

# **AOML Data Buoy (ADB) Comparison Study and Submergence VS. Strain Gauge Sensor Evaluation**

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# AOML Data Buoy (ADB) Comparison Study

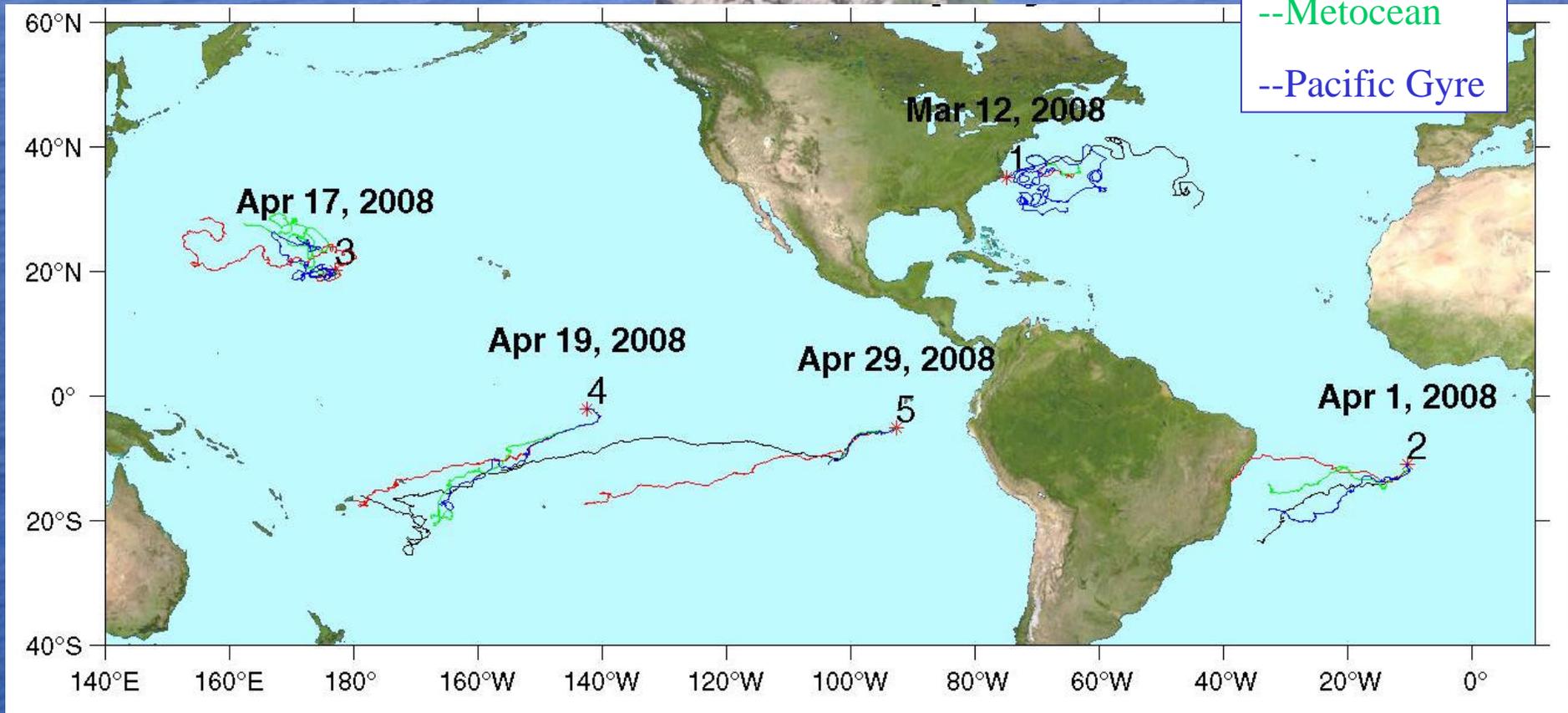
- The Global Drifter Program deployed five clusters of four SVP drifters, one each from **Clearwater**, **Technocean**, **Metocean**, and **Pacific Gyre**, in different oceans of the world, continuing a comparison study started in 2005.
- With data collected for over 1 year from the last deployment in 2008, we have evaluated how well these particular drifters' transmitters are surviving to the design lifetime of 450 days, how well we can detect drogue presence and how long are drogues lasting compared to the expected lifetime of 300 days.

