

Evaluation of Drogue Lifetimes

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Objectives

- + Drogue Design and Drogue Detection
- + Reanalysis of Drifter Database
- + Lessons Learned?
 - + Future Direction

Drogue Design and Detection

1979:

Drifter Invented
-Implementation/
Modification

Evolution of SVP w/ Holy Sock

2006:

Work with manufacturers to
identify plotting
irregularities.

Drogue Reanalysis.

2011-2012:

Strain gauge sensors demonstrate
an alarming drogue failure rate.

Second Drogue Reanalysis begins.

1979

2003

2006

2008-2009

2012

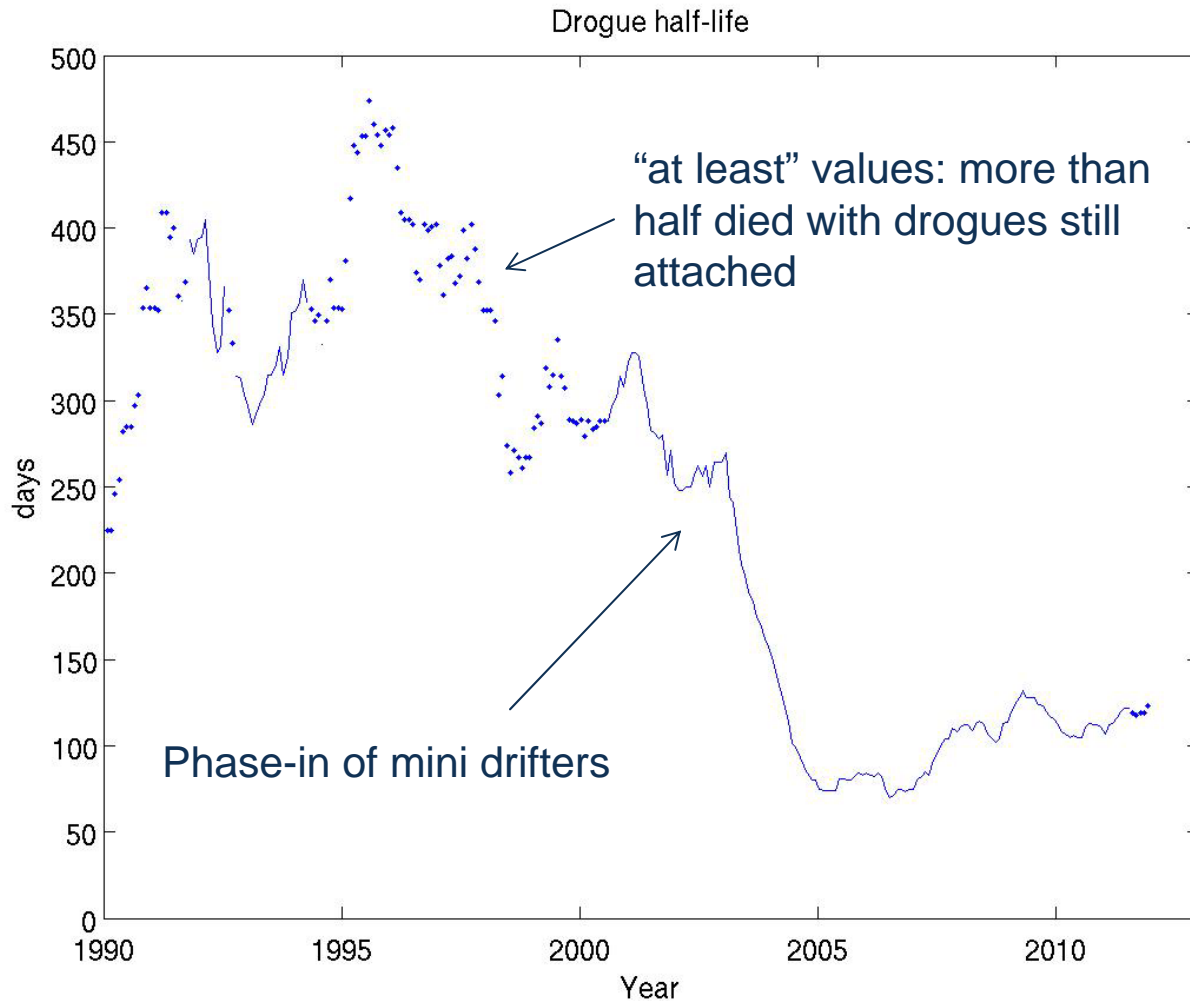
2003:

Introduction of Mini
Drifter/Drogue Design

2008-2009:

Implementation of strain
gauge sensor.

