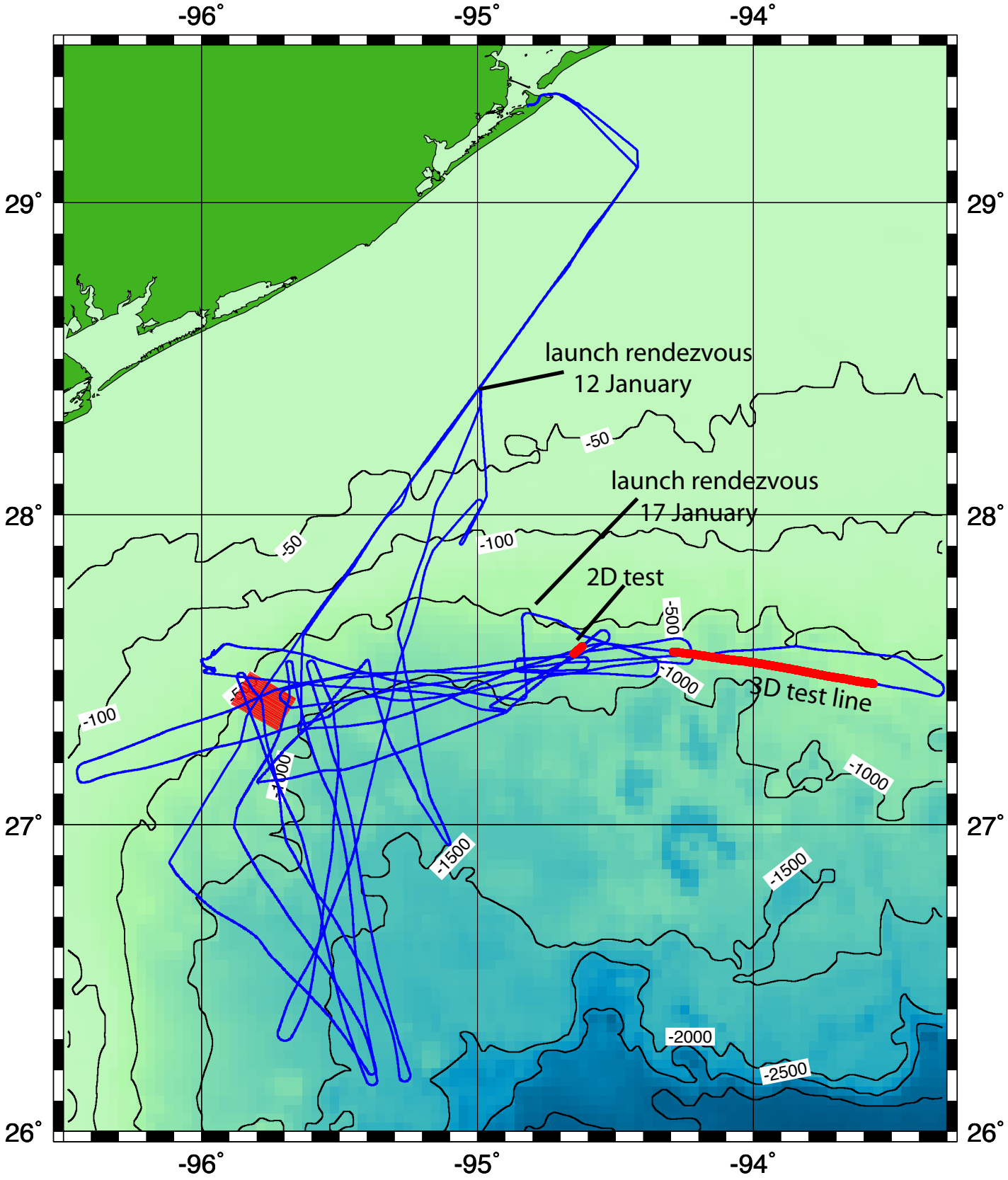
MGL0801
3 - 24 January 2008

cruise report

draft 27 Jan. 2008



ML0801
Galveston – Galveston 3 – 24 January 2008

Things we accomplished

4 streamers & tailbuoys ready to go
82 birds ready to go, interfaced with Spectra
Sonardyne modules ready and working on cables and gun strings
SIPS configured and operating
PosNet network up and running, interfaced with Spectra
Outer cables out with paravanes
Inner cable geometry, separation ropes
Paradigm Focus installed and operational
2D test line
"3D "test line

What we did not accomplish

Sonardyne tailbuoy modules [not critical]
Sonardyne network not interfaced with Spectra [critical]
Spectra interface with steering not verified or tested [critical]
Full 3D towing geometry refined [critical]
Full 3D test data set
Source arrays up to snuff

Cruise Narrative of John Diebold, Ch. Sci.

3 January – we spent most of the day fetching items and purchasing others, waiting on first A/E – New hire P. Lance Conrad drove his truck to Stafford to pick up gun jumpers that M&L had just completed, and took me to buy stainless steel stock from which to fabricate clamps for the
Sonardyne pods. We sailed at 18:00. Techs setting up POSnet pods

4 January – science meeting 08:30 – F&B drill 09:00 – ETA on site 10:00
#1 Tail buoy finally set up and deployed ca 14:30 With no PosNet license, however, it is not possible to tell whether the TB GPS works. SIPS still a problem, Martinson still working on it. Based on experience with cable # 4, we are adding 5 weights per section on cable #1 – many of the weights are unusable – some could be reclaimed by tapping out the screw holes.

There are two science watches:

Noon – Midnight
Koczynski
Troychansky
McKee

Midnight – Noon
Johnson
Conrad
Martinson

5 Jan – 02:30 down to tow leader on #1 – we must now take out the slack that appeared during MGL0706.

04:30 – second PV2000 float on at approx 300m

05:45 – Third float is on, gunners are [slowly] jury-rigging a fourth float – we have not yeat fabricated an axle for it, are using a reinforced rope loop instead. As we are approaching the Mexican EEZ, I elected to pull in 150m or so of cable and have the bridge execute a turn towards the North.

7:30 – turn being completed, we extended the cable, waiting on final rigging of the fourth buoy.

12:00 – rigging 5th float in similar fashion.

15:00 – cable #1 all the way out, slack removed, on its way in

18:00 – Teddy and I removed the last float, decided on a course of additional ballasting on the retrieval.

6 January

06:00 – streamer is about 2/5 in, Anthony is trying ballasting experiments. Martinson seems to have the SIPS correctly wired and working, at least as far as streamer units go.

I decided to roll the streamer out to the front again, to evaluate the extra weighting.
08:40 – cable #1 is out, commence towing tests. With 115m of tow leader from transom, front looks good. In general, the 7 weights per section seems like the proper amount. Need to add two weights to the tail half upon recovery.

10:30 cable #1 coming in.

Both Sonardyne pods had improperly latched outer collars – one was hanging on bird 12, causing our "light" problem at that spot. Later, Martinson informed us that cable #1 has fatal telemetry flaws – bad cans, probably, near the front. This will require another yo-yo session before we can get going.

I started putting birds together for streamer two – noticed again that 28 old Ewing birds [which we cannot use] were assembled and in the racks. I disassembled half a dozen or so to make room for the ones we need. Apparently this had been done by the crew over the holidays.

I finished with the birds just at dinnertime and just as the tailbuoy was being shifted from streamer #1 to streamer #2. I then played with the digicourse software to enter the bird serial numbers and eventually figured that out [we have no manuals for the DigiCourse software] but when the birds started to go on, they did not show up on the display and I could not talk to them. We checked out wiring, etc., and all seemed OK, so I asked Ted and crew to continue the deployment while we waited for our one resident expert to wake up. Sure enough, Dave Martinson showed up around 9:30 and almost instantly identified the necessary but not obvious final step (sensor -> bird -> deploy.) Deployment continues.

7 January

00:30 – cable #2 is about 1/3 out, tail somewhat heavier than #1, but apparently acceptable,

07:00 – a Monday, so email activity increases. Martinson has all #2 birds on 15 degrees up fin angle, and the cable is near the surface.

11:00 #2 nearly all the way out.

12:00 – a hitch: the front boot on the first active is trashed – reeling in the section to replace it.

1330 – flaked off old section on main deck, strung new section, making the connection.

14:00 – Streamer and birds check out OK, section going out with collars and ballast weights.

15:00 – 18:00 – ballasting observations were made. There seem to be three bad birds - #s 12 and 20 are not communicating and seem to be dragging the streamer down, indicating attachment problems. #18 has a bad DI, that returns either zero or absurd depths. We started to set its fin angle manually, interpolating between the adjacent birds for the value.

18:00 – decided on a reballasting plan and started retrieval.

I set up the birds for streamer # 3 – installing batteries, lanyards, racking and entering the list into the Digicourse computer.

21:30 – bird #12 recovered – its front attachment had pulled out of the bird body, I believe a sign of old age rather than any physical damage.

22:30 – weather is kicking up – seas coming from the rear are making life nasty on the main deck.

23:30 – last bird retrieved, we're heading north, with a south wind. Working out how to transfer the buoy across the stern from #2 to #3.

8 January

00:30 – transferred the STIC cable to #3 swivel – I forget why we don't have a tail stretch on #3 but it will be needed.

10:00 – cable #3 is out, Anthony running ballasting tests. Still light in the middle.

Crew has taken down the boxes from above the bird shack. Many empties – Ewing birds are going back in boxes in the XBT storage space for now. I found one last 28Khz bird. There are 15 SDRs – I'll have them put back up but on the outside and reachable, leaving all the SIPS stuff on deck for now.

12:00 – evaluating ballasting – the swell is bad enough that the streamer is controllable at 9 meters but not shallower. In any case, it's still a bit light in the middle – Ted's crew will retrieve.

12:30 – try for a conf. Call with Paul

set up birds for cable #4 – noticed some loose wing screws. I went over all the #4 birds, found some more assembly deficiencies. I mentioned to Ted and Anthony that wings needed to be checked on other birds before deployment.

20:15 – cable #3 aboard

Reviewing ballasting plan with Ted & team, swapping STIC and TB to #4

22:45 – cable #4 going out.

9 January

09:00 - cable #4 is half out, changing cans

11:00 – changed a section, put "bad" one on outboard side of spares reel.

email from Purdy:"…. I urge you to remain conservative in your decisionmaking. PLease do not allow the pressure to make progress cause you to take unreasonable risks - folks can only be pushed so far. But I know you know this, and i trust your judgment."

I spent much of the afternoon putting batteries in the Sonardyne SXRS streamer modules

17:00 – still debugging cable #4 telemetry – more cans, more sections.

20:00 – appealed to for help. I advise cleaning every connection again.

22:00 – progress is being made. – and David Martinson announces he is on until the 24th this is very good news.

10 January

09:00 – the team bailed on the #4 telemetry problems, finished ballasting, coming in.

13:00 – 15:00 – still retrieving # 4 – It was decided that the two "bad" sections that have been removed are most likely "good." I spent 2 hours with Stan, Ping and Ben unreeling the two good sections from the "bad" side of the spares reel – too tangled last night to use. Put them both back on the "good" side.

18:00 – cable #4 is aboard, begin switching STIC and TB back over to #1.

19:00 Ted and crew using cable #3 to test cans

11 January

8:00 – streamer #1 almost all the way out – one telemetry problem solved, another remains.

9:00 – ballasting tests – looks pretty good.

Schedule of launch with new people flip-flops several times during the day – seems as if it will be first light Saturday, Jan. 12. No Steinhaus, no Weiderspahn, no McKiernan.

12:00 – streamer #1 coming in. I am back on XSRS setup

19:15 #1tailbuoy coming aboard. My email to OMO:

19:15 - tail buoy is coming aboard. Cable # 1 has been reballasted, and had its telemetry problems solved (at least almost) the fact that we seem to be totally out of spare modules is going to make things interesting from here on out.

Status - cables 1 and 4 completely ballasted, but occasionally show telemetry

errors
Cables 2 and 3 are solid, telemetry-wise [at least for now] but both require slight adjustments to ballasting on the way out. Tail buoys, Gun float GPS in progress, nearly ready. Birds & acoustic modules - batteries installed, set to go.

Will now let bridge have their head and handle rendezvous with the launch and personnel transfer in the morning. We'll have a walkaround followed by a science meeting at 12:30 tomorrow.

12 January

06:00 – heading north waiting for daylight

07:15 sunrise
07:45 – launch unloads people & shipment

Discussions about rigging, etc. will cut main tow rope from D-ring to PMI rods at 50m.

Midnight – noon watch is now Heubner, Dolan, Conrad & Bonczkowski, Noon – Midnight is Koczynski, Troychansky,McKee and Carton

17:30 - #1 TB goes in.

- spent most of the evening working on TB GPS – could have avoided this problem if we'd had the Posnet license a lot earlier!

13 January

02:30 – ship blacks out

03:00 – weather starts kicking up.

06:00 – tailbuoy solved, crew waiting for word on whether or not to continue deployment. I said "yes" and then bird 21 was not seen by the controller. According to Martinson, the Digicourse line interface board port 5 had failed, and they moved str #11 to port 6. Now that port seems to have failed, and martinson moved the connection back to port 1, which now works. Seems as if we need a replacement/spares for this device.

9:00 it is deemed that the weather is too bad to deploy a paravane – probably for the next 4 days at least. Work to continue on tail buoy/gps issues.

Capt. Wants clarification of responsibilities on the night shift.

Stripped bird collar screws - #8-32 x 5/8 – grind 1/16" off the tip of a #3 EZ-out, tap it in the stripped socket with a hammer and slowly remove.

17:00 – tailbuoy #3 out, apparently working.

I wrote 3D_waypoints, a version of arc3D_survey that outputs waypoints for the Kongsberg Autotrak, as a backup for the as-yet-unimplemented Spectra/Autopilot combination.

19:00 Tailbuoy #4 out and working. Will bring it in, do same with #2

21:15 – cable #1 going out.

14 January

00:30 – 4,000m out

09:00 – swells are heavier, with whitecaps It is deemed too rough to deploy the starboard paravane.

13:00 – preparing to deploy source array #1 for 2D acquisition test. Will operate Spectra in 3D mode, with much of the system disabled.

14:00 PAM in the water, airing up string# 1, one gun is autofiring.

15:00 guns deploying – problems with gun string GPS, apparently due to mis-wiring.

(ca) 16:00 – started rampup on Digishot internal cycle – need to check documentation, this may be the only mode in which the Digishot rampup will work.

17:00 – finally shooting string 1, on time via Spectra, Digishot on external, Syntrak on external. – flip-flop mode, so every other shot is dead. Recording on disk in SeisNet "raw" format. 7 guns firing – misfires on #2 [360cu. in.] and #4 [180]

17:30 – stop shooting, recover guns and PAM

20:00 – review weather forecasts with captain, decide to recover cable #1, tune ballasting where heavy [around bird 16] and replace bird 16, which will not reset, and is possibly reporting erroneous fin angle.

15 January

Cable #1 & TB recovery complete during early morning hours – swell and wind continue. But the day has been productive – Helene Carton and I worked on yesterday's data. Gun pod GPS wiring solved. Andrew working on TB acoustics, planning to dry run Spectra -> Kongsberg links, Anthony working on SeisNet options, Tom Spoto continuing with rigging work, gunners working on solenoids, guns and modules, etc.

16 Jan

Gale force winds during the night – very heavy swells. Work on tow ropes, etc progressing, discussion with Lamont re towing rings and launch transfer. Nothing in the water.

14:00 – further discussion with Jeff Rupert re Wiederspahn and launch.

15:00 – prepare to deploy cable #4.

20:00 cable #4about halfway out, changing a can

17 January

Cable #4 is out, PMI rods applied, towing nicely. Gunners working on remaining cross-tie ropes, launch on its way. Ship has turned northward, into wind, which is now from the N.

Email in reply to Mike Purdy:

Hi, Mike;

As it happens, this is a slow morning. We are waiting for the launch that will bring some towing hardware and desperately needed digitizing streamer modules, and will take away Suzanne, Jim Holik, and co.

- we have one streamer out and ready to deploy a paravane, but some of the needed hardware is on the boat. According to forecasts, today is our window of availability for getting that paravane in the water. You put an outer streamer all the way out. Then launch the paravane on that side, attach it to the front of the streamer with a 25-meter rope, let them both out together. Then there's a second, 156-m rope that connects the leadins of the outer and inner streamers on that side, etc...

With the addition of Al Hise, from NCS Subsea systems, as party chief, and a few other bodies, we finally have the critical mass and expertise we need to get the rigging and layout done. One thing I had noticed before is that every single party-chief-type favors a different rigging setup. This is one reason we are waiting on hardware. The stuff we have was specified by one or two previous tenants of that position, and apparently it just won't do [actually, Al was willing to go with what we have if necessary, just not happy with it]. We have most of the "infrastructure" working now - acoustics, GPS, birds. Final step in that regard will be interacing the Sonardyne system with Spectra and getting the 3D Nav system to control the Kongsberg autopilot, but that looks viable.

