



Cruise Report

R/V Wecoma

W1110B

Cascadia Initiative Leg 2

October 15 to October 21

Newport, OR – Newport, OR

Bob Dziak & Del Bohnenstiehl

(Co-Chief Scientists)

Captain & Crew

R/V Wecoma:

Captain: Jeff Crews

Chief Engineer: Bob Ashley

1st Mate: Tony Monocandilos

2nd Mate: Patrick Breshears

Engineer: Jay Jeanbart

Engineer: Chip Millard

Bos'n: Doug Beck

AB: Marc Simpson

AB: Doug Andrews

AB: Doug Beck

Galley: Doug Caps

Cook: John Vanderbeck

Science Party:

Co-Chief Scientists:

Bob Dziak (OSU)

Del Bohnenstiehl (NCSU)

Marine Tech

Dave O'Gorman (OSU)

OSU/NCSU Science Party

Matt Fowler (Marine Tech, OSU)

Joe Haxel (Graduate Student, OSU)

Cory Scheip (Graduate Student, NCSU)

Bill Hanshumaker (Marine Educator, OSU-Sea Grant)

Scripps Institute of Oceanography OBS Team

Martin Rapa

Paul Georgief

Ray Klein

Lamont-Dohert Earth Observatory OBS Team

David Gassier

Vincent Oletu

Drew Stolzman

Introduction

Cruise W1110B aboard the R/V Wecoma was the second leg to deploy a series of ocean bottom seismometers (OBS's) as part of the National Science Foundation funded Cascadia Initiative. This community-based experiment represents a combined onshore-offshore seismic and geodetic study of the Cascadia Margin. See the following website for details of the year 1 plan science plan and for more information about the Cascadia Initiative <http://pages.uoregon.edu/drt/CIET>.

The objectives for the cruise were to deploy 15 trawl resistant OBSs built by the Scripps Institute of Oceanography (SIO) and 10 non-trawl resistant OBSs with absolute pressure gauges built by Lamont Doherty Earth Observatory (LDEO). Both the science party and OBS personnel worked a 24 hour schedule to get all of the instruments deployed while the weather remained calm. For the eight-day duration of the cruise, swells were 5-8 feet and wind waves 2-6 feet. Winds rarely exceeded 20 knots. In addition to the OBS deployments, we also performed one CTD cast and pinged on two LDEO TRM OBS deployed during the summer Leg 1 cruise (W1107B).

Deployment Site Selection.

Deployment sites were initially selected through a series of community meetings. The Cascadia Initiative Expedition Team (CIET), the Amphibious Array Steering Committee (AASC) and the co-chief scientists made slight modifications to avoid strong currents, seafloor hazards and areas of active shrimp and fish trawling (for sites < 1000 m).

In siting the OBSs, the team relied heavily on input from Barry Ackerman, Canadian Trawlers Association, Scott McMullen of the Oregon Fisherman's Cable Committee (OFCC), Brad Pettinger of the Oregon Trawl Commission, Liam Antrim of the Olympic Coast Marine Sanctuary, and Joe Schumaker from the Quinalt Dept of Fisheries, Jennifer Hagen representing the Quileute Natural Resources, Kaety Hildenbrand of Oregon Sea Grant - Marine fisheries extension agent, Ted Gibson representing shrimp fishermen out of Newport, Gary Ripka, representing the trawling fishermen out of Newport, Kevin Dunn representing Astoria trawlers, and Gary Wintersteen also of Astoria Trawler.

Some sites were moved slightly into nearby no-trawl zones, specifically Essential Fish Habitats (EFHs) in Grays Canyon region and Nehalem Bank/Shale Pile, and others were moved near known "hangs" based on specific suggestions by Scott McMullen. Liam Antrim was our contact with the Olympic Coast Sanctuary and expedited our permit to deploy at one location within the sanctuary. Mr. Antrim also initiated contact for us with the Quileute and Quinalt tribes to ensure our deployments did not impact their fishery rights. Kaety Hildebrand provided very helpful feedback, and was our main interface with the shrimp fishing and trawling community.

Final deployed locations are shown in Figure 1 and are listed in Table 1 at the end of this document. Detailed bathymetric maps of deployment sites are in given in Appendix 1.

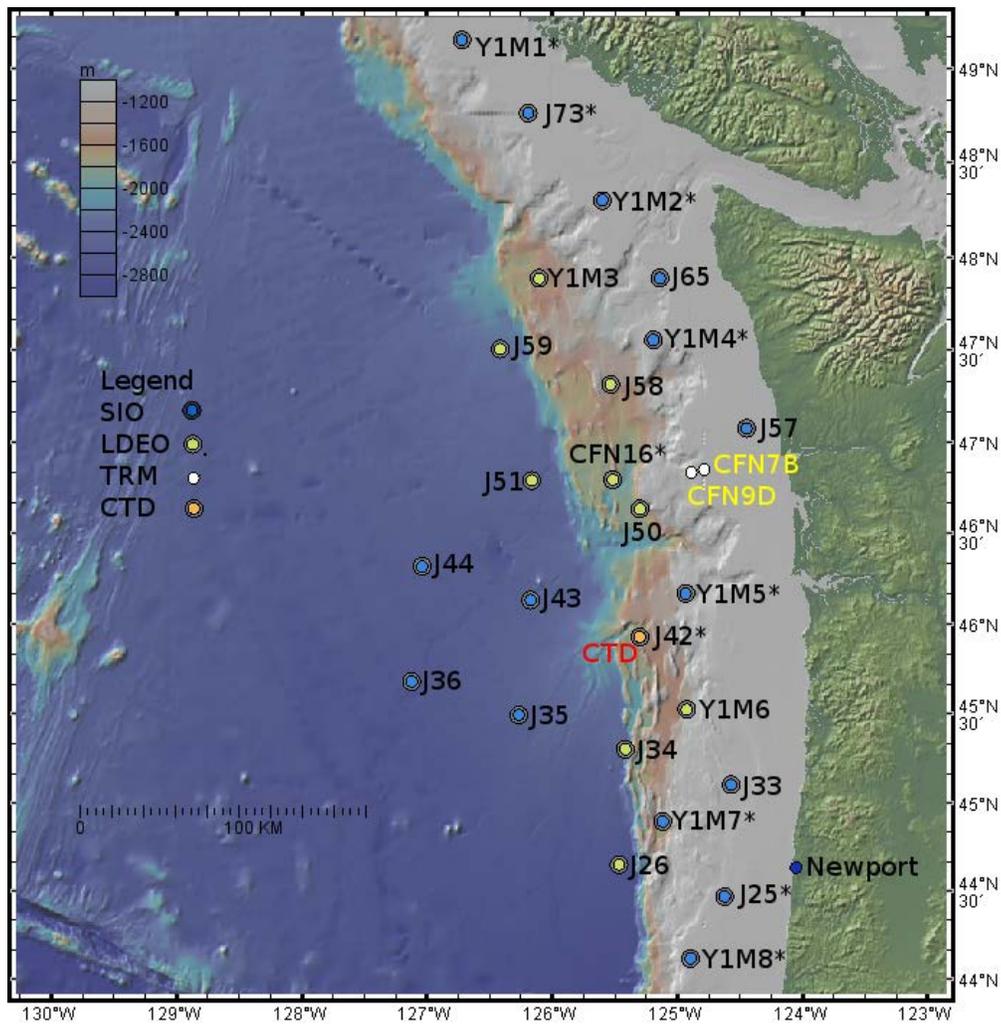


Fig 1: Map of OBS deployment locations. Legend shows the type of instrument deployed at each location. Asterisks denote deployment locations modified to accommodate concerns of fishing communities. Also shown are the locations of a single CTD conducted during the cruise, as well as position of the two Leg 1 – deployed LDEO TRM OBSs that were interrogated to test their releases.

OBS description

All 25 instruments fit on the fantail of the *R/V Wecoma* without stacking. Some minor shuffling prior to the last deployments was required to ease use of the crane for getting instruments over the side. All of the instruments are designed to operate autonomously; they are battery powered, with ~ 1 -year longevity. They were drop-deployed and will be recovered during the summer of 2012 using an acoustically triggered release. Each has a radio beacon, flasher and flag to aid in locating them on the sea surface.

Following deployment, each instrument's position on the seafloor was determined using the hull-mounted transducer on the *R/V Wecoma*, which circled the drop site at a radius of 0.5 times the local water depth. Final locations were derived from the recorded acoustic ranges using the Workboat software package (<http://www.seanav.com>). Screen grabs of the Workboat output for each survey are shown in Appendix 2.

The 10 "Cascadia" OBSs built by LDEO (Fig 2, left) are comprised of a three-axis broadband seismometer (3-channels, each with 24-bit resolution). The model is Trillium Compact manufactured by Nanometrics (Canada). The OBS package also contains an absolute pressure gauge (36-bit resolution), internal temperature sensor (24-bit resolution), and omni-directional hydrophone (24-bit resolution). The pressure sensor is a *Digiquartz* nano-precision depth sensor made by Paroscientific (USA). The hydrophone is model HTI-90-U, made by High Tech (USA). All six channels of sensor data are sampled continuously at 125Hz.

The 15 "Abalone" OBSs built by SIO (Fig 2, right) have a trawl-resistant mount. The beacon and flag are designed to be "break-away" so as to minimize disturbance by trawlers or damage to trawling equipment. Eleven of these instruments were therefore chosen to occupy the shallowest sites (56-1350 m) along the accretionary prism. The remaining four SIO instrument were interspersed with the LDEO instruments in deeper waters. The Abalone instrument package includes a three-axis broadband Trillium Compact OBS (3-channels, each with 24-bit resolution) and a dynamic pressure gauge (24-bit resolution). All four channels are sampled continuously at 50 Hz.



Fig 2: Left SIO Abalone Ocean Bottom Seismometer. Right LDEO seismometer, pressure sensor, hydrophone instrument package.

CTDs

One CTD was acquired during the cruise. The cast was taken near station D4-Y1M6 on Sunday Oct 26. We will use the CTD information to calculate a sound velocity profile for the continental shelf stations. Data from the CTD collected is shown in Appendix 3.

Outreach

A marine educator from OSU Sea Grant (Bill Hanshumaker) participated on our cruise and maintained a cruise blog (<http://blogs.oregonstate.edu/billgoestosea>). Several 3rd through 8th grade classrooms from Newport schools watched the blog and interacted with us while at sea.

CRUISE NARRATIVE:

Day 1: Saturday October 15, 2011 (Deployed Y1M7, J33)

We departed Newport at 11:00 PDT (18:00 z, JD: 288) after 1 hour lifeboat and fire drills. The first deployment is ~4.8 hours from Newport at 10 knts. Wind is out of north at 17 Knts, swells are ~ 4 feet.

First deployment location is **Y1M7**. We will be deploying one of the SIO Abalones. Depth at site is 1361m. In water 00:08Z, 44° 53.983'N 125° 07.012'W

This is SIO Abalone instrument number 15.

A circle survey was performed at a radius of 0.5 water depth using the hull mounted transducer and the survey software Workboat (J Illman, pers com.). The instrument reached the seafloor within 20 minutes.

D1-Y1M7 Surveyed position: 44° 53.9252' N; 125° 07.00089'W depth = 1356.0

Began transit to site 2 at 17:15 PDT (00:15z).

Arrived at site 2 (**D2 – J33**) at 20:50 PDT. Deployment location is 45 06.4'N, 124 34.24'W. Depth is 363 m. This is an SIO Abalone site.

Deployed at 0430z, 45° 6.392'N 124° 34.251'W, depth = 354m.

This was SIO Abalone number 16. The OBS was bounced twice against rail before deployment due to rough seas.

D2-J33 Surveyed position: 45° 06.3972'N; 124° 34.2473'W depth = 349.0 m

22:30 PDT began transit for site D3-J34.

Day 2: Sunday Oct 16, 2011 (Deployed J34, Y1M6, J42, Y1M5, J50)

Arrived at the third deployment site, **D3-J34**, at 02:33 PDT (09:33 z). This is the first LDEO deployment with an Absolute Pressure Gauge. Weather continues to be good, with winds out of the north at 23 knts and swells of 5-6 ft.

This is LDEO instrument C1.

Deployment location = 45° 18.338 N; 125° 24.931 W, Depth at deployment = 2589 m, time in water 03:37PDT (10:37z).

Instrument on bottom at 04:40 PDT. Survey began at 4:45PDT, survey complete at 05:45PDT (12:45z).

D3-J34 Surveyed position: 45° 18.3392'N; 125° 24.8696'W, depth=2574.0

Begin transit to next site Y1M6 at 05:50PDT (12:50 z).

Arrive on site **D4-Y1M6** at 08:15 PDT (15:15 z). This is LDEO instrument C8.

Instrument in the water at 09:45 PDT, depth = 1462m, 45° 31.779'N; 124° 55.614'W

10:20 – 10:50 PDT (17:20 z) instrument on seafloor; conduct acoustic survey.

D4-Y1M6 Surveyed position: 45° 31.7697'N; 124° 55.6101'W depth = 1438.5 m

11: 50 PDT (18:50 z), begin transit to next position, **D5-J42**. Arrive at D5-J42 for deploy at 13:40PDT (20:40 z). Wind 15 knts out of the north, 4-6 ft swell.

D5-J42, deployed at 15:10 PDT, depth =1554m, 45° 55.99'; 125° 17.998'W. This is LDEO instrument C5.

On bottom at 15:45PDT, beginning survey. At 16:30 PDT (23:30 z), survey is completed. Begin transit to next station.

D5-J42 Surveyed position: 45° 55.9831'N, 125° 17.9839'W depth = 1540.1m

Next site is D6-Y1M5, ETA is 18:34 PDT. Arrive at **D6-Y1M5** at 1820 PDT.

This is SIO Abalone number 14.

Instrument in water at 18:27 PDT, (01:27z) location 46° 10.506'N -124° 56.030'W, depth = 835 m. JD 290.

On bottom at 18:45 PDT, begin survey.

D6-Y1M5 surveyed position: 46° 10.4076'N, 124° 56.0743'W depth= 828.2 m

Next site is **D7-J50**, begin transit at 1900 PDT. Arrive at station **D7-J50** at 1945 PDT. Begin preparations for deployment. This is LDEO instrument number C2. The LDEO team required 2.5 hours to prepare the instrument.

In water at 12:10 PDT location 46° 38.380'N 125 17.986'W . depth = 1930 m.

On bottom at 12:50AM PDT (07:50z), survey begins. Survey ends at 01:40 PDT on Oct 17.

D7-J50 surveyed position: 46° 38.4093'N, 125° 17.9432'W depth =1908.0 m.

Begin transit to next site **D8 CFN-16**.

Day 3: Monday October 17, 2011-(Deploy CFN-16, J59, J58, Y1M4, J65)

Seas remain very calm and both SIO and LDEO groups are efficiently preparing and deploying their instruments.

Transiting to **D8 CFN-16**, arrive on station at 46 48N, 125 31W.

Arrived on site at 03:15 PDT (10:15z). Instrument in water at 04:30 PDT, 46° 47.986N 125° 30.965'W depth = 1928 m.

LDEO OBS number C6.

Instrument on bottom at: 05:05PDT (12:05 z), begin survey. Survey ends at 05:45PDT (12:45z)

D8 CFN-16 surveyed position: 46° 47.9761'N 125° 30.9682'W depth=1907.3

Begin transit to next site **D9-J57** 0545 PDT.

*During transit, stopped at two CFN – TRM sites to ping on the instruments to test their releases.

Tested and confirmed two releases. CFN9D, 7 chirps a 1 second interval, no pop up style (meaning its vertical). CFN7B, pop up style, 15 chirps at 2 sec interval.

Range for CFN9D – 1577 m slant, 46 50.5069'N 124 52.0711'W

Range for CFN7B – 328 m slant, 46 51.299'N 124 47.399'W

Arrived at site **D9-J57** at 10:50 PDT (17:50z).

This is SIO OBS instrument number 7, in water at 11:02 PDT (18:02z). Location 47°4.814'N 124° 27.024'W depth = 60 m.

Instrument on bottom at 11:04 PDT (18:04z). Begin survey.

D9-J57 surveyed position: 47° 04.8053'N, 124° 27.0276'W, depth = 55.8 m

Begin transit to **D10-J58** at 11:20 AM PDT. At 16:04 PDT (23:04 z) we arrived on site.

Seas are very calm, 4-6 foot swell. Winds are light at 11 knts out of the north.

This is LDEO instrument C3.

D10 – J58 in the water at 16:22 PDT (23:22 z). Deployment location is: 47° 19.072'N 125 31.962W depth = 1532 m.

On the seafloor at 17:00 PDT (00:00z). Begin survey.

D10-J58 surveyed position: 47° 19.1266'N, 125° 32.0651'W, depth = 1511.0 m

18:40 PDT, begin transit to **D11-Y1M4**.

This is SIO - OBS 10. Arrive on site at 0900 PDT, OBS deployed at 47 33.509'N 125 11.526'W, depth = 571 m.

Instrument D11-Y1M4 on bottom at 21:15 PDT, begin survey.

D11-Y1M4 surveyed position: 47° 33.4855'N 125° 11.5305'W, depth = 563.4 m

Begin transit to next position **D12-J65** at 21:35 PDT.

Arrive on site at 23:35 PDT (06:35 z, JD: 291)

Instrument in the water at 23:45 PDT, 47° 53.489'N, 125° 08.379'W, depth = 169 m.

Instrument number SIO 13. On bottom at 23:50 PDT. Begin survey.

D12-J65 surveyed position: 47° 53.4806'N, 125° 08.3776'W, depth = 165.2 m

23:55 PDT begin transit to next site D13-Y1M2.

Day 4 : Tuesday October 18, 2011 - (Deploy Y1M2, J73, Y1M1, Y1M3)

Arrive at station **D13-Y1M2** at 03:12 PDT (10:12z) after 3.1 hour transit. Winds 10 knts, seas at 4-6 feet.

This is SIO Abalone # 4. In water at 03:25 PDT (10:25z). 48° 18.422'N 125° 36.028'W, depth = 139m.

Instrument on bottom at 03:29 PDT, begin survey. Survey complete at 03:40 PDT.

D13-Y1M2 surveyed position: 48° 18.4194'N, 125° 36.0236'W depth = 139.0 m

03:41PDT begin transit to next site, **D14-J73**. Arrive at deployment site at 07:15 PDT.

Winds are out of northeast at 3 knts, swells again are 4-6 ft.

SIO instrument # 3 in water at 07:31 PDT (14:31z), 48° 46.054'N 126° 11.553'W, depth=149 m.

Instrument on bottom at 07:35 PDT, begin survey. Survey ends at 08:43 PDT (15:43z; JD: 291)

D14-J73 surveyed position: 48° 46.0607'N, 126° 11.550'W, depth = 143.0 m

Begin transit to next site **D15-Y1M1**. Arrive on site at 10:53 PDT (17:53z)

*During deployment of SIO OBS #11, the pin holding the anchor to the release parted and the anchor was lost to the sea. No spare anchor was sent with the SIO shipment, so another abalone was substituted for this deployment.

After 45 minute preparation time, the SIO Abalone #8 was readied for deployment.

D15-Y1M1 Instrument # 8 was deployed at 12:45 PDT (19:45z), 49° 08.915'N 126° 44.977'W depth = 138 m.

Instrument at bottom at 12:48 PDT.

D15-Y1M1 surveyed position: 49° 09.0254'N 126° 43.3277'W depth = 133.0 m.

Begin transit at 13:05 PDT to site **D16-Y1M3**. Arrive on site at 20:56 PDT (03:56z, JD:292).

LDEO OBS number 10 in water 21:08 PDT, drop location 47° 53.423'N 126° 06.313'W depth = 1840 m.

The instrument arrives at the seafloor at 21:50 PDT, begin survey.

D16-Y1M3 surveyed position: 47° 53.2956'N, 126° 06.2372'W depth = 1817.6 m

Begin transit to **D17-J59** at 22:20 PDT, ETA for this site 02:00 PDT.

Day 5: Wednesday October 19 2011. Deployed locations (J59, J51, J44)

Arrive at **D17-J59** site at 02:00 PDT (09:00z, JD:292)

This is LDEO instrument C4. The instrument is in the water at 02:35 PDT. Drop location: 47° 30.588'N 125° 24.900'W depth = 989 m.

*After deployment we determined we were at the wrong drop location. We will recover the instrument to redeploy. The error was caused by the science party passing along incorrect position to the bridge.

Instrument recovered at 04:00 PDT. It will be re-fitted with new anchors as we begin steam to the correct deployment site.

Arrive at correct **D17-J59** site at 08:40 PDT. LDEO OBS C4 in water at 09:15 PDT (16:15z).

Deployment location 47° 30.565'N 126° 2.859'W depth = 2392 m.

Instrument on bottom at 10:08 PDT (17:08z, JD:292). Begin survey.

D17-J59 surveyed position: 47° 30.5731'N, 126° 24.9177'W, depth = 2371.0 m.

At 10:55 PDT, begin transit to next deployment location **D18-J51**. Winds are light at 5 knts out of the North, swells 3-5 feet.

This is LDEO OBS instrument C9. Arrive at the deployment site for **D18-J51** at 15:19 PDT.

The instrument is in the water at 15:35 PDT (22:34 GMT) 46° 47.792'N 126° 9.826'W depth = 2630 m.

Time to bottom is 65 minutes, on bottom at 16:34 PDT (23:34z). Begin survey, completed at 17:30 PDT (00:30z, JD:293).

D18-J51 surveyed position: 46° 47.8178'N 126° 09.8465, depth = 2610.0 m.

At 17:30 PDT, begin transit to site **D19-J44**. Arrive on site at d19-J44 at 22:05 PDT.

D19-J44 is instrument SIO Abalone #5, in the water at 22:15 PDT (JD 293, 05:15 GMT). Deployment location is 46 19.05'N 127 02.325'W, depth = 2723 m.

