”Why MOBY and why MOBY-Refresh”

UNIVERSITY OF MIAMI

Kenneth Voss, Physics Dept. Univ of Miami

MOBY TEAM (Carol Johnson, NIST, and Mark Yarbrough and many at Moss Landing Marine lab)

5/14/14, NOAA STAR JPSS Science Team Annual Meeting.

1) Review of Vicarious Calibration Needs

2) Current MOBY system

3) MOBY-Refresh

4) Estimated Schedule

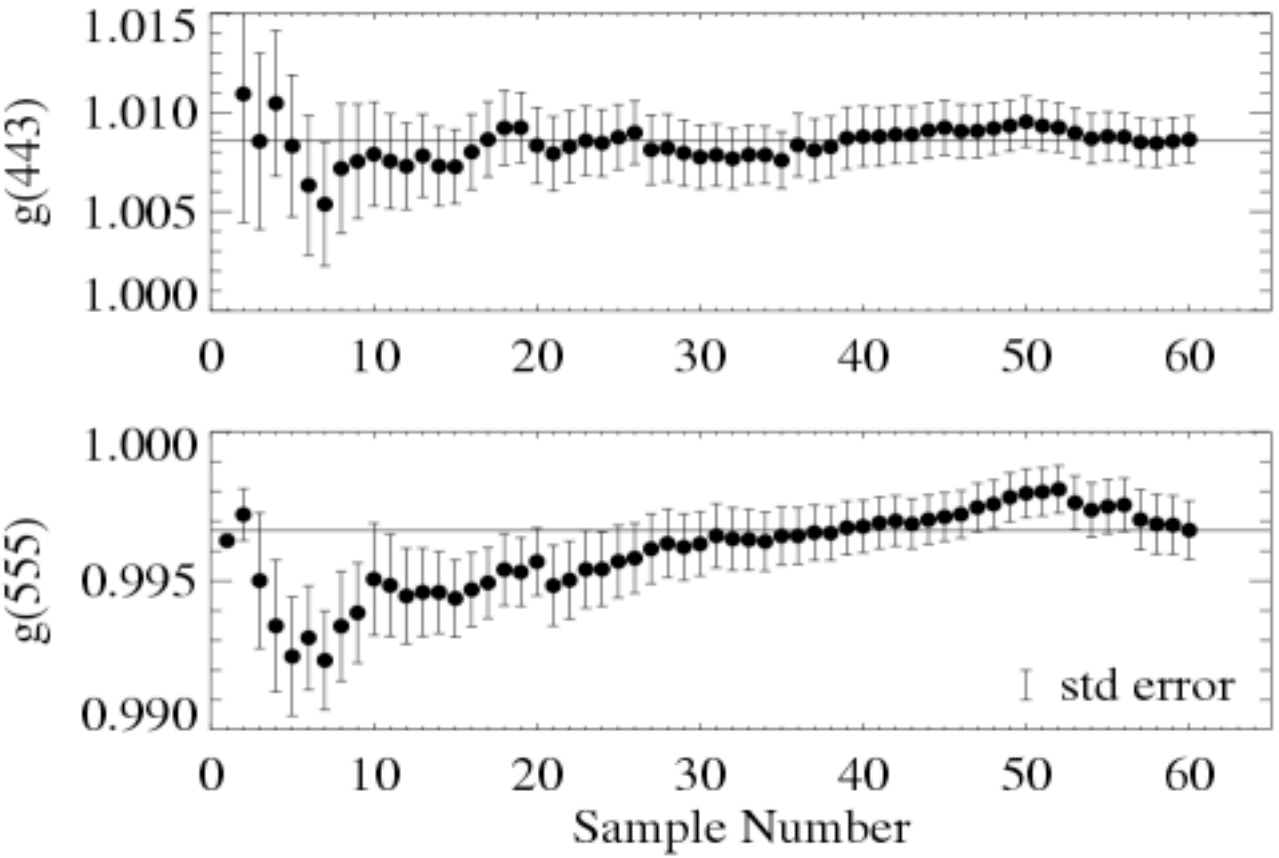
The originally announced goal for ocean color sensors:

The uncertainty in the (normalized) water-leaving radiance retrieved from the sensor in oligotrophic waters at 443 nm should not exceed 5%, and uncertainty in Chlorophyll should be < 30%.