In any case, as we discussed at AGU, the prime goal is to get the stuff in the water and towing right, and the infrastructure in place. We will, I am sure, get that done. How much actual data we get remains to be seen and depends a lot on luck and the weather. We did

collect an hour or so of 2D data so that Helene would have something to play with. The next part that needs to have a lot of attention paid to it is the documentation of how we have done what we are doing - so that another group with different techs can do it again without repeating all the missteps. - and as usual, there's just not enough time or people out here now to do that properly, though Anthony and others are working at it. Anthony Johnson, by the way is performing far above his job description - a real keeper.

…….

John

11:45 – 12:00 – launch transfer complete. Received our hardware, 7 Syntron modules.

13:00 – preparing linkages between #4 cable and Port paravane

15:15 – PV3000 float rigged on & deployed

15:45 – Hise decides that upon recovery & deployment, the float might damage the near active section [ie PMI rods installed too close to bell housing] – will add a Yale grip forward for the moment, but will need to install a second set of rods farther forward.

21:00 – all done, port paravane going out.

23:00 still adjusting, more out

24:00 – cable 4, paravane fully out. Will conduct towing tests, but not deploy #3 [contrary to my desire] tonight, due to weather.

<u>18 January</u>

Overcast, but not too rough. Scooter tire suspension on electronics racks have deflated, rack is wracking on the inboard end.

11:00 – deploying cable # 1

18:45 – two floats on, all the way out, towing with TB at 6385m - #4 is at 6415, and 350 m to port. Working #1 down to 14m. Too rough for paravane games.

19:45 - Dave Martinson has set up a new, 2-streamer network for the Sonardyne acoustics. Moving a monitor into the rack room [where the keyboard is] has helped in this. There are 6 acoustics per streamer, in three pairs. Five of the six are communicating.

However there is a hitch – the Sonardyne output is in ASCII, and Spectra expects a binary string. The administrator password for Sonardyne that can switch this is unknown to us.

20:00 during a broad turn to port [towards the paravane] cable 4 starts to sink, despite our speeding the ship up to 4 kt. Stopped the turn, which should be OK – now heading SE, almost directly into the wind at this moment.

19 January

From: captain@ldeo.columbia.edu
Subject: Weather forecasting
Date: January 19, 2008 8:55:02 AM EST
To: pwl@ldeo.columbia.edu, alwalsh@ldeo.columbia.edu, rupert@ldeo.columbia.edu
Cc: ajohnson@ldeo.columbia.edu, johnd@ldeo.columbia.edu

On future 3-D seismic trips we should consider contracting with a commercial weather forecasting service.

Weather reports for 2 storms we have had this trip were both underestimated in terms of wind strength and wave height.

Last storm we had all the gear aboard – in the storm we are going through today we have 1 paravane with 1 streamer, and a second streamer not connected to a vane.

Winds were forecast for 30-35 knots, and last night we had consistent 45 knots of wind with gusts to 55+. Wave heights were forecast for 8'-12', and we have 20' seas currently.

Regards
Mark

From: captain@ldeo.columbia.edu
Subject: Chase Boat - off scene
Date: January 19, 2008 9:08:56 AM EST
To: pwl@ldeo.columbia.edu, alwalsh@ldeo.columbia.edu, rupert@ldeo.columbia.edu
Cc: ajohnson@ldeo.columbia.edu, johnd@ldeo.columbia.edu

We are currently suffering through another storm, and the M/V Madison, our chase boat, has had to break off with us to seek better conditions.

0030 – winds shifted to North + increased to 45 Knots, gusts to 55+

0655 – winds steady 30-35 knots from the NNE and waves occasionally to 20' - M/V Madison contacted, since their position was getting closer to the Langseth, and we asked that they maintain 2Nmi + off our side. They reported difficulty steering in the weather and reported that they were going to seek a fairer course and / or head in to shallower water depths. They were reminded to stay clear of our cables if they were going to go astern of us, and they acknowledged and headed South, away from the Langseth and her gear.

They have settled on a SW course, and not sure when we will see them again.

Mark

The port window in my cabin fractured during the night.

Gear is towing well, no signs of surfacing or abnormal wear. The electronics racks continue to be a problem.

16:00 – after 4 hours of thinking I had everyone convinced to do this, we begin a very slow 180 degree turn to head west again. We are at about 94 15', at least 18 hours from the worksite, and the weather is supposed to be improving west of 95, hence my decision.

19:00 – another weather conference – streamers look good, we are heading west, but swells & wind still high. Waiting until ca. Midnight.

I am working on merging wx windspeed and direction files with heading and sog from pos-mv files to extract true wind speed and direction, plot them. Perhaps heave would be nice, but we are not logging that from SeaPath – string is:

$PSXN,23,0.47,0.57,20.62,0.03*0C

roll in degrees, positive with port side up d.dd

pitch in degrees, positive with bow up d.dd

Heading, degrees true d.dd

heave in meters, positive down m.mm

Checksum

-

But the $PASHR string from the PosMV has the same info.

<u>20 January</u>

01:30 – deciding whether to begin work with #1 streamer again. Need to pull it in, remove old PMI rod,s install new, etc., deploy Starboard paravane

ca. 02:00 begin this work

06:30 – starboard paravane launched

07:00 cable#1 & paravane going out

07:45 – full out – both at 6405 on PosNet, 290m lateral separation

10:00 – prepare to deploy cable #2

11:00 #2 TB launched, Powered up streamer & TB, GPS appeared in PosNet

13:00 cable #2 going out. Bird 5 working but flaky – needs rechecking.

Ted was worried about the #2 winch brake chattering on stopping. I tightened it up [1 3/4" socket] but no improvement. I tightened all of the other brakes a turn or two to make up for initial bedding in of the new brake band material.

Bird deploy routine:
Assign unit #
Read Serial Number
Read Battery Voltage
Read AGC values
Wing reset
Assign depth

14:35 – #2 cable tail is sinking, possibly crossing # 1 [hard to tell, there's a fault in Spectra's "deploy" mode.] – speed up and hold off on deploying for 10 minutes raises the tail.

16:00 – 4600m to the Tailbuoy

17:20 – at the tow leader

18:00 – removing old Yale grips

20:00 finished installing new grips.

21:00 float attached and in the water, TB's 130 and 140 meters from #1 and #4 respectively, beginning Port turn – two 90's.

22:00 – turn complete, headed 085 degrees.

<u>21 January</u>

It got fairly windy and rough during the night – not in very good keeping with yesterday's forecast. Cable #2 is not on the paravane, and now TB4 is dead, not drawing power. Riding out the weather.

09:55 – lost Stbd propulsion and all electric power. Electric came back quickly as the load was switched [apparently] to the port shaft generator, propulsion next, but by then the ship had lost headway and the bow blew an unknown amount to port. As a result, the port side cables ran straight back and down, while the starboard side appeared to lead straight out sideways. The ship regained a course of 080 [originally 089] and things slowly straightened out.

Email from C/E to the office:

At about 0950 the port M/E tripped out. Both the Aux Gen and Emergency Gen came on line within a few seconds. The engine tripped out because of work being done on the mist detector system. Both engines mist detector systems have been in the alarmed condition since we left Canada, and work has been done with limited success to reset it. Brad (1a/e) has experience on these systems and started the cleaning and resetting process at about 0820 this morning. After cleaning the screens, the systems "green" light finally came on and it appeared everything was reset and working well, until about 15 minutes later when the engine shut down on a high mist condition.

Normally the mist detection system is tied only into the alarm system. No one was aware it was tied into the PLC and would shut the engine down.

During this drill it also became apparent that the stbd engine was soon to over heat and shut down on high jacket water temperature since the pitch was raised from about 80% to 95%. In relatively cool sea conditions we should not be having this problem, although we were getting air in the sea chest from pitching. We will check the sea strainer in port, even though it was checked before we left. We will also acid circ the coolers (if we get the acid). We should also consider sending a diver down to check the condition of the sea chest covers, and insure they aren't clogged up in Galveston.

Unless something changes, we will have overheating problems at 750 RPM and high degrees of pitch.

19:00 – weather has continued bad all day, with big swells coming in from the SE and strong winds. Several large waves struck the bow during the afternoon, and streamer 4 sank to nearly 30 meters at the tail. After 45 minutes or so, it re-equilibrated. Weather forecasts predict imrovement "tonight," whenever that is.

I checked some of the SeisNet "RAW" files and they are straight SEG-D V.1.

Ted and Mark Weiderspahn are working on the STU interface – we can only find one board [need 4] but there are other problems – mouse, display….

23:45 – STU display is working, program initiates, but mouse does not respond, though it does on the same machine running DOS.

22 January

00:15 – meet in lab, decide it may be calm enough to resume operations. Will tie cable #2 to the paravane, then deploy gun strings 1 and 2, spread them.

03:30 – 156m separation rope on on, streamers #1 and #2 out and aligned.

Source string 1 was deployed, but then recovered when the GPS failed to come to life.

09:00 – working on GPS, considering using strings 2 and 3. – it's a warm, sunny day, finally, and very late in the game.

09:45 – deploying PAM while GPS work proceeds.

Email from Paul Ljunggren:

Presently I am summarizing your plans for the time remaining and will send to MLSOC and to NSF. At this point we should plan to arrive at the pilot station at 1200 on June 24.

Paul

12:00 – still struggling with GPS, and trying to get administrator password from Sonardyne so that the SIPS output format can be changed to binary. – this should have been done days ago…

14:00 – still no word from Sonardyne. Al Walsh has offered to call, I sent him the number and the info. We decided to turn back west. After I made the call to the bridge, the captain required a conference, which resulted in a joint decision to actually make the turn. Capt. Specified a spot ["waypoint #1"] and a transit time from it to the buoy of 10 hours. We will, after the turn, be heading for the area of that waypoint.

We will, during the turn, finish gun string preps [swapping out a GPS pod] and be ready to launch.

Cable #2 is towing deep at the front – float is submerged – either need a closer tow or two more PV3000 floats to sub for the smaller ones.

16:00 – string 1 has been all the way out, but does not spread very far to starboard – the streamer heads are quite far back and I suspect that the catenary is pretty loopy. Pulled string 1 in up to connect point to shorten main gun tow rope.

Rupert calls with Sonardyne admin password = "JAWS" – Anthony and Martinson working on SIPS.

15:00 – SIPS is reconfigured, but Spectra is still not picking it up.

Tried to start the rampup, tried to configure to one string, DigiShot locked up, had to reboot it. Afterwards OK.

17:20 – string 1 deployed again, and rampup starts. String 1 is still not far enough from the centerline. I think it is not far enough back, or the tow leader on #1 cable is too loose, with a sagging catenary. String 1 guns are behaving pretty much as they did during MGL0707 – mostly indicated no fires on gun #1, consistent "autofires" and no timing signal on guns 4 and 5.

ca. 18:00 – string 2 in and firing. Switched from DigiSHOT internal cycle to Spectra time cycle after ca. 65 shots fired with DigiSHOT – Spectra restarts at 1001. First effort at recording data 18:13. It takes until 18:47 [00:47Z on the 23rd] to get SeisNet started and recording at shot 1247 – that's 300 shots missed.

Still no acoustics. Looking at the controller I saw
S2T1 – S1T1 96.8 ms
G1T2 – S1T1 225 ms
G1T2 – S1T2 309 ms
S2T2 – S1T1 136.6 ms

There is water on the deck of the port side Engine Utility room, from condensation from the HP air muffler, which runs through there very close to the isolation transformers.

The focus license is in place, and Helene Carton is reading the data, making plots.

<u>23 January</u>

According to the Sonardyne readout and TB GPS, spacing between streamers 1 and two is about perfect – 150m at the TB, 98msec between acoustics. Without direct acoustic comms between streamer 2 and 4 and TB4 GPS, it's impossible to measure the overall spread.

00:15 – filled the disk with SeisNet output

We plan to shoot until 02:00, then pull the gear

09:00 - overcast, but very calm day.

10:00 – cable #2 aboard, recovering Stbd paravane, cable #1
two cable 2 birds had missing wings, greatly contributing to the unusual depth of the front of cable 2 last night – reminds me that I had discovered some loose screws on cable 4 birds while installing batteries. I fixed these, realized they were the result of the wings having been installed by ship's crew. I had passed the word on to Ted and Anthony that wings should be checked upon deployment, but it seems this was forgotten – and I did not follow up, either.

14:00 cable #1 is in to bird 16. Shortening up on Port paravane and cable #1.

Tom Spoto points out that several teeth are rounded off on the chain drive cog that extends starboard paravane aft boom.

15:00 #1 TB about to be retrieved.

15:30 – squeezing TB1 through the aft opening.

16:00 – begin recovering Port paravane

16:35 – paravane on board, recovering PV3000

16:50 – begin cable #4 recovery

20:00 – halfway in.

21:25 – recovering #4tail buoy

22:00 – end of science in-water ops, headed for the sea buoy.

24 January

14:00L – Backing into 40th St. pier

Things needed – the short list

Telephone, 1st aid kit, and Bird/Acoustic tool kit in bird shack
Bigger, better first aid kits everywhere
Relocate controls for spares reel – cantilevered shelf aft of reel on Port side might do.
Tool kit for birds & acoustics – include cheap VOM, angle allen keys, cordless driver with good clutch.
RVIMs, Stubbies,
Signature hydrophones for gun strings
Shutoff valves for gun strings
Tension readouts for paravane winches
Radio controls for all winches
STU boards and debug
Sonardyne Engineer in-port?
2D nav/control package to replace Spectra during 2D cruises.

Appendices

Cruise participants

3D test data example

Weather plots

Rigging & layout diagrams

Rigging photos

Bird fin records

Streamer sheets

R/V Marcus Langseth

NATIONALITY - U.S.A. PORT OF REGISTRY - NEW YORK, NEW YORK

IMO# 9010137 GROSS TONS – 3834 NET TONS - 1150

At: Underway in Gulf of Mexico DATE – Jan 12, 2008

Voyage ML 08-01

CREW LIST

#	NAME	POSITION
1	Landow, Mark C.	Master
2	Zeigler, Stanley P. Jr.	Chief Mate
3	Wolford, David H.	2nd Mate
4	Crum, Breckenridge C.	3rd Mate
5	Oboza, Salvador O.	AB
6	Rimando, Inocencio B	AB
7	Paragas, Petronio S.	AB
8	Applewhite, Nicky, R.	OS
9	Nadler, Marcus B.	OS
10	Karlyn, Albert D.	Chief Engr.
11	McDermott, Bradford J.	1St Engr.
12	Kenny, Brian T.	3rd Engr.
13	Vetting, Ryan P.	3rd Engr.
14	Uribe, Guillermo F.	Oiler
15	Thibault, Louis J.	Oiler
16	Gray, Pearle	Oiler
17	Brodock, Gary C.	Steward
18	Cannon, Jeffrey J.	Cook