2003: Mini Drifter/Drogue



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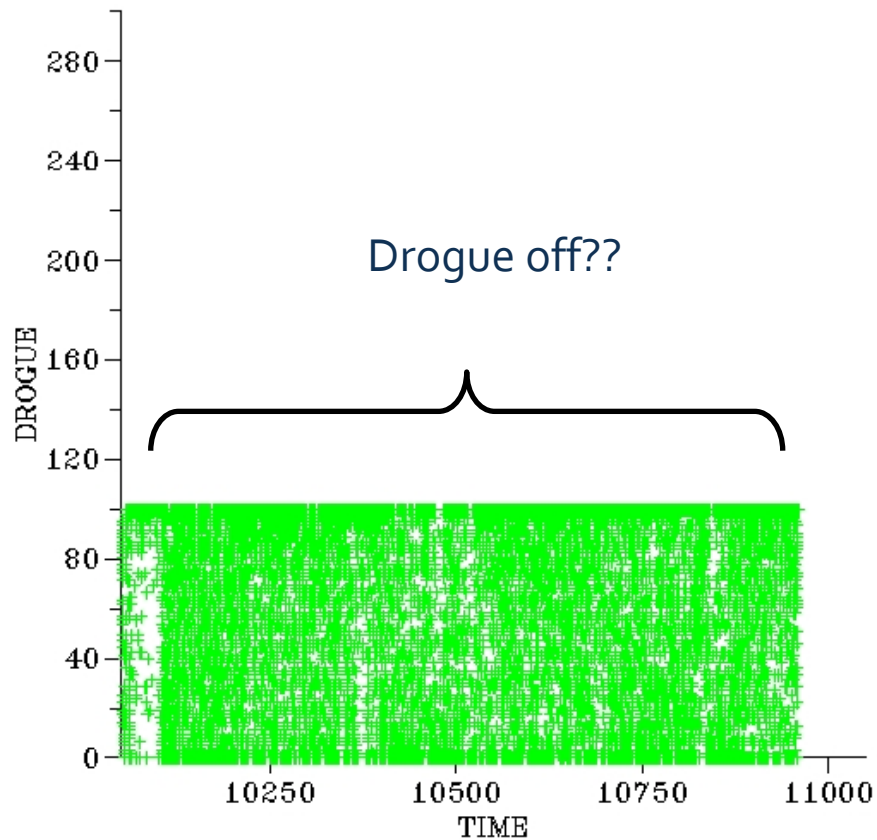
2008-2009:

Implementation of strain
gauge sensor.

2006: 1st Drogue Reanalysis

B 63839 EXP 7325

Tech St: 7/ 8/2006 Et:10866 D.off: 0 death:ALIVE



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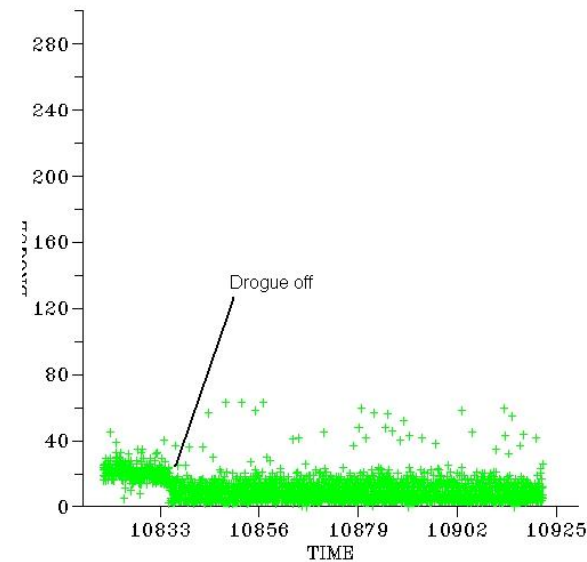
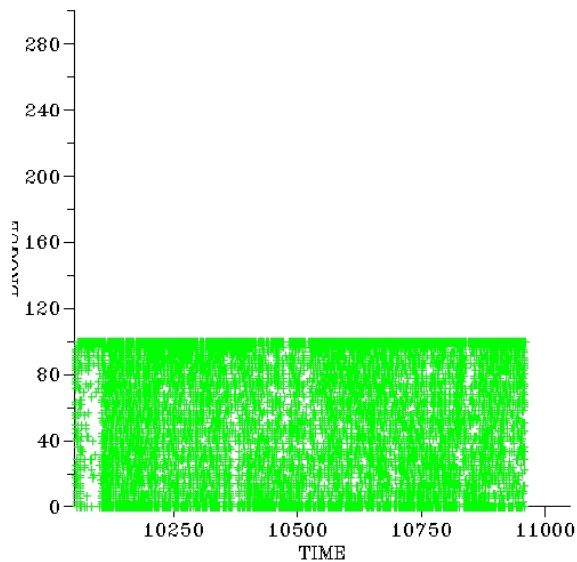
Implementation of strain
gauge sensor.