# ADB 2008 Cluster Deployments

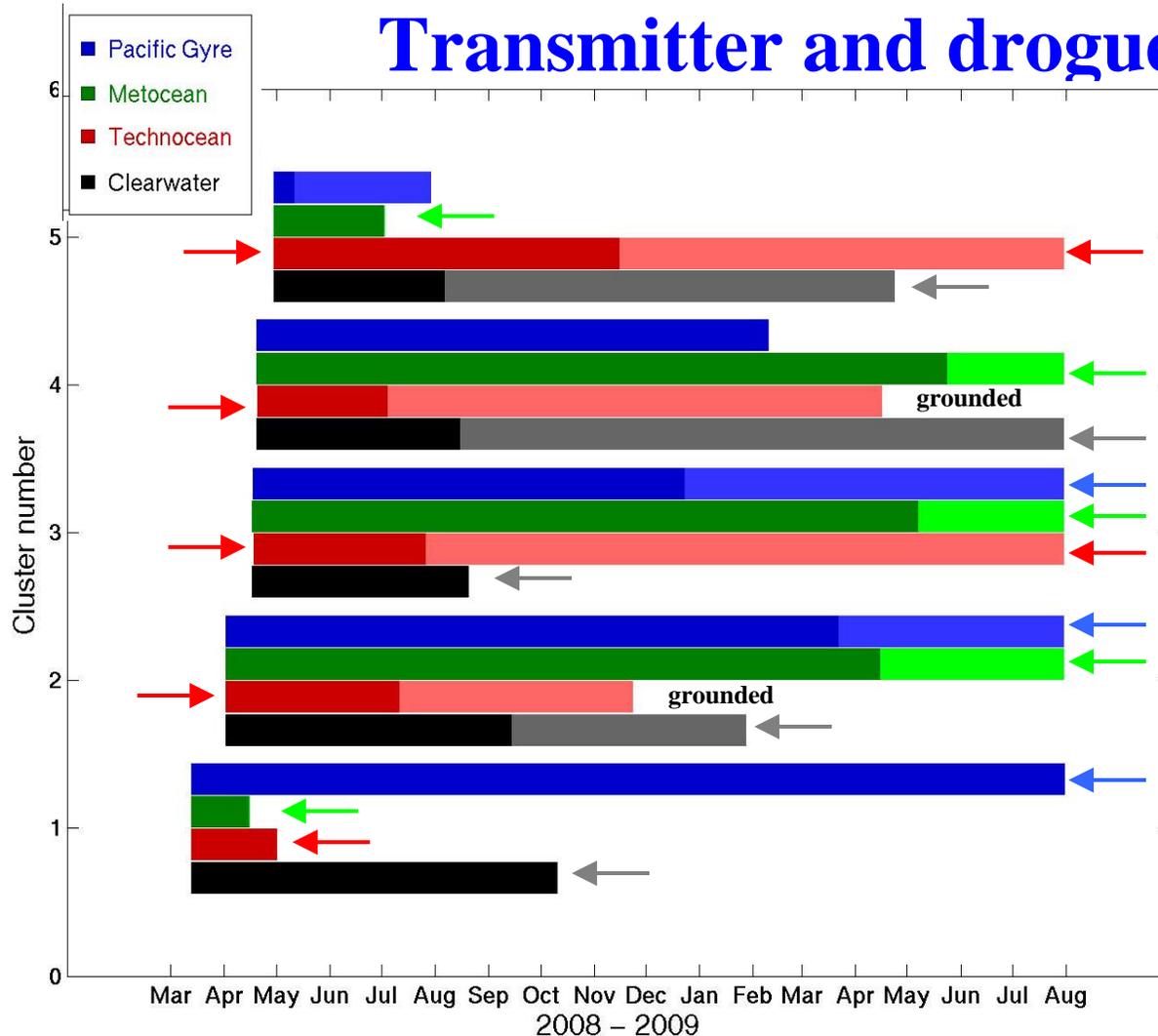
\* Indicates cluster deployment location



- Clearwater
- Technocean
- Metocean
- Pacific Gyre



# Transmitter and drogue lifetimes



Latest update: July 31, 2009

Lighter shades of colors indicate transmitters' life

Darker shades of colors indicate drogues' life

**Pacific Gyre and Metocean drifters had the best lifetime performance: 3 out of 5 each still alive after >450 days**

**Clearwater drifters died more rapidly, only one is still alive after >450 days.**

**None of the drifters failed on deployment but two from Metocean and one from Technocean ceased transmitting in less than three months.**

**Two Technocean drifters ran aground. Two still alive.**

**Four of Technocean drifters lost their drogues before dying, with a mean drogue lifetime of 120 days.**

**Both Metocean and Pacific Gyre had large average drogue lifetime**



# Summary Table of Transmitters' Life Times (days)

9 alive (passing life expectancy of 450 days, 11 dead)

## Clusters

Manufacturers	1	2	3	4	5
<b>Clearwater</b>	212 (Quit)	301 (Quit)	125 (Quit)	*	359 (Quit)
<b>Technocean</b>	50 (Quit)	236 (Gr)	*	361 (Gr)	*
<b>Metocean</b>	34 (Quit)	*	*	*	64 (Quit)
<b>Pacific Gyre</b>	*	*	*	296 (Quit)	91 (Quit)
<b>Max. Days Possible</b>	<b>506</b>	<b>485</b>	<b>469</b>	<b>467</b>	<b>457</b>

\* = OK until last update,  
July 31, 2009

### Clearwater:

One transmitter alive, four quit after 125, 212, 301, 359 days.

### Technocean:

Two transmitters alive, one died after 50 days, two grounded after 236 and 361 days.

### Metocean:

Three transmitters alive, two quit after 34 and 64 days.

### Pacific Gyre:

Three transmitters alive, two quit after 91 and 296 days.