Instrument on bottom at 23:04 PDT, begin survey. Survey ends at 23:45 PDT (07:45z, JD 293).

D19-J44 surveyed position: 46° 19.3820'N 127° 02.3401'W depth = 2724.0 m.

At 23:46 PDT, begin transit to **D20-J36**.

Day 6: Thursday October 20, 2011. Stations Deployed (J36, J43, J35)

Arrive at station **D20-J36** at 03:45 PDT (10:45z, JD:293)

This is SIO OBS #2, in water at 04:05 PDT (11:05Z). Deployment location is 45° 41.108'N 127° 03.82'W depth = 2072 m.

Instrument on bottom at 04:55 PDT, begin survey. Survey ends at 05:40 PDT.

D20-J36 surveyed position: 45° 41.1315'N 127° 07.3500'W, depth = 2821.0 m

At 05:55PDT begin transit to site **D21-J43**.

Arrive on site D21-J43 at 11:30 PDT. Arrive on site D31-J43 at 10:40 PDT. Wind is 12 knts out of the east (090 degrees), swell 2-3 feet.

SIO Instrument #01 in water at 10:43 PDT (17:43Z), location 46° 8.292'N 126° 10.364'W, depth = 2678 m.

Instrument on bottom at 11:30 PDT, begin surveying position. Survey completed at 12:15 PDT (19:15z, JD:293).

D21-J43 surveyed position: 46° 08.2696'N 126° 10.3250'W, depth = 2654.0 m.

Begin transit to site **D22-J35** at 12:30 PDT. Arrive on site at 16:15 PDT.

SIO Instrument Abalone #9 in water at 16:30 PDT (23:30 Z) . Deployment **D22-J35** location is 45° 29.918'N 126° 15.982'W depth = 2684 m.

Instrument on bottom at 17:30 PDT, commence survey. Survey completed at 18:45 PDT (01:45z, JD: 294)

D22-J35 surveyed position: 45° 29.9339'N 126° 16.0069'W depth = 2662.0 m.

Begin transit to next site, **D23-J26**. ETA is 00:45 PDT

Day 7: Friday October 21, 2011. Stations Deployed (J26,Y1M8, J25)

Arrive on site **D23-J26** at 12:55 PDT. The instrument to be deployed is LDEO #C7.

LDEO has 1 hour of prep work before deployment. The sensor was dropped on the deck during installation, LDEO worked to repair before deploying.

The OBS was checked out and deployed at 02:53 PDT (09:53 z). The deployment location was 44° 39.310'N, 125° 27.969'W, depth = 2880 m.

The OBS is on bottom at 04:00 PDT. Survey ends at 05:45 PDT (12:45z JD:293).

D23-J26 surveyed position: 44° 39.2822'N 125° 27.9826 'W depth = 2864.0 m.

Release disabled, begin transit to **D24-Y1M8**. On site D24-Y1M8 at 08:45PDT. This is SIO Abalone instrument #6.

In water at 09:00 PDT (16:00 GMT, JD: 294). On bottom at 09:05 PDT. 44° 7.123'N 124° 53.713'W, depth = 130 m.

Begin survey. Survey ends at 09:15 PDT (16:15z JD: 294).

D24-Y1M8 surveyed position: 44° 07.1237 124° 53.7209'W, depth = 126.4 m.

09:30 PDT, begin transit to Newport to pick up spare Abalone anchor.

15:30 PDT, arrive at OSU pier, pick up anchor and head back to deploy SIO Abalone at site **D25-J25**.

This is SIO OBS #11. Arrived at site 17:55 PDT, in water 18:05 PDT. Deployed at 44° 28.362'N 124° 37.309'W, Depth = 144 m.

On bottom 18:08 PDT. Begin survey, which ends at 18:20 PDT (01:20z, JD:295)

D25-J25 surveyed position: 44° 28.3710'N 124° 37.2968'W, depth = 143.0 m.

This is final mooring. Release disabled; begin transit to Newport at 18:30 PDT.

Arrive Newport at 20:00 PDT.

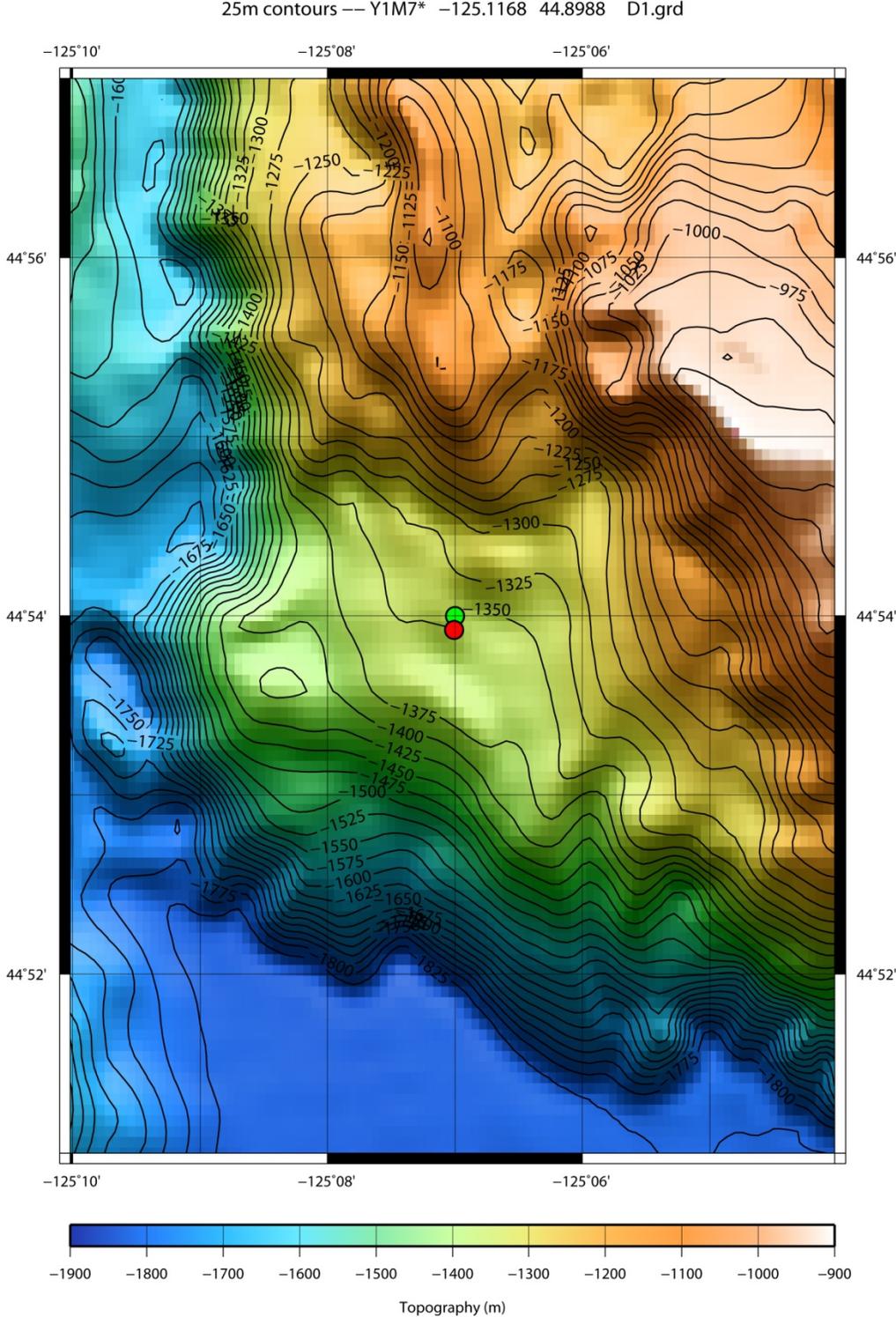
Table 1: Target and Surveyed Deployment Locations

| Target Location | | | | | | | | | | Survey Location | | | | | | |
|-----------------|----------|------------|----------|-------|---|-----------|-------|---|-----------|-----------------|---------|---|-----------|---------|---|-----------|
| Station Number | Activity | Instrument | Latitude | | | Longitude | | | Depth (m) | Latitude | | | Longitude | | | Depth (m) |
| | | | Deg. | Min. | | Deg. | Min. | | | Deg. | Min. | | Deg. | Min. | | |
| 1 | Y1M7* | SIO-015 | 44 | 53.93 | N | 125 | 07.01 | W | 1350 | 44 | 53.9252 | N | 125 | 7.009 | W | 1356 |
| 2 | J33 | SIO-016 | 45 | 06.40 | N | 124 | 34.24 | W | 363 | 45 | 6.3972 | N | 124 | 34.2473 | W | 349 |
| 3 | J34 | LDEO-C01 | 45 | 18.35 | N | 125 | 24.94 | W | 2562 | 45 | 18.3392 | N | 125 | 24.8696 | W | 2574 |
| 4 | Y1M6 | LDEO-C08 | 45 | 31.80 | N | 124 | 55.59 | W | 1447 | 45 | 31.7679 | N | 124 | 55.6101 | W | 1438 |
| 5 | J-42* | LDEO-C05 | 45 | 56.00 | N | 125 | 18.00 | W | 1568 | 45 | 55.9831 | N | 125 | 17.9839 | W | 1540 |
| | CTD | | 45 | 56.01 | N | 125 | 18.01 | W | 1568 | | | | | | | |
| 6 | Y1M5* | SIO-014 | 46 | 10.50 | N | 124 | 56.00 | W | 951 | 46 | 10.4076 | N | 124 | 56.0743 | W | 828 |
| 7 | J50 | LDEO-C02 | 46 | 38.40 | N | 125 | 18.00 | W | 1908 | 46 | 38.4093 | N | 125 | 17.9432 | W | 1908 |
| 8 | CFN16* | LDEO-C06 | 46 | 48.00 | N | 125 | 31.00 | W | 1869 | 46 | 47.9761 | N | 125 | 30.9682 | W | 1907 |
| 9 | J57 | SIO-007 | 47 | 4.8 | N | 124 | 27 | W | 59 | 47 | 4.8053 | N | 124 | 27.0276 | W | 56 |
| 10 | J58 | LDEO-C03 | 47 | 19.08 | N | 125 | 31.93 | W | 1543 | 47 | 19.1266 | N | 125 | 32.0651 | W | 1510 |
| 11 | Y1M4* | SIO-010 | 47 | 33.53 | N | 125 | 11.55 | W | 750 | 47 | 33.4855 | N | 125 | 11.5305 | W | 563 |
| 12 | J65 | SIO-013 | 47 | 53.51 | N | 125 | 08.38 | W | 169 | 47 | 53.4806 | N | 125 | 8.3776 | W | 165 |
| 13 | Y1M2* | SIO-004 | 48 | 18.25 | N | 125 | 36.00 | W | 138 | 48 | 18.4194 | N | 125 | 36.0236 | W | 139 |
| 14 | J73* | SIO-003 | 48 | 46.01 | N | 126 | 11.55 | W | 145 | 48 | 46.0607 | N | 126 | 11.55 | W | 143 |
| 15 | Y1M1* | SIO-008 | 49 | 09.03 | N | 126 | 43.20 | W | 124 | 49 | 9.0254 | N | 126 | 43.3277 | W | 133 |
| 16 | Y1M3 | LDEO-C10 | 47 | 53.44 | N | 126 | 06.31 | W | 1758 | 47 | 53.2956 | N | 126 | 6.2372 | W | 1817 |
| 17 | J59 | LDEO-C04 | 47 | 30.58 | N | 126 | 24.88 | W | 2366 | 47 | 30.5731 | N | 126 | 24.9177 | W | 2370 |
| 18 | J51 | LDEO-C09 | 46 | 47.78 | N | 126 | 09.83 | W | 2623 | 46 | 47.8178 | N | 126 | 9.8465 | W | 2610 |
| 19 | J44 | SIO-005 | 46 | 19.51 | N | 127 | 02.34 | W | 2717 | 46 | 19.382 | N | 127 | 2.3401 | W | 2724 |
| 20 | J36 | SIO-002 | 45 | 41.10 | N | 127 | 07.40 | W | 2838 | 45 | 41.1315 | N | 127 | 7.35 | W | 2821 |
| 21 | J43 | SIO-001 | 46 | 08.29 | N | 126 | 10.36 | W | 2650 | 46 | 8.2696 | N | 126 | 10.325 | W | 2654 |
| 22 | J35 | SIO-009 | 45 | 29.91 | N | 126 | 15.99 | W | 2661 | 45 | 29.9339 | N | 126 | 16.0069 | W | 2662 |
| 23 | J26 | LDEO-C07 | 44 | 39.30 | N | 125 | 27.98 | W | 2854 | 44 | 39.2822 | N | 125 | 27.9826 | W | 2864 |
| 24 | Y1M8* | SIO-006 | 44 | 07.10 | N | 124 | 53.76 | W | 131 | 44 | 7.1237 | N | 124 | 53.7209 | W | 126 |
| 25 | J25* | SIO-011 | 44 | 28.35 | N | 124 | 37.31 | W | 145 | 44 | 28.371 | N | 124 | 37.2968 | W | 143 |

* - Denotes station locations that were adjusted to accommodate fishing concerns.

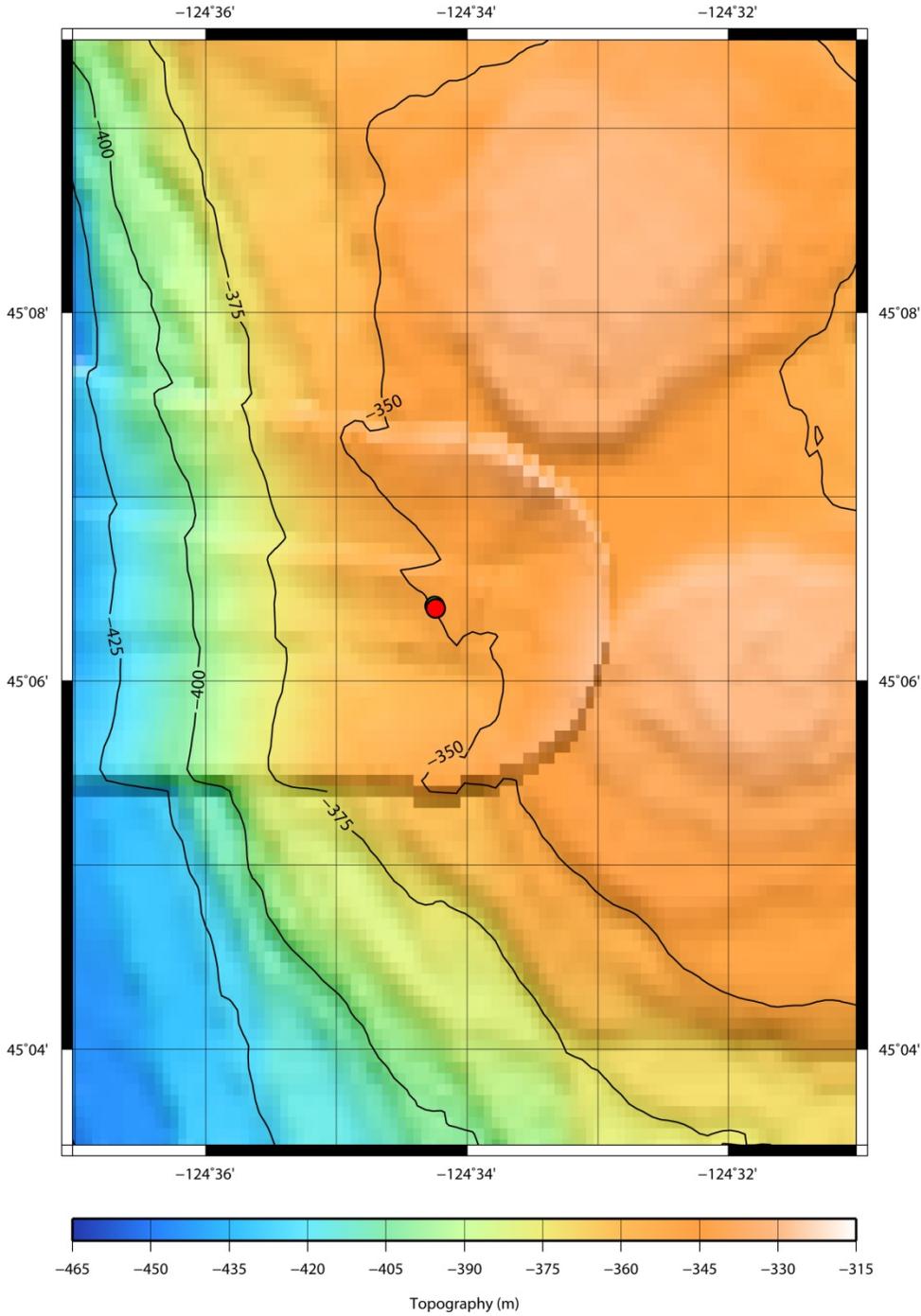
Appendix 1: Bathymetry of surveyed area. Green circles denotes target locations, red are surveyed locations. All contours are 25 m.

D1-Y1M7 Surveyed position: 44 53.9252N; 125 0.00089W depth = 1356.0



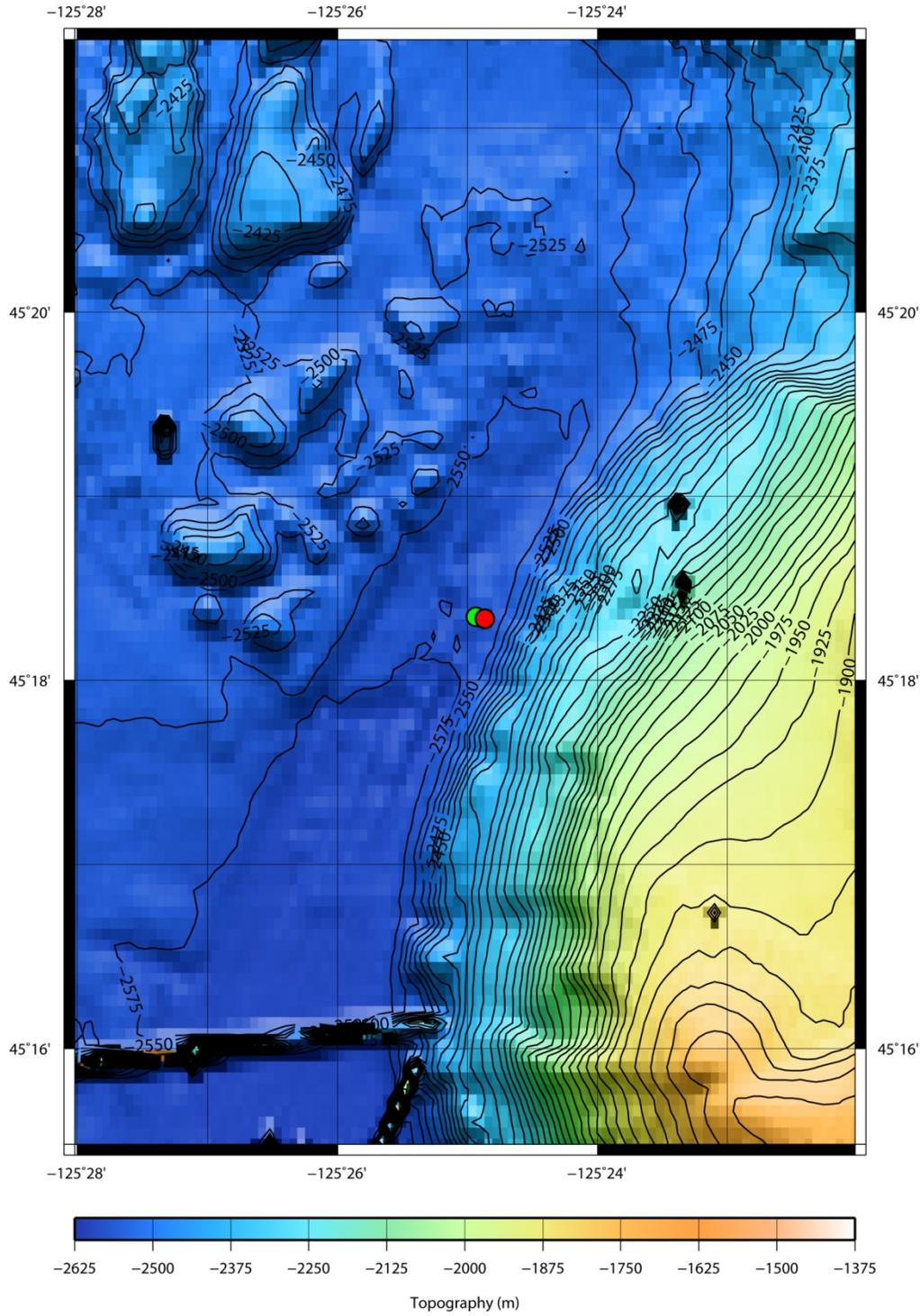
D2-I33 Surveyed position: 45 06.3972; 124 34.2473 depth = 348.0 m

