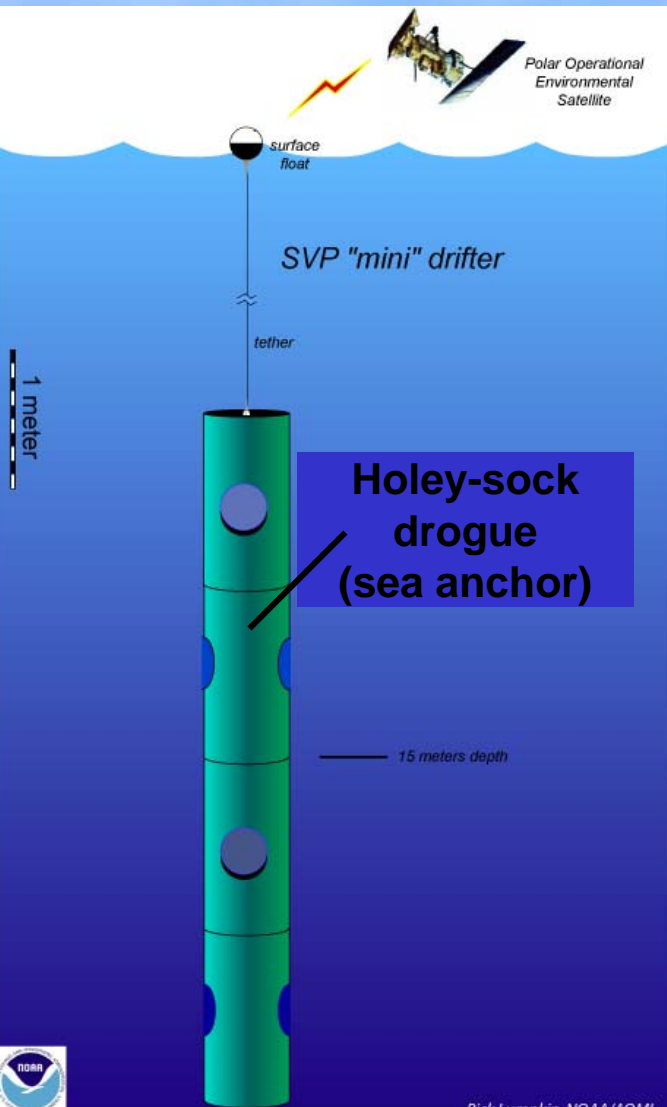


Drifters' drogues: on or off?



Operational drogue status:
Drifter DAC, NOAA/AOML
(Jessica Redman and Erik Valdes)



WHY THIS MATTERS: the quality and accuracy of mixed layer current measurements depends upon drogue (sea anchor) presence.

With drogue attached: <math><1\text{ cm/s}</math> "slip" per 10 m/s wind (Niiler and Paduan, 1995).

Without drogue: ~9 cm/s per 10 m/s wind (Pazan and Niiler, 2000).

Overview

In 2004-2005, the drifter Data Assembly Center (DAC, NOAA/AOML) determined that drogue status was no longer being correctly interpreted due to changes in submergence sensors, divergence between different manufacturers, and misinterpretation of tether strain records.

Before 1998, a drop to zero submergence indicated drogue loss. But things had changed ...

Starting in mid-2004, manufacturers were contacted and presented with many, many examples of submergence or tether strain records and asked to assist in interpretation. All generously offered their time, most dramatically exemplified by a full-day visit to AOML by Technocean personnel.

The DAC has now determined that manufacturer-dependent and time-dependent criteria are necessary to judge drogue status.

Through 2005 and into early 2006, the DAC undertook a complete reevaluation of drogue presence for all drifters in the period 1998-present. Results were included in the quality controlled database released 1 May 2006.

Detection of drogues

In the following slides, we demonstrate “typical” submergence or tether strain records for four drifter manufacturers: Metocean, Pacific Gyre, Technocean and Clearwater.