Meeting this goal requires the sensor have a calibration uncertainty no more than ~ 0.5% at 443 nm. This is difficult to meet even prelaunch!

In-orbit calibration (vicarious) is required to adjust the pre-launch calibration. Need Accurate data for this!

Because of measurement and atmospheric correction uncertainties and variability's, one measurement is not sufficient.

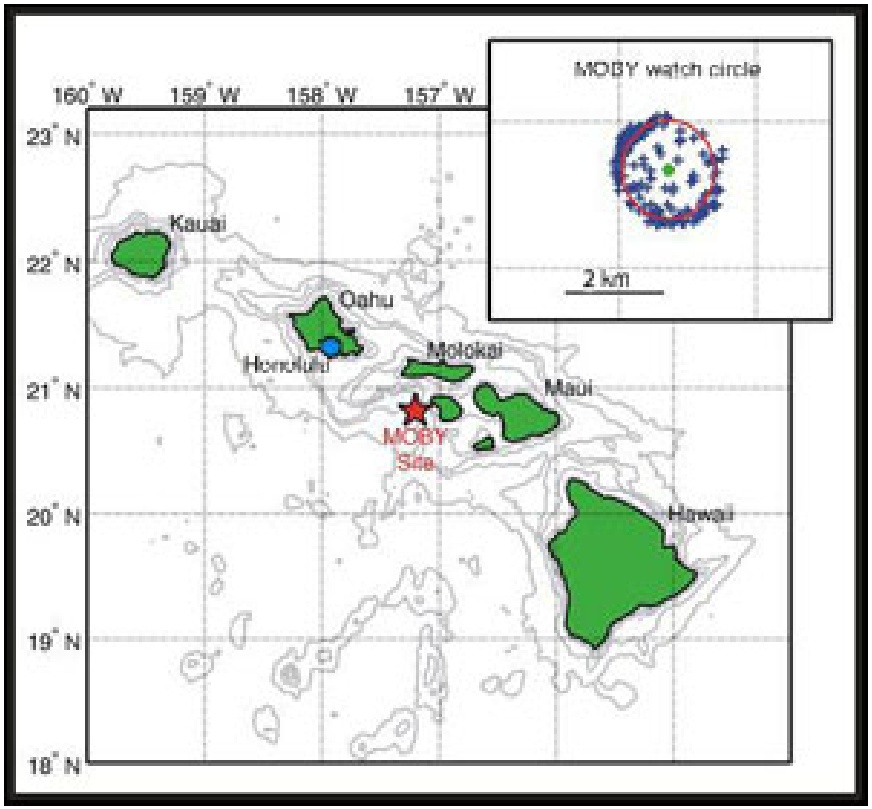


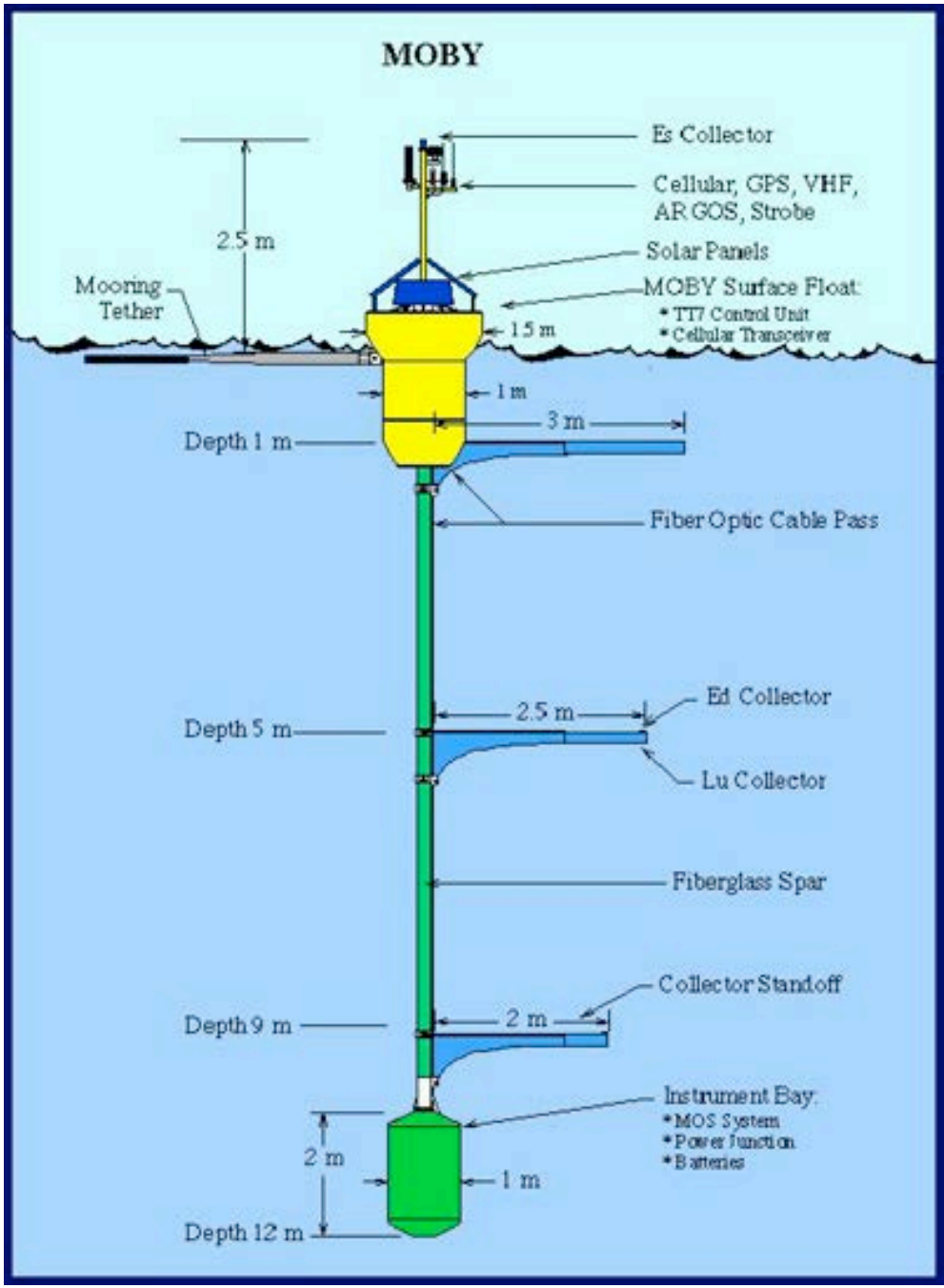
This is the very stable SeaWIFS with frequent lunar looks to keep temporal stability in check.

Shows the need for both an autonomous system and reprocessing of the satellite data.