25m contours --- J33 -124.5707 45.1066 D2.grd



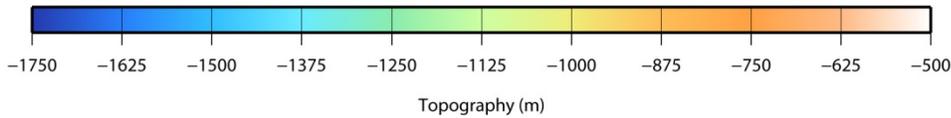
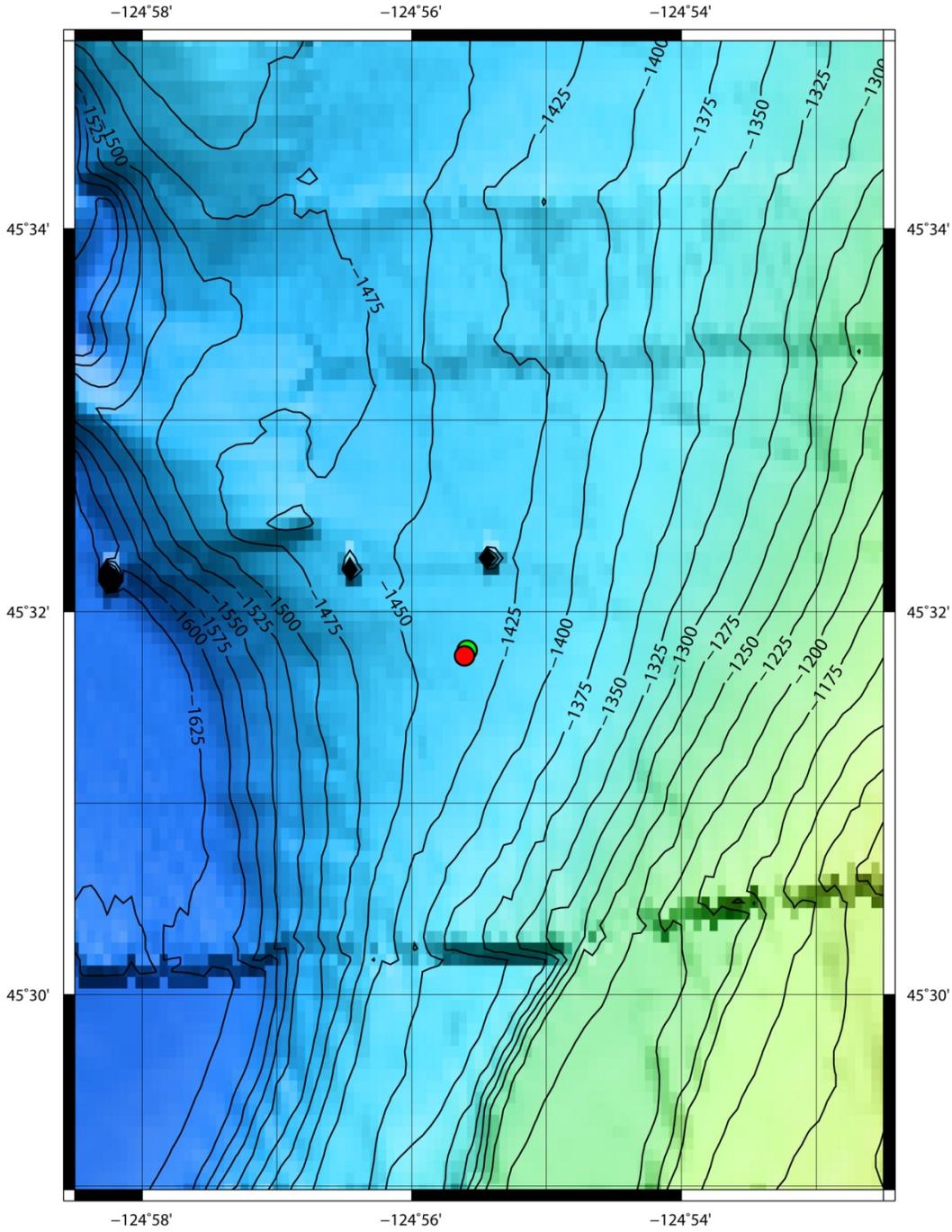
D3-J34 Surveyed position: 4518.3392; 125 24.8696, depth=2574.0

25m contours --- J34 -125.4145 45.3056 D3.grd



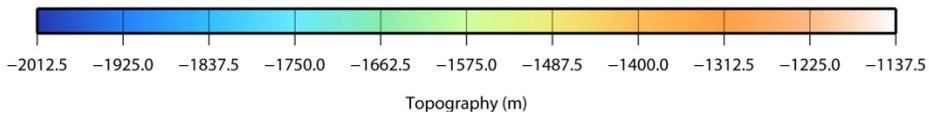
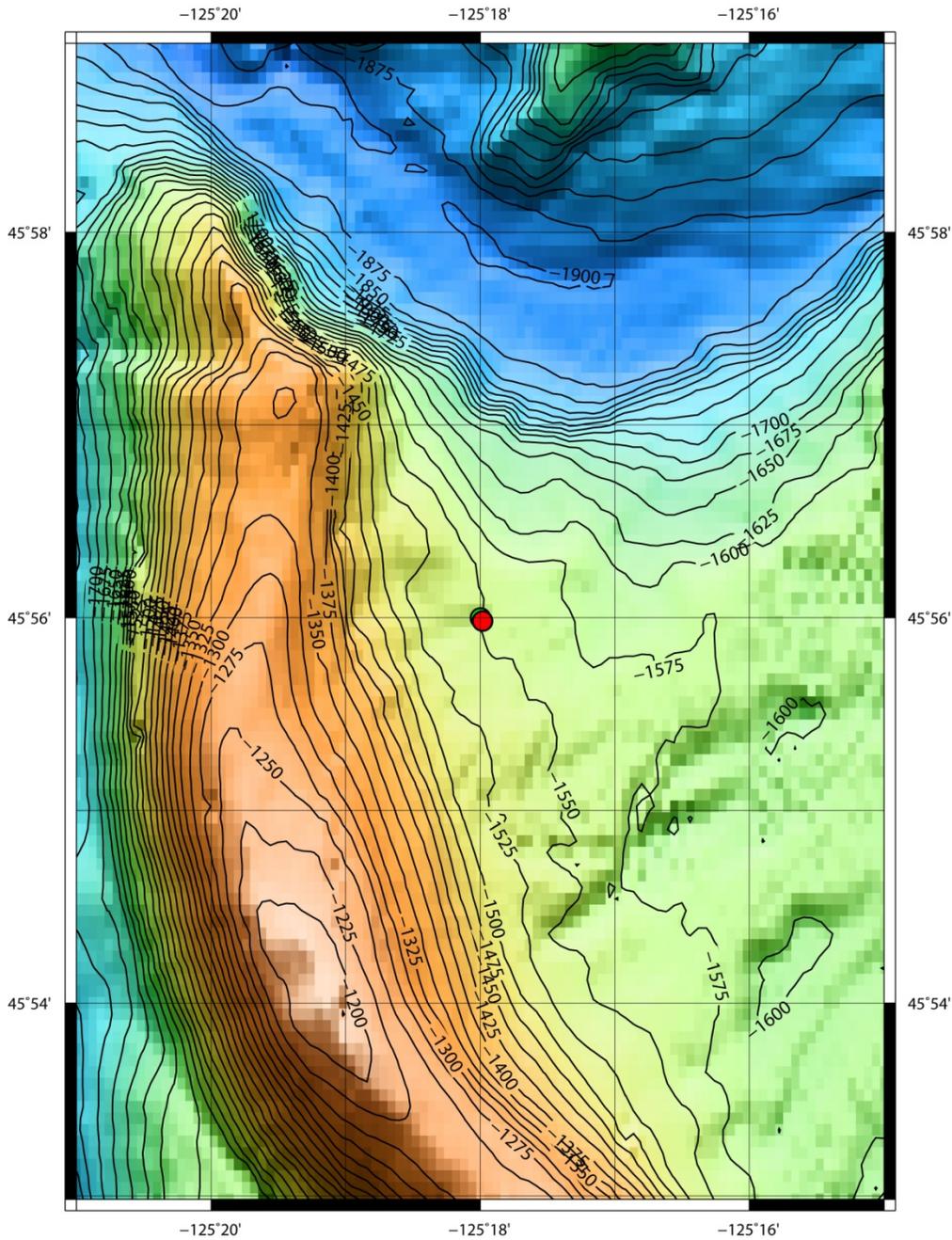
D4-Y1M6 Surveyed position: 45 31.7697; 124 55.6101 depth = 1438.5 m

25m contours --- Y1M6 -124.9268 45.5295 D4.grd



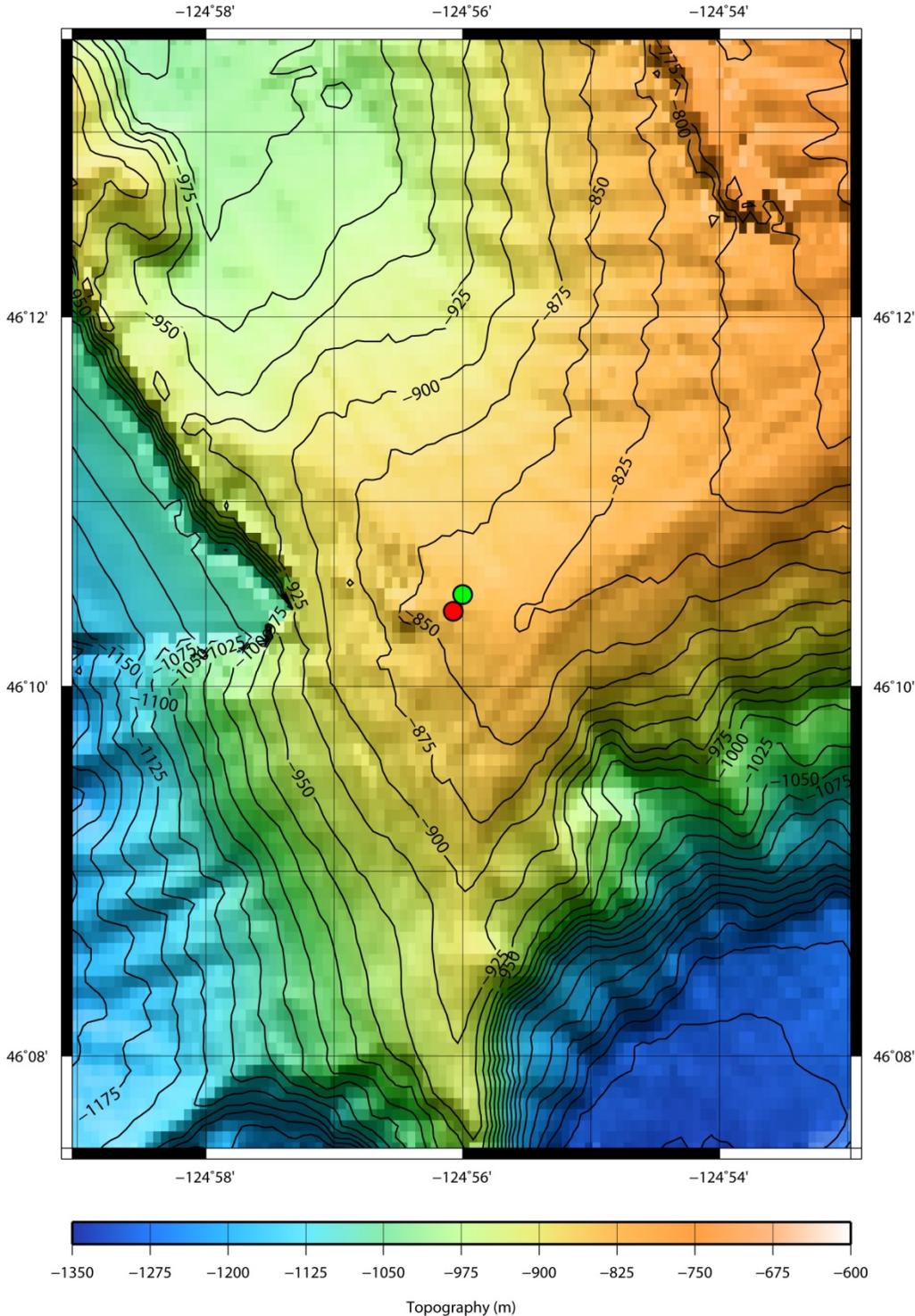
D5-I42 Surveyed position: 45 55.9831, 125 17.9839 depth = 1540.1m

25m contours -- J42 -125.2997 45.9331 D5.grd



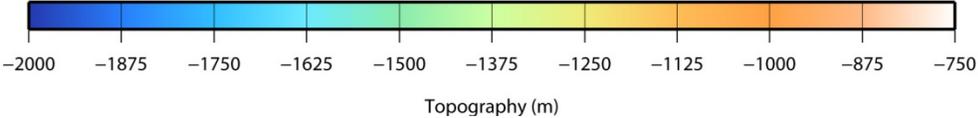
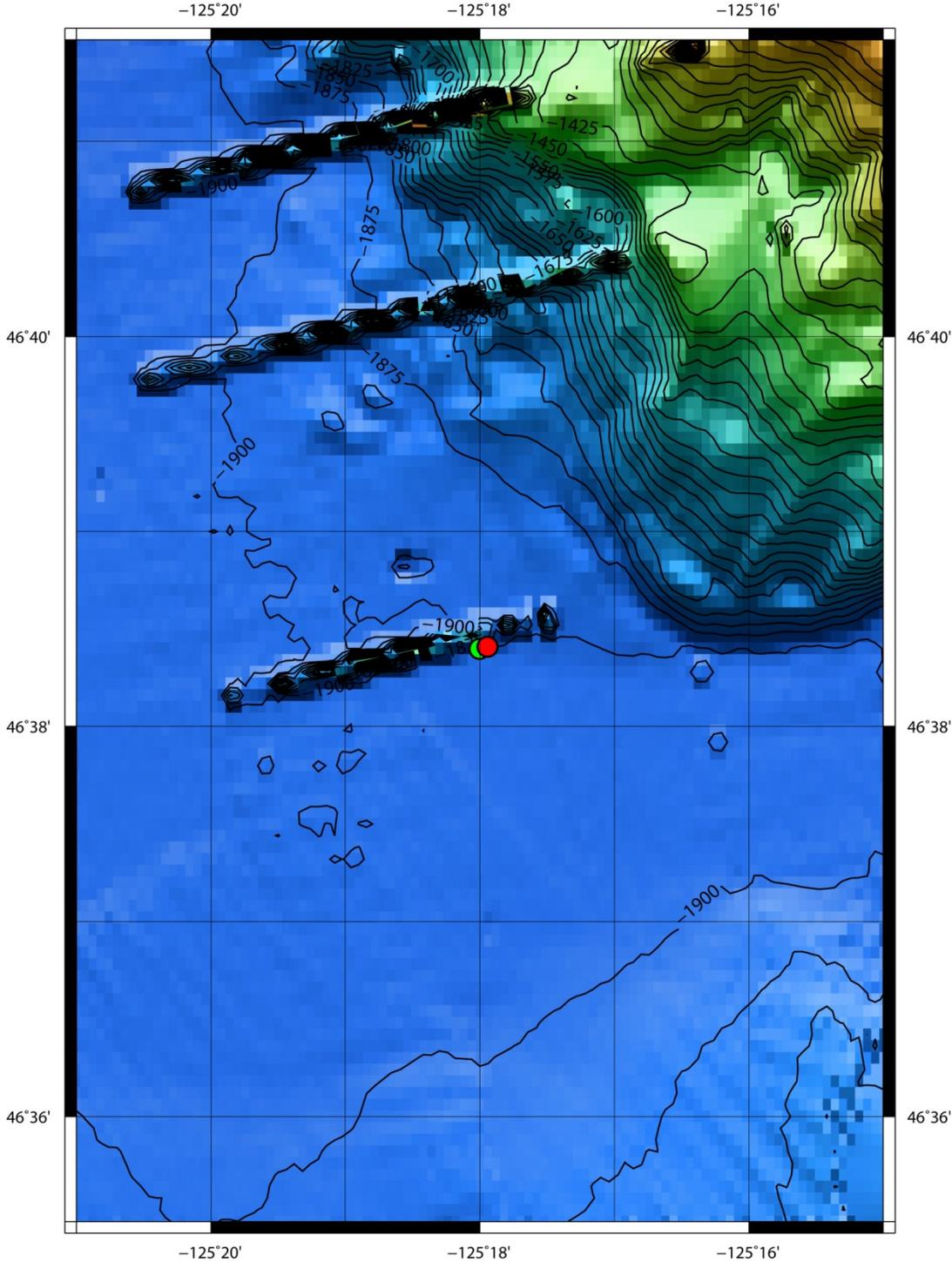
D6-Y1M5 surveyed position: 46 10.4076, 124 56.0743 depth= 828.2 m

25m contours --- Y1M5 -124.9346 46.1735 D6.grd



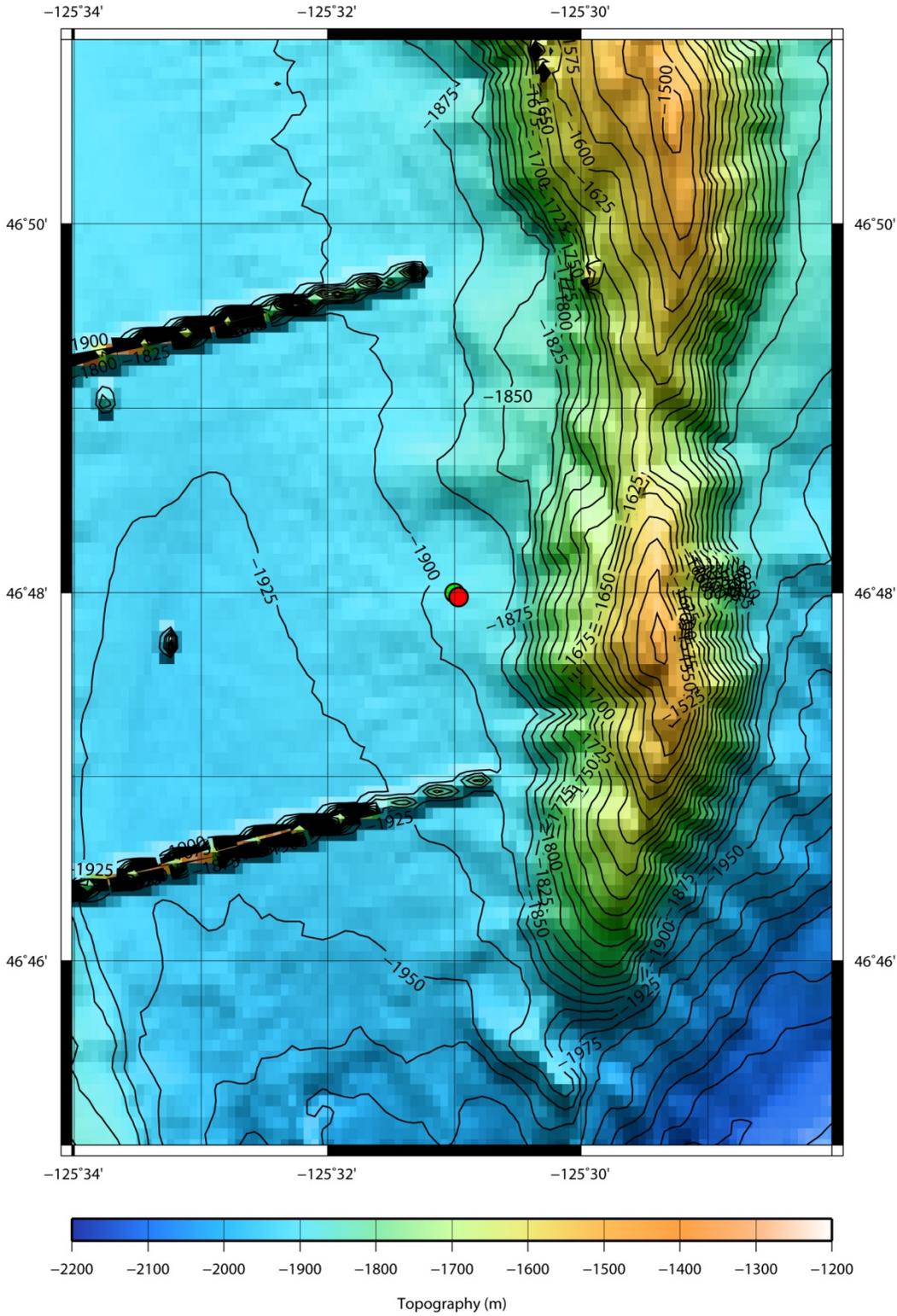
D7-150 surveyed position: 46 38.4093N, 125 17.9432'W depth =1908.0 m