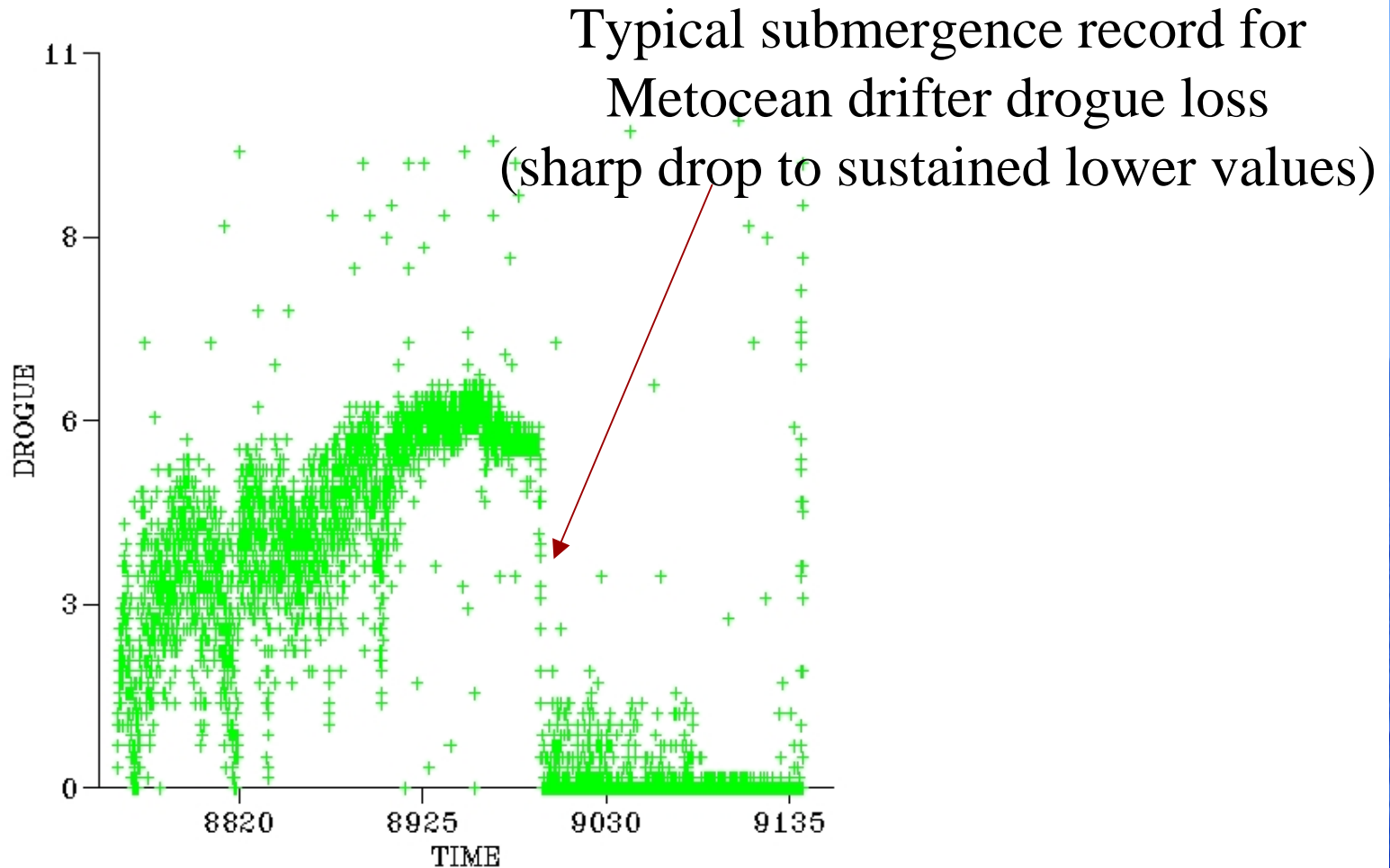
Differences in how submergence is counted, differences in sensitivity, etc. result in manufacturer-dependent behavior, exacerbating our ability to automate drogue detection for the 1250-buoy array.

We also show some anomalous or difficult-to-interpret records, to emphasize that this process is not trivial.