R/V MARCUS G. LANGSETH

At: Underway in Gulf of Mexico DATE – Jan 12, 2008

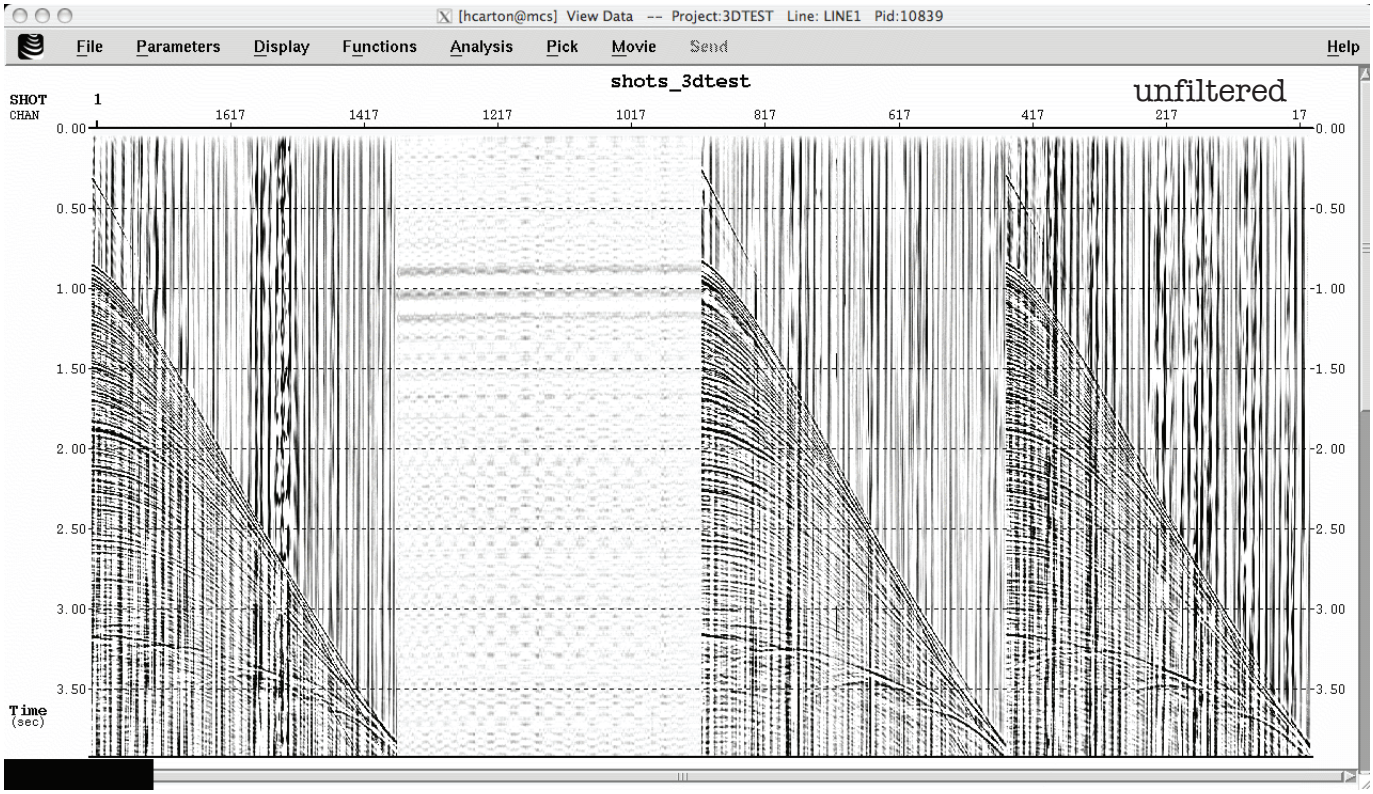
Voyage ML 08-01

SCIENCE LIST

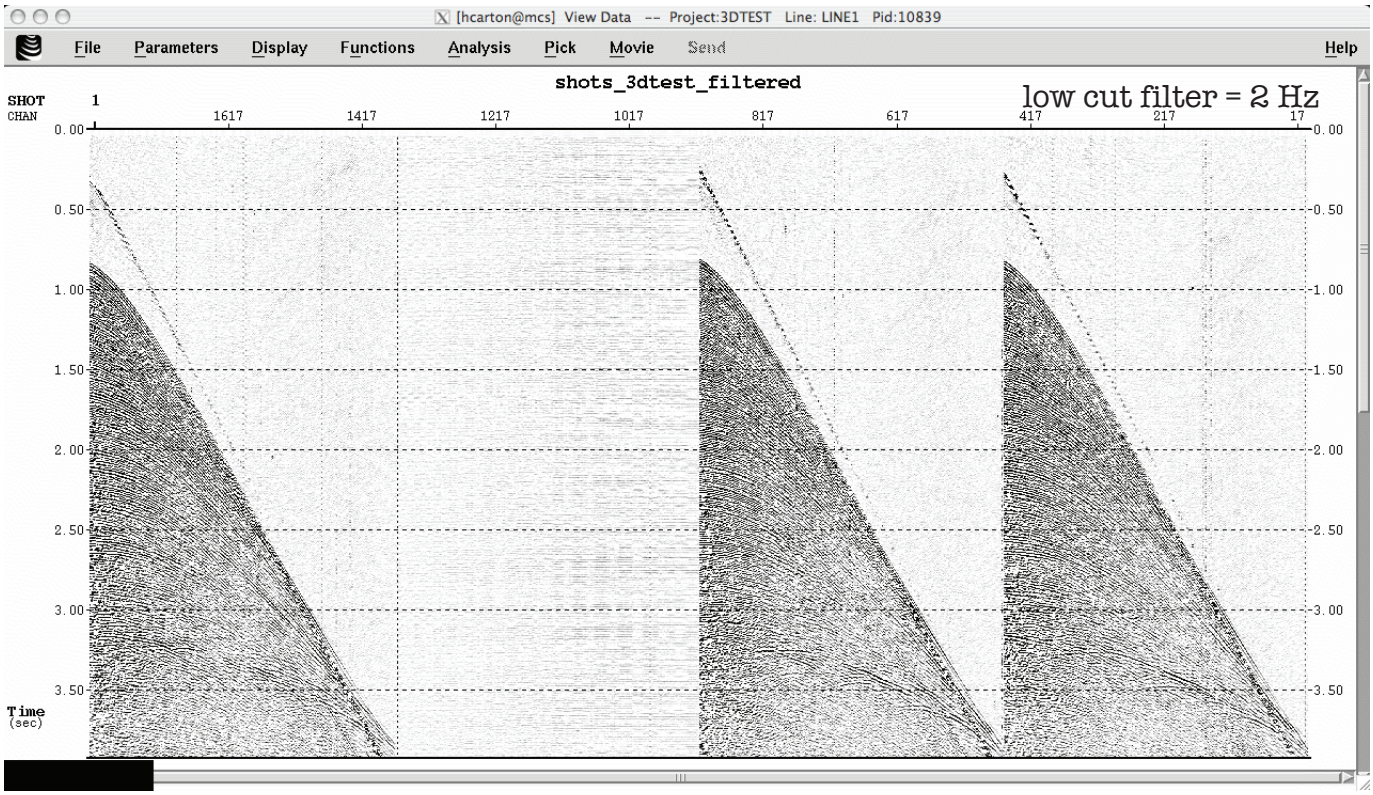
#	NAME	POSITION
1	Johnson, Anthony	Science Officer
2	Conrad, Paul L.	Science Tech
3	Dolan, James W.	Science Tech
4	Koczynski, Theodore	Science Tech
5	Martinson, David	Science Tech
6	McKee, Andrew	Science Tech
7	Schwartz, John H.	Science Tech
8	Troychansky, Eli	Science Tech
9	Finsterwald, Paul G.	Sound Source
10	Goodick, Brian E.	Sound Source
11	Gutierrez, Carlos D.	Sound Source
12	Spoto, Tom	Sound Source
13	Walsh, Justin	Sound Source
14	Dawe, Bradley E.	MMO
15	Fossati, Claudio	MMO
16	Holst, Meike	MMO
17	Hurley, Brendan J.	MMO
18	Nicholas, John R.	MMO
19	Diebold, John B.	Ch/Scientist
20	Carbotte, Suzanne	Scientist
21	Carton, Helene D.	Scientist
22	Bonczkowski, Juliet	Scientist
23	Arko, Robert A.	Scientist
24	Holik, James	NSF Observer
25	Hise, Alfred L.	Science Tech
26	Huebner, Richard C.	Science Tech