25m contours -- J50 -125.2991 46.6402 D7.grd



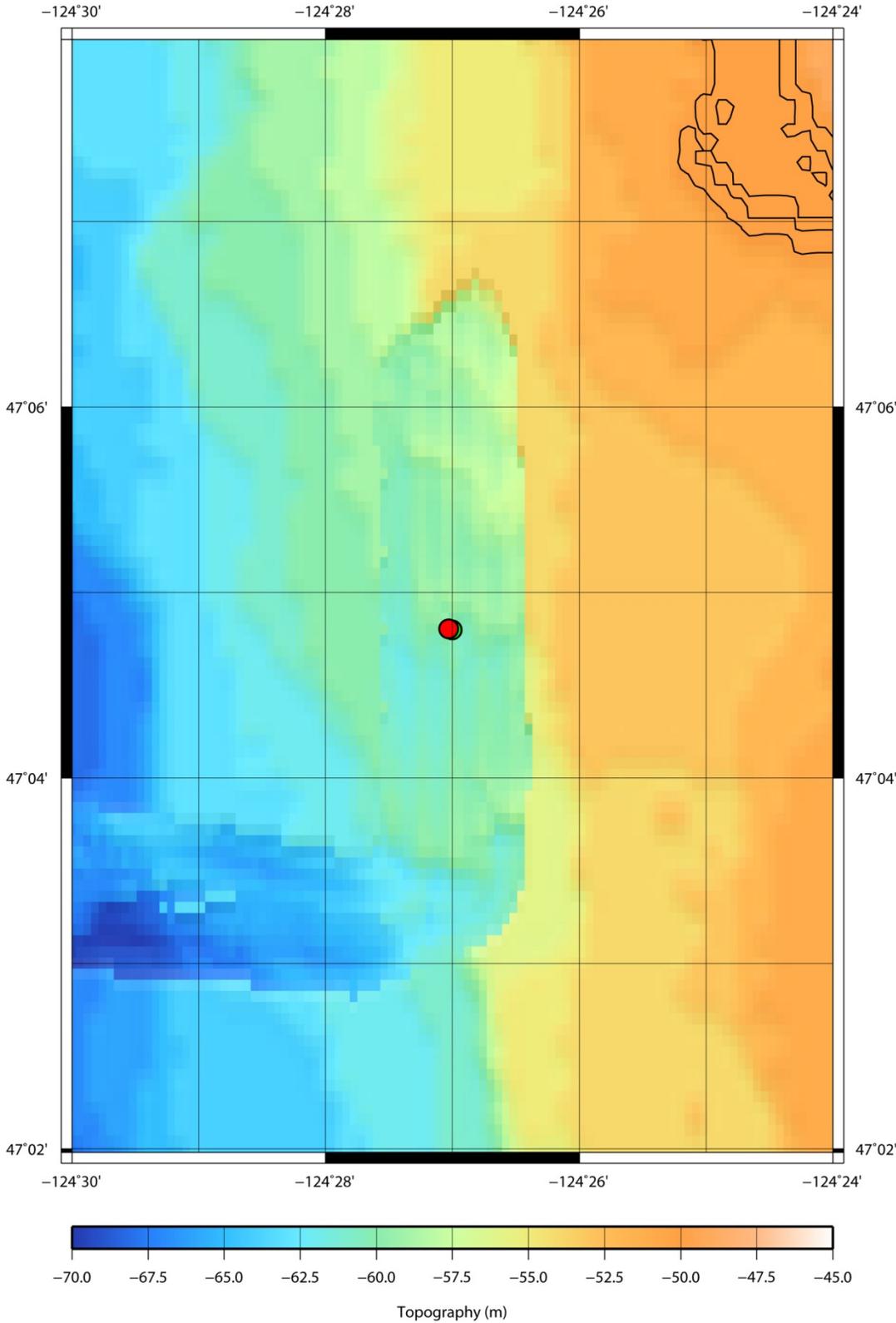
D8 CFN-16 surveyed position: 46 47.9761'N 125 30.9682'W depth=1907.3

25m contours --- CFN16 -125.5161 46.7996 D8.grd



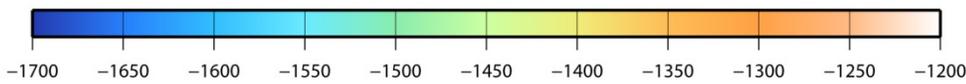
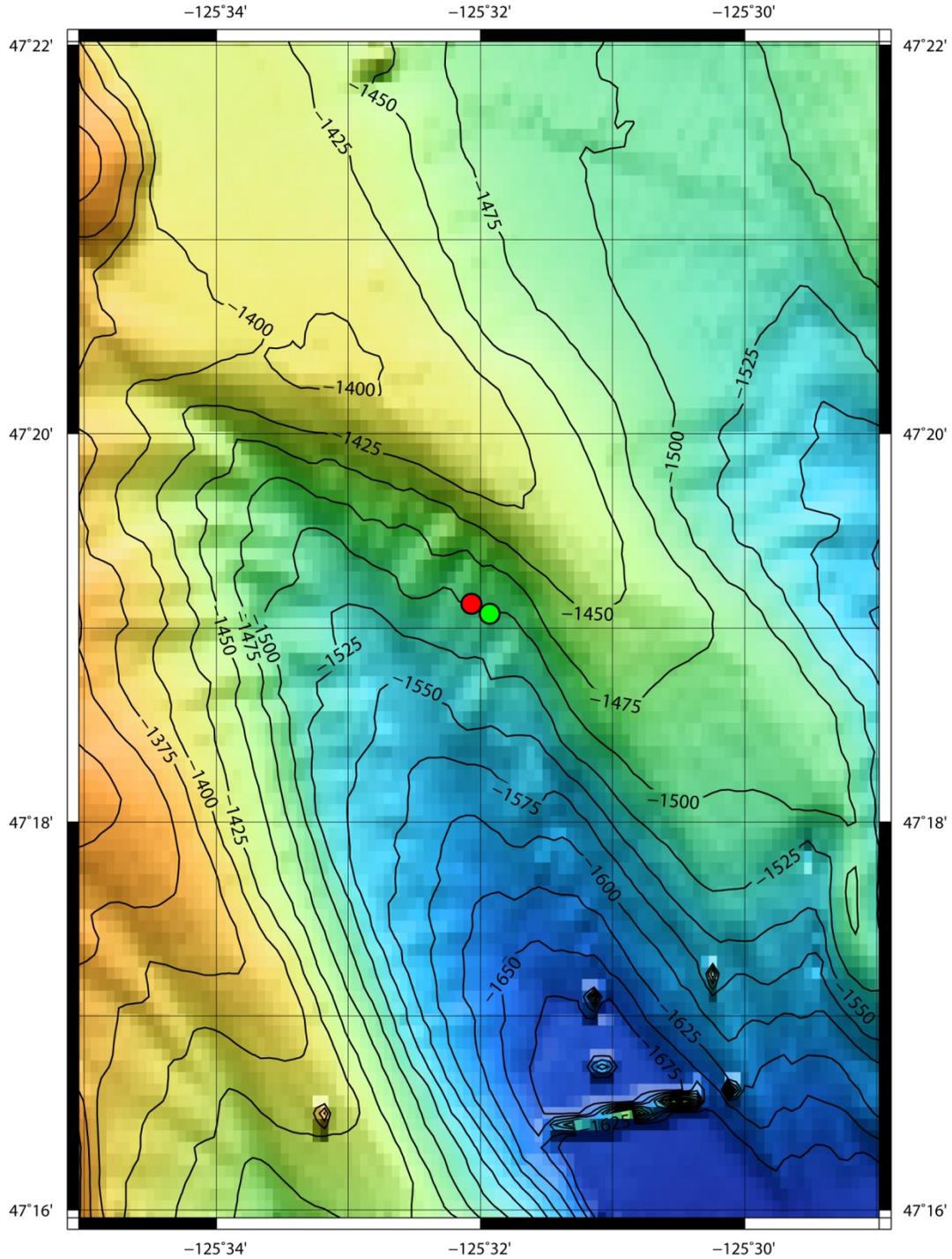
D9-I57 surveyed position: 47 04.8053, 124 27.0276W, depth = 55.8 m

25m contours -- J57 -124.4505 47.0801 D9.grd



D10-J58 surveyed position: 47 19.1266N, 125 32.0651W, depth = 1511.0 m

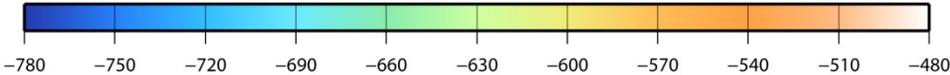
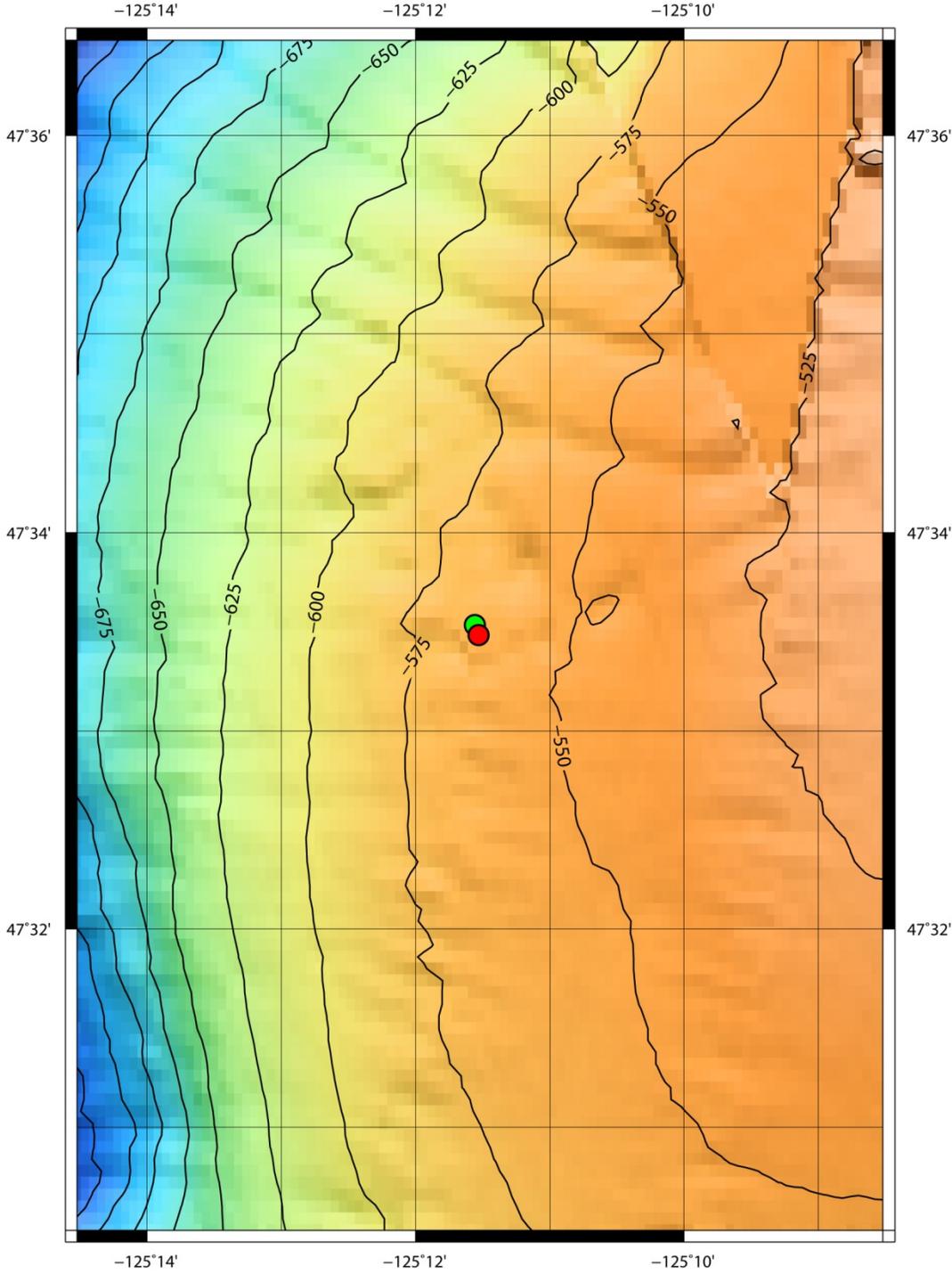
25m contours -- J58 -125.5344 47.3188 D10.grd



Topography (m)

D11-Y1M4 surveyed position: 47 33.4855 125 11.5305, depth = 563.4 m

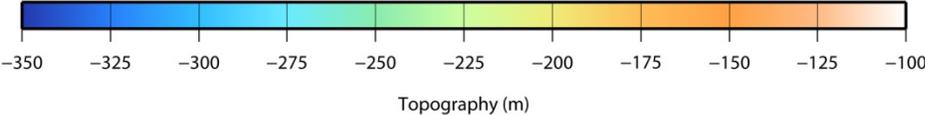
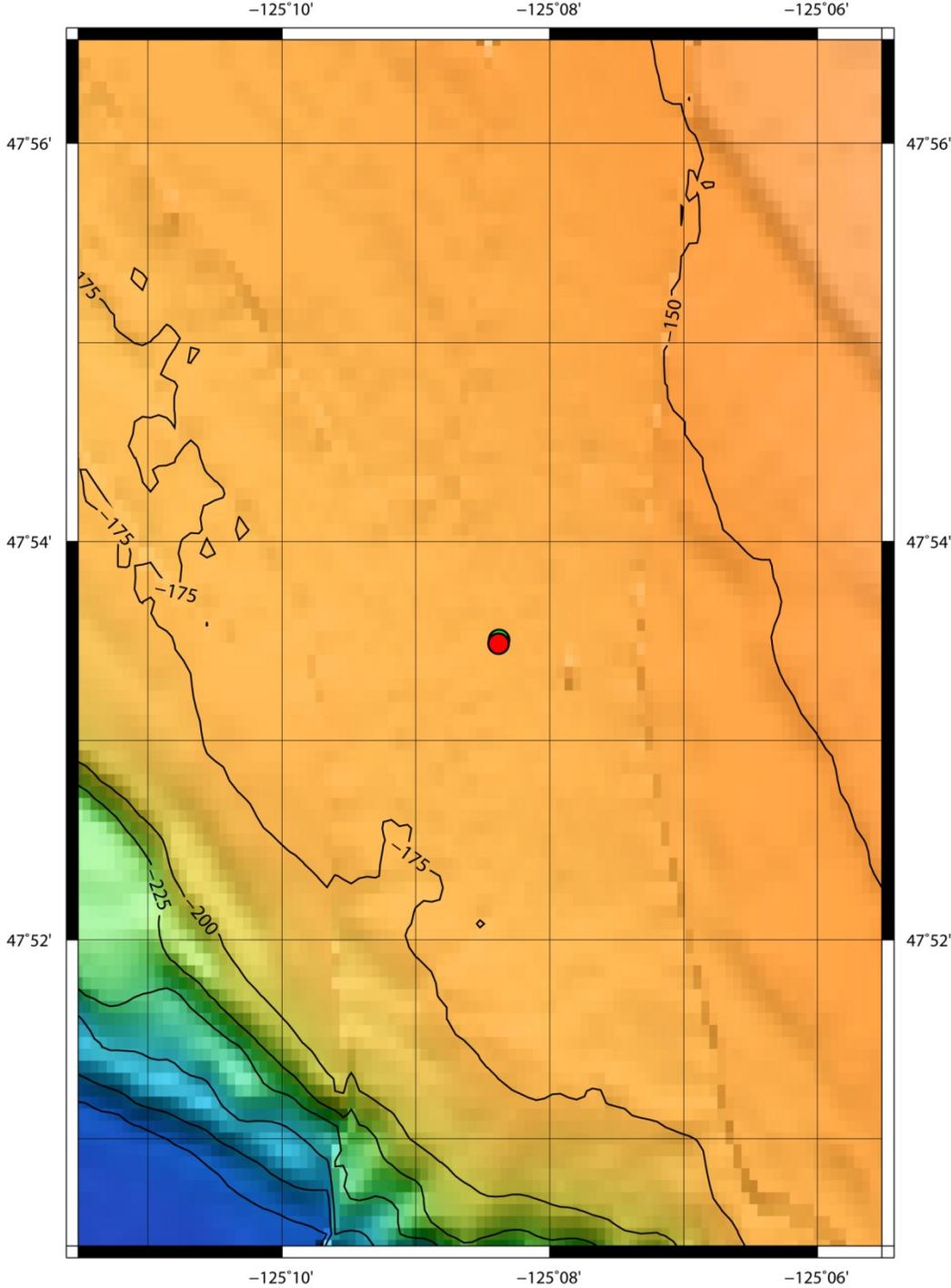
25m contours -- Y1M4* -125.1922 47.5581 D11.grd



Topography (m)

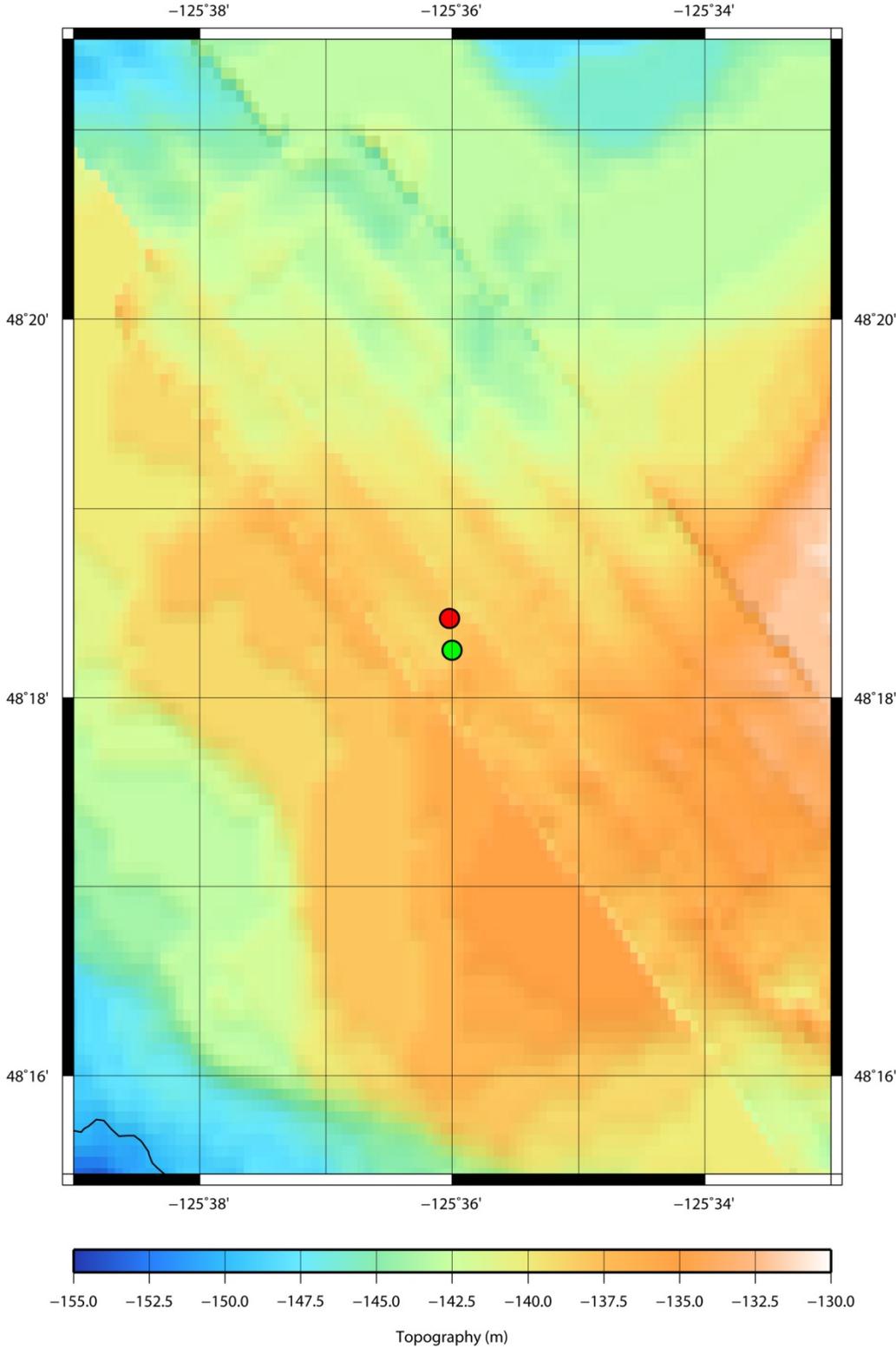
D12-J65 surveyed position: 47 53.4806N, 125 08.3776W, depth = 165.2 m

25m contours --- J65 -125.1397 47.8915 D12.grd



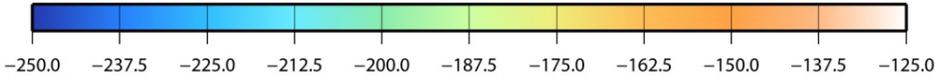
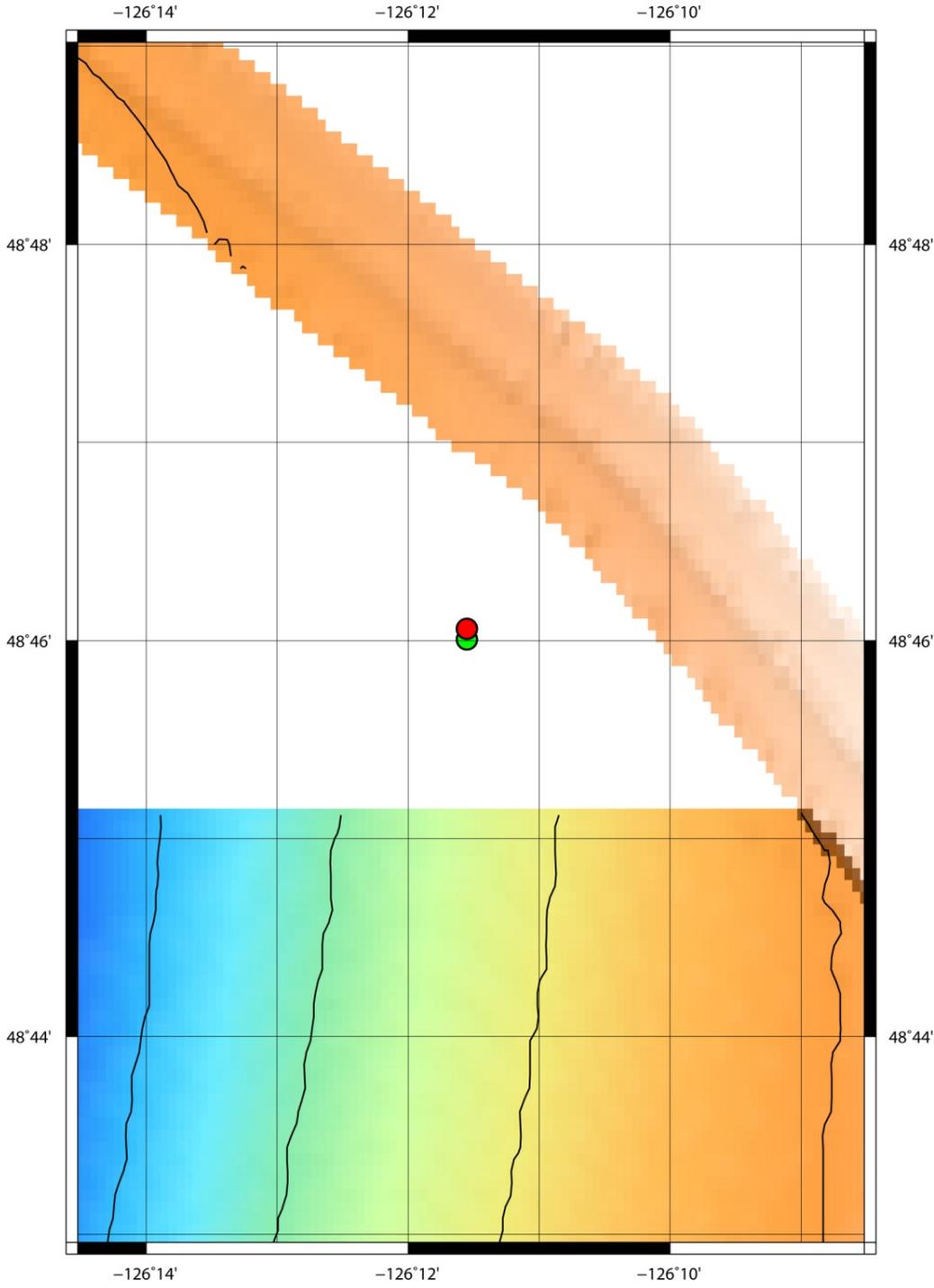
D13-Y1M2 surveyed position: 48 18.4194'N, 125 36.0236'W depth = 139.0 m