# Summary Table of Drogues' Life Times (days)

(drogue life expectancy is 300 days)

## Clusters

<i>Manufacturer</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<b>Clearwater</b>	212* (Quit)	166	125* (Quit)	119	99
<b>Technocean</b>	50* (Quit)	101	100	75	200
<b>Metocean</b>	34* (Quit)	379	385	400	64* (Quit)
<b>Pacific Gyre</b>	*	354	250	296* (Quit)	12
<b>Max. Days Possible</b>	<b>506</b>	<b>485</b>	<b>469</b>	<b>467</b>	<b>457</b>

### Clearwater:

Two drogues attached until transmitter quit, three drogues lost after 99, 119 and 166 days.

### Technocean:

One drogue attached until transmitter quit at 50 days, other drogues lost after 75, 100, 101 and 200 days.

### Metocean:

Two drogues attached when transmitter quit, 3 drogues lost after 379, 385 and 400 days.

### Pacific Gyre:

One drogue still attached after 506 days, 1 attached when transmitter quit and 3 drogues lost after 12, 250 and 354 days.

**\* = OK until last update,  
July 31, 2009 (or drifter death)**

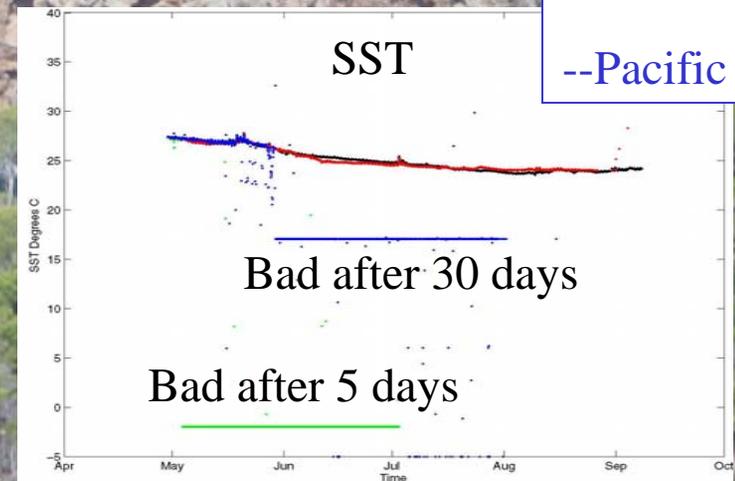
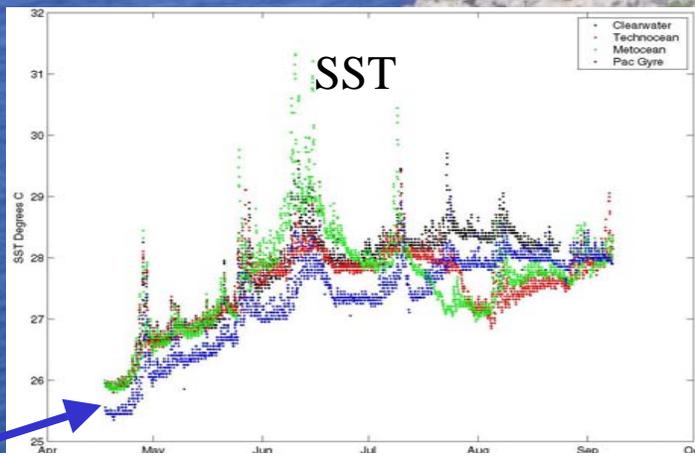
# SST Summary- All good except: Pacific Gyre:

- One SST sensor failed after 30 days in the water.
- One drifter had SST too cold by  $0.45^{\circ}$  (confirmed that correct coefficient was being used).

## Metocean:

- One SST sensor failed after 5 days in the water.