Metocean

B 36242 EXP 9085

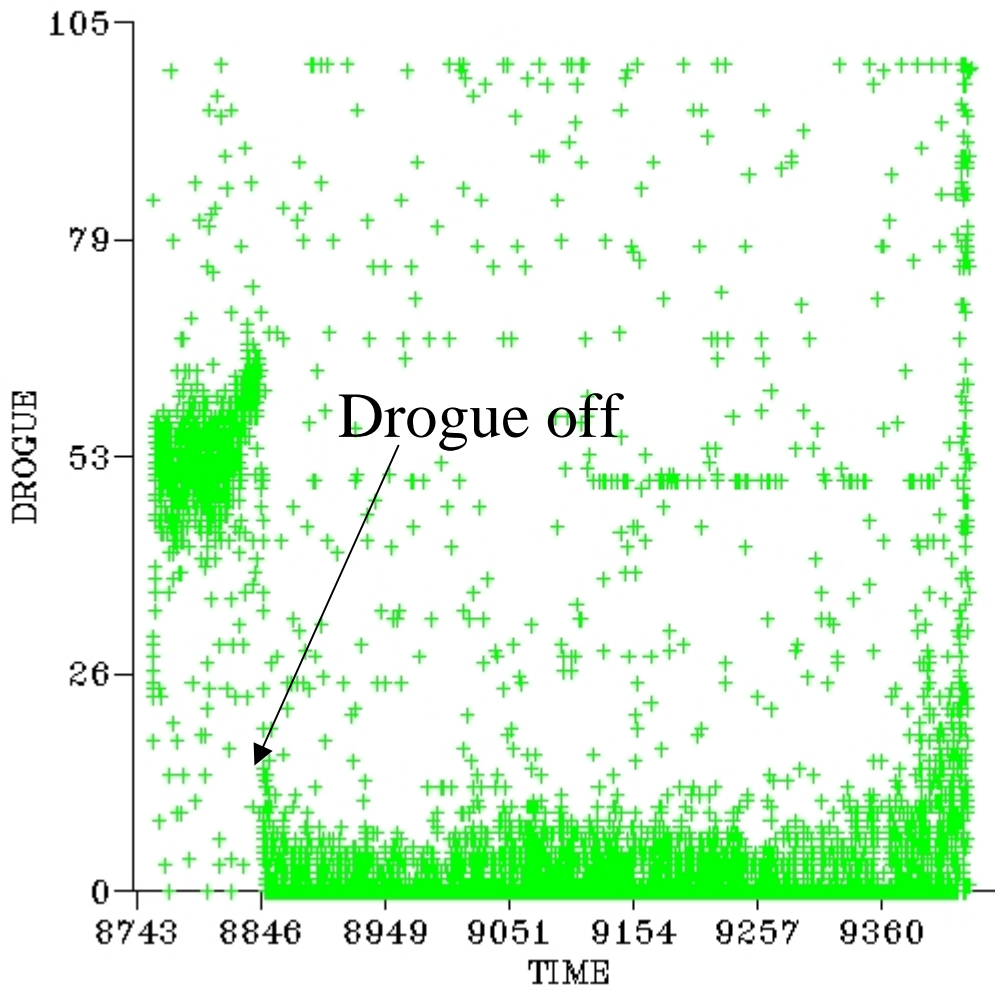
Meto St:12/15/2002 Bt: 9142 D.off: 9142 death:QUIT



Metocean

B 13697 EXP 9484

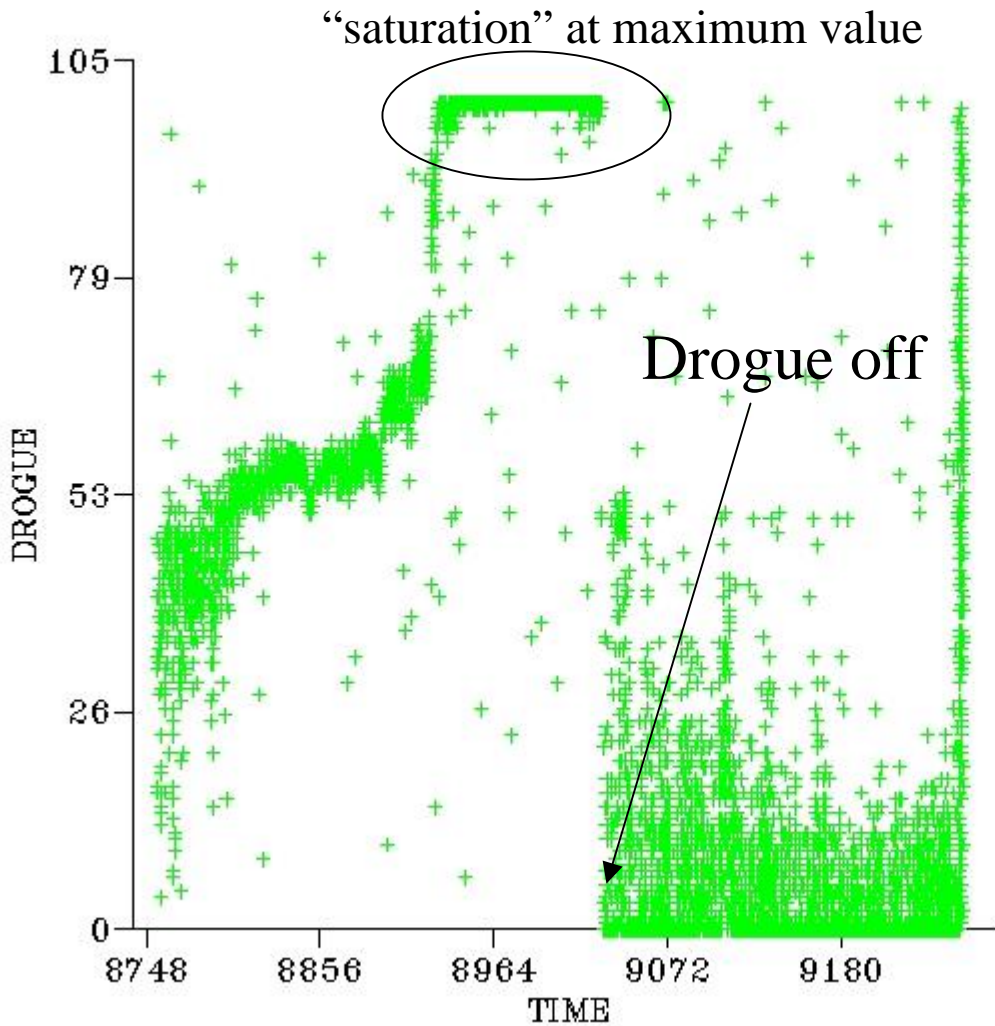
Meto St:12/20/2002 Et: 9433 D.off: 8846 death:QUIT