25m contours -- Y1M2* -125.6004 48.307 D13.grd



D14-J73 surveyed position: 48 46.0607'N, 126 11.550'W, depth = 143.0 m

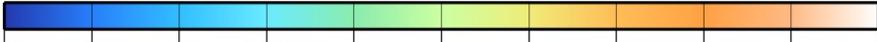
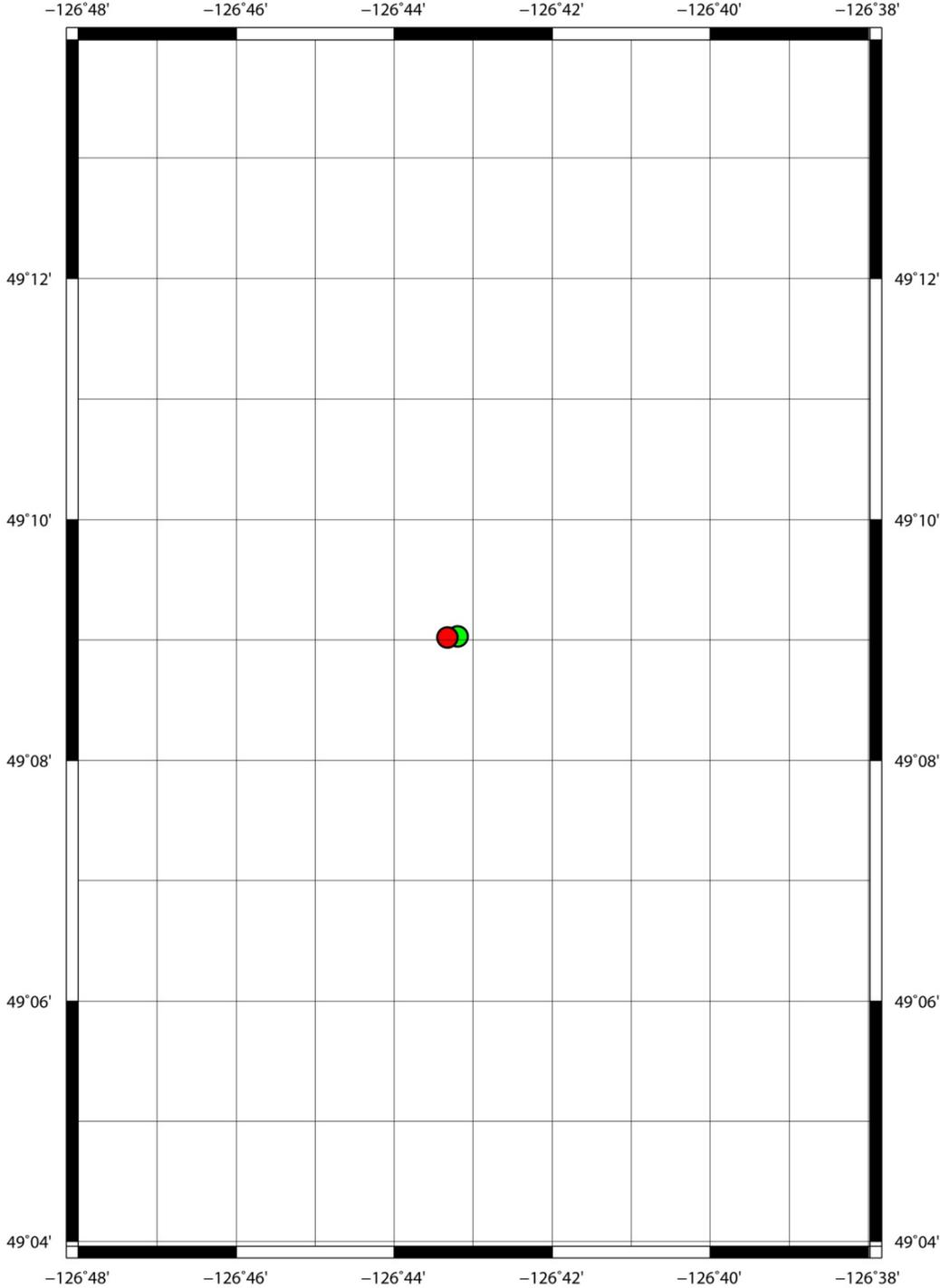
25m contours --- J73* -126.1925 48.7677 D14.grd



Topography (m)

D15-Y1M1 surveyed position: 49 09.0254'N 126 43.3277'W depth = 133.0 m.

25m contours --- Y1M1* -126.72 49.1505 D15.grd

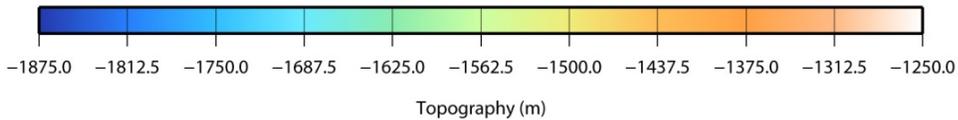
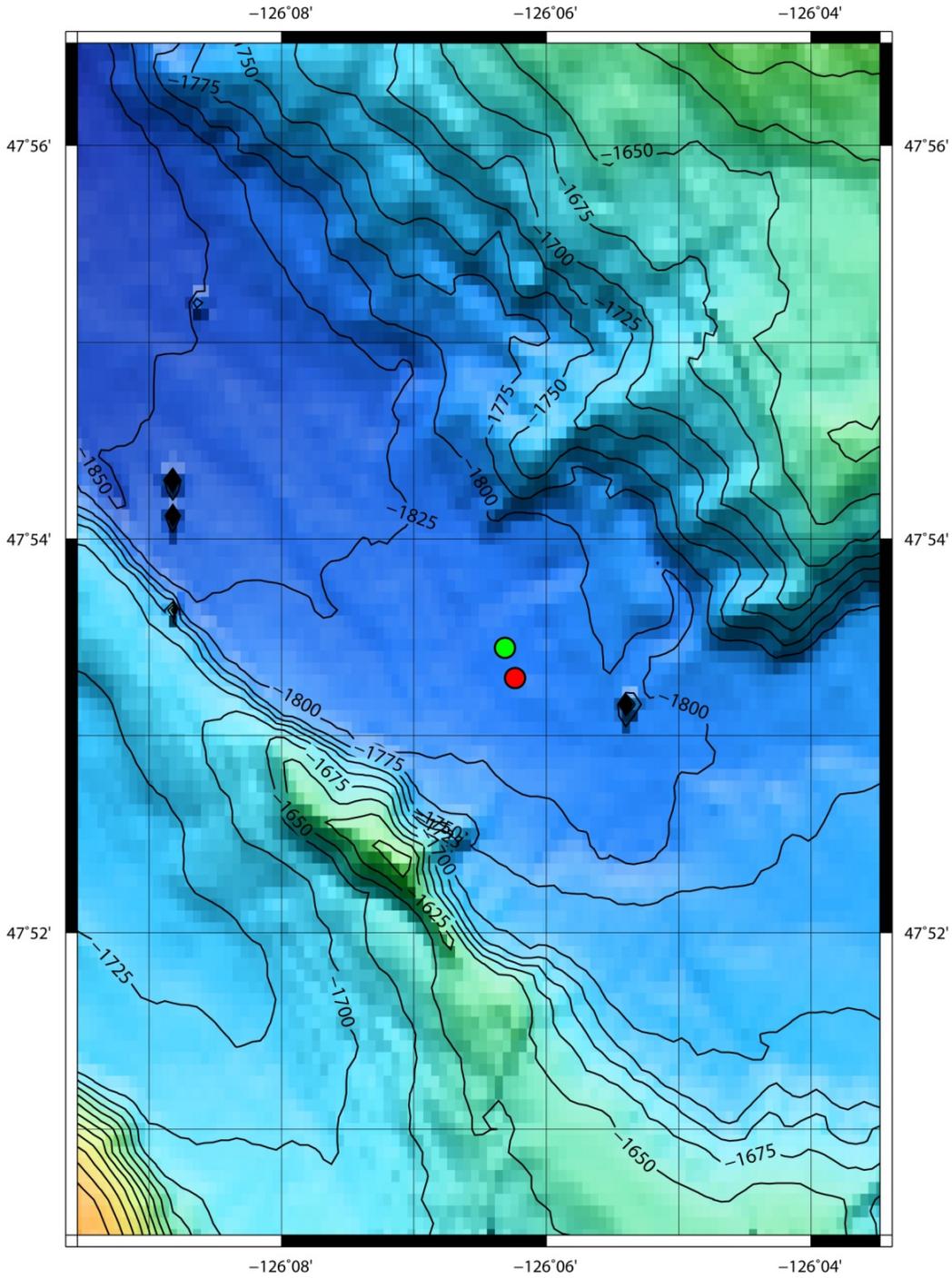


-200.375 -199.500 -198.625 -197.750 -196.875 -196.000 -195.125 -194.250 -193.375 -192.500 -191.625

Topography (m)

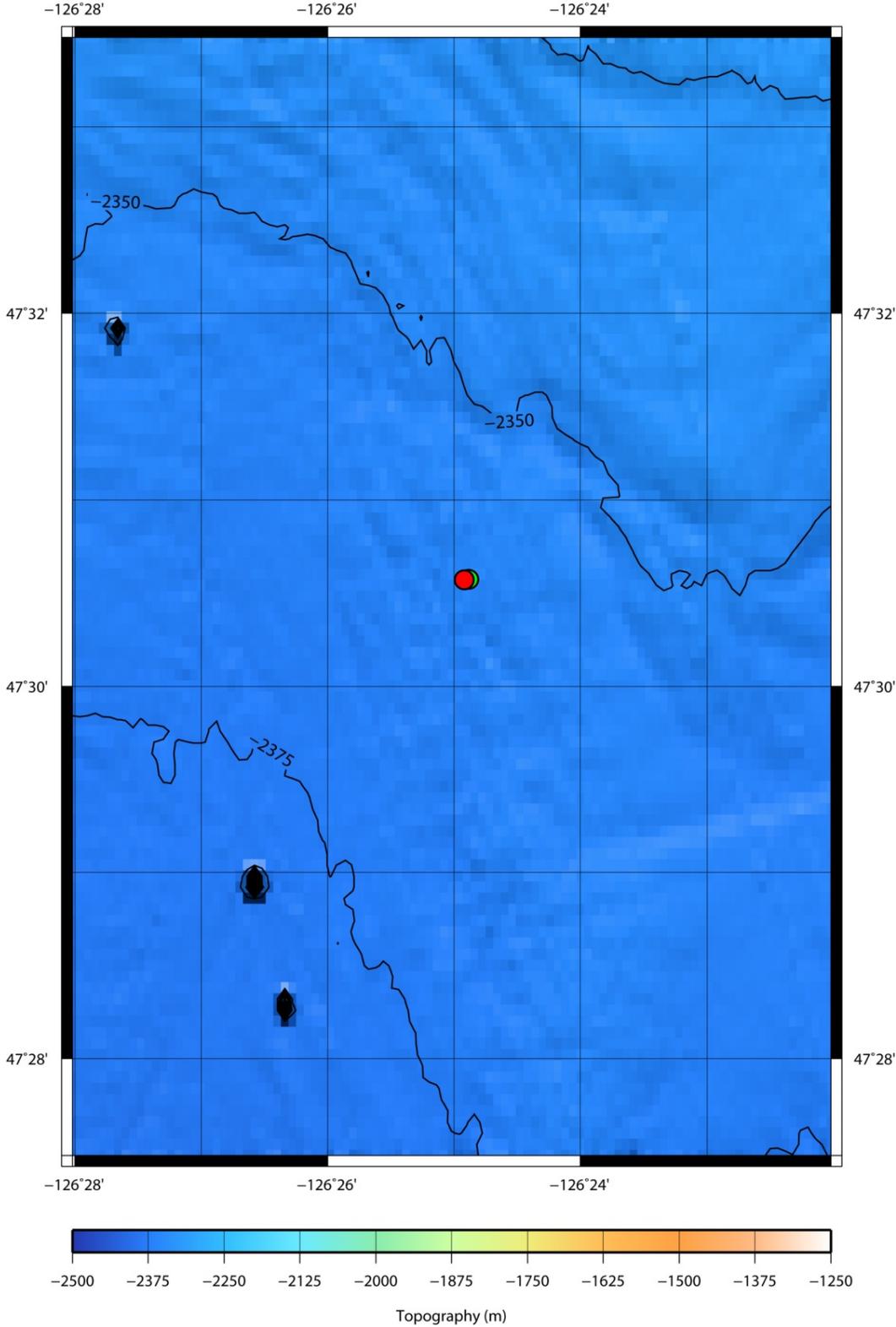
D16-Y1M3 surveyed position: 47 53.2956'N, 126 06.2372 depth = 1817.6 m

25m contours -- Y1M3 -126.104 47.8883 D16.grd



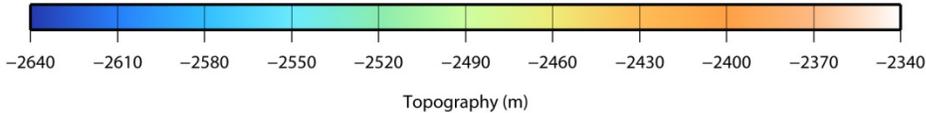
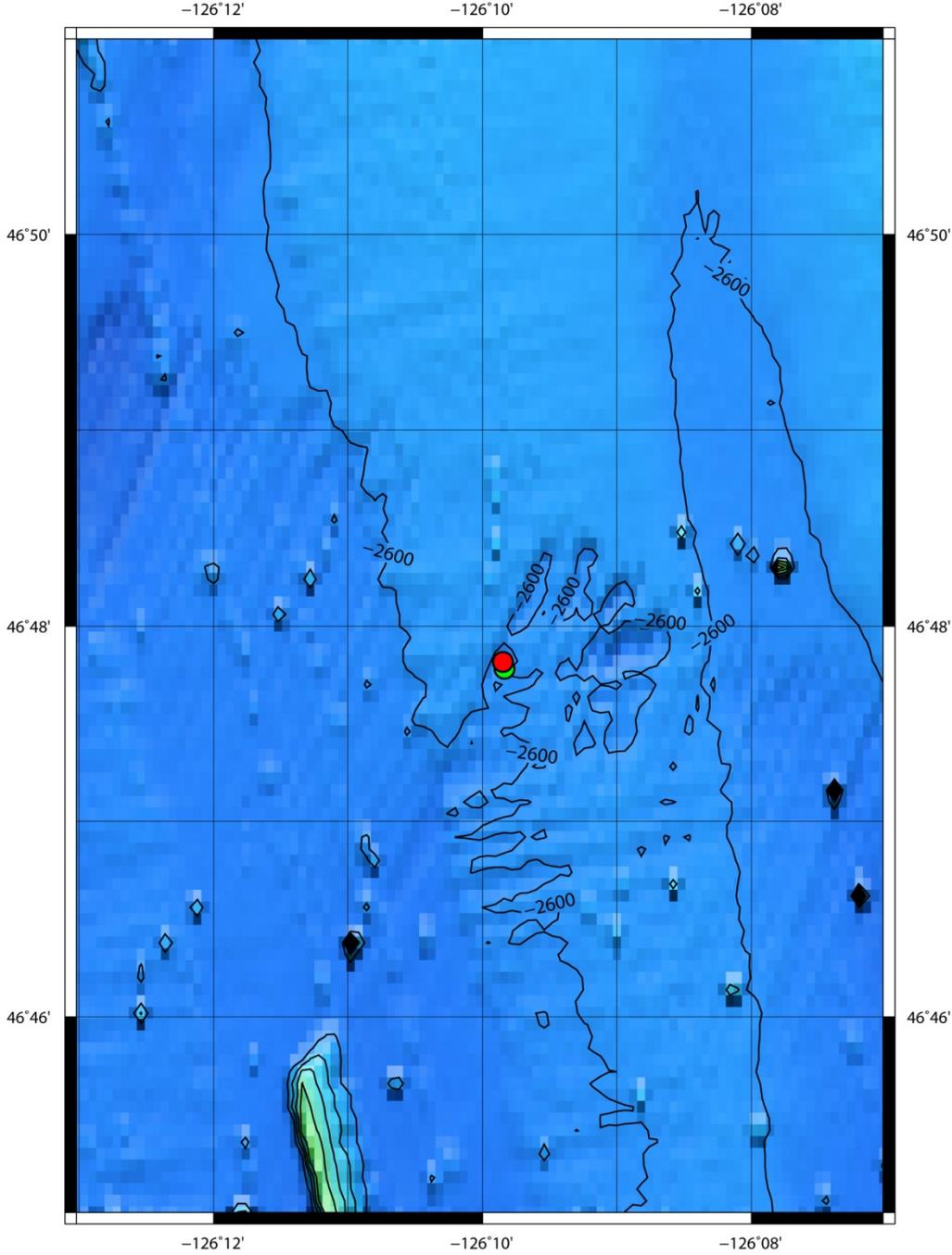
D17-J59 surveyed position: 47 30.5731'N, 126 24.9177'W, depth = 2371.0 m.

25m contours --- J59 -126.4153 47.5096 D17.grd



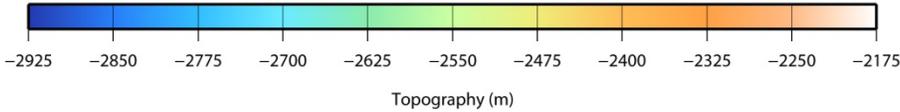
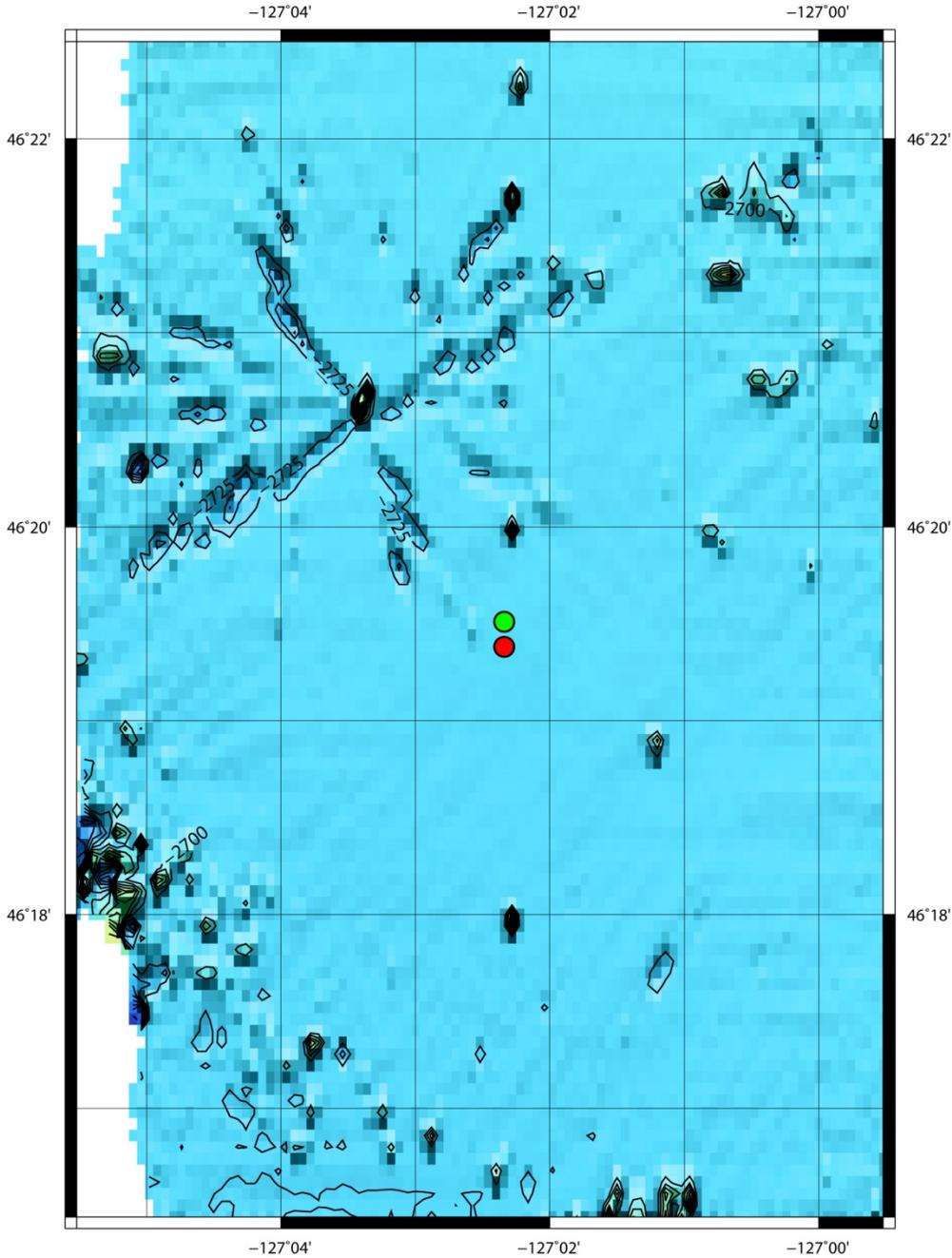
D18-J51 surveyed position: 46 47.8178'N 126 09.8465, depth = 2610.0 m.