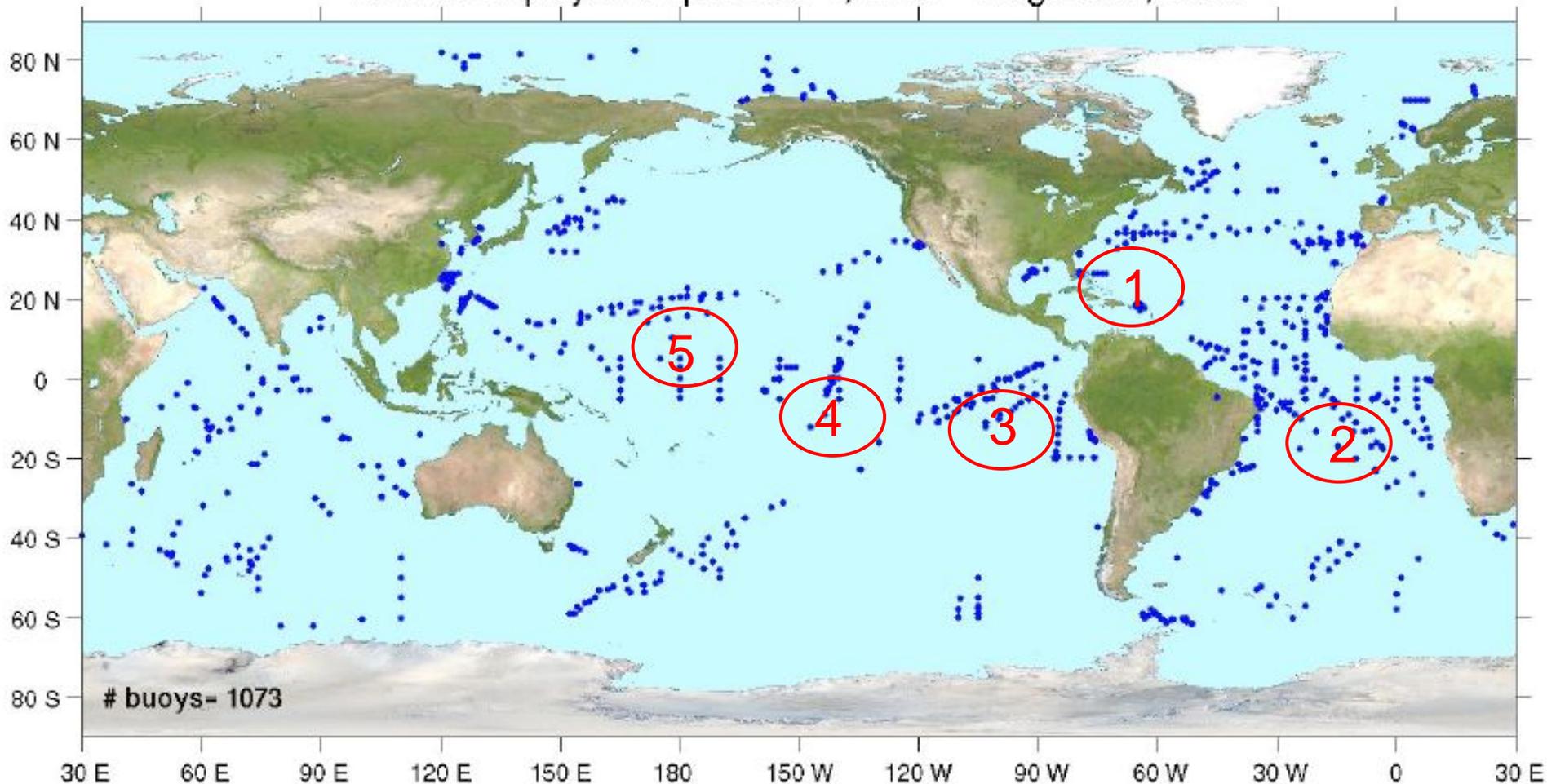
-- Clearwater  
-- Technocean  
-- Metocean  
-- Pacific Gyre



0.45 offset was added to correct SST

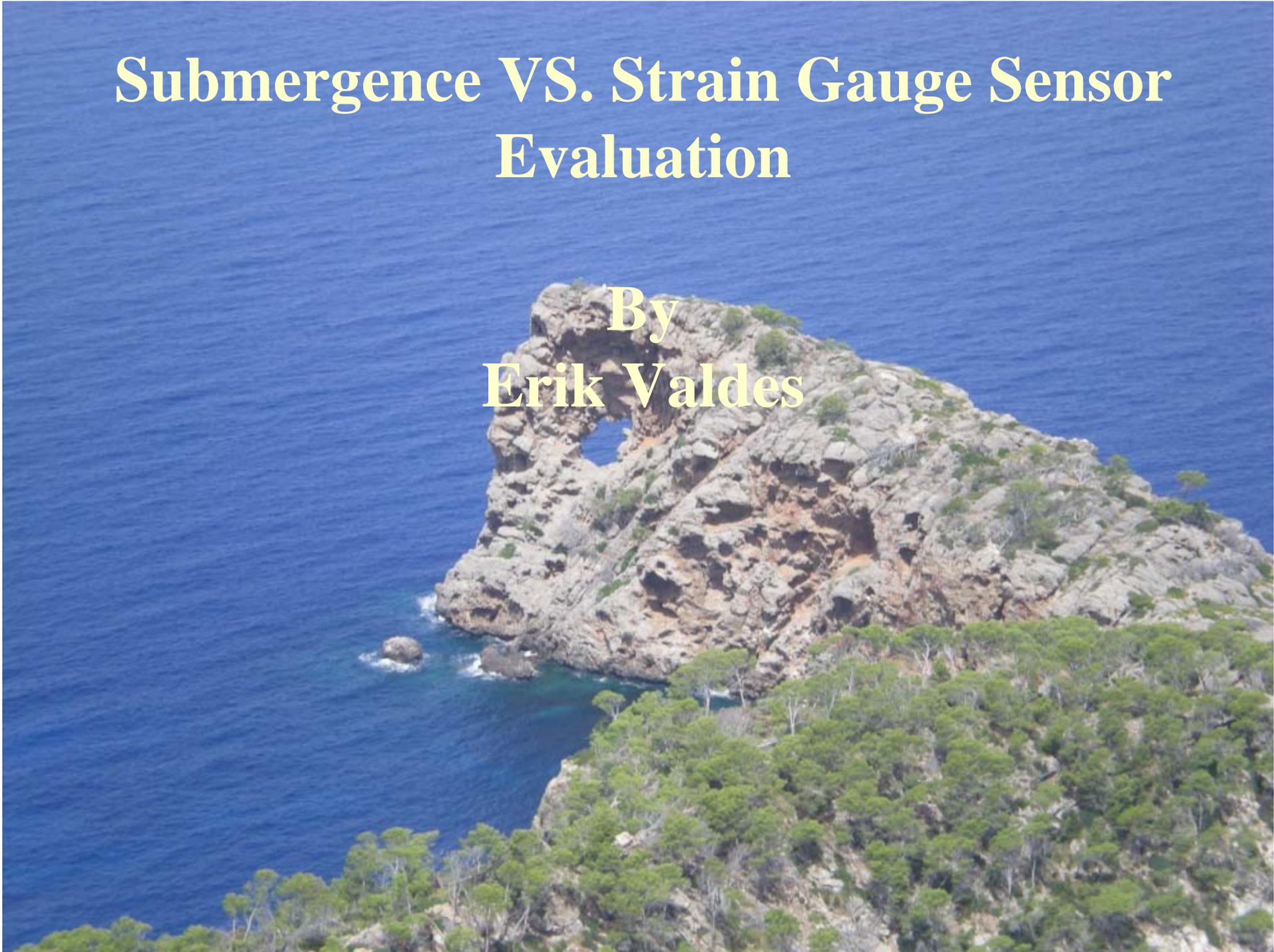
# Plans for 2010 ADB Comparison Study Deployment Locations