Metocean

B 21623 EXP 9484

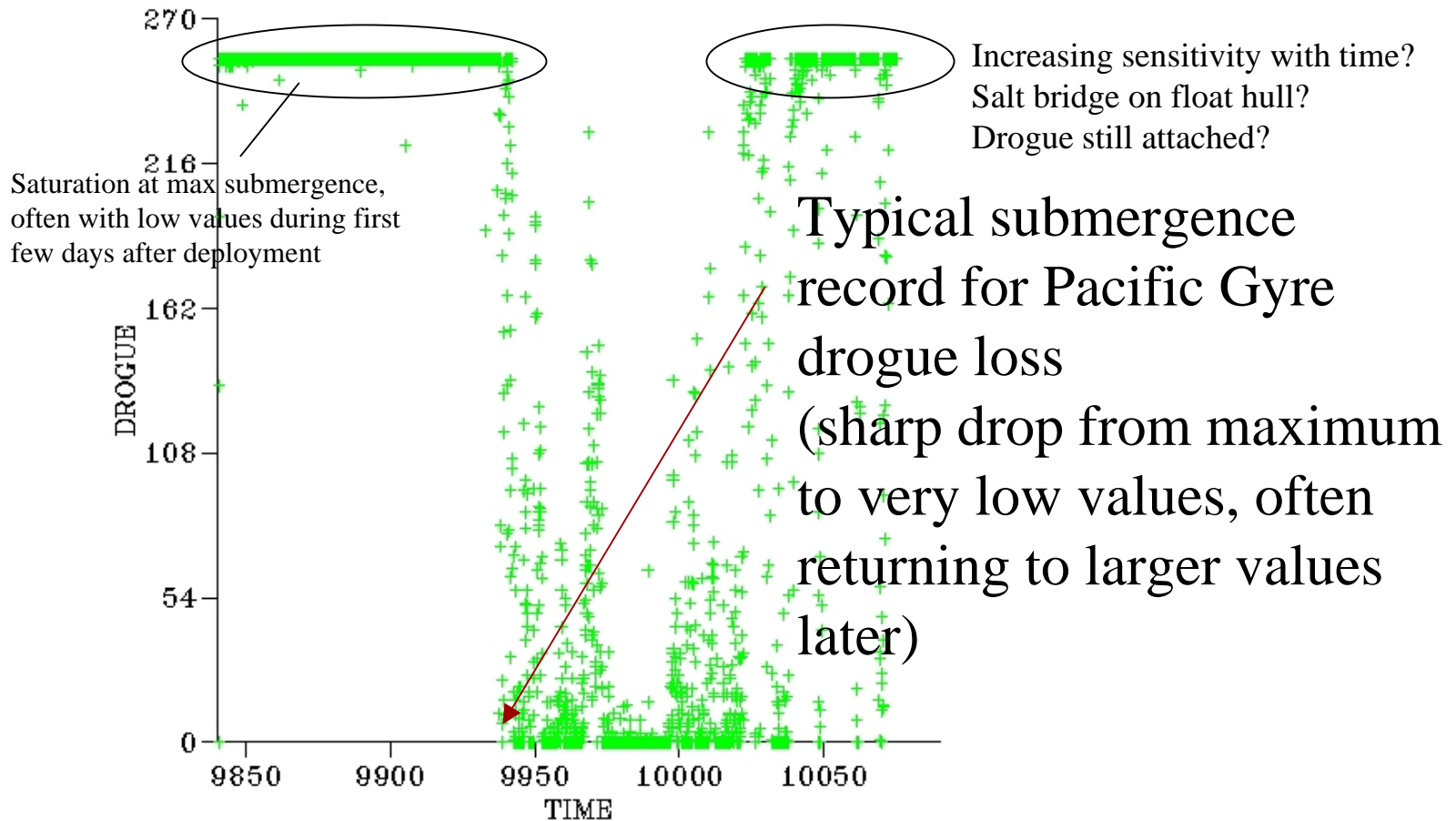
Meto St:12/19/2002 Et: 9256 D.off:9031 death:QUIT