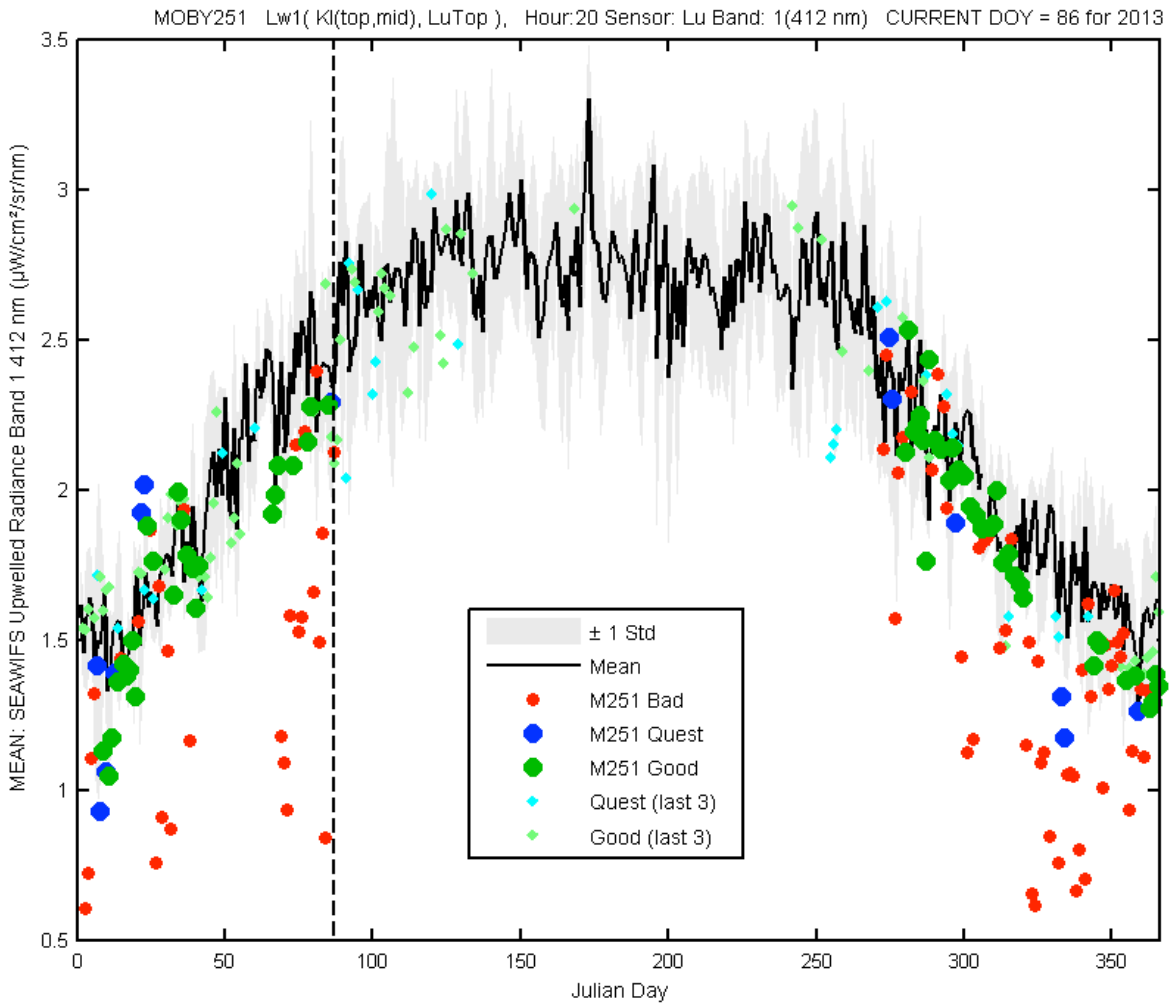
Werdell et al., 2006, Ocean Optics XVIII,
http://oceancolor.gsfc.nasa.gov/cgi/obpgpubs.cgi

Dennis Clark (NOAA/NESDIS) chose the site shown below off of Lanai, Hawaii and measurements began there in 1997.





Obtain a time series of Lw, individual measurements used in VC



Each good measurement if a corresponding satellite measurement is found, can be be used to generate a gain factor to adjust the calibration of the satellite sensor

Goals of MOBY-Refresh

- Update control electronics (example, TT7 has 68332 processor, 100MByte HD limit).
- Update optics to correct degradation, and improve system above original performance
- Add other systems (UV biofouling, better orientation sensing, better depth sensing) to reduce uncertainties in the final products.

GOALS: Reduce risk of instrument failure and improve measurement variability and uncertainty!

MOBY Refresh

If there is one point that we are using to improve the MOBY Lw uncertainties it is the concept of simultaneity:

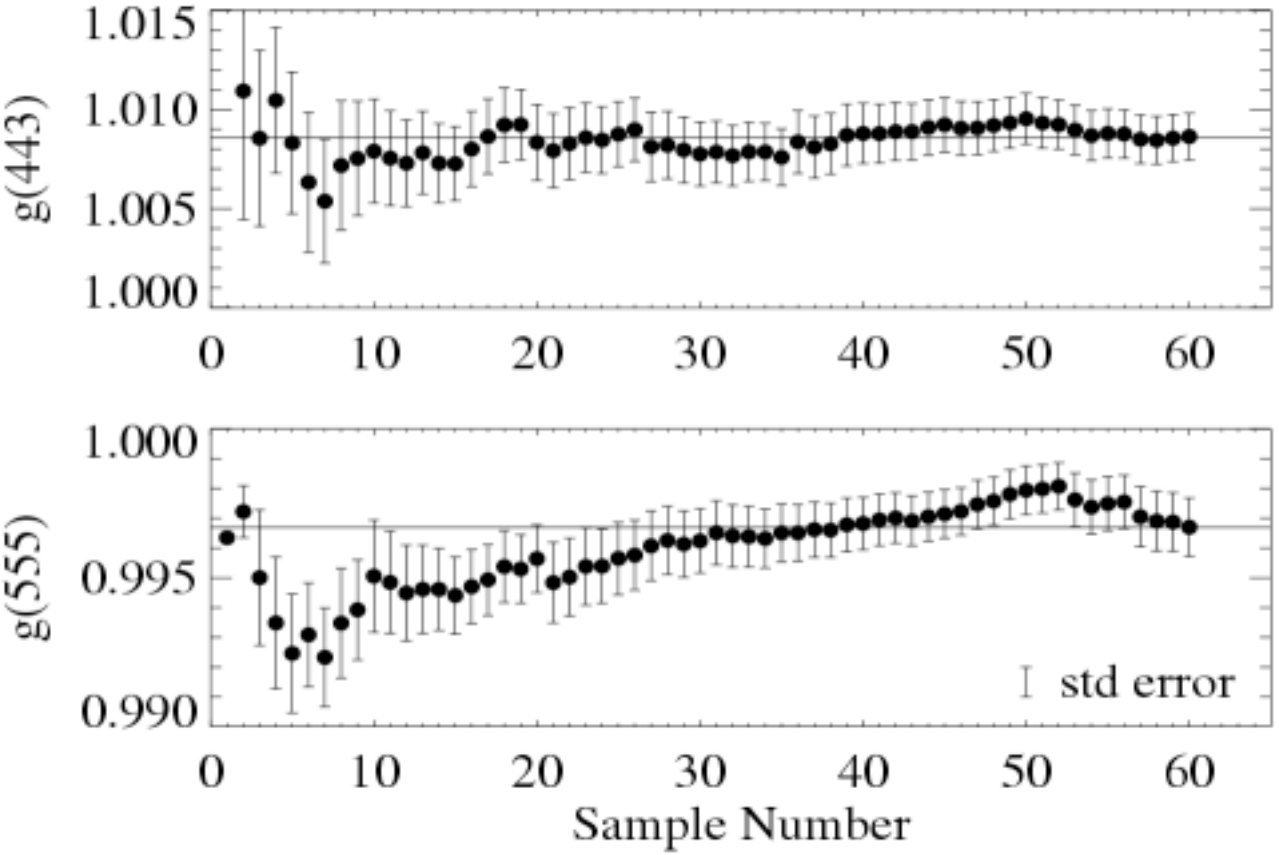
Simultaneous acquisition of all Lu, Ed, and Es data (7-8 channels)

Possibility to include calibration inputs at same time (red, blue LED's, incandescent lamp).

Simultaneous acquisition of other auxiliary measurements: tilt, roll, arm depth.

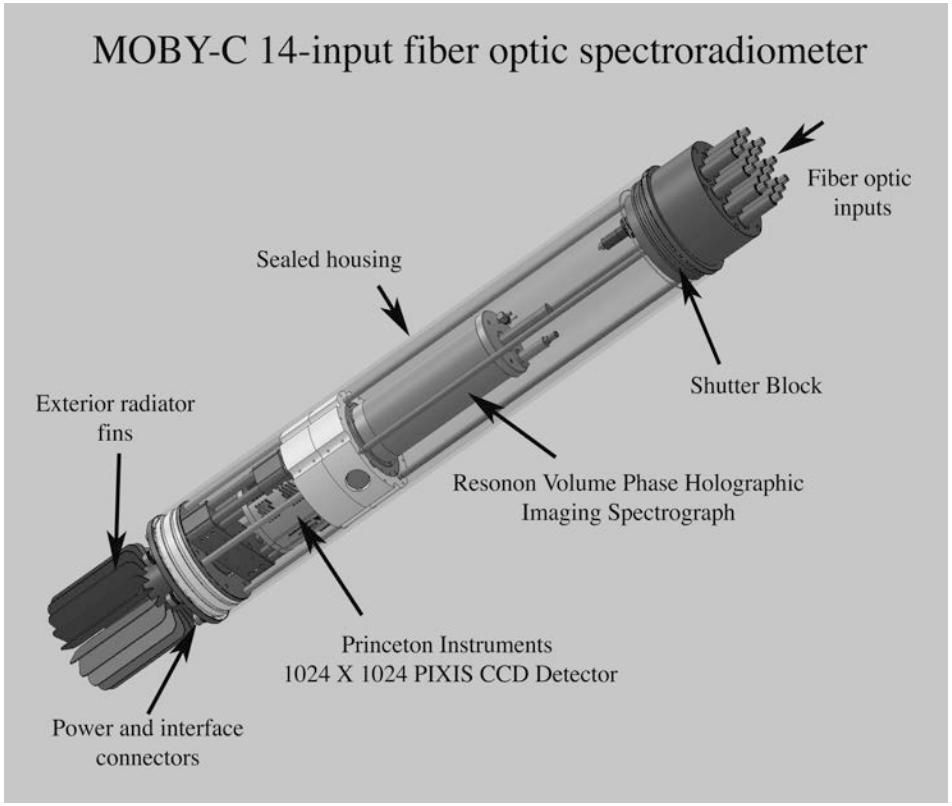
Reduce measurement uncertainties and variability!