25m contours --- J51 -126.1641 46.797 D18.grd



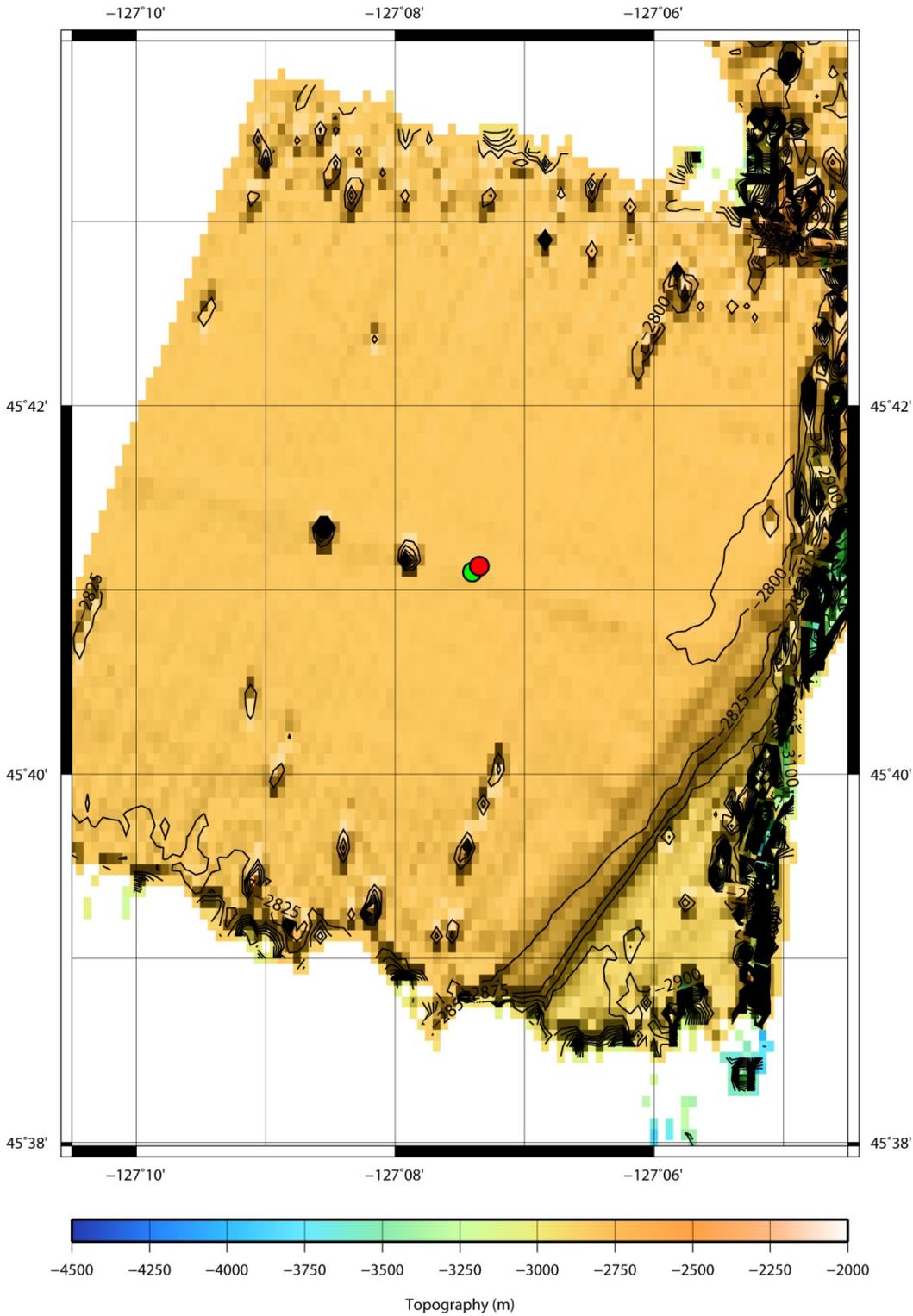
D19-J44 surveyed position: 46 19.3820'N 127 02.3401'W depth = 2724.0 m.

25m contours --- J44 -127.039 46.323 D19.grd



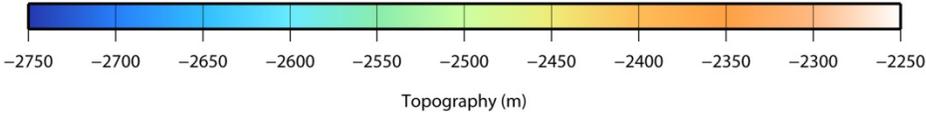
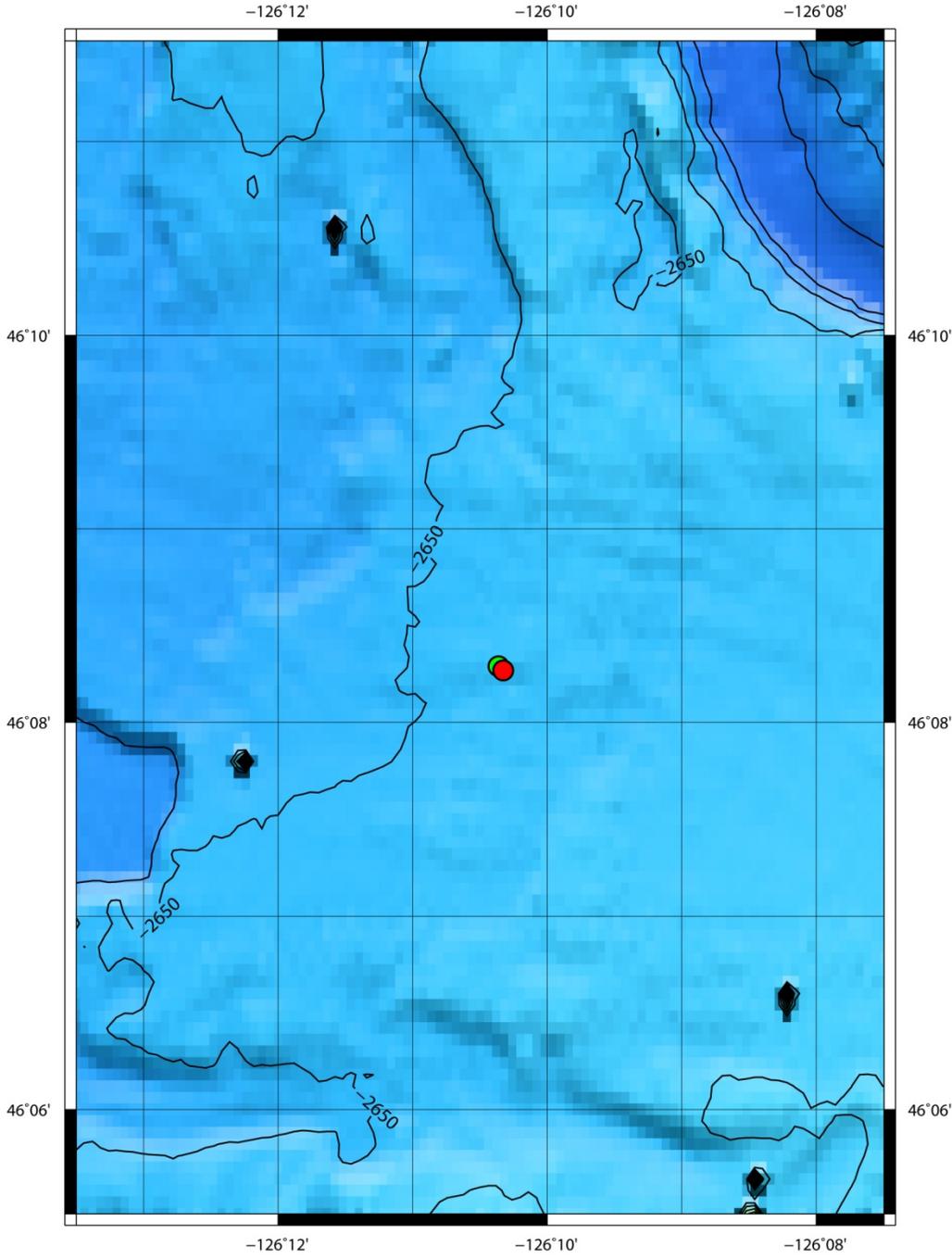
D20-J36 surveyed position: 45 41.1315'N 127 07.3500'W depth = 2821.0 m

25m contours -- J36 -127.1225 45.6855 D20.grd



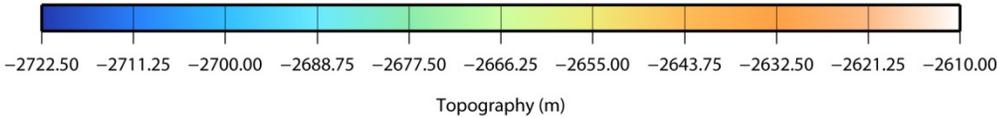
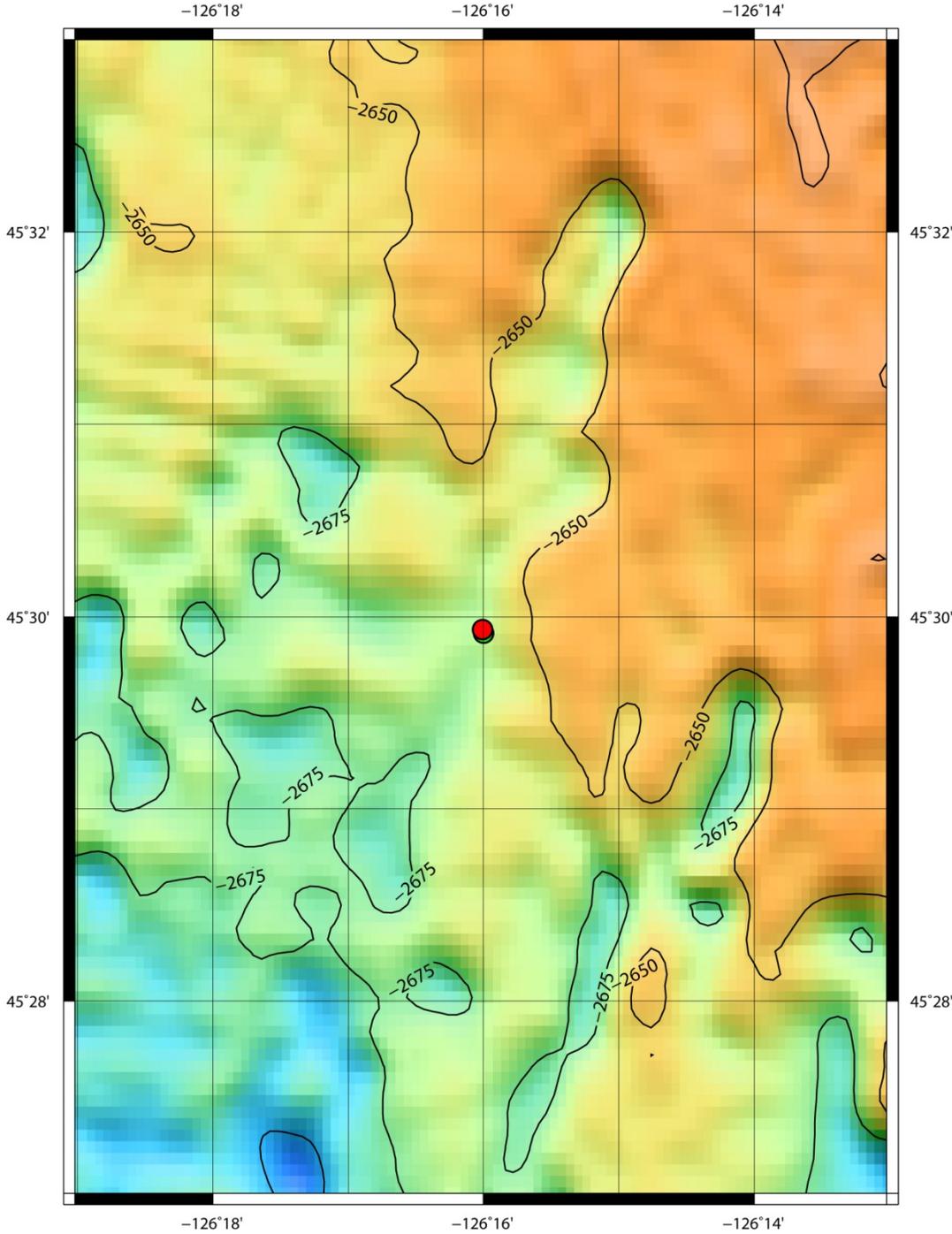
D21-I43 surveyed position: 46 08.2696'N 126 10.3250'W, depth = 2654.0 m.

25m contours -- J43 -126.1721 46.1378 D21.grd



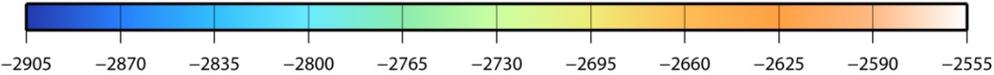
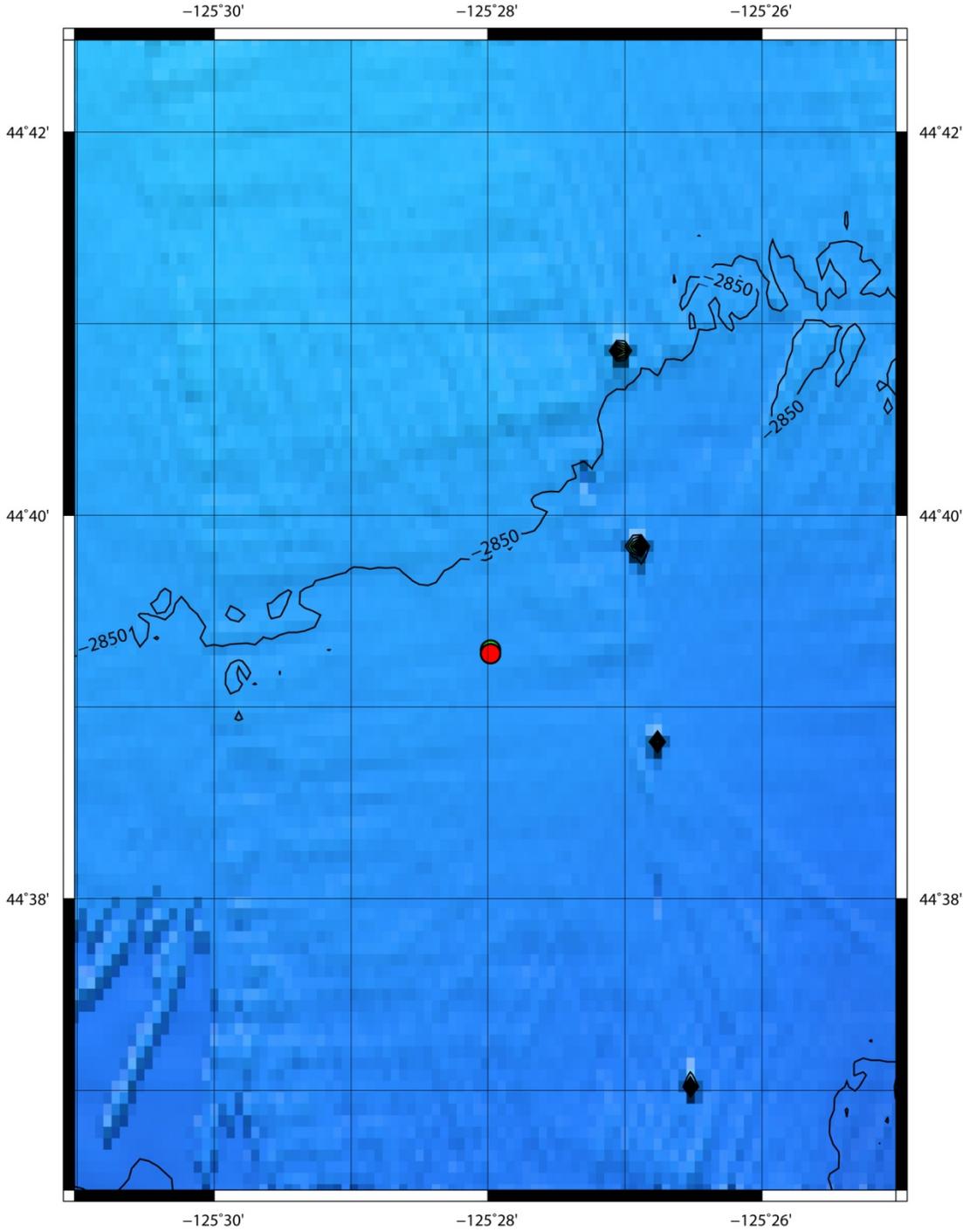
D22-J35 surveyed position: 45 29.9339'N 126 16.0069'W depth = 2662 m.

25m contours --- J35 -126.2668 45.4989 D22.grd



D23-J26 surveyed position: 44 39.2822'N 125 27.9826 'W depth = 2864.0 m.

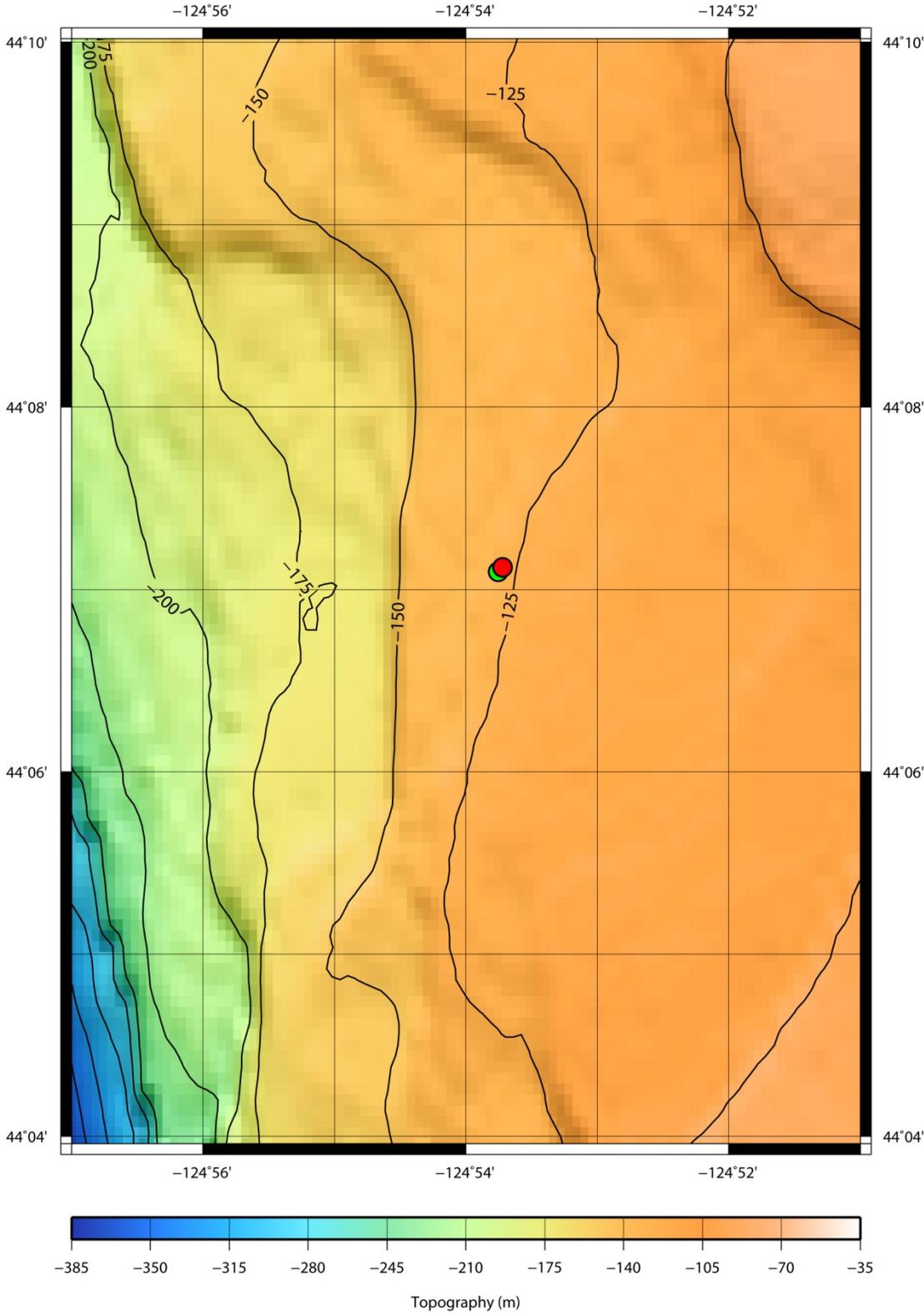
25m contours -- J26 -125.4664 44.6547 D23.grd



Topography (m)