Pacific Gyre

B 56681 EXP 8325

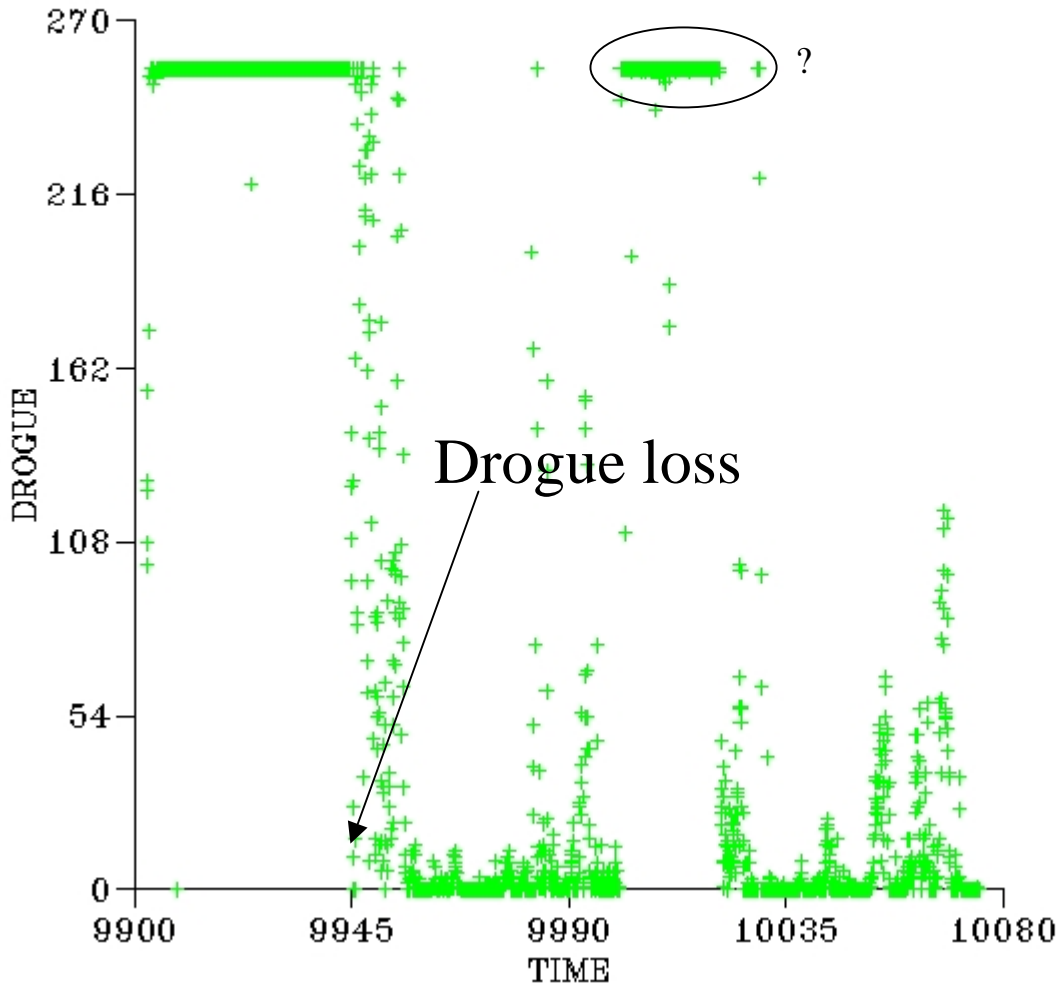
Pac St:12/ 9/2005 Et:10043 D.off: 9938 death:ALIVE



Pacific Gyre

B 59915 EXP 8325

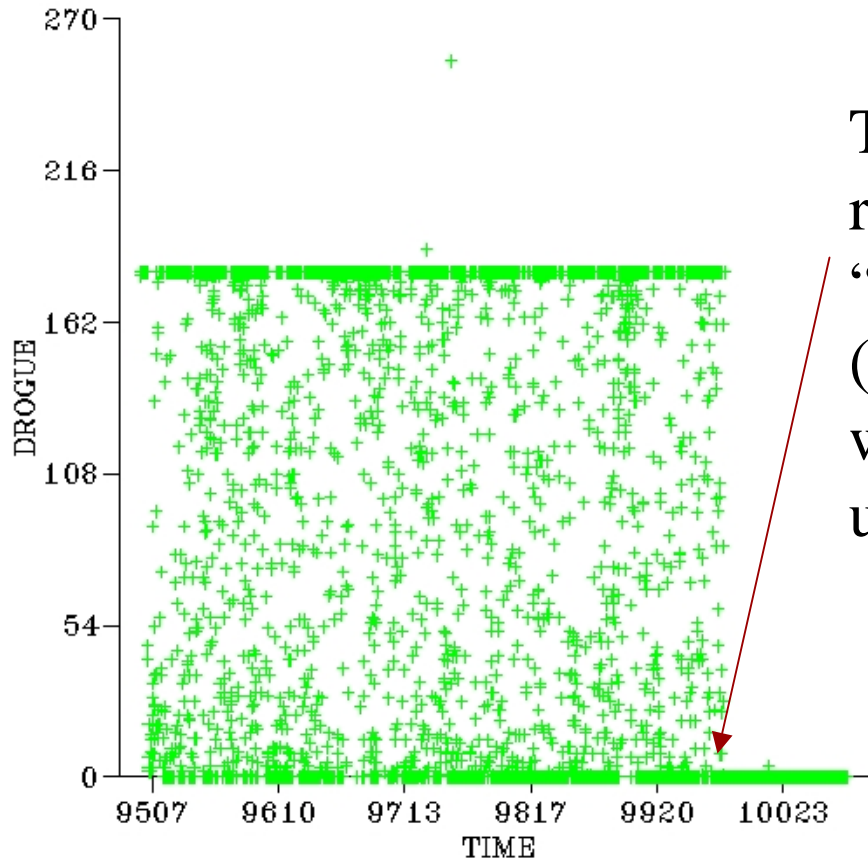
Pac St: 2/ 9/2006 Rt:10044 D.off: 9944 death:ALIVE



