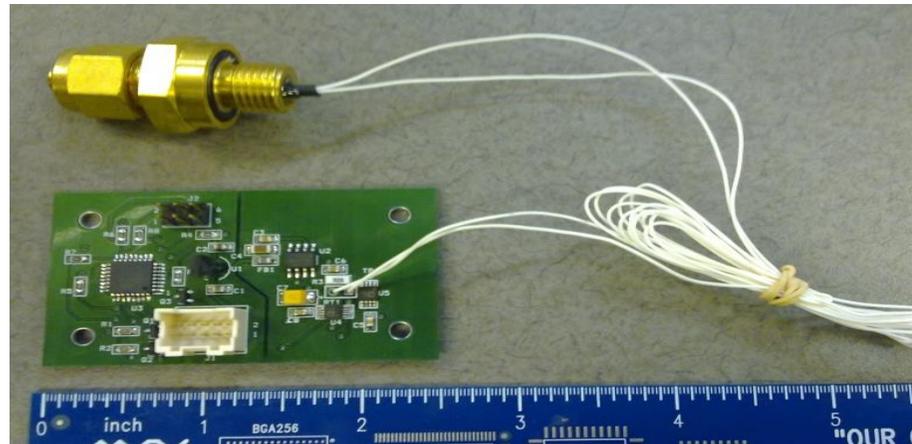
Last update: 13-mar-12





Sensors: HRSST

Item	Description	MetOcean Compliance
System accuracy	Measure SST to +/- 0.05 deg C	High accuracy thermistor.
System accuracy	Calibrate buoy to meet SST	Each probe is calibrated and the coefficients stored in ROM.
System resolution	Report SST to +/-0.01 deg C	DBCP data format
Location accuracy	+/- 500 meters	GPS
Time accuracy	+/- 5 minutes	The buoy scheduler samples SST within 5 minutes of top of the hour



**MetOcean
HRSST Circuit
card**



Sensors: HRSST

The Steinhart-Hart equation is a widely used third-order approximation:

$$\frac{1}{T} = a + b \ln(R) + c \ln^3(R)$$

where a, b and c are the S-H parameters. Rearranging and solving this equation leads to R as a function of T.

Sample of 3 K Ω Ohm thermistor at 25 degrees C. The error in this equation is typically less than 20 millidegrees K.

$$a = 1.40 \times 10^{-3} \quad b = 2.37 \times 10^{-4} \quad c = 9.90 \times 10^{-8}$$

These are then entered in the circuit card ROM and the calibration applied. This allows the calibration to remain with the sensor and not the buoy and allows for recalibration if the buoys are recovered.



Iridium 9602/3 congestion management

- Version TA11002 released in January 2012 developed problems when the Iridium clock rolled over on April 19th, 2013.
- Iridium have implemented a fix on the satellite that checks for congestion several times a day.
- Performing a CSQ checks before transmitting data prevents the device from locking due to marginal RF conditions.
- Buoy firmware must save data for future retransmission.



Iridium 9602/3 congestion management

1	Date (ADT)	YEAR	MONTH	DAY	HOUR	MINUTE	SST	VBAT	SBDTIME	GPSDELAY	TTFF	MAXDB
23	2013-06-05 14:04:10 ADT	2013	6	5	17	0	18.77	14.2	30	0	32	48
24	2013-06-05 13:04:12 ADT	2013	6	5	16	0	18.61	14.2	30	0	10	48
25	2013-06-05 12:04:10 ADT	2013	6	5	15	0	18.57	14.2	255	0	8	48
26	2013-06-05 11:08:29 ADT	2013	6	5	14	0	18.62	14.2	255	0	32	48
27	2013-06-05 11:08:21 ADT	2013	6	5	13	0	18.61	14.2	255	0	10	48
28	2013-06-05 11:08:12 ADT	2013	6	5	12	0	18.7	14.2	255	0	32	48
29	2013-06-05 11:08:00 ADT	2013	6	5	11	0	18.87	14.2	255	0	8	48
30	2013-06-05 11:07:44 ADT	2013	6	5	10	0	18.92	14.2	255	0	32	48
31	2013-06-05 11:07:35 ADT	2013	6	5	9	0	18.9	14.2	255	0	10	48
32	2013-06-05 11:07:26 ADT	2013	6	5	8	0	18.93	14.2	255	0	32	48
33	2013-06-05 11:07:17 ADT	2013	6	5	7	0	18.95	14.2	255	0	10	44
34	2013-06-05 11:07:09 ADT	2013	6	5	6	0	18.99	14.2	255	0	8	48
35	2013-06-05 11:06:57 ADT	2013	6	5	5	0	18.96	14.2	255	0	32	48
36	2013-06-05 11:06:49 ADT	2013	6	5	4	0	19.01	14.2	255	0	12	44
37	2013-06-05 11:06:35 ADT	2013	6	5	3	0	19.73	14.2	255	0	10	48
38	2013-06-05 11:06:27 ADT	2013	6	5	2	0	19.96	14.2	255	0	32	48
39	2013-06-05 11:06:18 ADT	2013	6	5	1	0	20.01	14.2	255	0	10	48
40	2013-06-05 11:06:09 ADT	2013	6	5	0	0	20.12	14.2	30	0	10	48
41	2013-06-04 20:04:17 ADT	2013	6	4	23	0	20.24	14.2	30	0	8	48
42	2013-06-04 19:04:09 ADT	2013	6	4	22	0	20.31	14.2	30	0	32	48
43	2013-06-04 18:04:09 ADT	2013	6	4	21	0	20.4	14.2	30	0	12	48
44	2013-06-04 17:04:10 ADT	2013	6	4	20	0	20.51	14.2	30	0	10	48
45	2013-06-04 16:04:11 ADT	2013	6	4	19	0	20.54	14.2	30	0	32	48



THANK YOU

Oceanography

iSVP, WOCE

Oceanographic drifting buoy



Buoys & Profilers



Beacons & Flashers



Tracking & Locating



Naval Systems

About MetOcean

MetOcean designs and manufactures various drifting buoys, environmental platforms, and also produces the world renowned NOVATECH location and recovery, satellite, RF, and strobe locator beacon product line. MetOcean's drifting buoy family consists of the following environmental monitoring, oil spill response, and search and rescue drifters: NOVA profiling float, Iridium SVP (iSVP), iSPHERE, Argosphere, SLDMB, and iSLDMB.

- [Learn more about MetOcean](#)
- [Read the company Policy](#)
- [Meet MetOcean's Team](#)

Featured Product



[NOVATECH Iridium Beacon](#)

- [Learn more](#)
- [View more products](#)

What's New

- Jun 28, 2013 [NOVATECH Mini Locator Beacons Receive FCC Approval](#)
- May 10, 2013 [Emily and Laura Join MetOcean](#)
- Nov 20, 2012 [Canadian Coast Guard Award](#)

www.metocean.com