TOTAL CREW & SCIENTISTS – 44

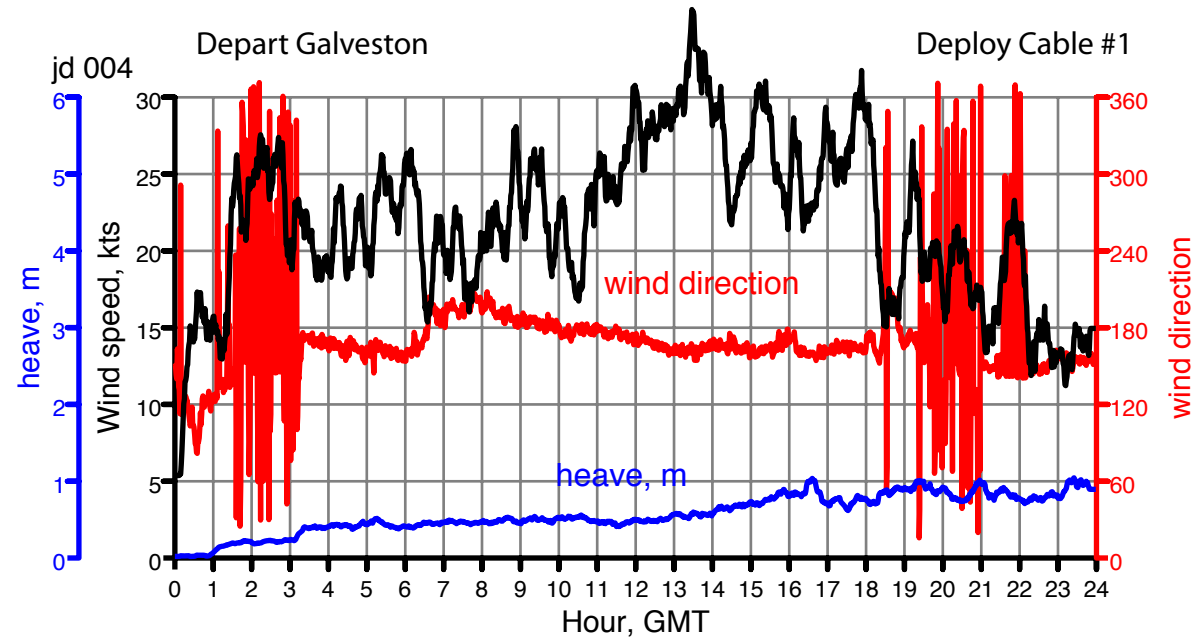
MGL0801 3D test line shot gathers

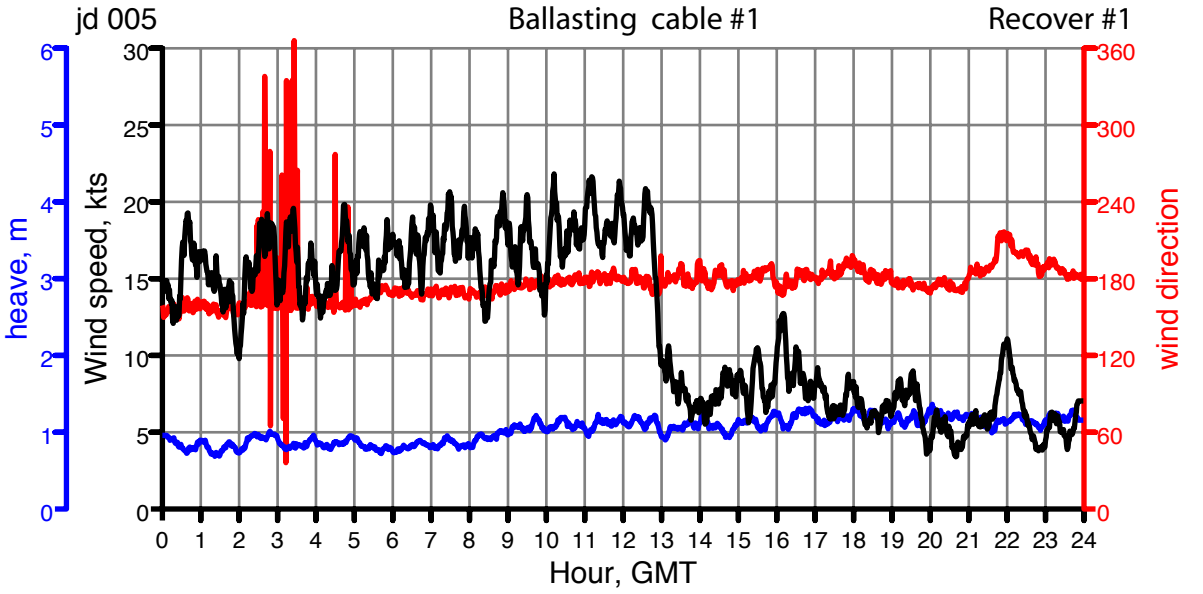


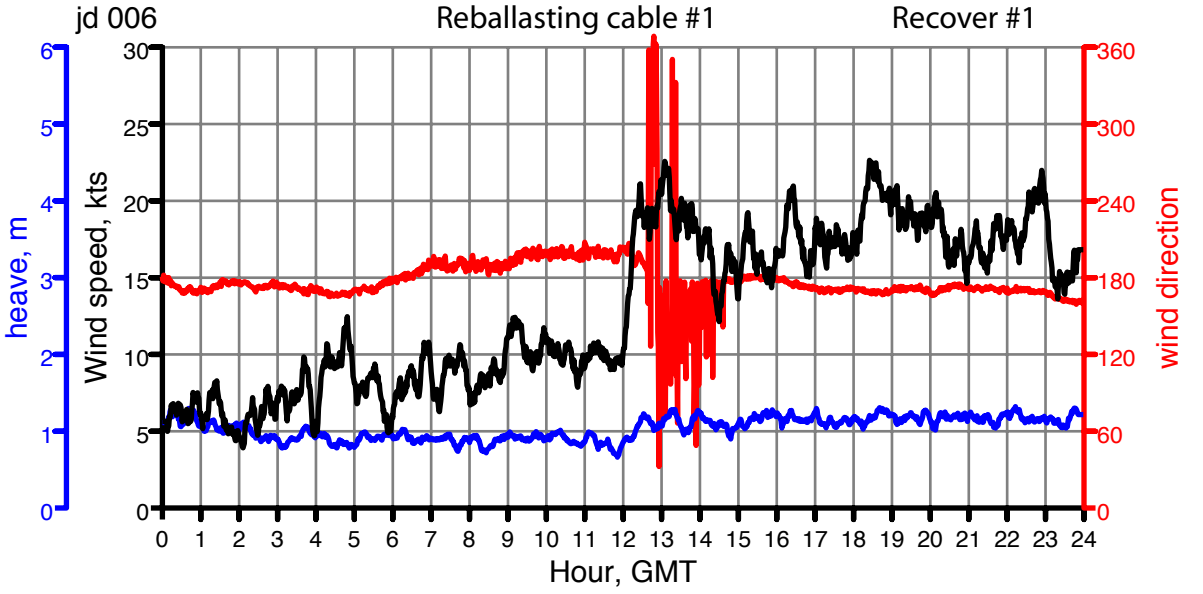
cable 1 cable 3 cable 4

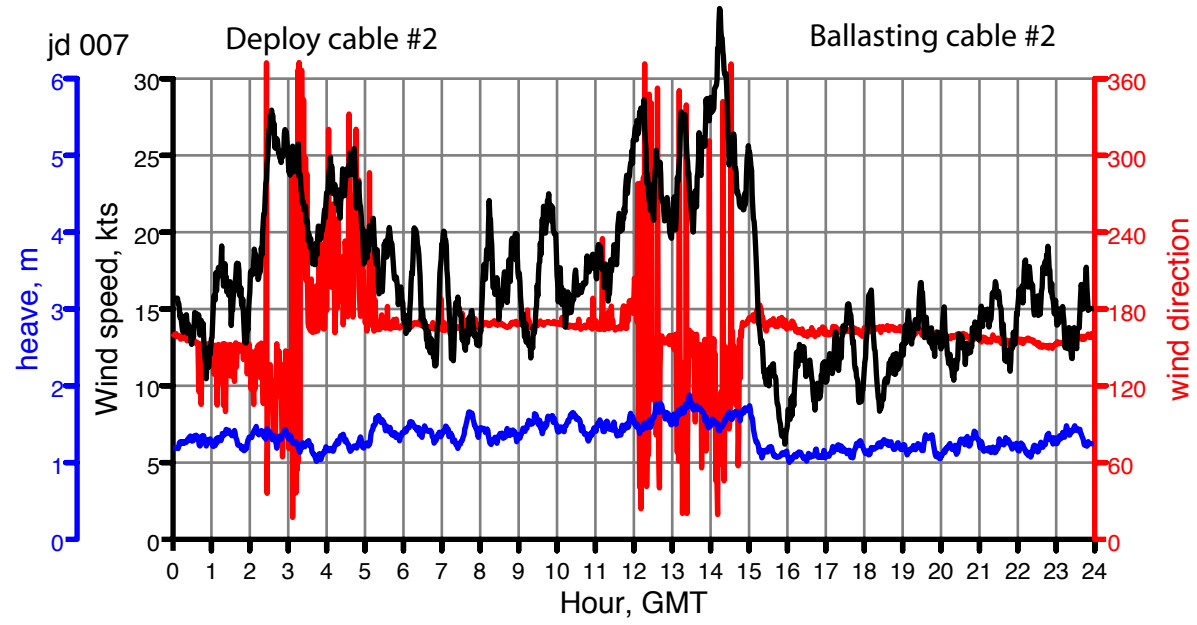


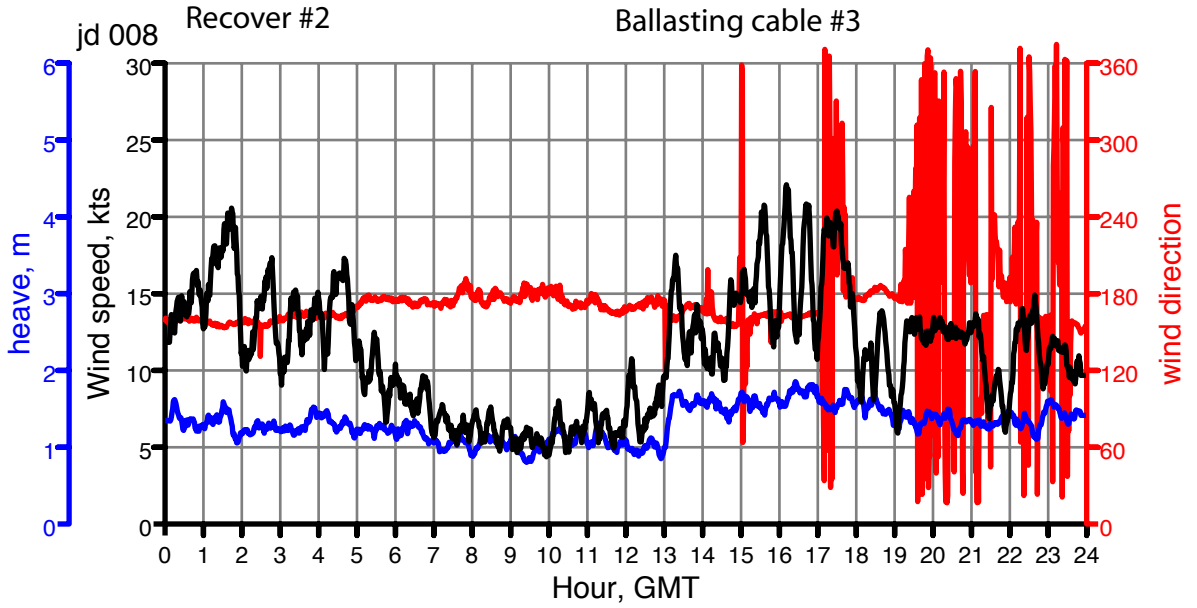
H. Carton, L-DEO

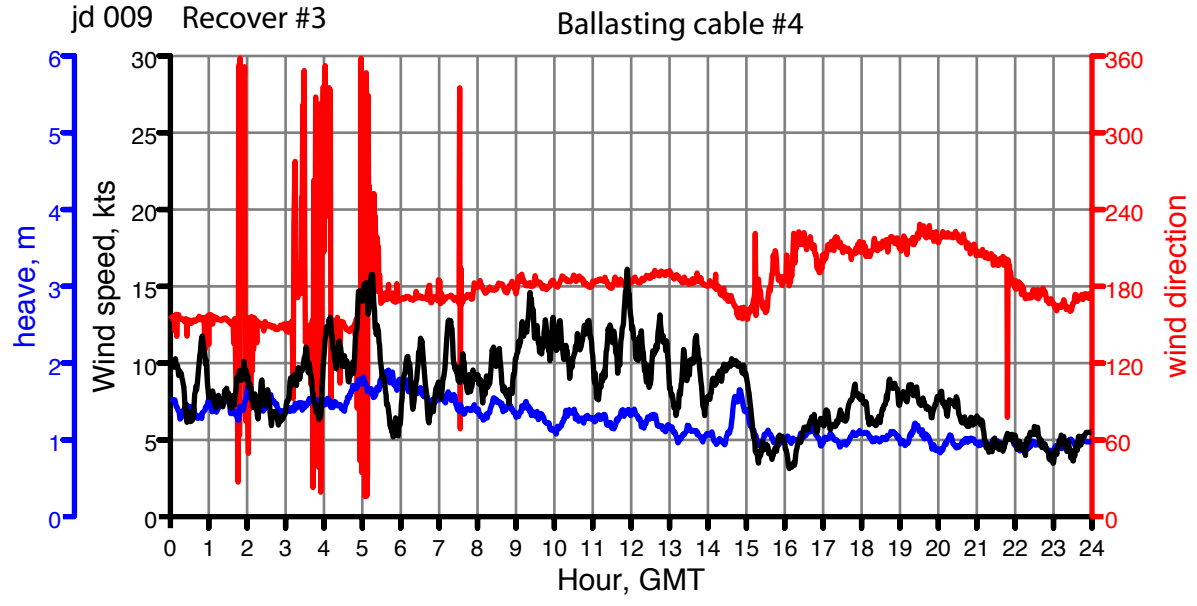

jd 004
Depart Galveston
Deploy Cable #1
heave, m
Wind speed, kts
wind direction
heave, m
Hour, GMT

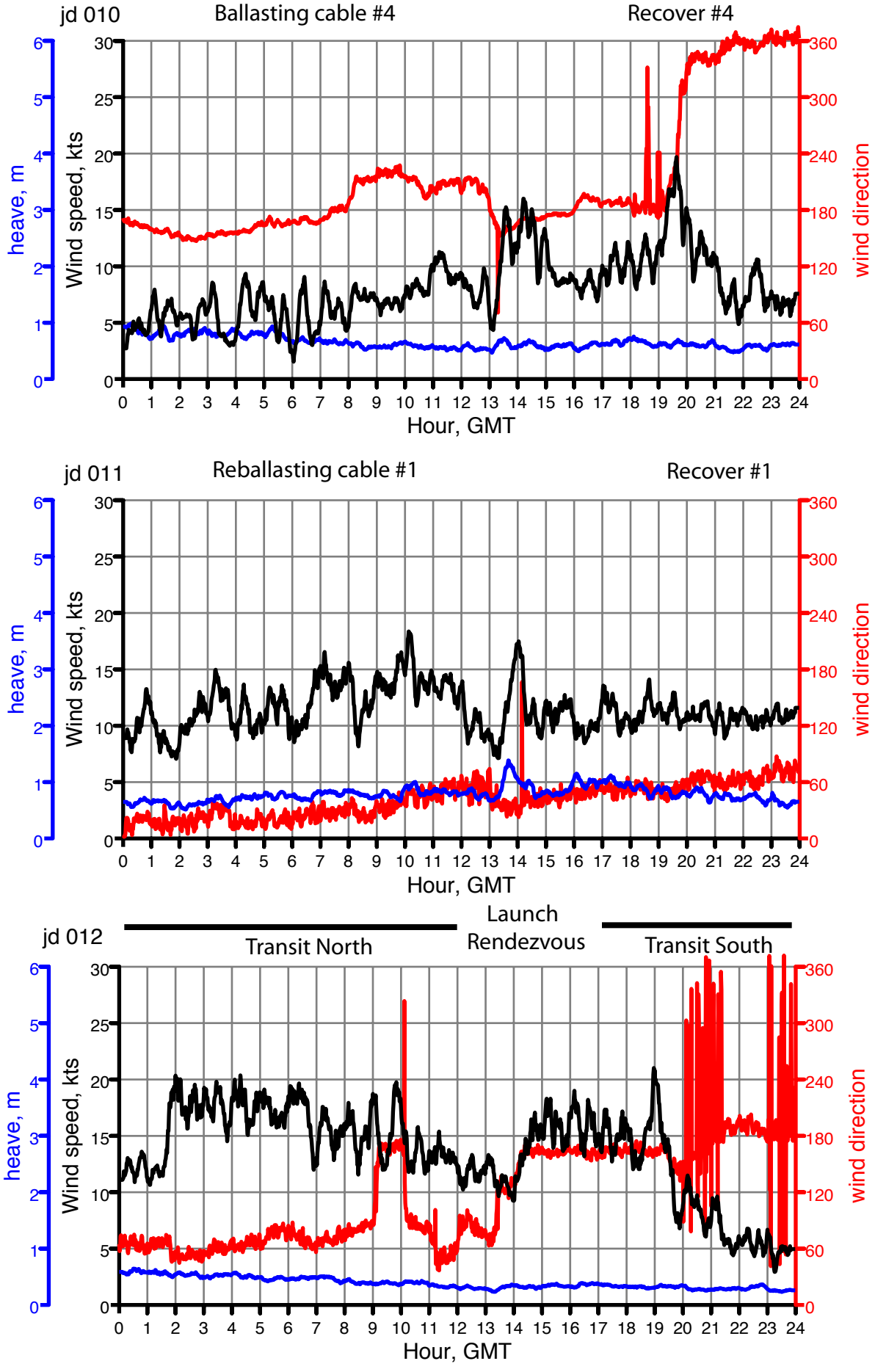

jd 005
Ballasting cable #1
Recover #1
heave, m
Wind speed, kts
wind direction
Hour, GMT

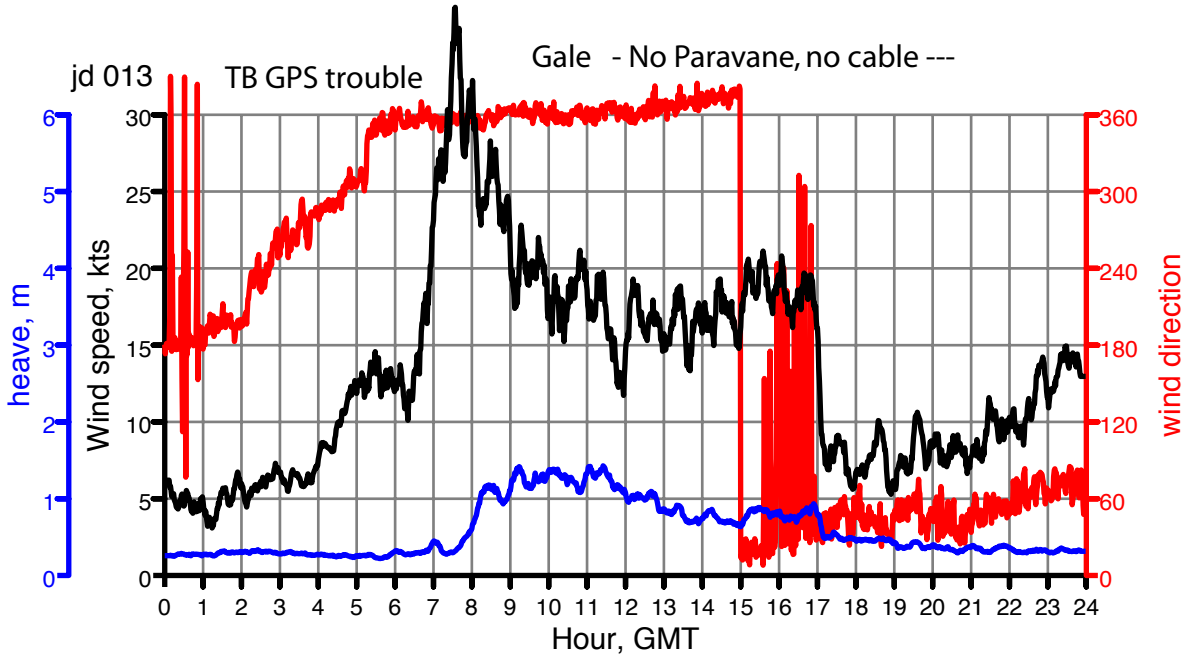

jd 006
Reballasting cable #1
Recover #1
heave, m
Wind speed, kts
wind direction
Hour, GMT

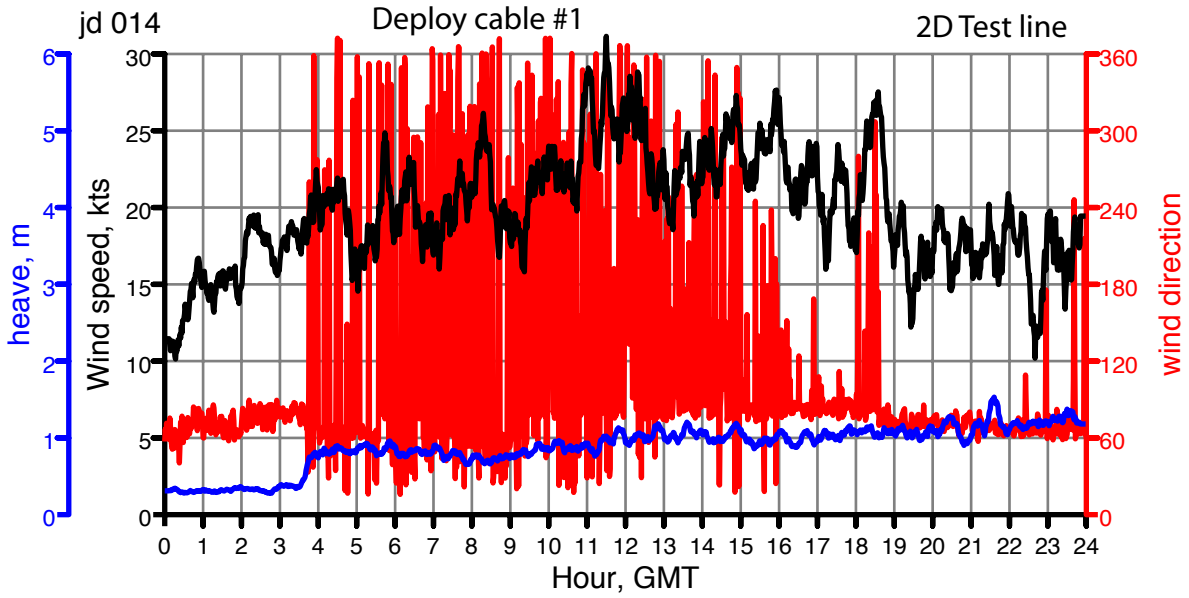

jd 007
Deploy cable #2
Ballasting cable #2
heave, m
Wind speed, kts
wind direction
Hour, GMT

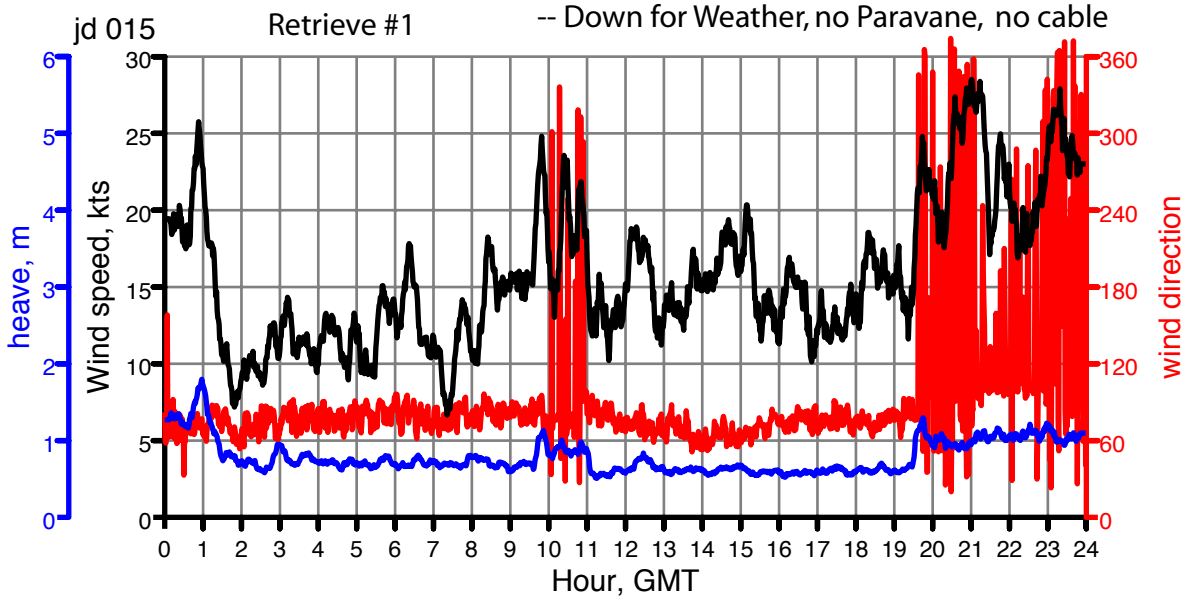

jd 008
Recover #2
Ballasting cable #3
heave, m
Wind speed, kts
wind direction
Hour, GMT