Technocean

B 53368 EXP 7325

Tech St:12/31/2004 Et: 9974 D.off: 9972 death:P.U

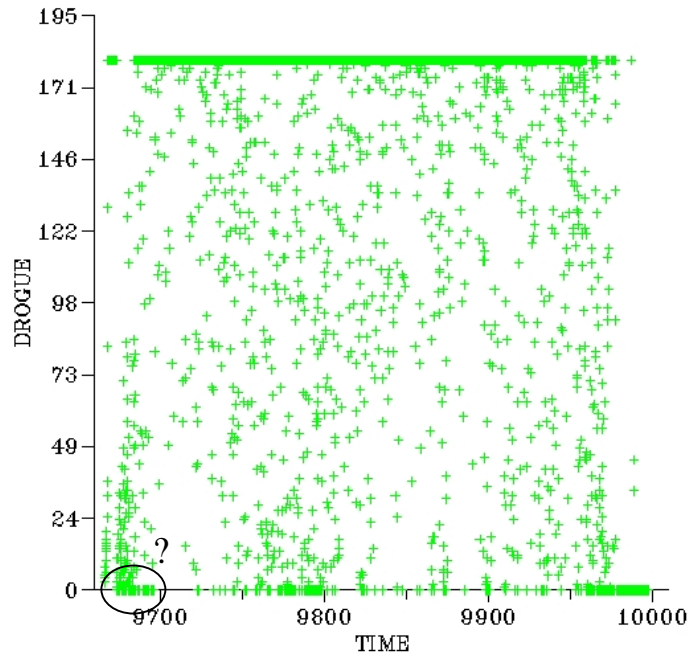


Typical submergence record for Technocean
“drogue loss”
(sharp drop to zero
when drifter is picked
up).

Technocean

B 54671 EXP 7325

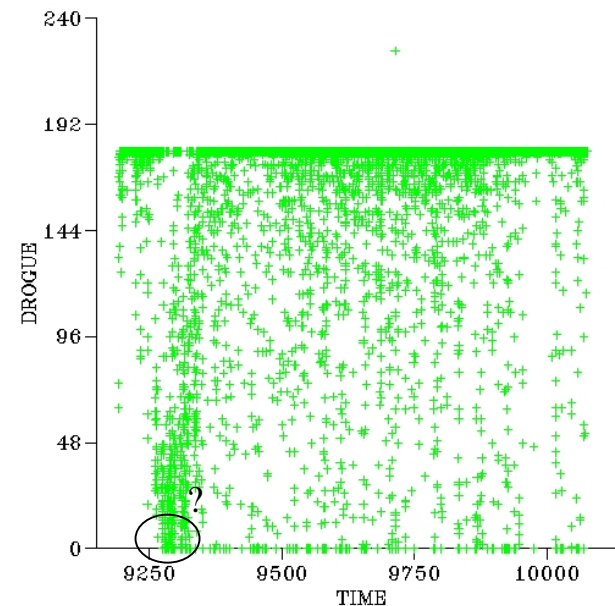
Tech St: 6/18/2005 Et: 9997 D.off: 9977 death:QUIT



Sensitive Technocean submergence; manufacturer suggests calling “drogue off” if record drops to low values, but many examples where it drops, then goes back up to maximum values for long time.