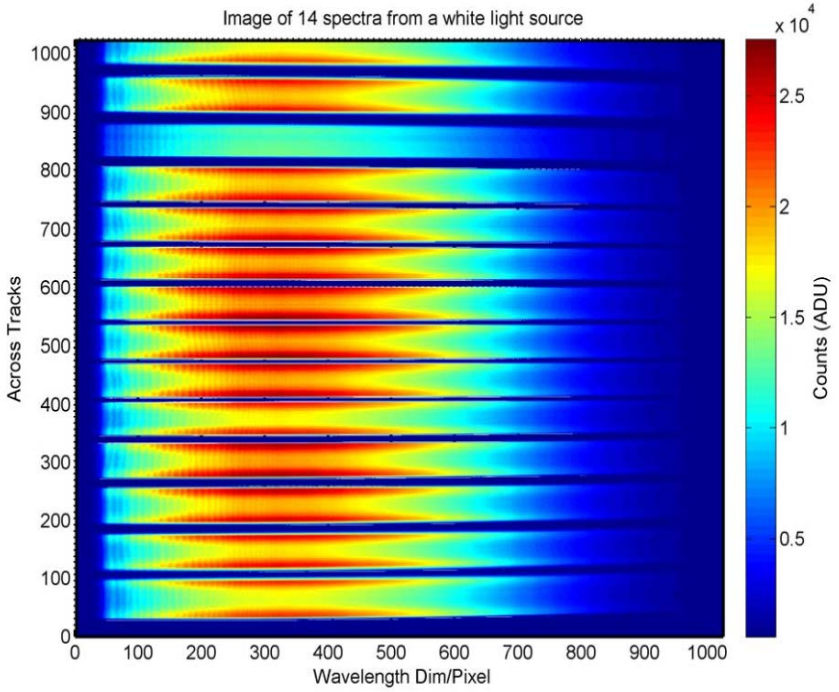
This is a combination of measurement variations and atmospheric correction variations



Werdell et al., 2006, Ocean Optics XVIII,
http://oceancolor.gsfc.nasa.gov/cgi/obpgpubs.cgi

MOBY Refresh





MOBY Refresh

Auxiliary measurements (tilt, roll, compass, depth) currently measured between other measurements now.

With new controllers they will record these values at high frequency while spectrometer shutter is open….will return minimum, maximum, standard deviation, average.

Auxiliary measurements will be more accurate, for example 24-bit high speed pressure transducer for depth.

Schedule

- 6/13-2/14-blue spectrometers have been ordered, control system is assembled and is being programmed, orientation modules in hand.
- 3/14-2/15: Fabricate parts to be able to attach spec to MOBY (along with old optics), develop control software, start characterizing systems
- 3/15-2/16: Finish characterizing systems, start fielding first set of Blue optics on a buoy deployment, continue fabricating other blue systems

Schedule continued

- 3/16-2/17: Start acquisition for Red optical system. Keep Blue system operating side/side with the old system.
- 3/17-2/18: characterize Red optical system, deploy as possible
- 3/18-2/19: phase out old optics, operational deployment with 3 full up buoys with spare part assemblies for another system.