Drifters Deployed September 1, 2008 – August 31, 2009



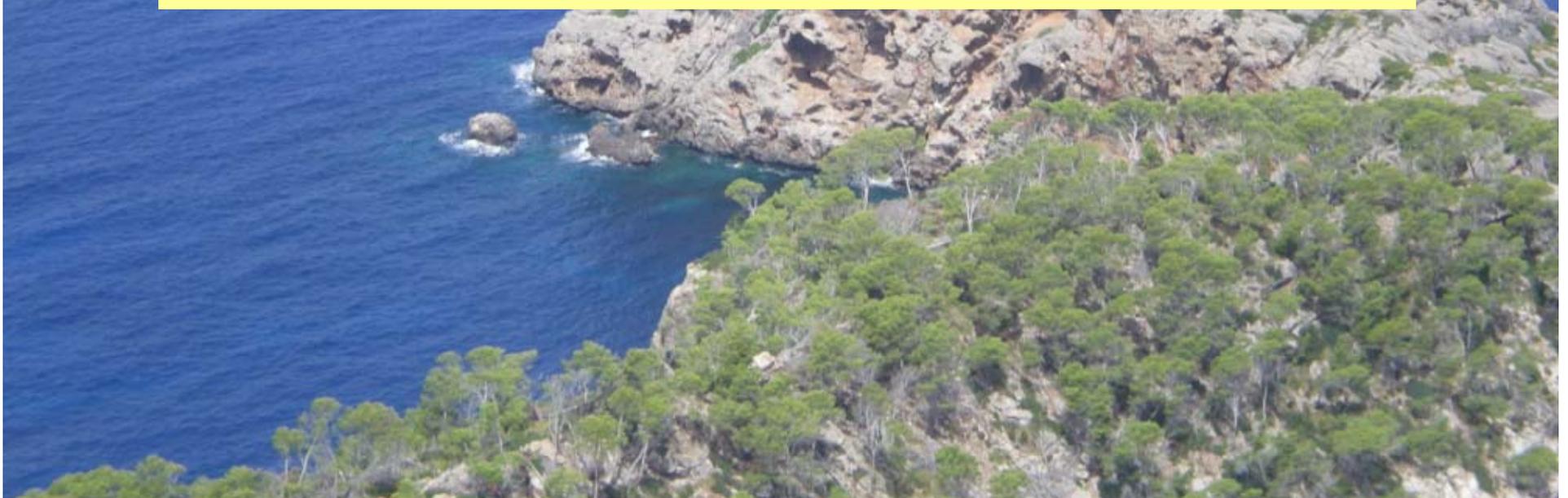
# Submergence VS. Strain Gauge Sensor Evaluation

By  
Erik Valdes



# Drogue Sensor Evaluation

- The GDP has been examining submergence and strain gauge for drogue detection.
- The DBCP recommended that drifter manufacturers implement tether strain for drogue detection following the success of Clearwater strain gauge drifters.



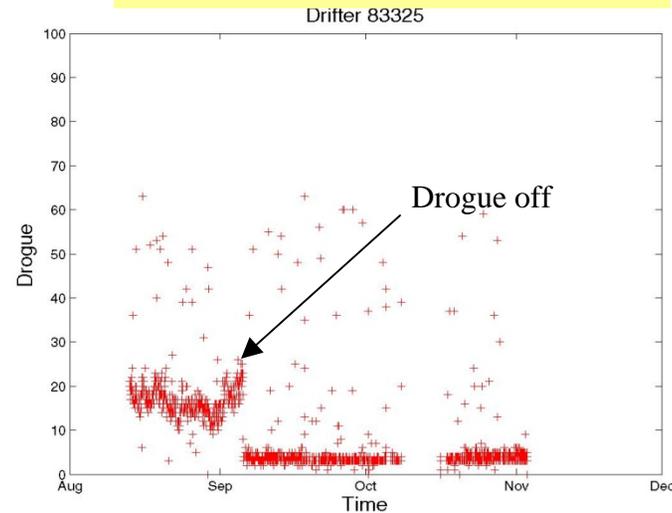
# Bay of Biscay Study

- In September 2008, a pilot study was conducted in the Bay of Biscay.
- The three US manufacturers, Clearwater, Technocean and Pacific Gyre, each had tether strain implemented in their drifters and participated in the study.
- Results were mixed, indicating that challenges remain in detecting drogue presence and their ability to stay attached to the drifters for a longer period of time.