2008: Enhanced Drogue Detection

Submergence Sensor Vs. Strain Gauge Sensor

B 63839 EXP 7325 Tech St: 7/ 8/2006 Et:10866 D.off: 0 death:ALIVE

B 83326 EXP 6325 Tech St: 8/14/2008 Et:10866 D.off: 0 death:ALIVE



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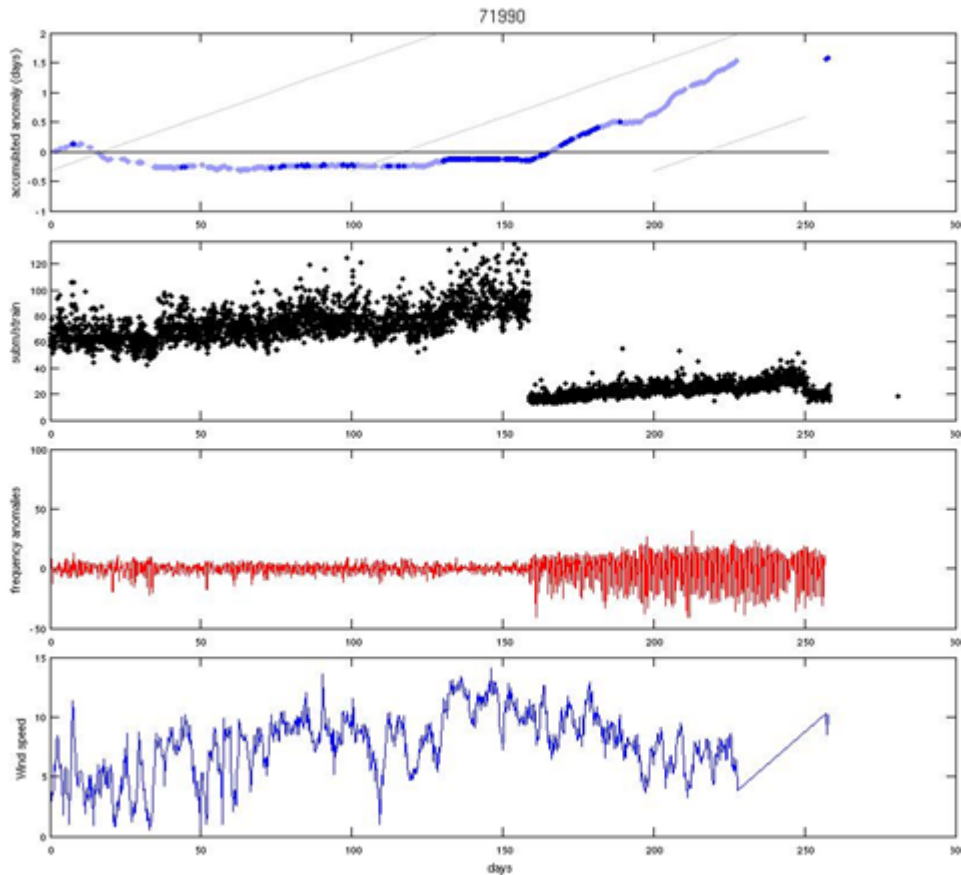
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gauge sensor.

2012: Complete Drogue Reanalysis



- Drifter Down-Wind Movement
- Drogue Detection
 - Tether Strain
- Transmission Frequency
- Wind Speed

Percent which Live <90 days

lost drogue in less than 90d divided by # deployed that year.

2012: values through 25 March. **Bold:** more than 25%. **Large:** >50%.

<u>Manufacturer</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Clearwater	46%	57%	54%	34%	28%	36%	39%	21%
Marlin-Yug	*	0%	0%	44%	46%	36%	*	100%
Metocean	22%	15%	9%	15%	25%	36%	46%	
	32%							
Pacific Gyre	27%	24%	16%	23%	12%	11%	14%	21%
Technocean	69%	57%	62%	78%	52%	46%	26%	50%

Half-life of Drogues (days)

of days after which half have lost drogue, as function of deployment year. Includes Failed on Deployment.

Values through 25 March 2012. **Bold:** less than 100 days (**Large:** <50 days).

<u>Manufacturer</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Clearwater	89	63	72	106	106	96	88	>61
Marlin-Yug	*	197	152	72	57	167	*	16
Metocean	305	308	>407	280	225	85	90	>77
Pacific Gyre	>161	>321	>242	199	>263	>244	>164	>70
Technocean	13	45	47	33	65	77	154	>27

Wagon Wheel Drogue Lifetime (days)

of days after which half have lost drogue, as function of deployment year. Includes Failed on Deployment.