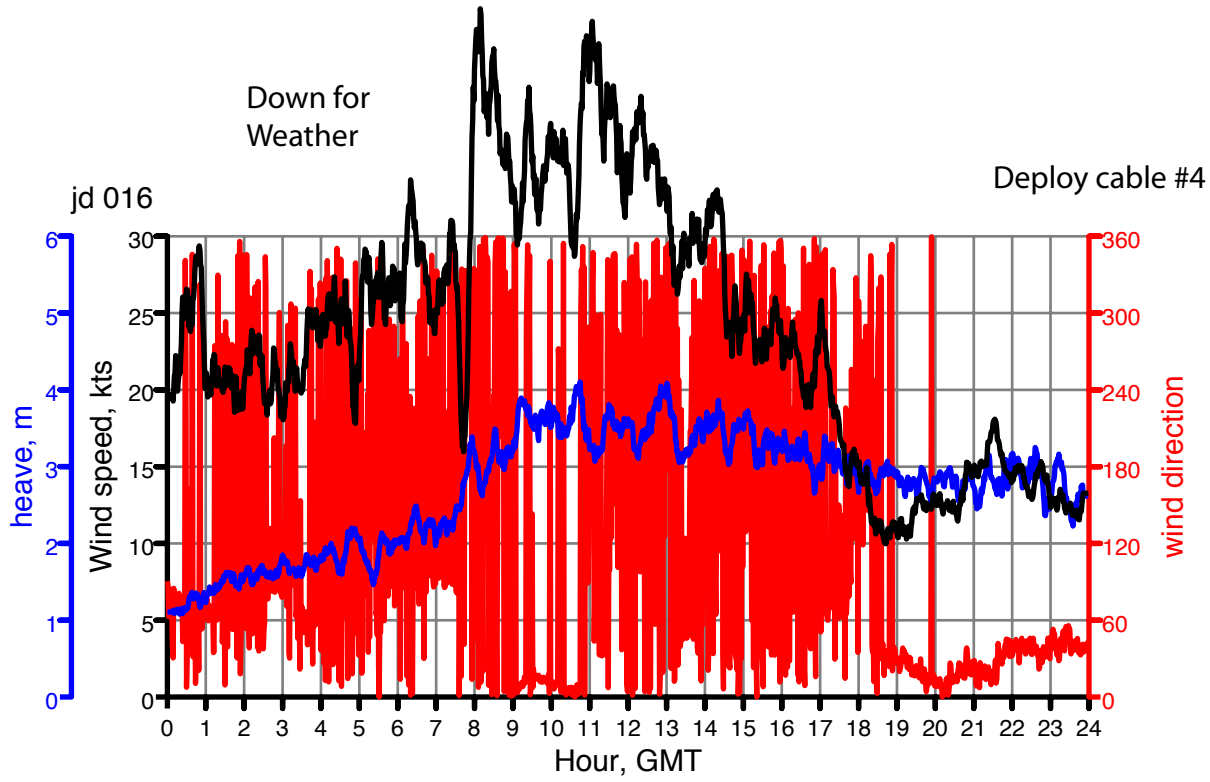

jd 009
Recover #3
Ballasting cable #4
heave, m
Wind speed, kts
wind direction
Hour, GMT

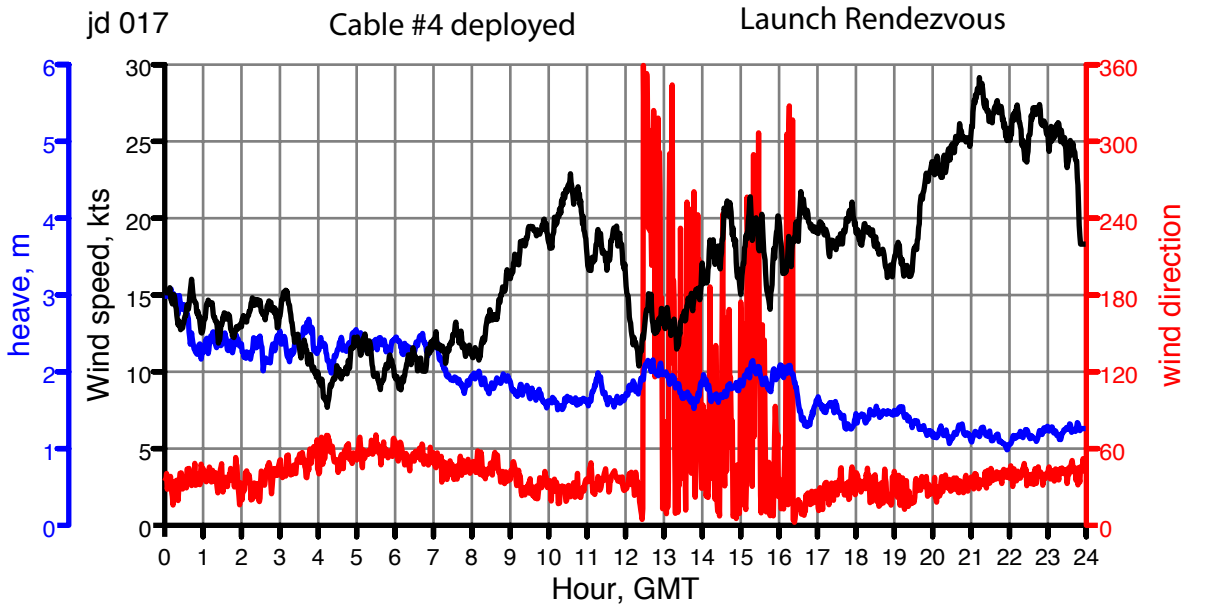

jd 010
Ballasting cable #4
Recover #4
heave, m
Wind speed, kts
wind direction
Hour, GMT
jd 011
Reballasting cable #1
Recover #1
heave, m
Wind speed, kts
wind direction
Hour, GMT
jd 012
Transit North
Launch
Rendezvous
Transit South
heave, m
Wind speed, kts
wind direction
Hour, GMT

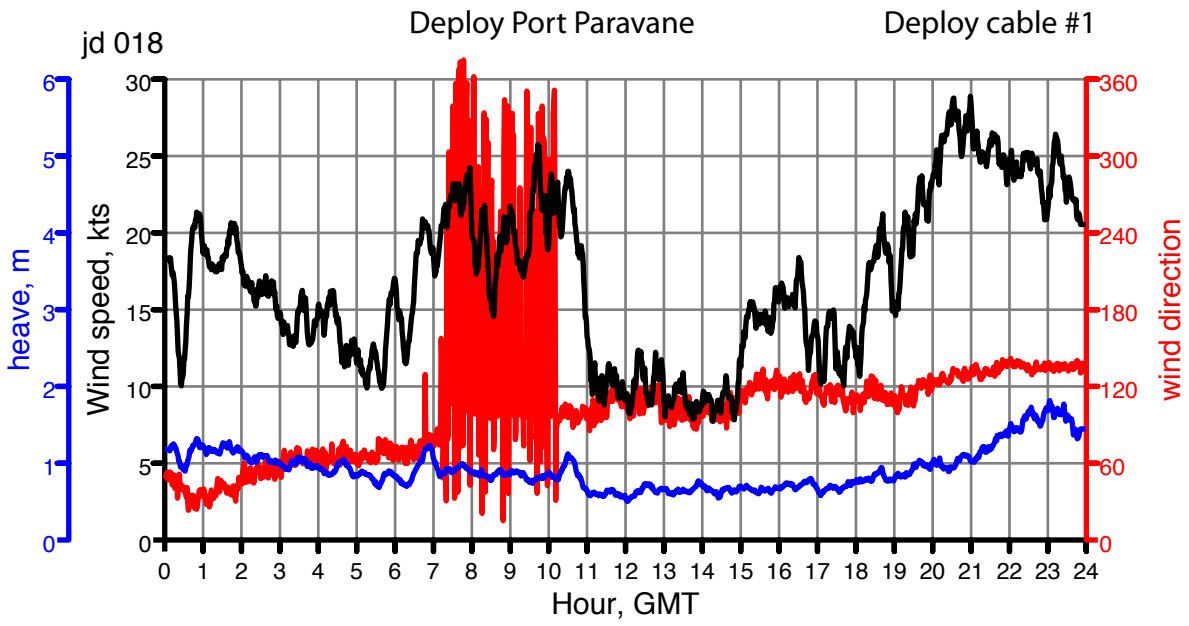

jd 013
TB GPS trouble
Gale - No Paravane, no cable ---
heave, m
Wind speed, kts
wind direction
Hour, GMT

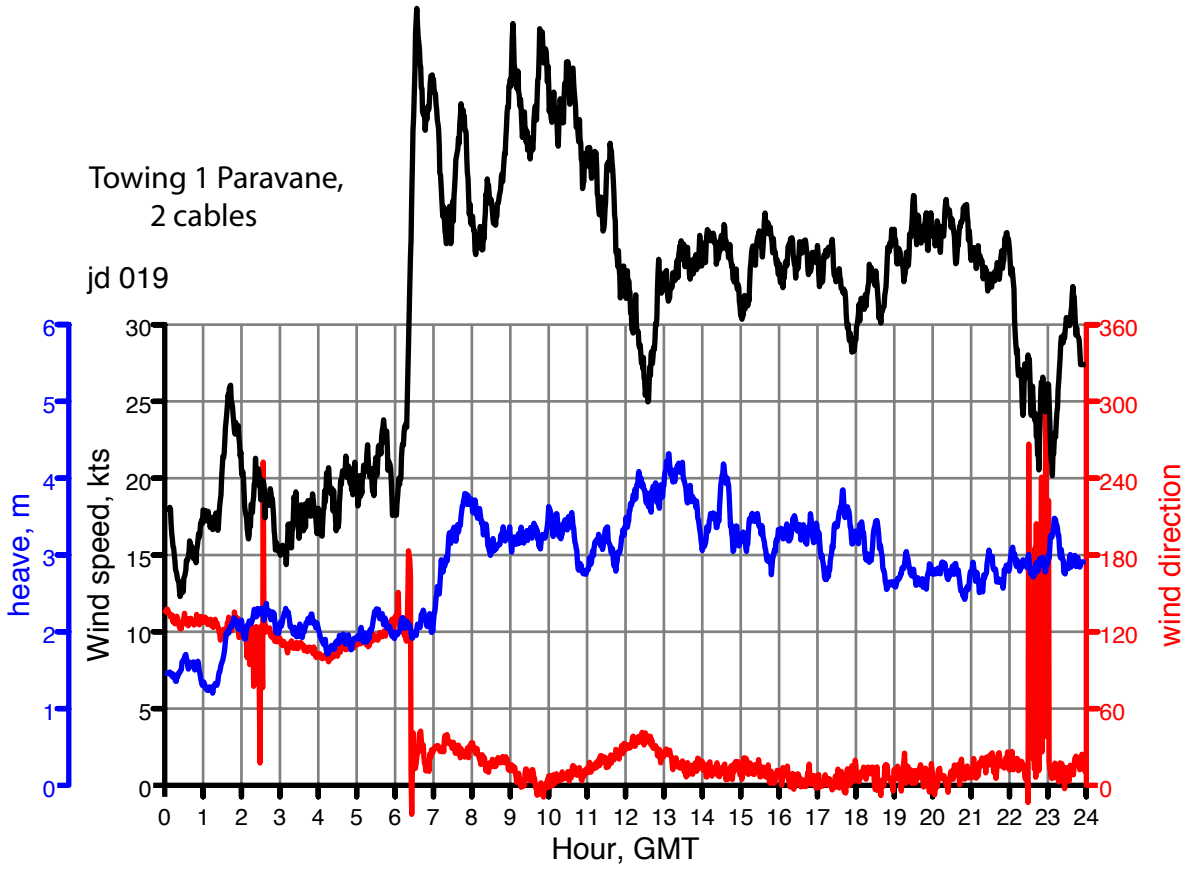

jd 014
Deploy cable #1
2D Test line
heave, m
Wind speed, kts
wind direction
Hour, GMT

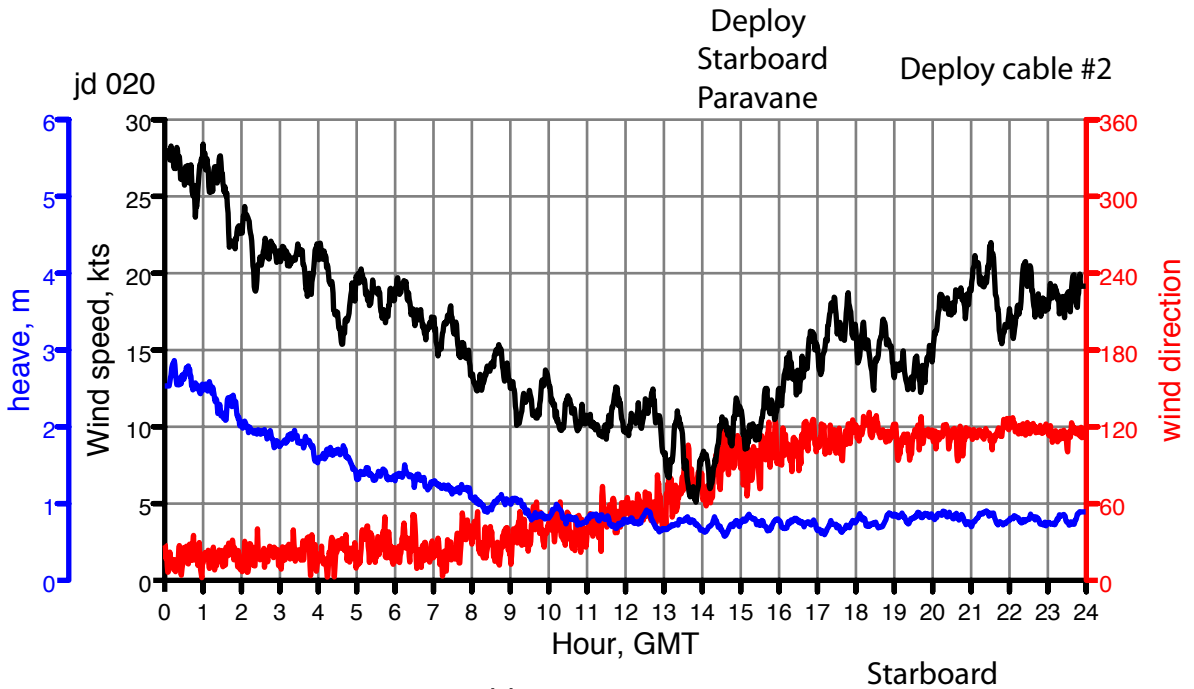

jd 015
Retrieve #1
-- Down for Weather, no Paravane, no cable
heave, m
Wind speed, kts
wind direction
Hour, GMT

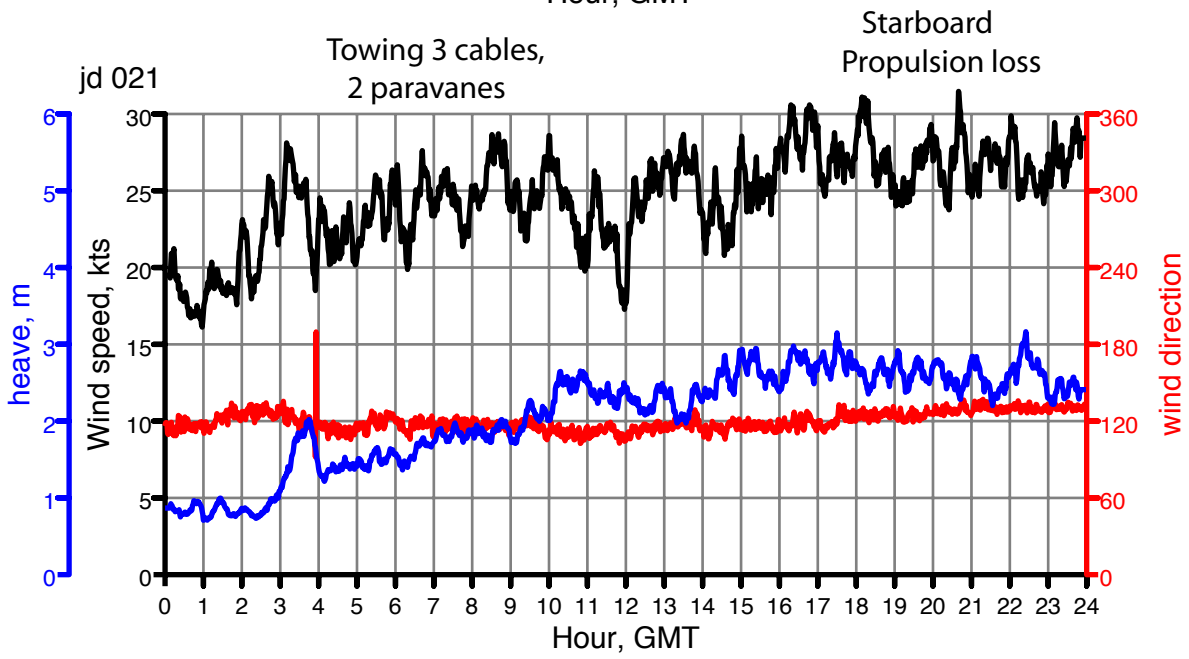

Down for
Weather
Deploy cable #4
jd 016
heave, m
Wind speed, kts
wind direction
Hour, GMT