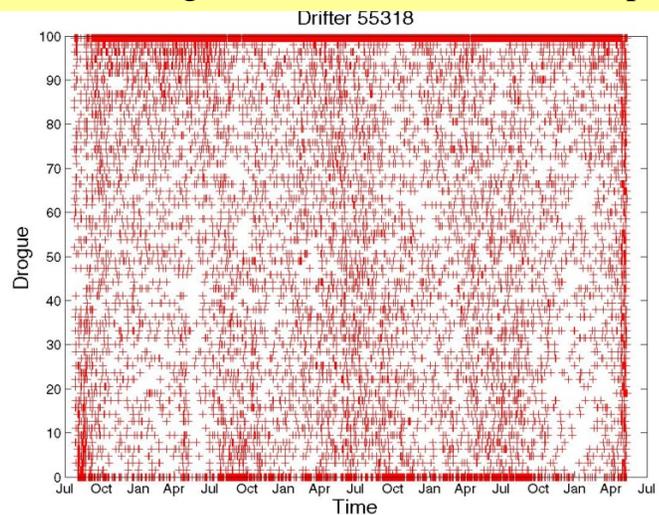
# Technocean

- Submergence drogue sensors have improved dramatically over the last two years clearly indicating when drogue is off.
- Strain gauge sensors also indicate when drogue is off with a clear drop in value.
- There is a concern over how long the drogues stay attached as most lose their drogue within two months (Technocean has subsequently responded with an enhancement to the system).