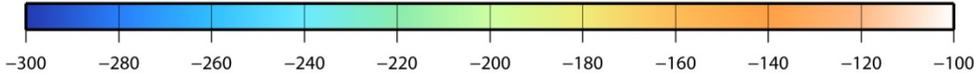
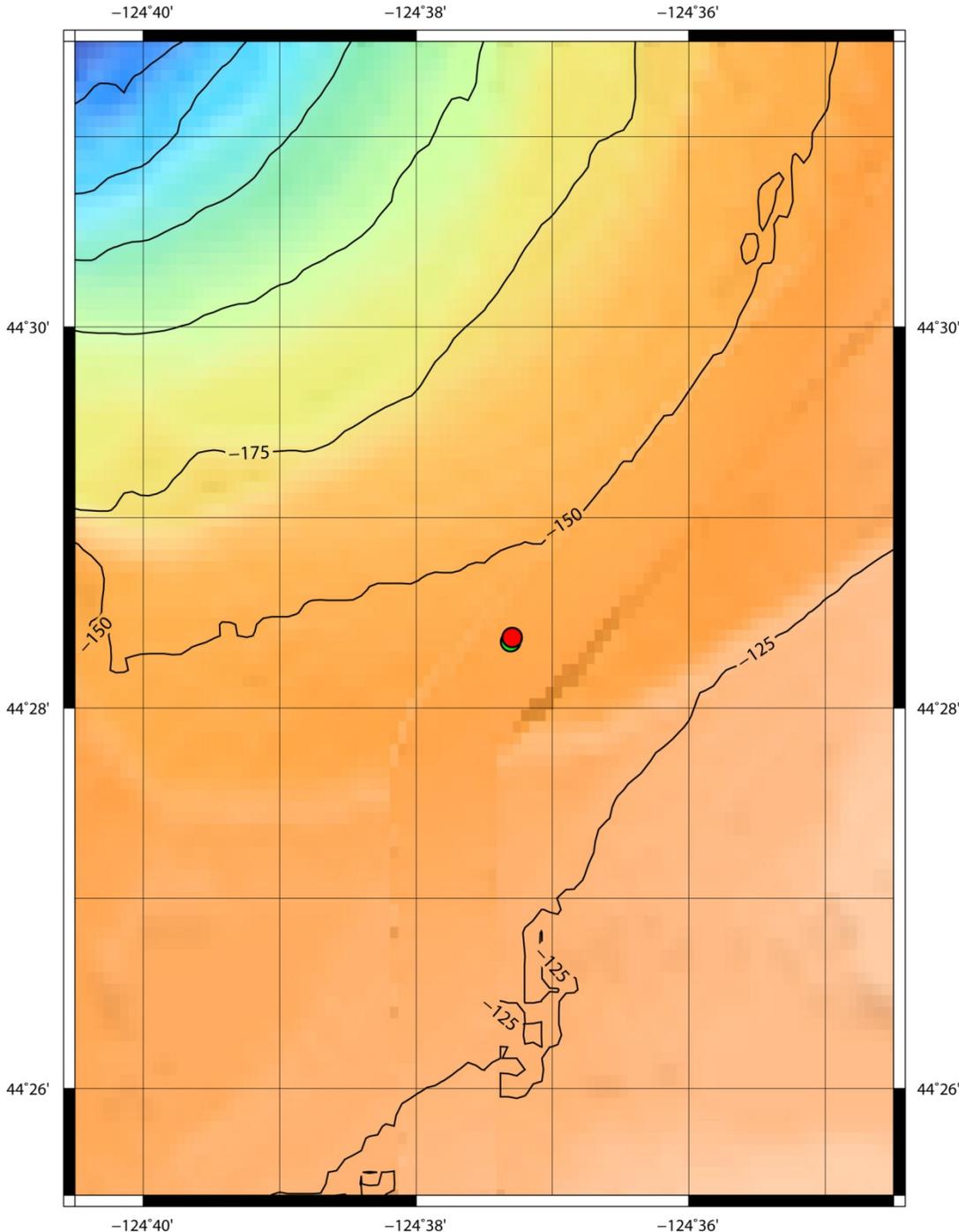
D24-Y1M8 surveyed position: 44 07.1237 124 53.7209'W, depth = 126.4 m.

25m contours -- Y1M8* -124.8953 44.1187 D24.grd



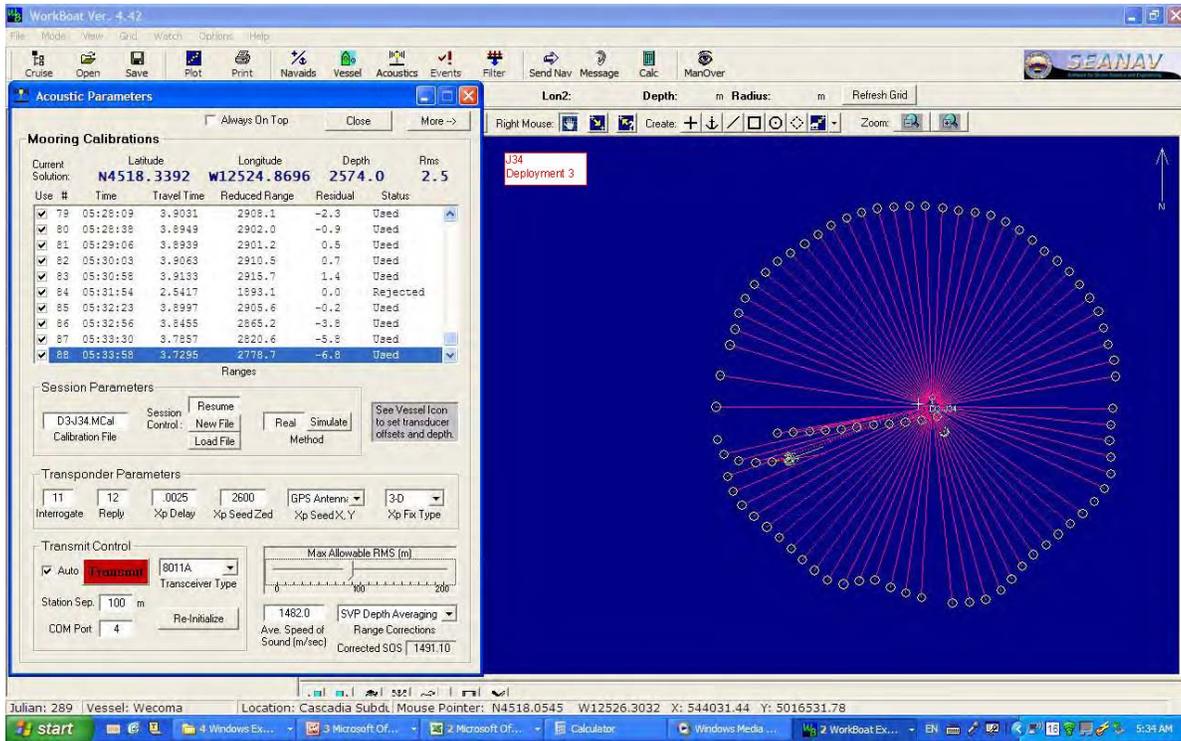
D25-J25 surveyed position: 44 28.3710'N 124 37.2968'W, depth = 143.0 m.

25m contours --- J25* -124.6216 44.4729 D25.grd

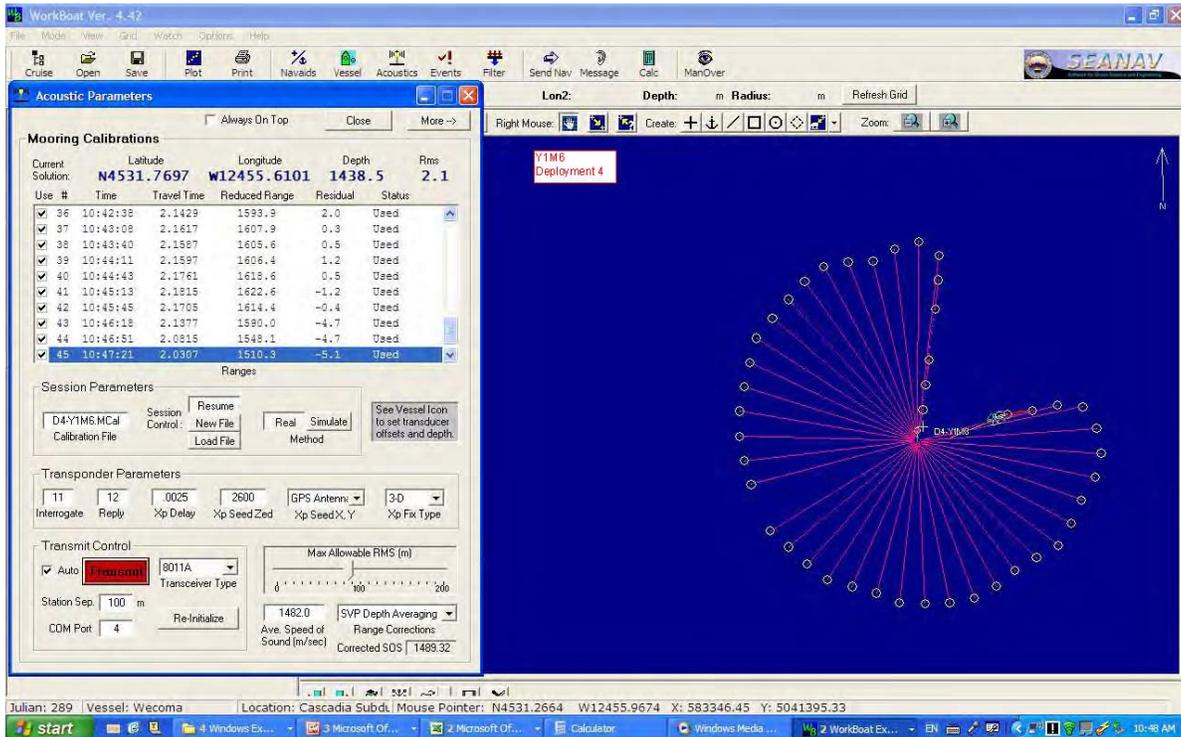


Topography (m)