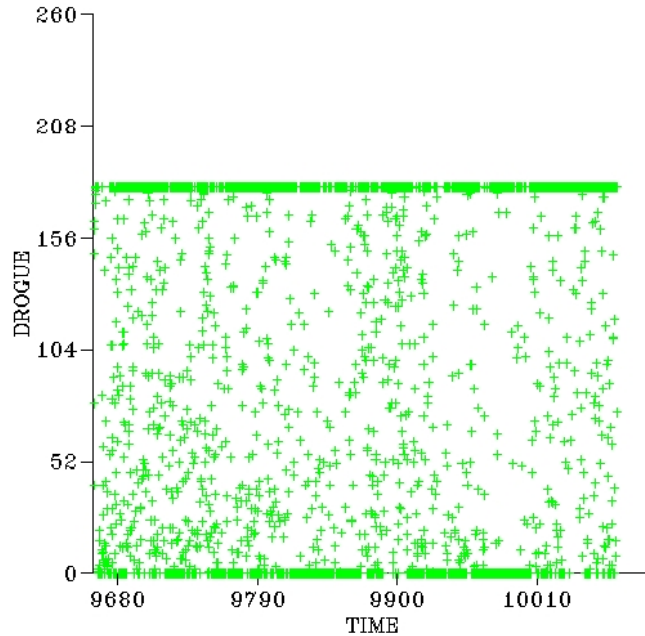
B 43568 EXP 6325

Tech St: 3/ 1/2004 Et:10044 D.off: 0 death:ALIVE



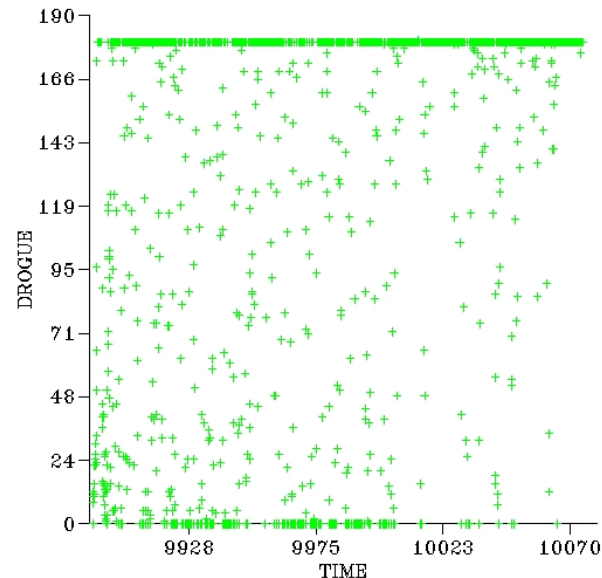
Technocean

B 57909 EXP 7325 Tech St: 6/13/2005 Et:10043 D.off: 0 death:ALIVE



Technocean has recently reduced the sensitivity of the submergence sensor in response to our feedback. Shown here: time series from the modified drifters.

B 59332 EXP 7325 Tech St: 1/29/2006 Et:10043 D.off: 0 death:ALIVE



Tether strain

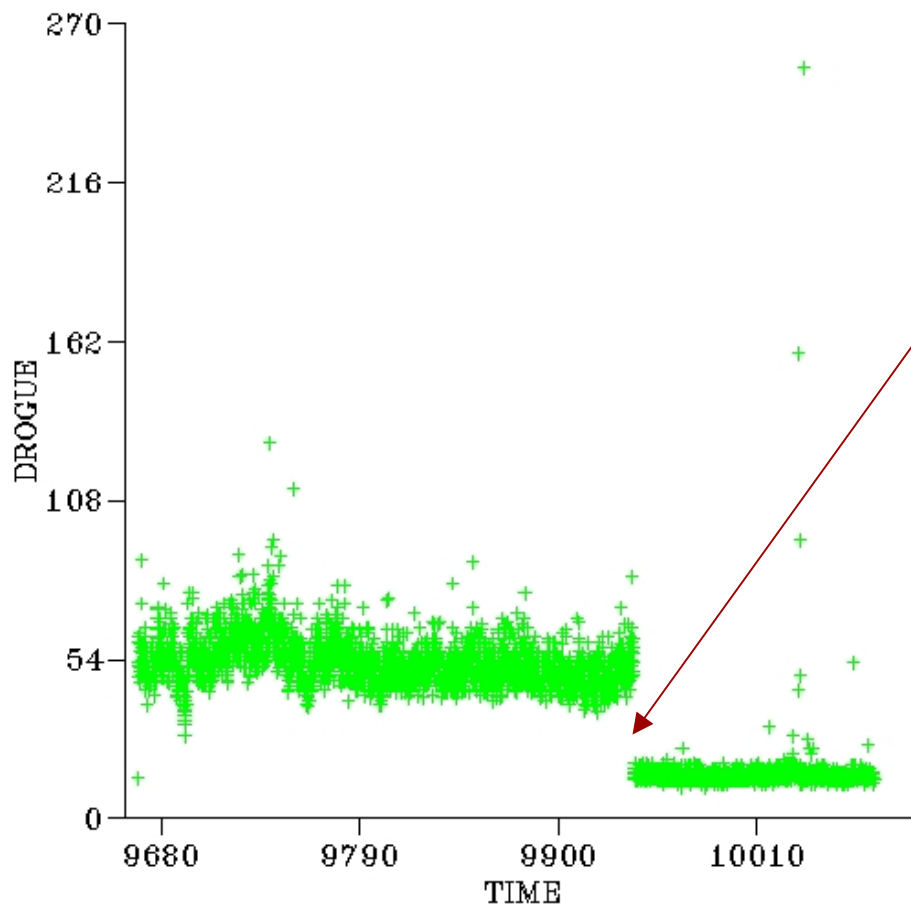
In early communications with Clearwater regarding tether strain, a drop below a specific value was identified with drogue loss.