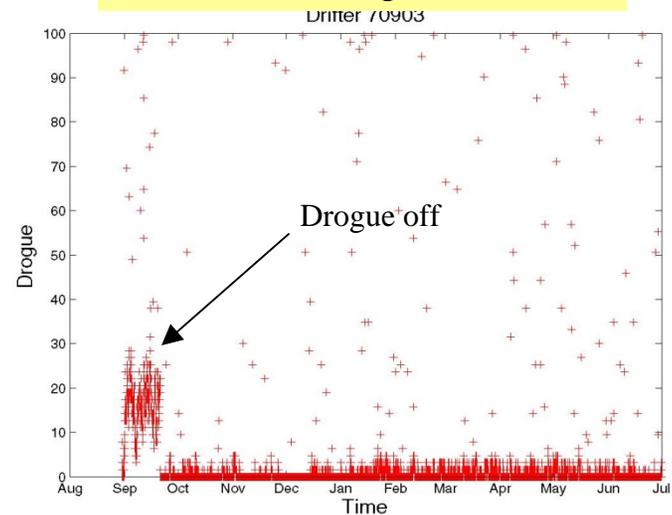
Bay of Biscay Strain Gauge



Old Submergence Sensor-difficult to interpret



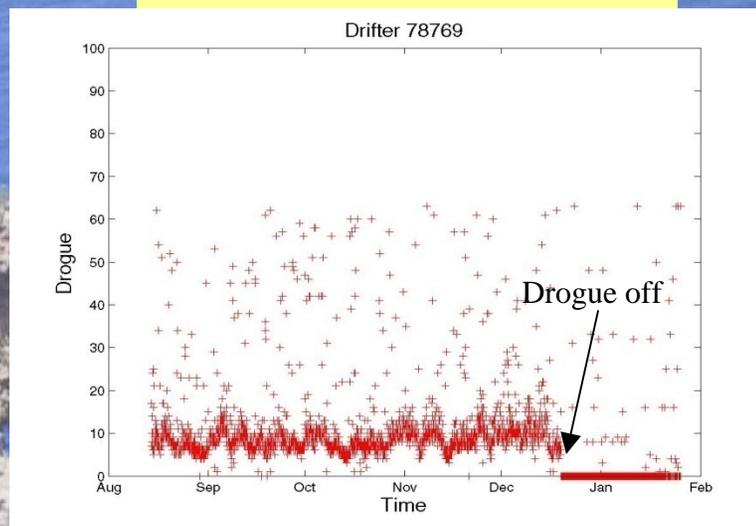
Modified Submergence Sensor



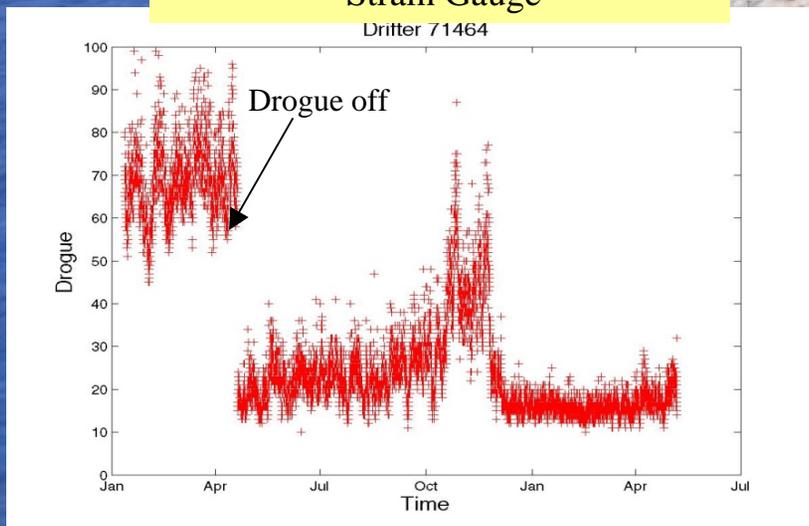
# Clearwater

- Clearwater has used strain gauge drogue sensors for many years, a technique which almost always clearly shows when the drogue is lost with a sharp drop in value.
- There is also a concern with Clearwater over how long the drogues stay attached as most lose their drogue within six months.

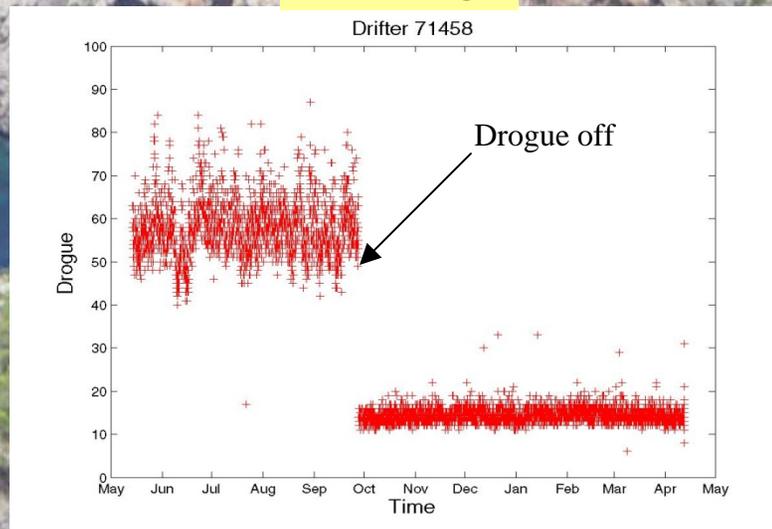
Bay of Biscay Strain Gauge



Strain Gauge



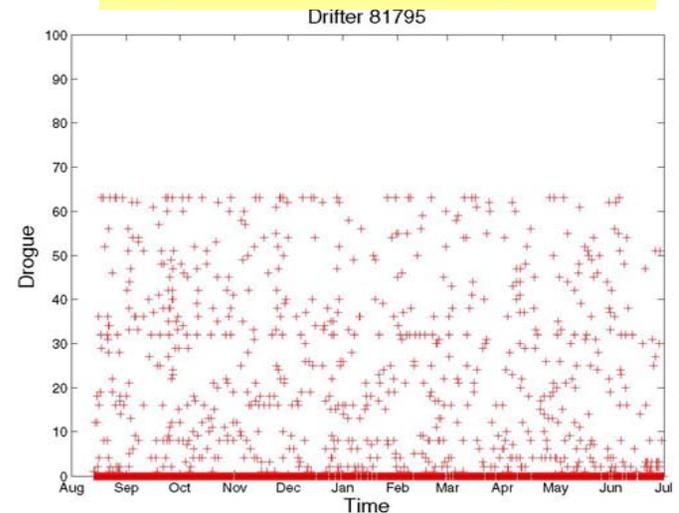
Strain Gauge



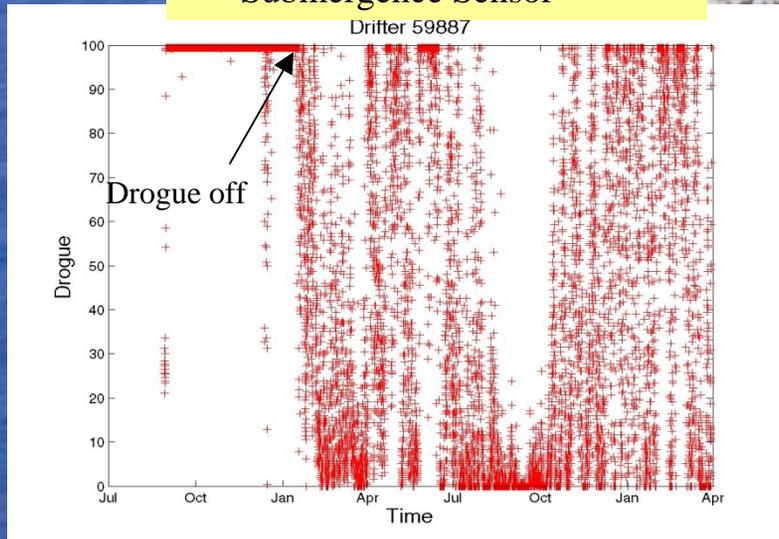
# Pacific Gyre

- Pacific Gyre submergence drifters tend to peg at a high level for a long period of time.
- Submergence drogue sensors shows a clear drop in value indicating drogue off.
- Strain Gauge test drifters malfunctioned resulting in all five buoys failing to report strain value (has subsequently been addressed by Pacific Gyre).