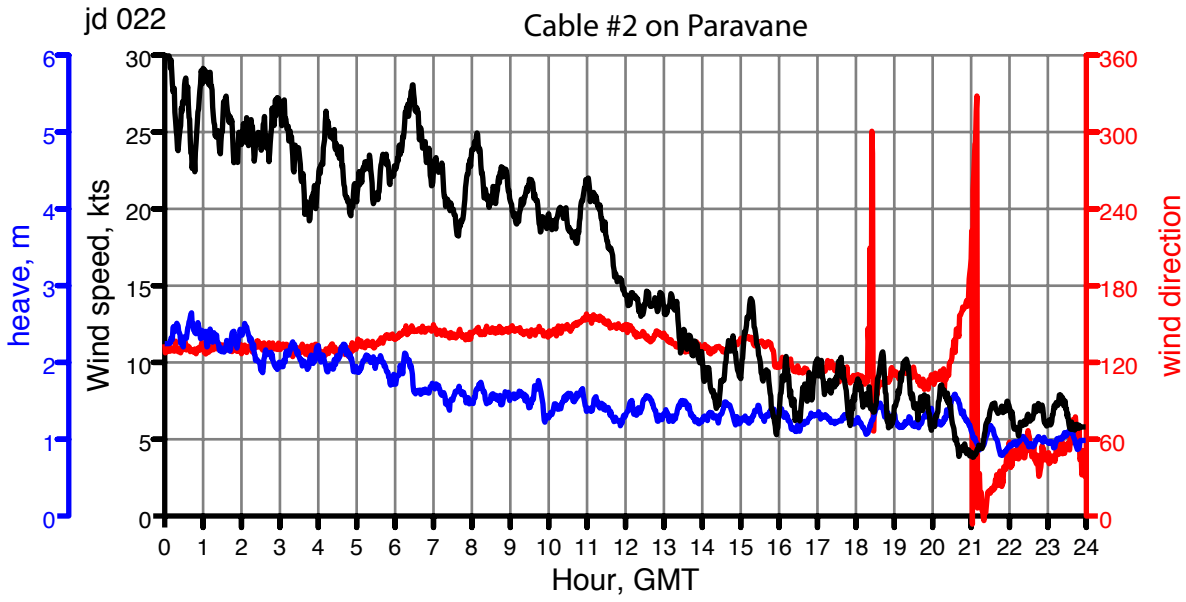

jd 017
Cable #4 deployed
Launch Rendezvous
heave, m
Wind speed, kts
wind direction
Hour, GMT

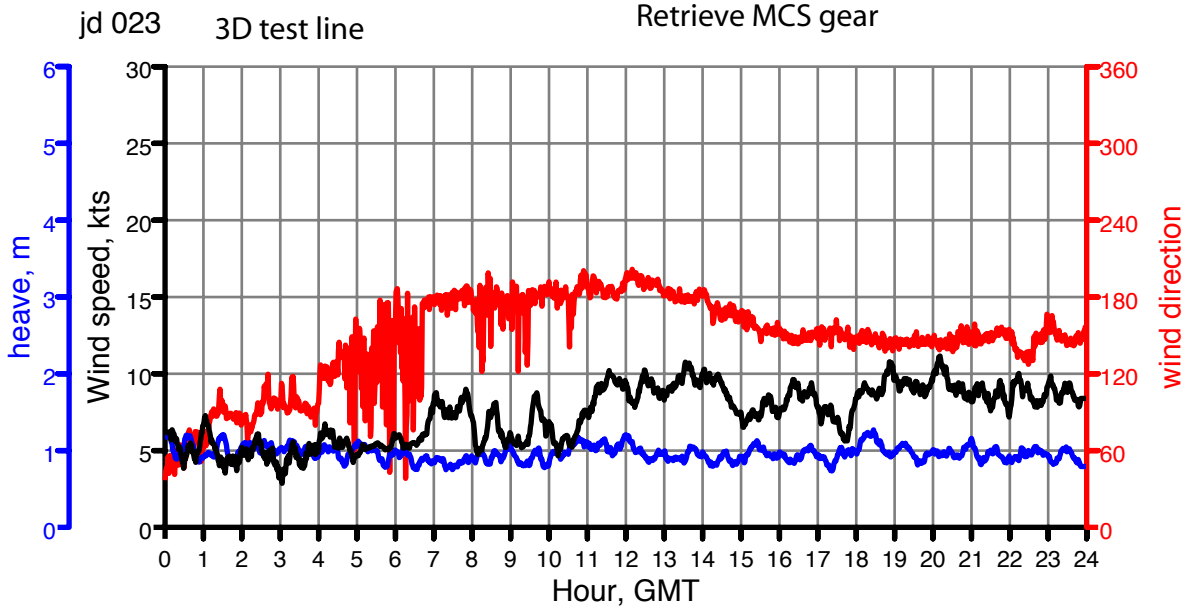

jd 018
Deploy Port Paravane
Deploy cable #1
heave, m
Wind speed, kts
wind direction
Hour, GMT

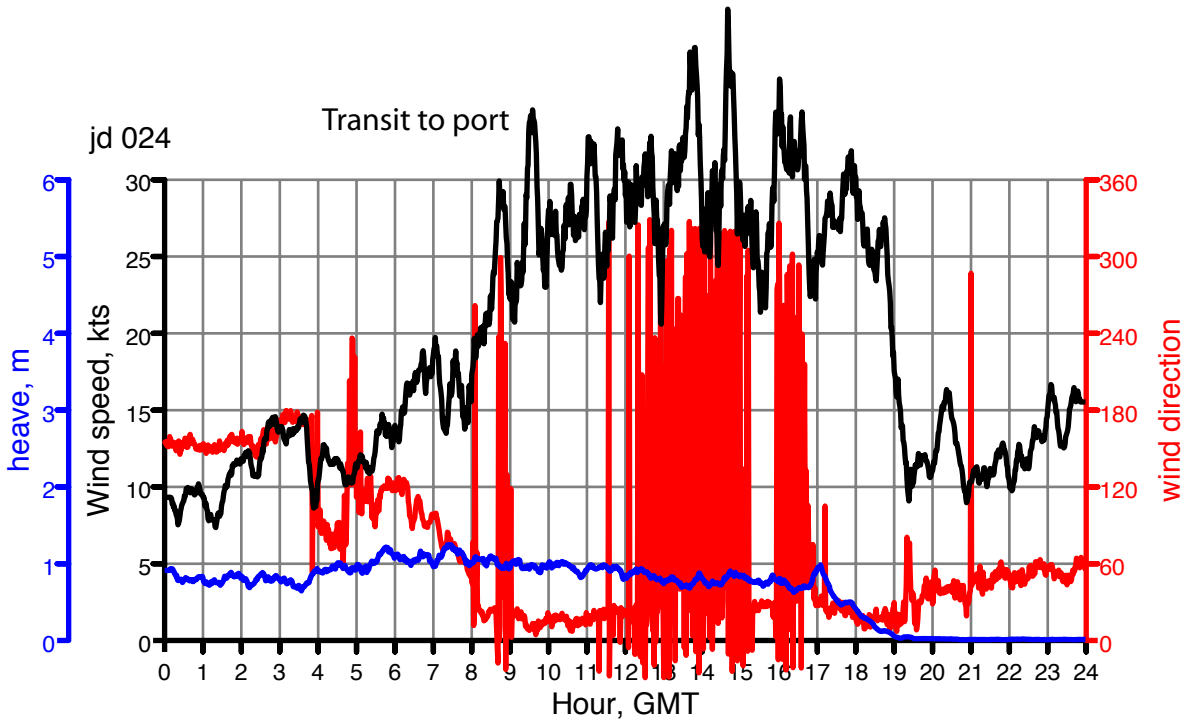

Towing 1 Paravane,
2 cables
jd 019
heave, m
Wind speed, kts
wind direction
Hour, GMT


jd 020
Deploy
Starboard
Paravane
Deploy cable #2
heave, m
Wind speed, kts
wind direction
Hour, GMT

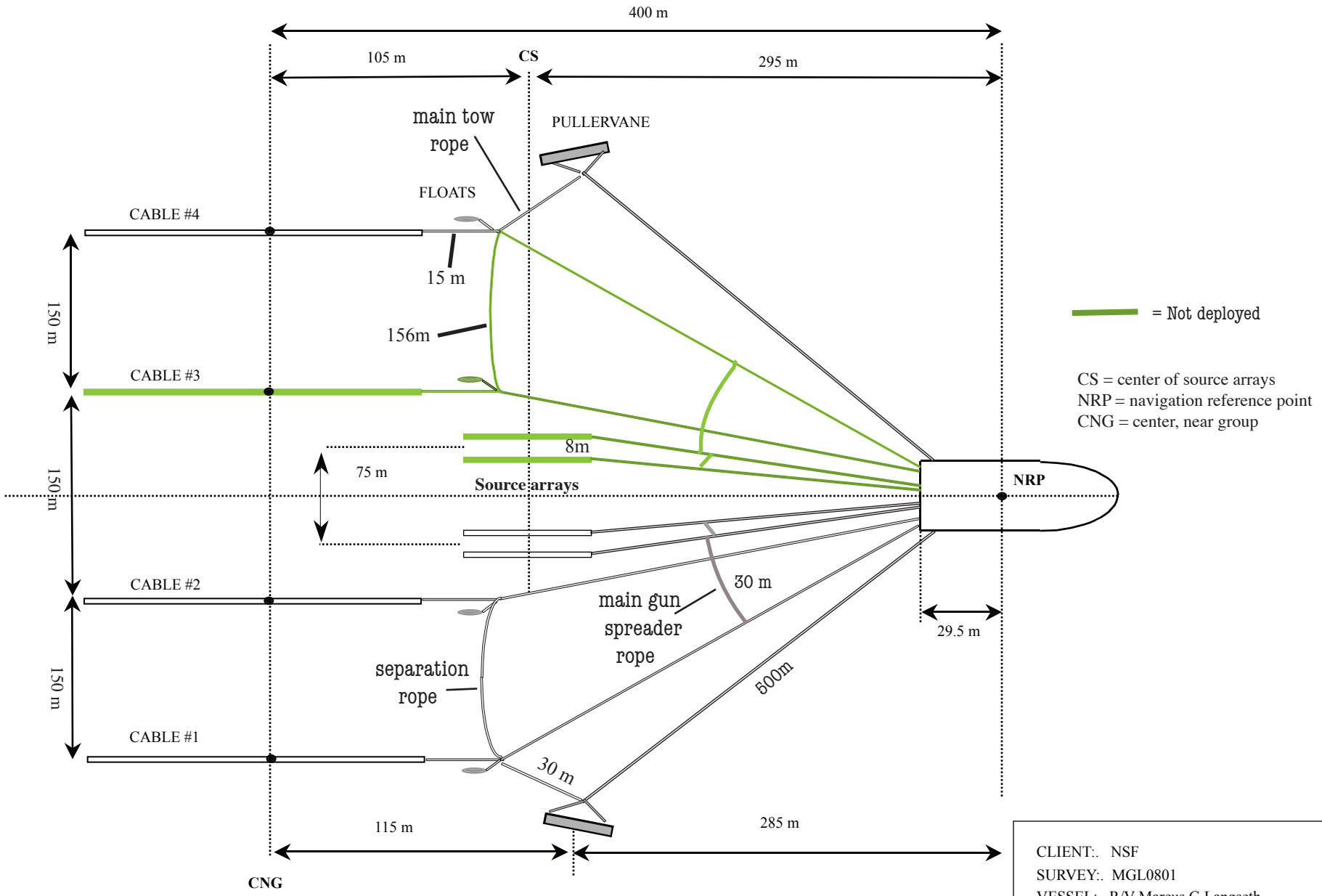

jd 021
Towing 3 cables,
2 paravanes
Starboard
Propulsion loss
heave, m
Wind speed, kts
wind direction
Hour, GMT


jd 022
Cable #2 on Paravane
heave, m
Wind speed, kts
wind direction
Hour, GMT


jd 023
3D test line
Retrieve MCS gear
heave, m
Wind speed, kts
wind direction
Hour, GMT