<u>Manufacturer</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Metocean	305	308	>407	280	225	85	90	>77
Technocean	13	45	47	33	65	77	154	>27

Total Median: 42days

Median number of days with drogue attached, as function of deployment year. Does NOT include Failed on Deployment.

<u>Manufacturer</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>
Metocean					103	72	85
Technocean	11	09	28	35	28	20	48

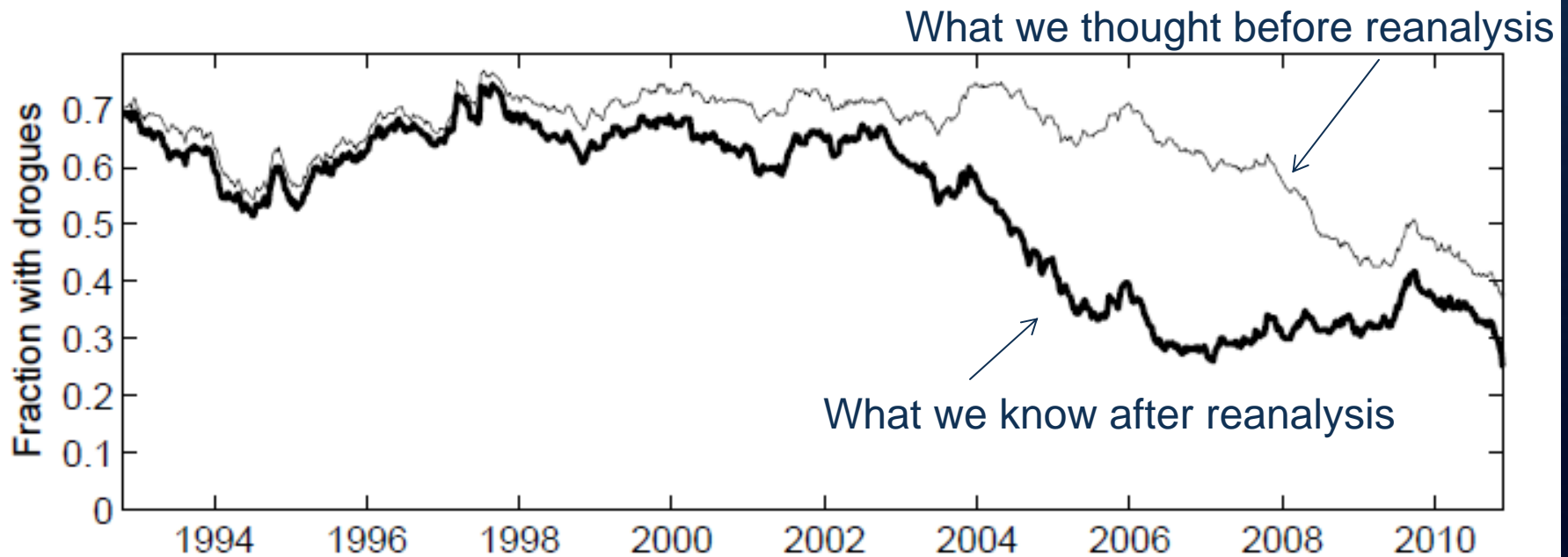
Lessons Learned

- The misdiagnosis of drogue loss caused us to think that more drifters had drogues attached than in reality. Misdiagnosis became significant in 2004, faded away as tether strain replaced submergence.
- The half-life of an average drogue fell from 300—400 days for the old, large drifters to 74 days for the mini drifters, averaged across all manufacturers.
- *Clearwater*: drogue half-life 60—100 days.
- *Metocean*: drogue half-life >200 days until 2010, when half-life fell to 85—90d.
- *Pacific Gyre*: drogue half-life generally large; early in study period, most drifters died (relatively early) with drogues still attached. Overall drogue half-life >200d.
- *Technocean*: very short drogue lifetimes masked by difficult-to-interpret submergence until recently. Drogue half-lives <50 days until 2009, jumped to >150d in 2011 (but overall lifetime decreased sharply that year).

Lessons Learned

The drogue misdiagnosis error became serious starting in 2004, and reached its peak in mid-2006. We used to think that 65% of the drifters then had drogues attached. We now know that only 29% did.

By early 2010, when most drifters had tether strain, the problem wasn't as severe: we thought that 37% had drogues attached, when 23% did.



Future Direction

- + SIO has re-designed the tether attachment in order to make it more resistant to stress, torque, and has enhanced the waterproofing seal.
- + Drogue construction now calls for:
 - + 600 den, or higher, rip-stop cordura nylon.
 - + Double fabric along the seams.
 - + End tacking.
 - + Spider wheel.
- + Synthetic Rope is being evaluated.

Thank You

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