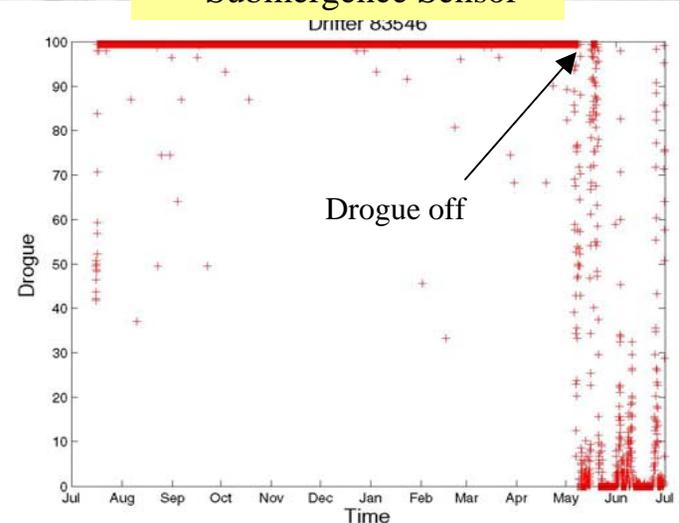
Bay of Biscay Strain Gauge



Submergence Sensor



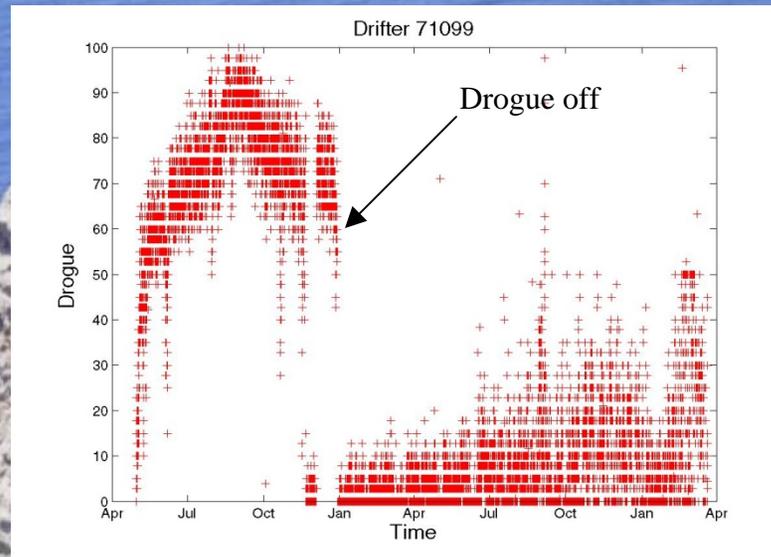
Submergence Sensor



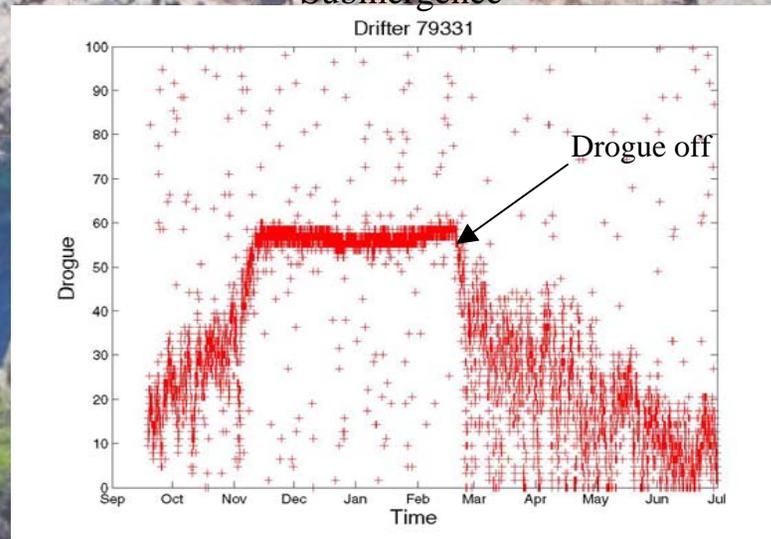
# Metocean

- Metocean submergence drifters has performed well indicating drogue off with a clear drop in value.
- Metocean was not part of the Bay of Biscay study evaluating strain gauge drifters.
- Strain Gauge drifters were recently developed and deployed.

Submergence



Submergence



# Conclusion

- The Clearwater and Technocean tether strain sensors performed well indicating drogue lost, but raised concerns over drogue life. The Pacific Gyre sensors malfunctioned (this has subsequently been addressed by Pacific Gyre).
- Meanwhile, over the last two years Technocean submergence sensors have improved dramatically and now appear to clearly indicate drogue loss.
- Metocean submergence sensors have also continued to perform well, clearly indicating drogue loss.
- There is concern over drogues not staying attached for more than six months for Technocean and Clearwater.
- If the Pacific Gyre submergence sensors are accurately reflecting drogue presence, then they have the longest drogue life of all manufacturers.