jd 024
Transit to port
heave, m
Wind speed, kts
wind direction
Hour, GMT

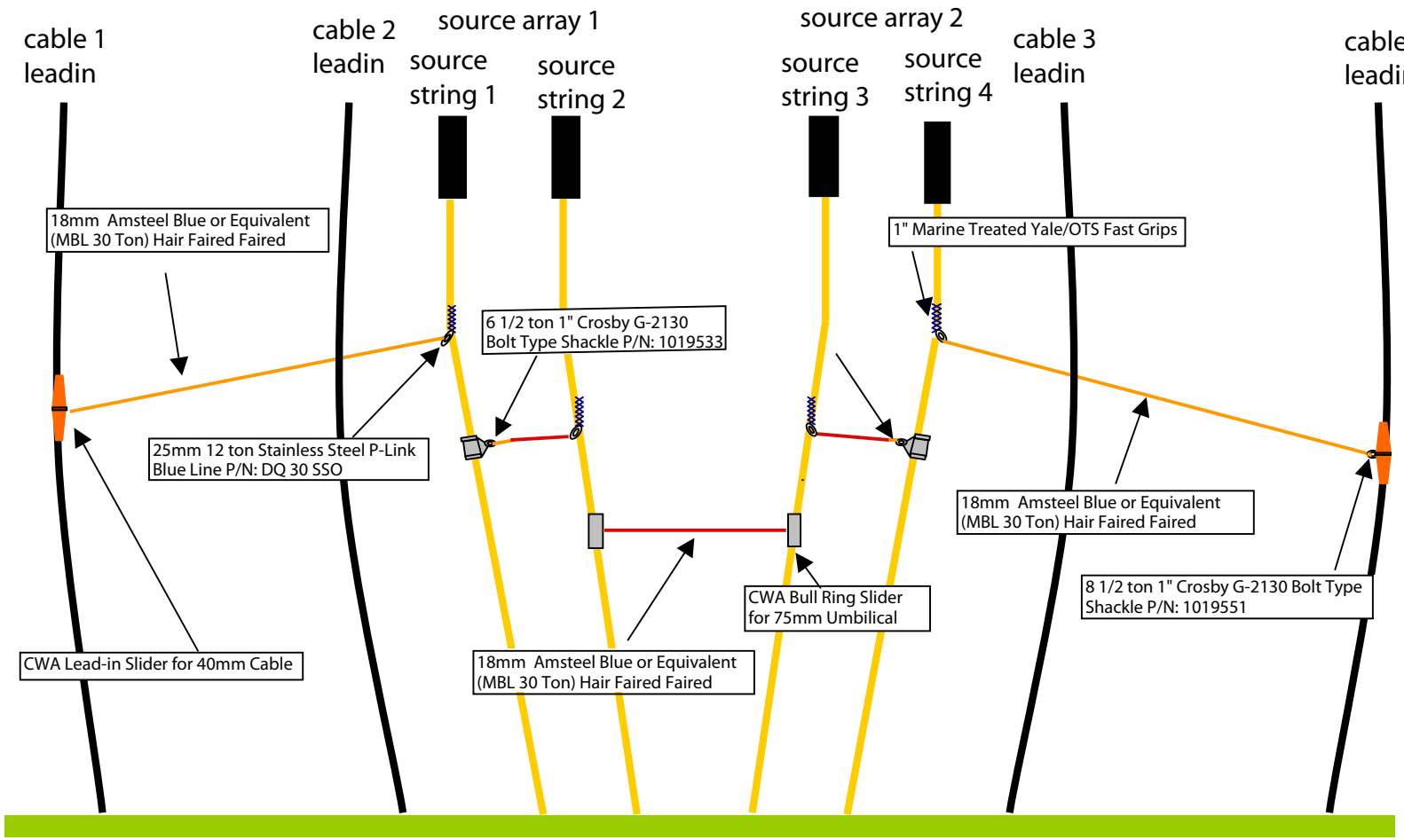
TOWING CONFIGURATION AND OFFSETS



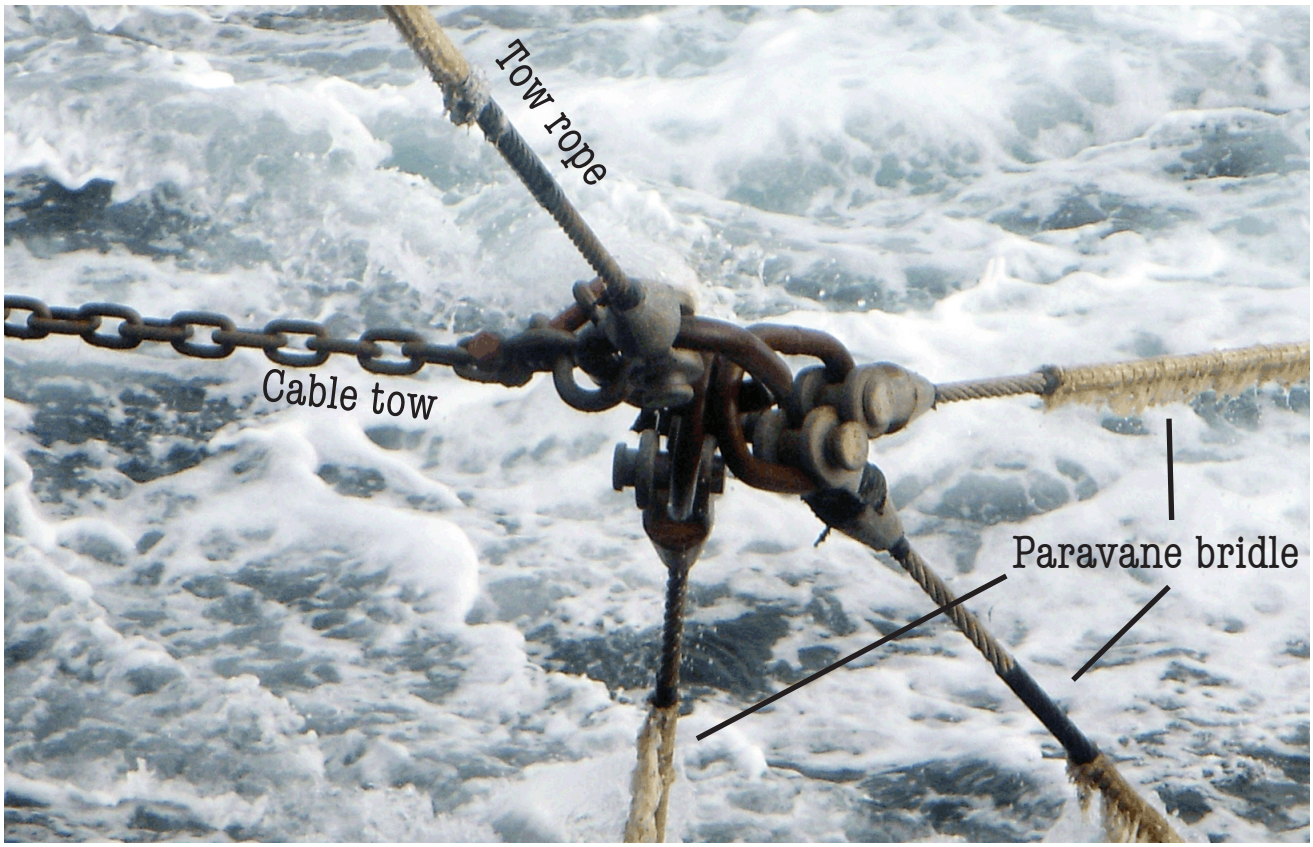
CLIENT:. NSF
SURVEY:. MGL0801
VESSEL: R/V Marcus G Langseth

Note: Drawing not to scale

Marcus Langseth 3D rigging: source array cross tags

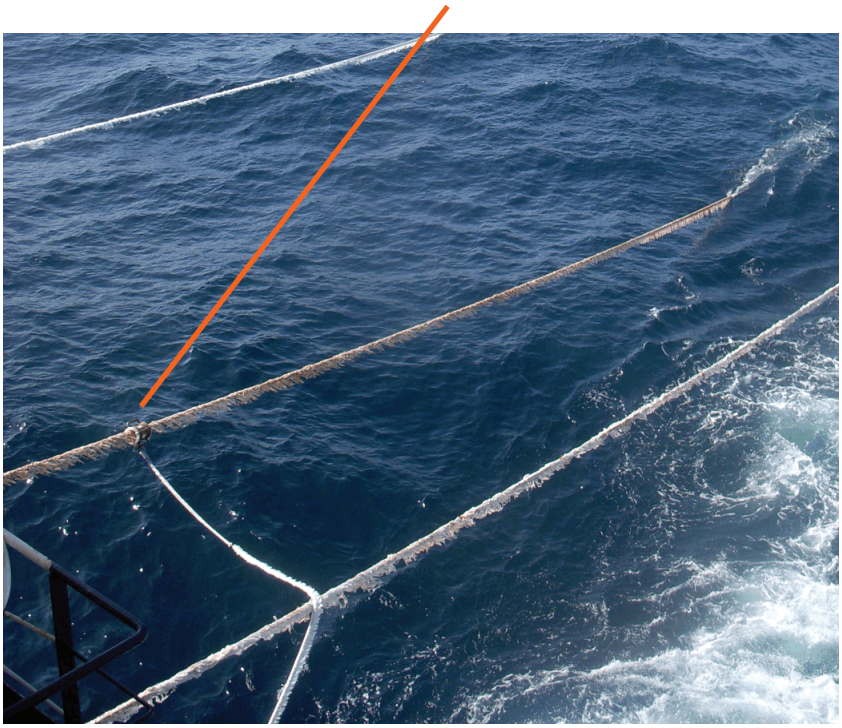


MGL 0801 cruise photos - cable/paravane rigging



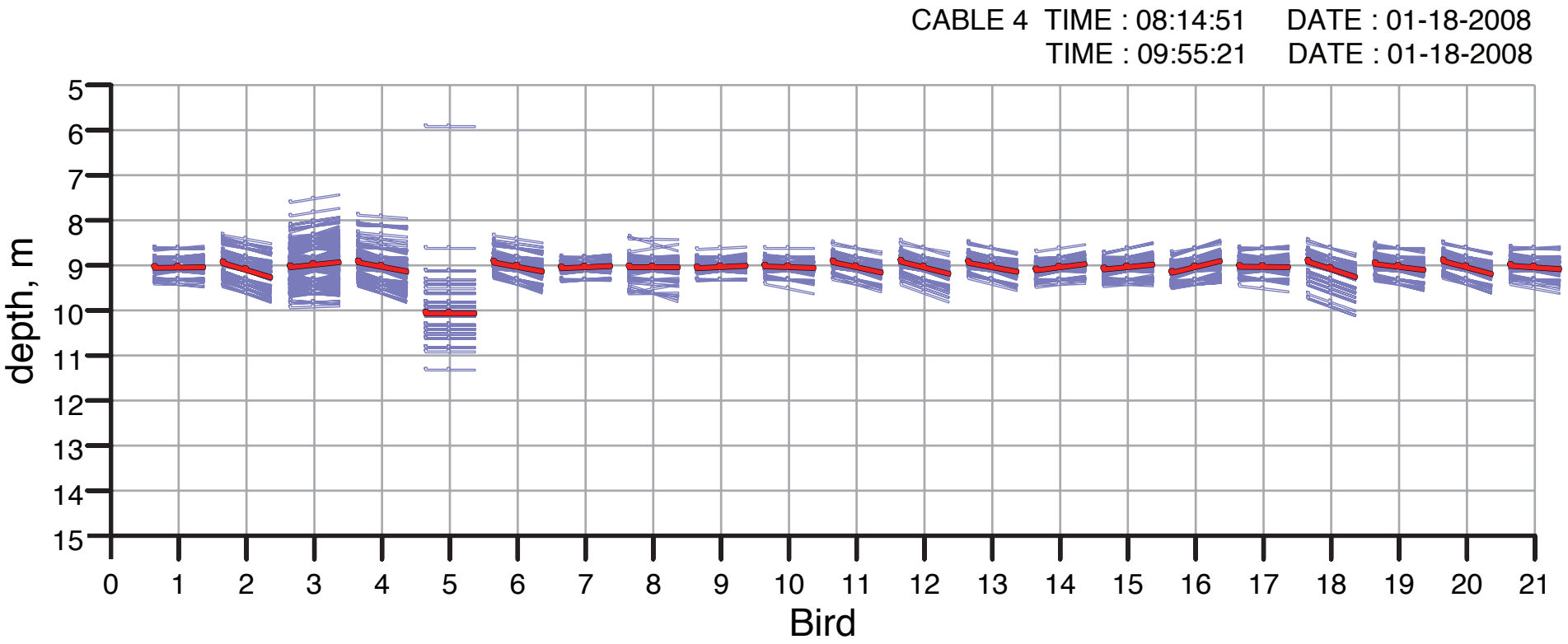
Cable separation rope rigging

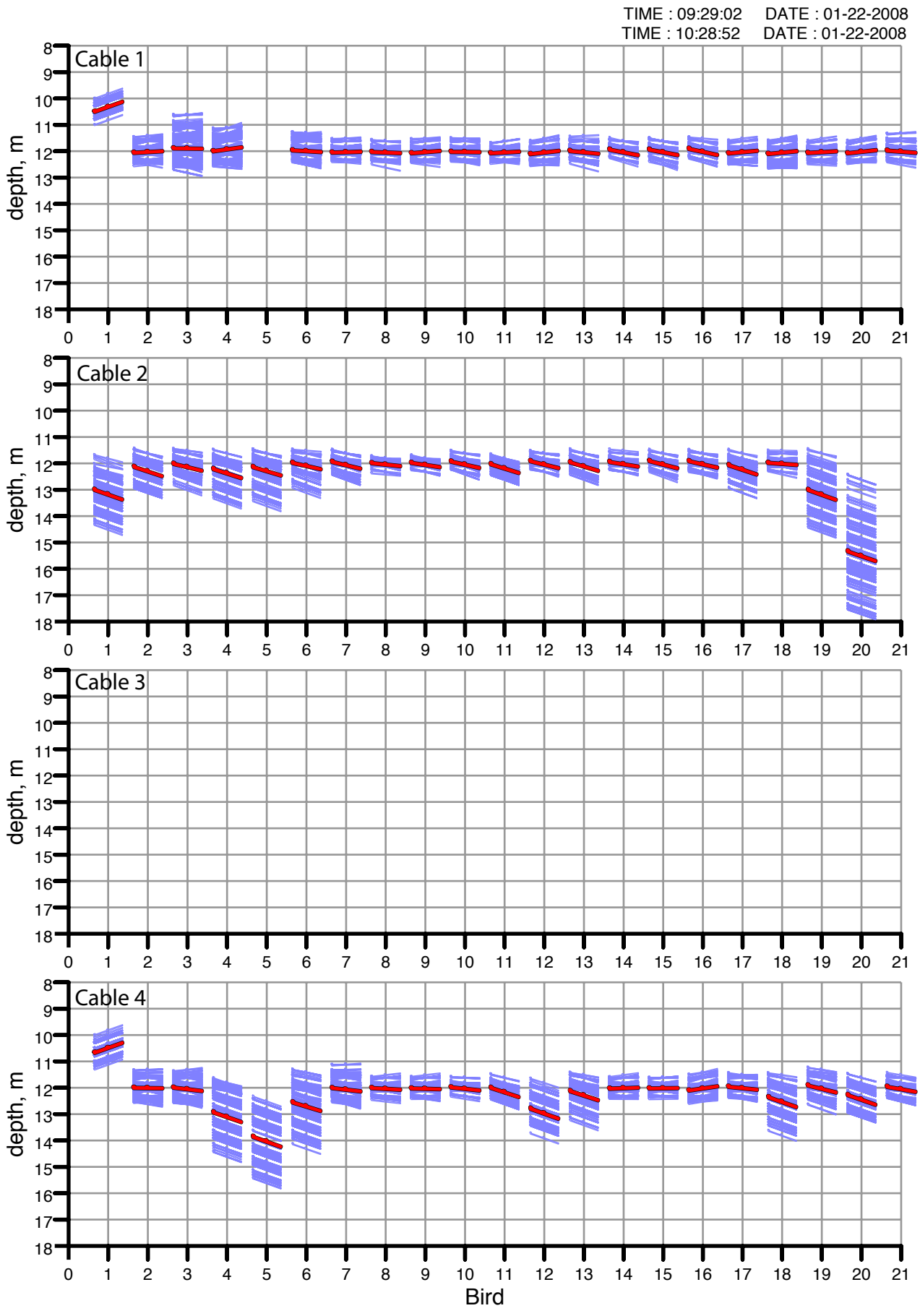
Source spreader rope and slider



Bird fin angle/depth plots:

The Digicourse bird controller will log fin angle, depth and temperature if desired. The resulting log files are useful for assessing ballasting and overall depth control. This example is a plotted summary for a single cable over the course of an hour and forty minutes. Individual entries are plotted in light blue, overal bird-by-bird averages in red.




TIME : 09:29:02 DATE : 01-22-2008
TIME : 10:28:52 DATE : 01-22-2008
Cable 1
Cable 2
Cable 3
Cable 4
depth, m
Bird

Streamer 1

MGL0801 *23-Jan-08*

	Serial No.	Chans	Offset (m)		Bird	Acoustic	Weight	Targ Wt	Comments
Slip Ring									
Lead-in					At head coil	At tail coil			
Radial Str STU			75						No stretch installed
Active 40	10529	480 - 469	225	AB1 / AA1	20636	2081	2 4 5 6 888* 10	8	Went to 60m, 3 wts on 8 for acstc
Module 40	276								2 sets SRD collars on section 40
Active 39	10546	468 - 457	375	… / AA2		3092	2 4 5 6 888* 10	8	3 wts on 8 for acoustic
Module 39	479								
Active 38	10454	456 - 445	525	AB2 / …	30049		2 4 5 6 7 8 10	7	
Module 38	122								
Active 37	10372	444 - 433	675	… / …			2 4 5 6 7 8 10	7	
Module 37	172								
Active 36	10571	432 - 421	825	AB3 / …	12766		2 4 5 6 7 8 10	7	
Module 36	461								
Active 35	10494	420 - 409	975	… / …			2 4 5 6 7 8 10	7	
Module 35	299								
Active 34	10234	408 - 397	1125	AB4 / …	10698		2 4 5 6 7 8 10	7	
Module 34	331								
Active 33	10191	396 - 385	1275	AB5 / …	32579		1 4 5 6 7 8 10	8	no bird on
Module 33	306								
Active 32	10474	384 - 373	1425	AB6 / …	19504		2 4 5 6 7 8 10	7	
Module 32	406								
Active 31	10129	372 - 361	1575	… / …			2 4 5 6 7 8 10	7	
Module 31	153								
Active 30	10268	360 - 349	1725	AB7 / …	6620		2 4 5 6 7 8 10	7	
Module 30	562								Low Pressure, 12.4psi, keep
Active 29	10551	348 - 337	1875	… / …			2 4 5 6 7 8 10	8	
Module 29	675								Low Pressure, 14.7psi, keep
Active 28	10313	336 - 325	2025	AB8 / …	13825		2 4 5 6 7 8 10	7	
Module 28	222								Low Pressure, 8.9 psi, keep
Active 27	10521	324 - 313	2175	… / …			2 4 5 6 7 8 10	7	
Module 27	181								
Active 26	10292	312 - 301	2325	AB9 / …	13354		2 3 4 5 6 7 8 10	8	
Module 26	151								
Active 25	10552	300 - 289	2475	… / …			2 4 5 6 7 8 10	7	
Module 25	218								
Active 24	10506	288 - 277	2625	AB10 / …	5646		2 4 5 6 7 8 10	7	
Module 24	438								Low Pressure, 11.1psi
Active 23	10584	276 - 265	2775	… / …			1 3 5 6 7 8 10	7	
Module 23	166								
Active 22	10560	264 - 253	2925	AB11 / …	10690		2 4 5 6 7 8 10	7	
Module 22	358								
Active 21	10359	252 - 241	3075	… / AA3		3967	2 4 6 AC 10	7	
Module 21	651								
Active 20	10207	240 - 229	3225	AB12 / AA4	32304	3935	2 3 4 AC 10	7	
Module 20	301								Low Pressure, 9.2psi
Active 19	10532	228 - 217	3375	… / …			2 4 5 6 7 8 10	7	
Module 19	398								
Active 18	10349	216 - 205	3525	AB13 / …	17325		2 4 6 8 10	6	
Module 18	466								
Active 17	10247	204 - 193	3675	… / …			2 4 5 6 7 8 10	7	
Module 17	133								
Active 16	10203	192 - 181	3825	AB14 / …	18468		2 4 6 8 10	6	
Module 16	405								
Active 15	10465	180 - 169	3975	… / …			2 4 5 6 7 8 10	7	
Module 15	355								
Active 14	10245	168 - 157	4125	AB15 / …	10845		2 4 6 8 10	6	
Module 14	536								
Active 13	10213	156 - 145	4275	… / …			2 4 5 6 7 8 10	7	
Module 13	661								tele and init problems
Active 12	10257	144 - 133	4425	AB16 / …	10834		2 4 6 8 10	6	
Module 12	323								shape, change d/t boots?
Active 11	10033	132 - 121	4575	… / …			2 4 5 6 7 8 10	7	
Module 11	277								