This arbitrary value, rather than the behavior of the strain record, was initially used by the DAC to evaluate drogue presence.

After clarification from Clearwater, the DAC now look for an abrupt reduction in the *scatter* of the observations, usually accompanied by a reduction in the strain values.

Clearwater (tether strain)

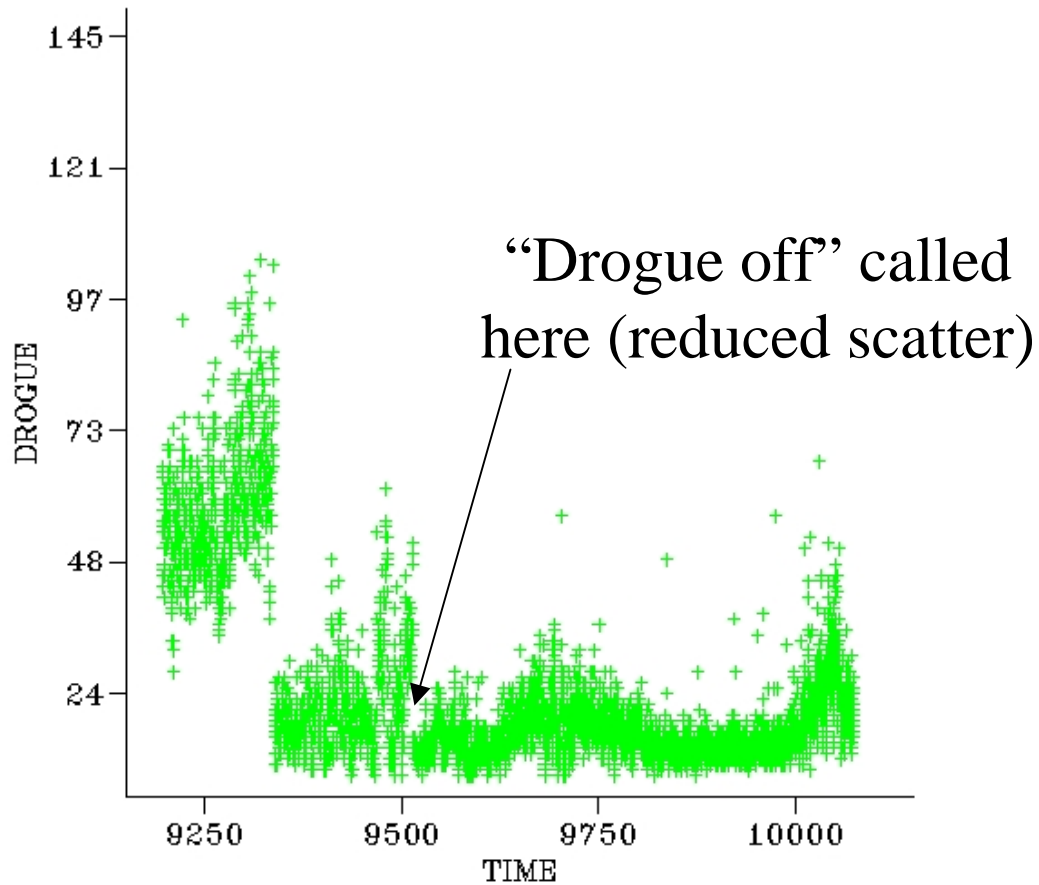
B 52853 EXP 6129 Tether Clea St: 6/18/2005 Et:10032 D.off: 9941 death:GR



Typical tether strain record for Clearwater with drogue loss (sharp reduction in scatter of strain observations).

Clearwater (tether strain)

B 44806 EXP 6129 Tether Clea St: 3/ 4/2004 Et:10044 D.off: 9514 death:ALIVE



Conclusions

The DAC completed drogue reevaluation in early 2006, and incorporated results in public release of database on 1 May. Many changes in time of “drogue off”: some earlier, a few later.

Ongoing interpretation of drogue status is now based on what the DAC has learned during this process.

Differences in how submergence is counted, differences in sensitivity, and other factors all cause manufacturer-dependent behavior. This has prevented the DAC from implementing automatic drogue detection for the 1250-buoy array. Very sensitive submergence sensors appear to produce short-term spurious high or low values, preventing accurate real-time assessment (we have to examine the long-term behavior).

Based on the DAC’s experience, tether strain is the easiest record with which drogue presence can be determined. Automatic detection seems straightforward to implement here, based on a standard deviation criterion accompanied by a drop in strain.