Active 10	10251	120 - 109	4725	AB17 / …	19585		2 4 6 8 10	6	
Module 10	245								
Active 9	10424	108 - 97	4875	… / …			2 4 5 6 7 8 10	7	
Module 9	720								
Active 8	10379	96 - 85	5025	AB18 / …	17151		2 4 6 8 10	6	
Module 8	149								
Active 7	10440	84 - 73	5175	… / …			2 4 5 6 7 8 10	7	
Module 7	390								Low Pressure, 6.4psi (change)
Active 6	10014	72 - 61	5325	AB19 / …	17812		2 4 6 8 10	6	
Module 6	117								
Active 5	10485	60 - 49	5475	… / …			2 4 5 6 7 8 10	7	
Module 5	304								
Active 4	10520	48 - 37	5625	AB20 / …	6946		2 4 6 8 10	6	
Module 4	192								
Active 3	10074	36 - 25	5775	… / …			2 4 5 6 7 8 10	7	
Module 3	241								
Active 2	10503	24 - 13	5925	AB21 / AA5	15900	4534	2 4 6 8 10	6	
Module 2	397								
Active 1	10337	12 -1	6075	… / AA6		4027	2 4 5 6 7 8 10	7	
Power module	LI1015								check if pwr mod. is on
Tail Stretch	SS1 0896 0208		6150	… / AA7		3892			
Tail Swivel	0607-CON-312								
Stic	n/a								
TailBuoy	n/a								

Streamer 2

	Serial No.	Chans	Offset (m)		Bird	Acoustic	Weight	Comments
								Jan 6 2008
Slip Ring								
Lead-in					At head coil	At tail coil		
Radial Str			75					
STU								
Active 40	10531	480 - 469	225	BB1 / BA1	32515		2 3 5 6 8 9	
Module 40	572							
Active 39	10435	468 - 457	375	… / BA2			2 3 5 6 8 9	
Module 39	260							
Active 38	10437	456 - 445	525	BB2 / …	20935		2 3 5 6 8 9	
Module 38	568							
Active 37	10496	444 - 433	675	… / …			2 3 5 6 8 9	-
Module 37	652							
Active 36	10338	432 - 421	825	BB3 / …	6517		2 3 5 6 8 9	
Module 36	456							
Active 35	10558	420 - 409	975	… / …			2 3 5 6 8 9	
Module 35	706							
Active 34	10568	408 - 397	1125	BB4 / …	11726		2 3 5 6 8 9	
Module 34	656							
Active 33	10375	396 - 385	1275	... / …			2 3 5 6 7 8 9	
Module 33	678							
Active 32	10360	384 - 373	1425	BB5 / …	18920		2 3 4 6 7 8 9	
Module 32	744							
Active 31	10575	372 - 361	1575	… / …			2 3 4 6 7 8 9	
Module 31	322							
Active 30	10399	360 - 349	1725	BB6 / …	15601		2 3 4 6 7 8 9	
Module 30	760							
Active 29	10219	348 - 337	1875	… / …			2 3 4 6 7 8 9	
Module 29	476							
Active 28	10294	336 - 325	2025	BB7 / …	13151		2 3 4 6 7 8 9	
Module 28	134							
Active 27	10502	324 - 313	2175	… / …			2 3 4 6 7 8 9	
Module 27	573							
Active 26	10278	312 - 301	2325	BB8 / …	29487		2 3 4 6 7 8 9	
Module 26	317							
Active 25	10154	300 - 289	2475	… / …			1 3 4 6 7 8 9	
Module 25	396							
Active 24	10323	288 - 277	2625	BB9 / …	22316		2 3 4 6 7 8 9	
Module 24	411							
Active 23	10509	276 - 265	2775	… / …			2 3 4 6 7 8 9	
Module 23	512							
Active 22	10516	264 - 253	2925	BB10 / …	10806		2 3 4 6 7 8 9	
Module 22	549							
Active 21	10132	252 - 241	3075	… / BA3			2 3 4 6 7 8 9	
Module 21	537							
Active 20	10369	240 - 229	3225	BB11 / BA4	16932		1 3 4 6 7 8 9	
Module 20	354							
Active 19	10260	228 - 217	3375	… / …			2 3 4 6 7 8 9	
Module 19	170							
Active 18	10366	216 - 205	3525	BB12 / …	17114		2 3 4 6 7 8 9	
Module 18	703							
Active 17	10158	204 - 193	3675	… / …			2 3 4 6 7 8 9	
Module 17	496							
Active 16	10121	192 - 181	3825	BB13 / …	10803		2 3 4 6 7 8 9	
Module 16	193							
Active 15	10293	180 - 169	3975	… / …			2 3 4 6 7 8 9	
Module 15	335							

Active 14	10242	168 - 157	4125	BB14 / …	15570		2 3 4 6 7 8 9	
Module 14	156							
Active 13	10258	156 - 145	4275	… / …			2 3 4 6 7 8 9	
Module 13	681							
Active 12	10578	144 - 133	4425	BB15 / …	13827		2 3 4 6 7 8 9	
Module 12	607							
Active 11	10167	132 - 121	4575	… / …			2 3 4 6 7 8 9	
Module 11	311							
Active 10	10356	120 - 109	4725	BB16 / …	8098		2 3 4 6 7 8 9	
Module 10	148							
Active 9	10525	108 - 97	4875	… / …			2 3 4 6 7 8 9	
Module 9	667							
Active 8	10522	96 - 85	5025	BB17 / …	17314		2 3 4 6 7 8 9	
Module 8	457							
Active 7	10387	84 - 73	5175	… / …			2 3 4 6 7 8 9	
Module 7	184							
Active 6	10312	72 - 61	5325	BB18 / …	8048		2 3 4 6 7 8 9	
Module 6	417							
Active 5	10243	60 - 49	5475	… / …			2 3 4 6 7 8 9	
Module 5	617							
Active 4	10478	48 - 37	5625	BB19 / …	19672		2 3 4 6 7 8 9	
Module 4	546							
Active 3	10453	36 - 25	5775	… / …			2 3 4 6 7 8 9	
Module 3	724							
Active 2	10346	24 - 13	5925	BB20 / BA5	15426		2 3 4 6 7 8 9	
Module 2	716							
Active 1	10185	12 -1	6075	… / BA6			2 3 4 6 7 8 9	
Module 1								
Tail Stretch	19310425		6150	… / BA7				
Tail Swivel								
Stic								tail power 410130R17
TailBuoy								

Streamer 3

	Serial No.	Chans	Offset (m)		Bird	Acoustic	Weight	Comments
Slip Ring								
Lead-in					At head coil	At tail coil		
Radial Str			75					
STU								
Active 40	10144	480 - 469	225	CB1 / CA1	29405		9 8 6 5 3 2	
Module 40	649							
Active 39	10461	468 - 457	375	… / CA2			9 8 6 5 3 2	
Module 39	473							
Active 38	10044	456 - 445	525	CB2 / …	13424		9 8 6 5 3 2	
Module 38	516							
Active 37	10066	444 - 433	675	… / …			9 8 6 5 3 2	wt 4 is metric
Module 37	177							
Active 36	10045	432 - 421	825	CB3 / …	9607		9 8 6 5 3 2	
Module 36	590							
Active 35	10296	420 - 409	975	… / …			9 8 6 4 3 2	
Module 35	353							
Active 34	10287	408 - 397	1125	CB4 / …	9707		9 8 6 4 3 2	
Module 34	112							
Active 33	10299	396 - 385	1275	... / …			9 8 6 4 3 2	
Module 33	403							
Active 32	10477	384 - 373	1425	CB5 / …	8335		9 8 6 4 3 2	
Module 32	422							
Active 31	10486	372 - 361	1575	… / …			9 8 6 4 3 2	
Module 31	654							
Active 30	10367	360 - 349	1725	CB6 / …	17759		9 8 6 4 3 2	
Module 30	127							
Active 29	10223	348 - 337	1875	… / …			9 8 6 4 3 2	
Module 29	426							
Active 28	10088	336 - 325	2025	CB7 / …	17594		9 8 6 4 3 2	
Module 28	722							18.4 psi
Active 27	10344	324 - 313	2175	… / …			9 8 6 4 3 2	
Module 27	124							18.0 psi
Active 26	10310	312 - 301	2325	CB8 / …	32411		9 8 6 4 3 2	
Module 26	732							17.7 psi
Active 25	10419	300 - 289	2475	… / …			9 8 6 4 3 2	
Module 25	538							
Active 24	10189	288 - 277	2625	CB9 / …	17919		9 8 6 4 3 2	Front bird collar failed
Module 24	502							
Active 23	10225	276 - 265	2775	… / …			9 8 6 4 3 2	
Module 23	641							
Active 22	10487	264 - 253	2925	CB10 / …	19663		9 8 6 5 3 2	
Module 22	120							
Active 21	10036	252 - 241	3075	… / CA3			9 8 6 5 3 2	
Module 21	389							
Active 20	10058	240 - 229	3225	CB11 / CA4	17668		9 8 6 5 3 2	
Module 20	195							16.5 psi
Active 19	10176	228 - 217	3375	… / …			9 8 6 4 3 2	
Module 19	123							
Active 18	10043	216 - 205	3525	CB12 / …	13034		9 8 6 4 3 2	
Module 18	368							
Active 17	10392	204 - 193	3675	… / …			9 8 6 4 3 2	
Module 17	452							
Active 16	10148	192 - 181	3825	CB13 / …	9173		9 8 6 4 3 2	4 might be 5?
Module 16	493							
Active 15	10550	180 - 169	3975	… / …			9 8 6 4 3 2	
Module 15	670							18.4 psi

Active 14	10198	168 - 157	4125	CB14 / …	11403		9 8 6 4 3 2	
Module 14	139							
Active 13	10519	156 - 145	4275	… / …			9 8 6 4 3 2	
Module 13	284							
Active 12	10266	144 - 133	4425	CB15 / …	32258		9 8 6 4 3 2	
Module 12	589							
Active 11	10042	132 - 121	4575	… / …			9 8 6 4 3 2	
Module 11	180							16.8 psi
Active 10	10035	120 - 109	4725	CB16 / …	9457		9 8 6 4 3 2	
Module 10	171							
Active 9	10253	108 - 97	4875	… / …			9 8 6 5 3 2	
Module 9	699							
Active 8	10480	96 - 85	5025	CB17 / …	14137		9 8 6 5 3 2	
Module 8	567							
Active 7	10108	84 - 73	5175	… / …			9 8 6 5 3 2	
Module 7	636							
Active 6	10523	72 - 61	5325	CB18 / …	17643		9 8 6 5 3 2	
Module 6	410							bad cnxn aft of can
Active 5	10391	60 - 49	5475	… / …			9 8 6 5 3 2	
Module 5	164							
Active 4	10039	48 - 37	5625	CB19 / …	14011		9 8 6 5 3 2	
Module 4	494							
Active 3	10384	36 - 25	5775	… / …			9 8 6 5 3 2	
Module 3	577							
Active 2	10113	24 - 13	5925	CB20 / CA5	17780		9 8 6 5 3 2	
Module 2	332							
Active 1	10263	12 -1	6075	… / CA6			9 8 6 5 3 2	
Power Module								
Tail Stretch			6150	… / CA7				No stretch
Tail Swivel								
Stic								
TailBuoy								

Streamer 4

	Serial No.	Chans	Offset (m)		Bird	Acoustic	Weight	Comments
Slip Ring								
Lead-in					At head coil	At tail coil		
Radial Str			75					
STU								
Active 40	10412	480 - 469	225	DB1 / DA1	8104	4139	2,3,5,6,8,9	total 6 wts
Module 40	513							
Active 39	10056	468 - 457	375	… / DA2		1726	2,3,5,6,8,9,10	total 7 wts
Module 39	448							
Active 38	10308	456 - 445	525	DB2 / …	14992		2,3,5,6,8,9	total 6 wts
Module 38	119							
Active 37	10300	444 - 433	675	… / …			2,3,5,6,8,9,10	total 7 wts
Module 37	445							
Active 36	10249	432 - 421	825	DB3 / …	14043		2,3,5,6,8,9	total 6 wts
Module 36	246							
Active 35	10290	420 - 409	975	… / …			2,3,5,6,8,9,10	total 7 wts
Module 35	265							
Active 34	10500	408 - 397	1125	DB4 / …	12641		2,3,5,6,8,9	total 6 wts
Module 34	643							
Active 33	10378	396 - 385	1275	DB5 / …	18582		2,3,5,6,8,9,10	total 7 wts
Module 33	655							
Active 32	10037	384 - 373	1425	DB6 / …	8690		2,3,5,6,8,9	total 6 wts
Module 32	104							
Active 31	10579	372 - 361	1575	… / …			2,3,5,6,8,9,10	total 7 wts
Module 31	587							
Active 30	10318	360 - 349	1725	DB7 / …	9140		2,3,5,6,8,9	total 6 wts
Module 30	357							
Active 29	10177	348 - 337	1875	… / …			2,3,5,6,8,9,10	total 7 wts
Module 29	640							
Active 28	10443	336 - 325	2025	DB8 / …	18375		2,3,5,6,8,9	check weight at 2
Module 28	459							
Active 27	10377	324 - 313	2175	… / …			2,3,5,6,8,9,10	total 7 wts
Module 27	437							
Active 26	10585	312 - 301	2325	DB9 / …	6300		2,3,5,6,8,9	total 6 wts
Module 26	157							
Active 25	10504	300 - 289	2475	… / …			2,3,5,6,8,9,10	total 7 wts
Module 25	631							**no init**
Active 24	10432	288 - 277	2625	DB10 / …	19358		2,3,5,6,8,9	total 6 wts
Module 24	741							**this can & aft OK**
Active 23	10405	276 - 265	2775	… / …			2,3,5,6,8,9,10	total 7 wts
Module 23	697							
Active 22	10272	264 - 253	2925	DB11 / …	7188		2,3,5,6,8,9	total 6 wts
Module 22	504							active 21 total 7 weights
Active 21	10370	252 - 241	3075	… / DA3		3953	2,3,5,6,8,9,10	Torn boot @ tail
Module 21	212							
Active 20	10173	240 - 229	3225	DB12 / DA4	16248	3949	2,3,5,6,8,9	total 6 weights
Module 20	701							
Active 19	10265	228 - 217	3375	… / …			2,3,5,6,8,9,10	total 7 wts
Module 19	329							
Active 18	10476	216 - 205	3525	DB13 / …	13082		2,3,5,6,8,9	total 6 wts
Module 18	506							
Active 17	10155	204 - 193	3675	… / …			2,3,5,6,8,9,10	total 7 wts
Module 17	4							
Active 16	10216	192 - 181	3825	DB14 / …	30963		2,3,5,6,8,9	total 6 wts
Module 16	340							
Active 15	10122	180 - 169	3975	… / …			2,3,5,6,8,9,10	total 7 wts
Module 15	464							
Active 14	10316	168 - 157	4125	DB15 / …	33173		2,3,5,6,8,9	total 6 wts
Module 14	349							**2.3 psi**
Active 13	10195	156 - 145	4275	… / …			2,3,5,6,8,9,10	total 7 wts
Module 13	529							
Active 12	10514	144 - 133	4425	DB16 / …	13110		2,3,5,6,8,9	total 6 wts

Module 12	436							
Active 11	10450	132 - 121	4575	… / …			2,3,5,6,8,9,10	
Module 11	625							
Active 10	10499	120 - 109	4725	DB17 / …	30917		2,3,4,5,6,7,8,9	
Module 10	447							
Active 9	10468	108 - 97	4875	… / …			2,3,5,6,8,9	
Module 9	401							
Active 8	10470	96 - 85	5025	DB18 / …	19985		1,2,5,6,8,9	
Module 8	114							
Active 7	10401	84 - 73	5175	… / …			2,3,4,6,8,9,10	
Module 7	?65							
Active 6	10060	72 - 61	5325	DB19 / …	30936		2,3,5,6,8,9	ballast OK
Module 6	596							
Active 5	10236	60 - 49	5475	… / …			2,3,5,8	
Module 5	441							
Active 4	10573	48 - 37	5625	DB20 / …	8493		2,4,6,8,9	
Module 4	714							
Active 3	10094	36 - 25	5775	… / …			2,3,5,6,8,9	
Module 3	556							
Active 2	10205	24 - 13	5925	DB21 / DA5	9683	3431	2,3,5,6,8,9	
Module 2	497							
Active 1	10233	12 -1	6075	… / DA6		3119	2,3,5,6,8,9,10	
Power Module	?							get s/n
Tail Stretch	?		6150	… / DA7		3064		get s/n
Tail Swivel	?							get s/n
Stic	n/a							
TailBuoy	n/a							