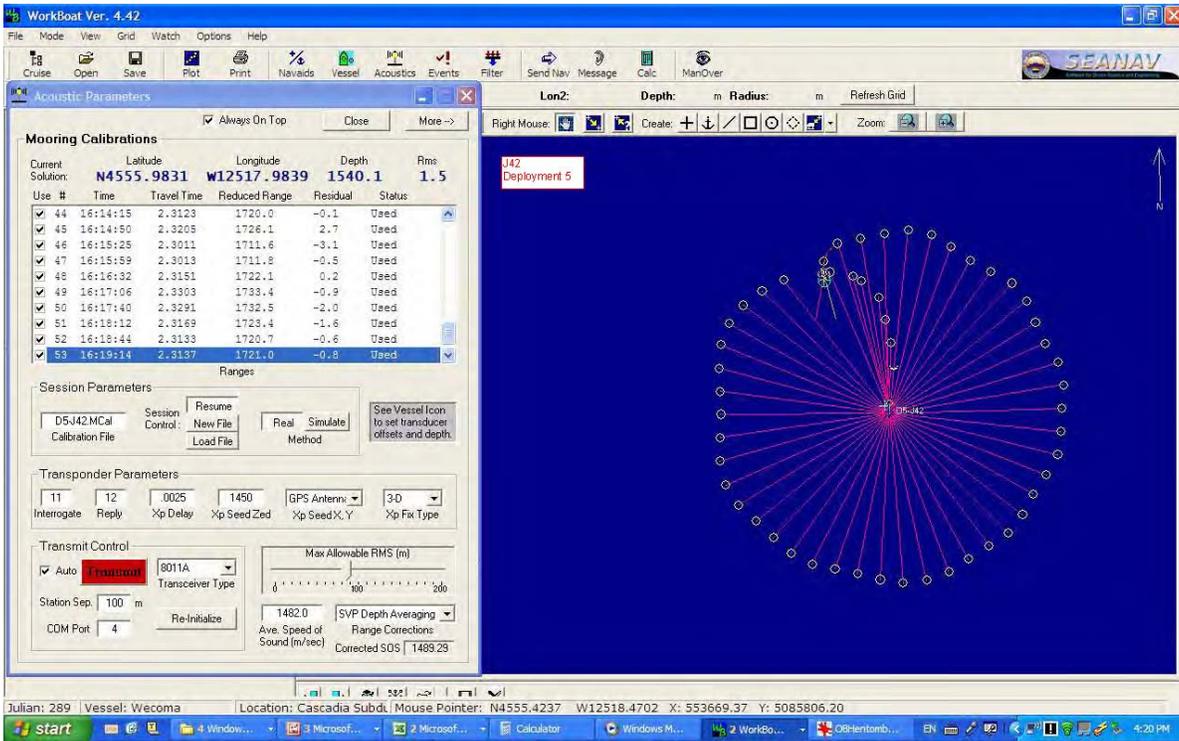
D3-J34



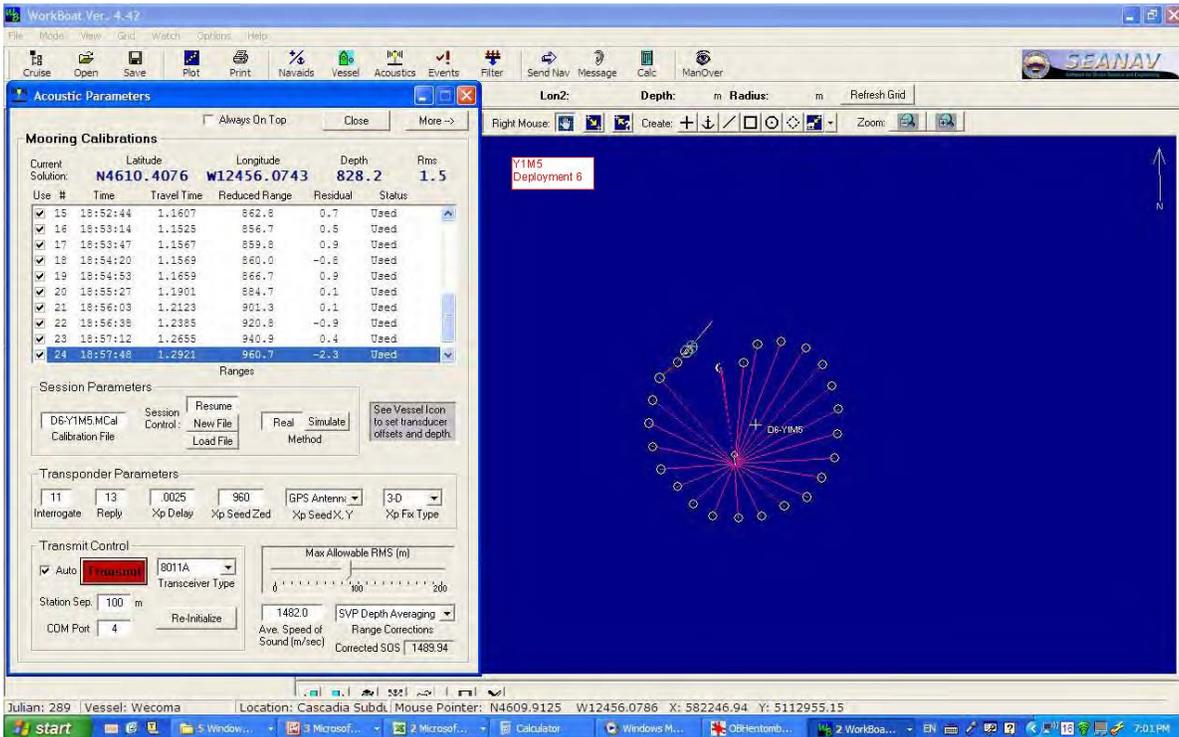
D4-Y1M6



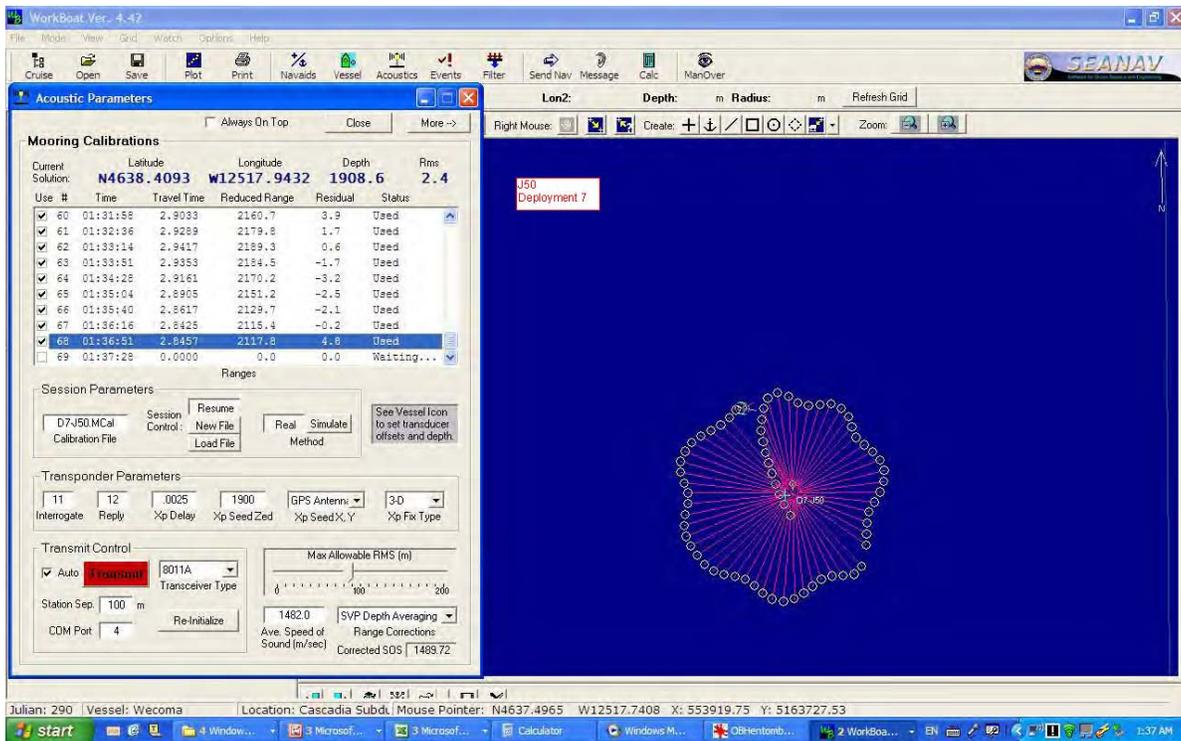
D5-J42



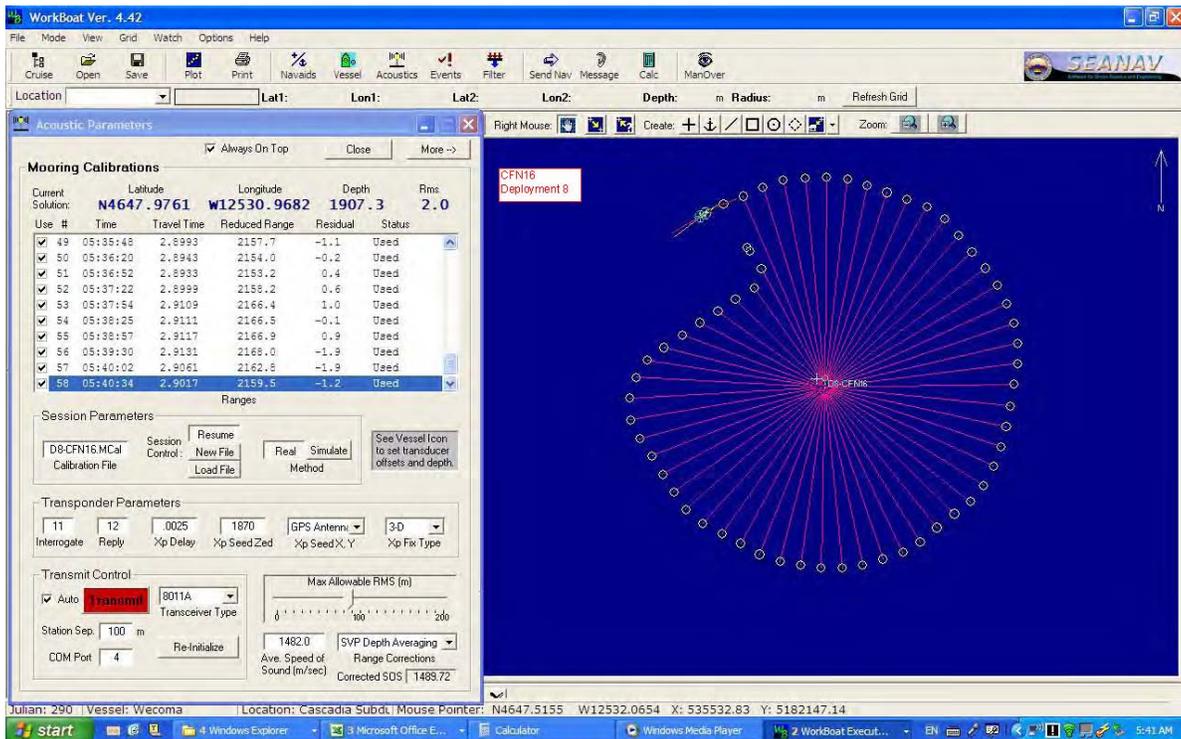
D6-Y1M5



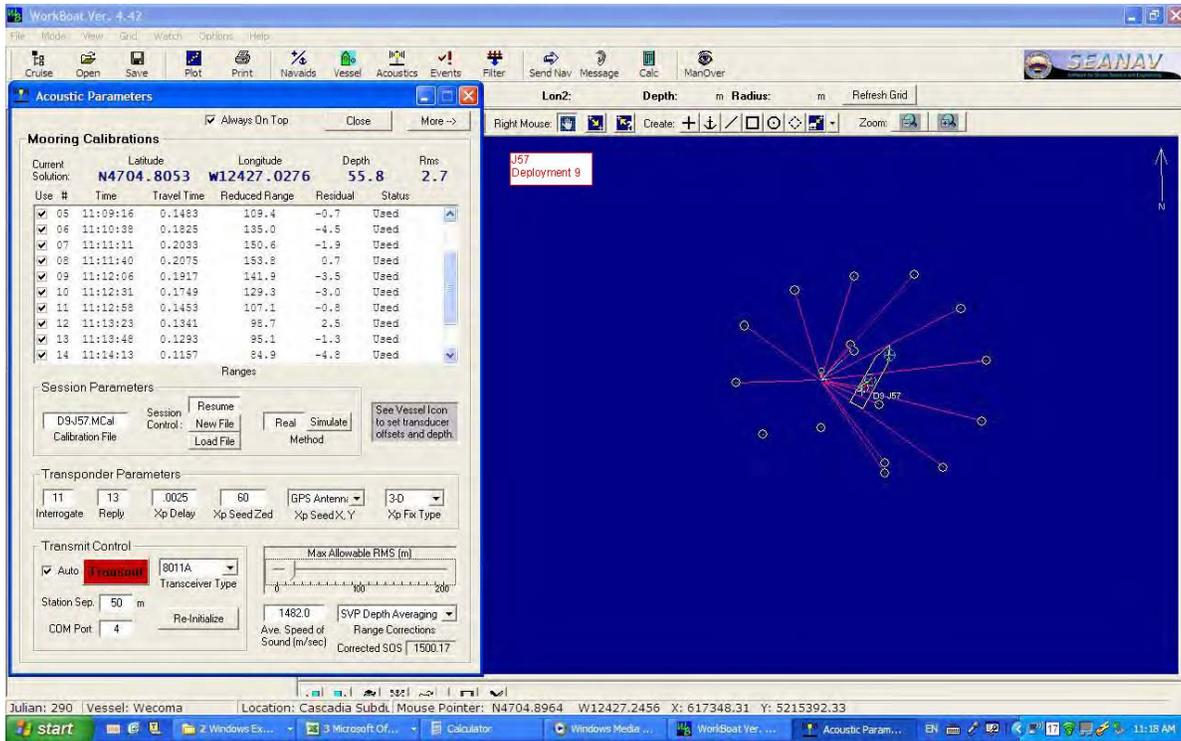
D7-J50



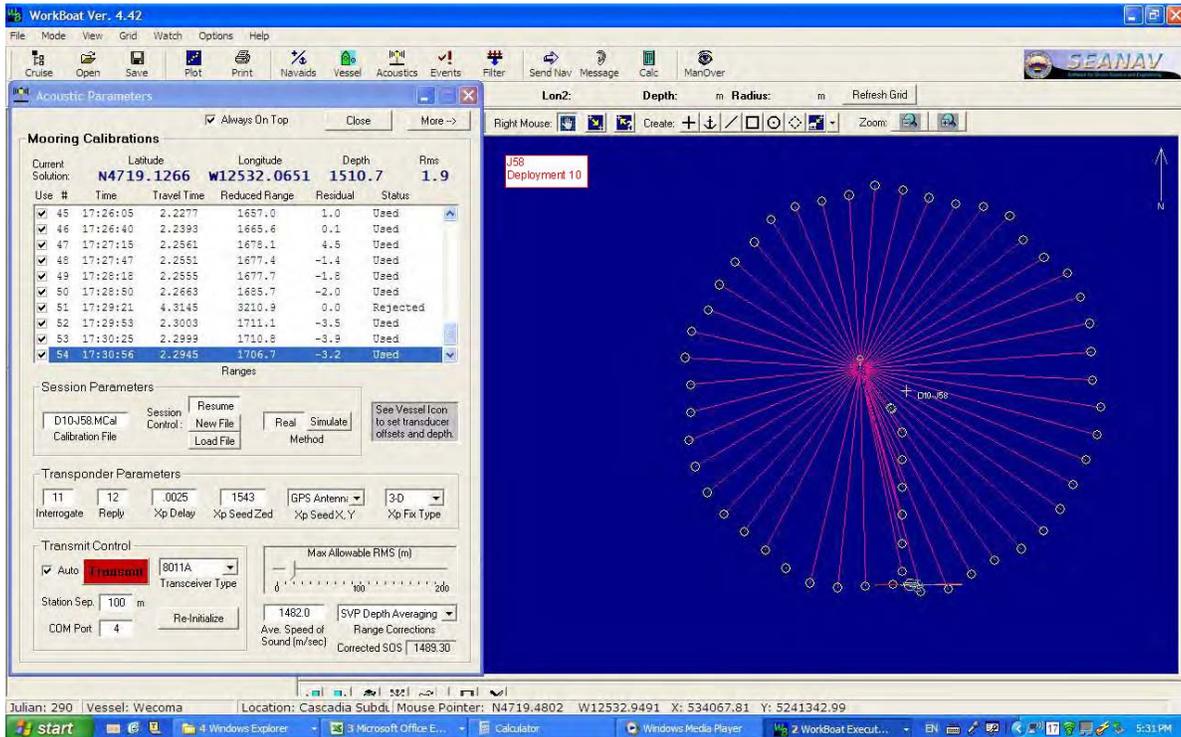
D8-CFN16



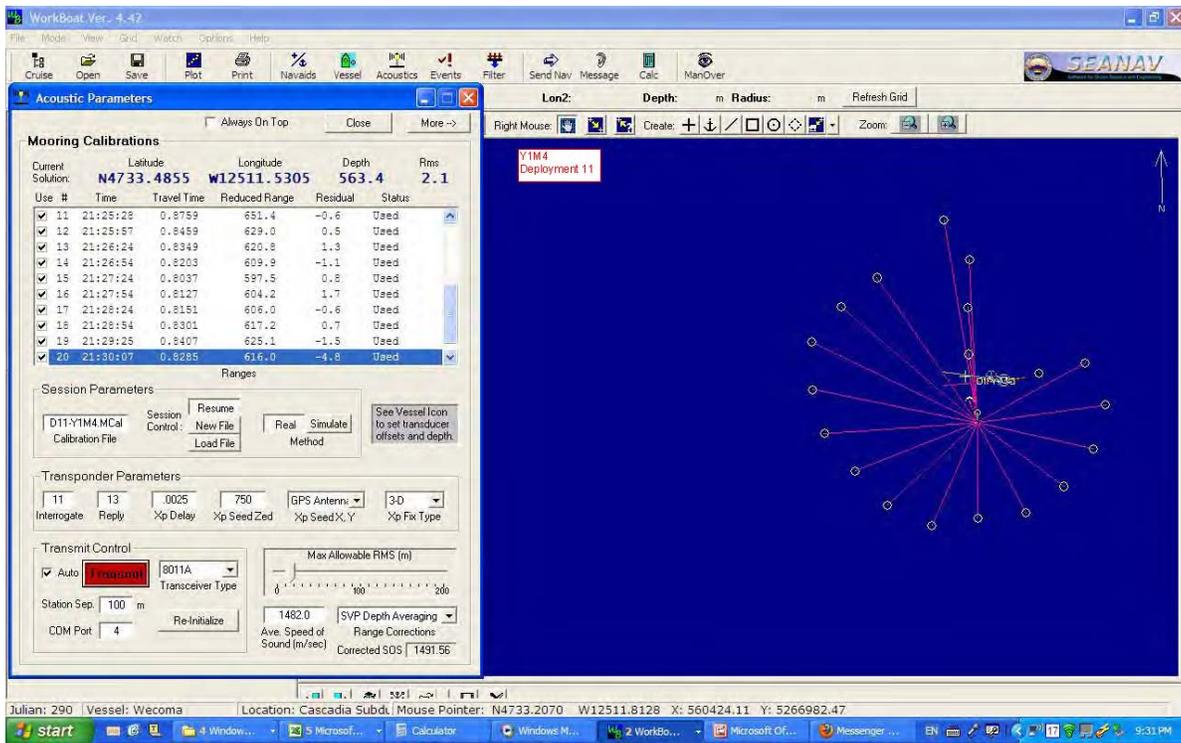
D9-J57



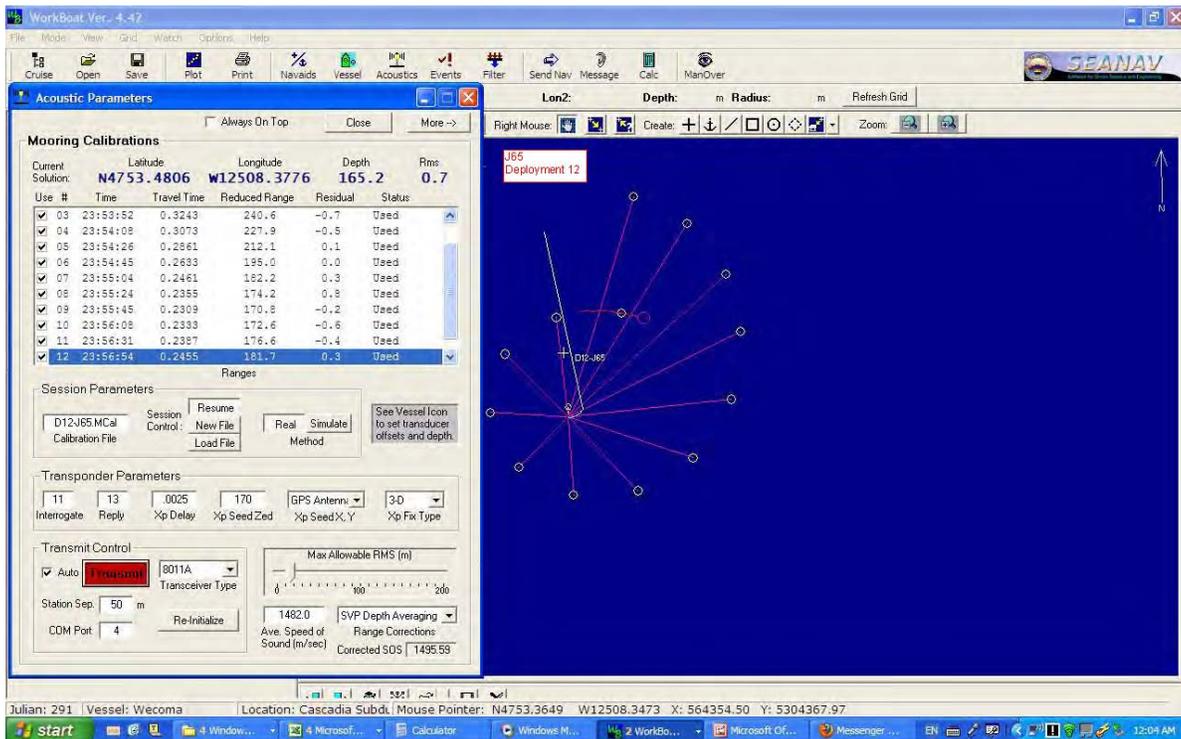
D10-J58



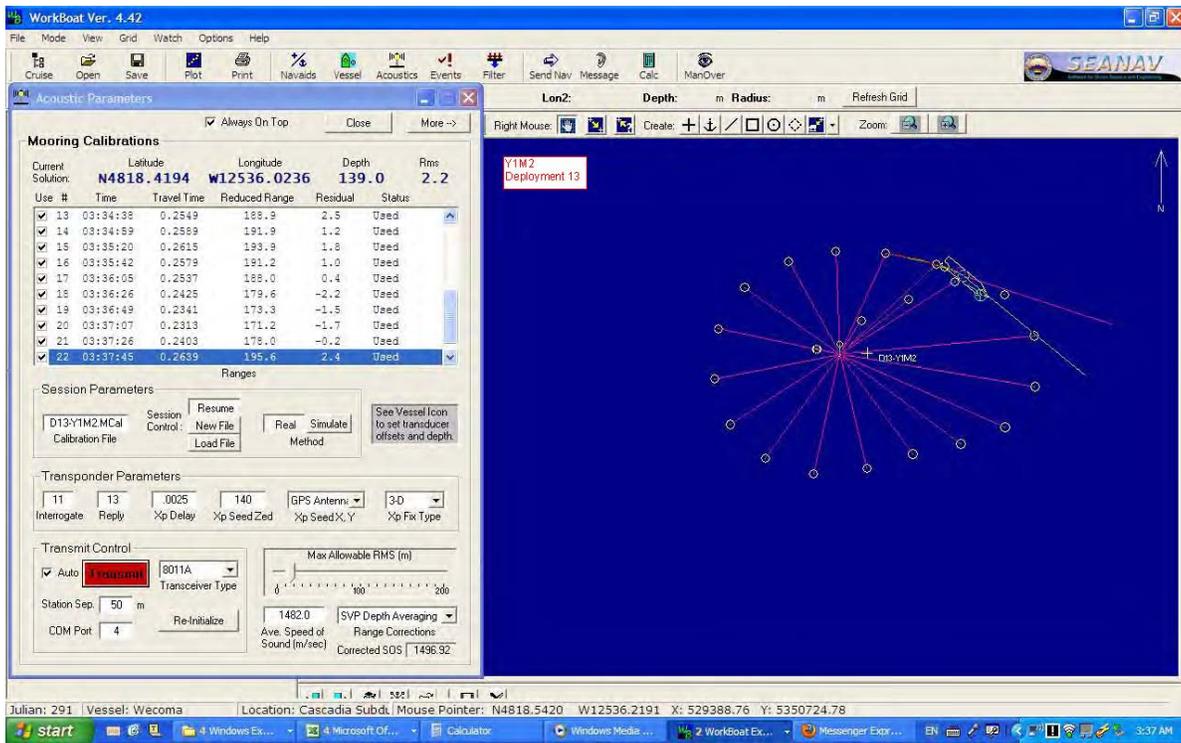
D11-Y1M4



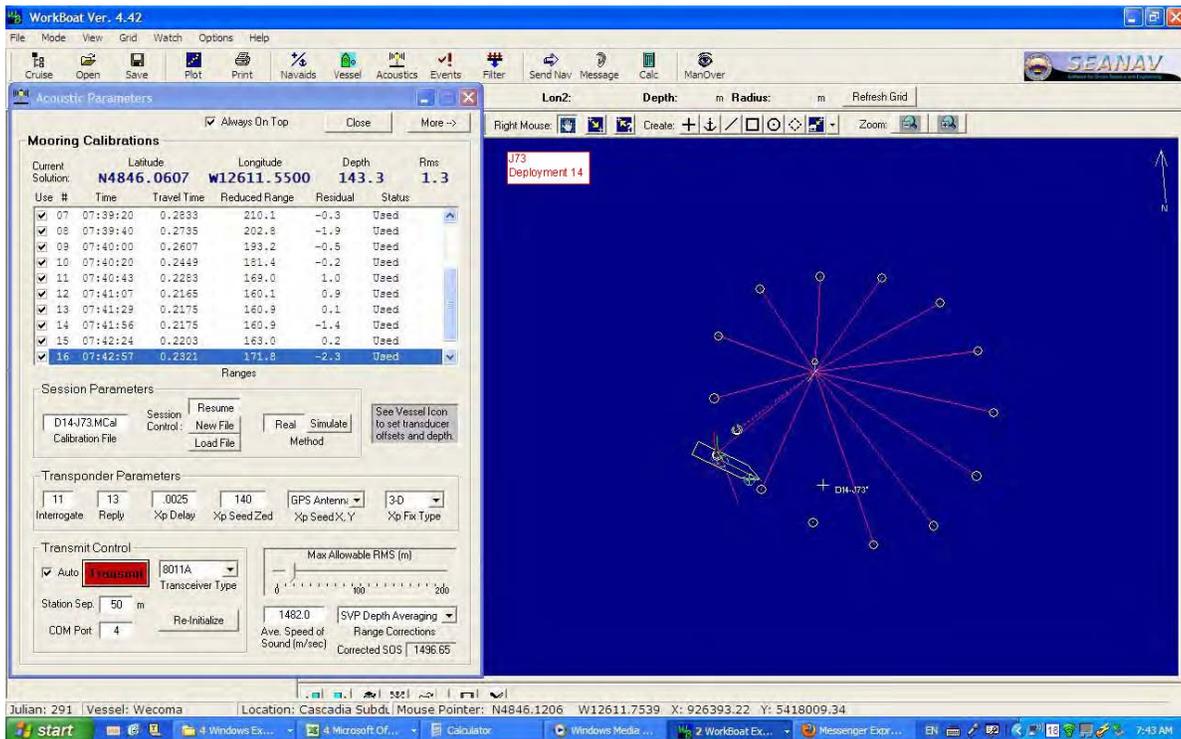
D12-J65



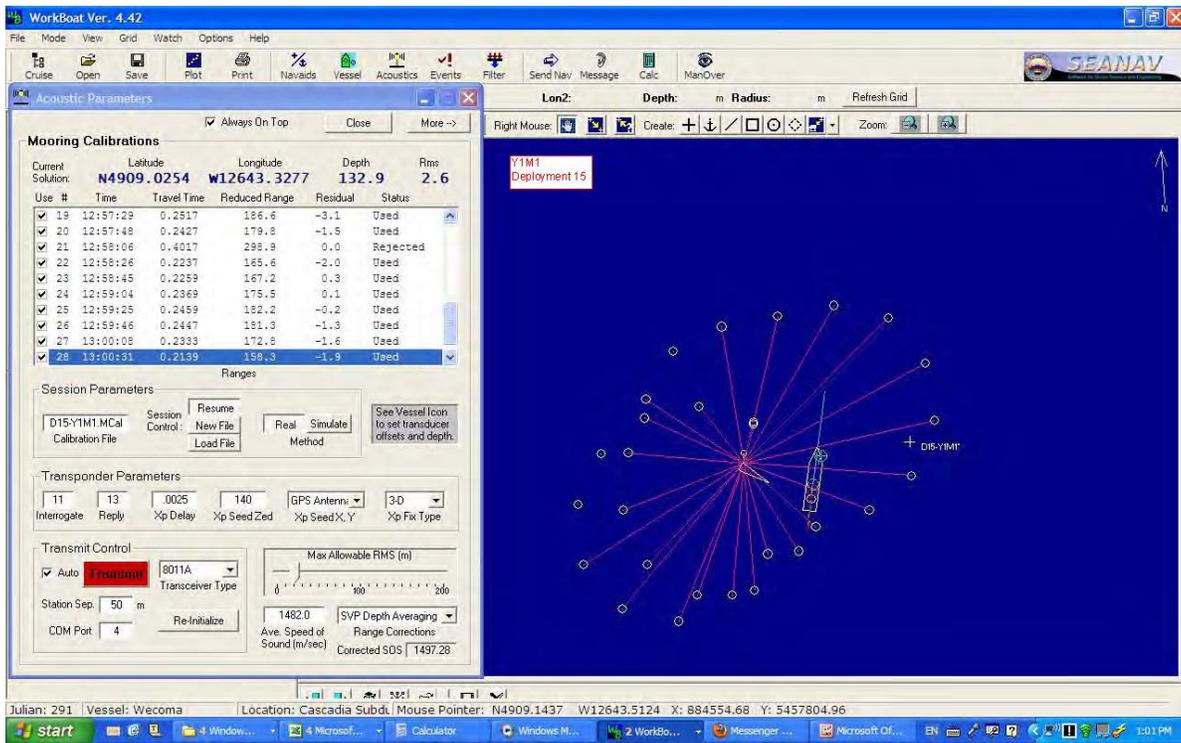
D13-Y1M2



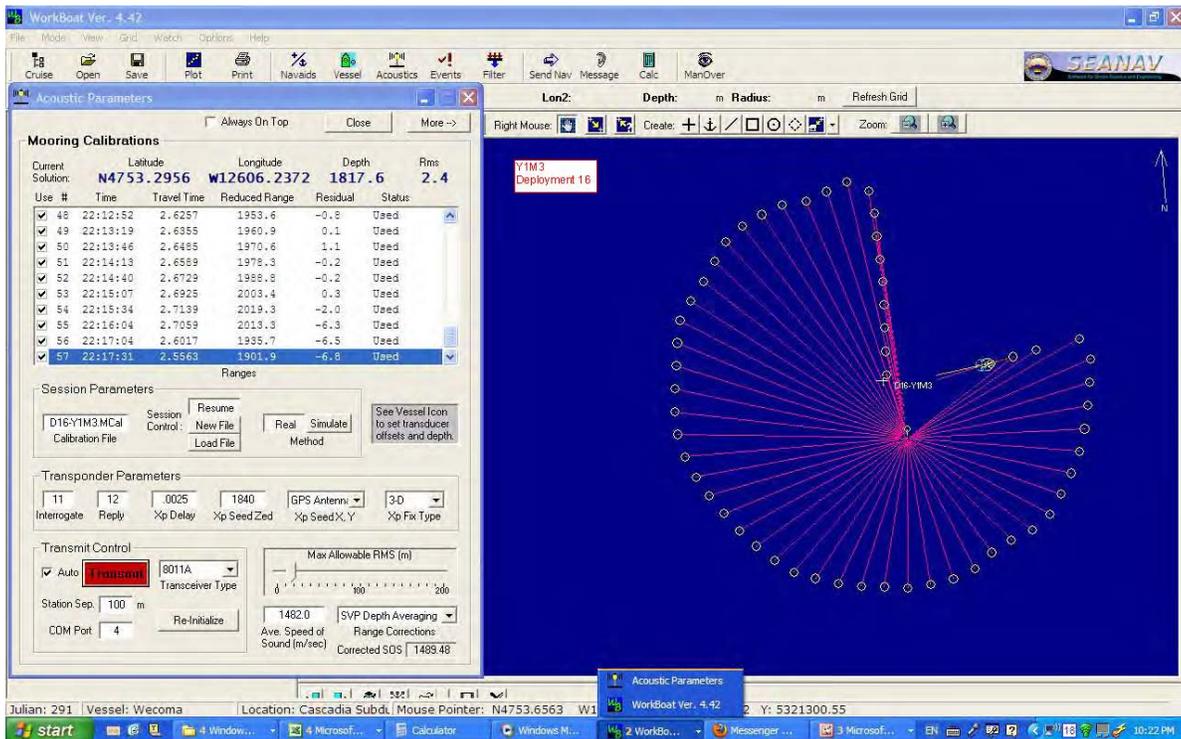
D14-J73



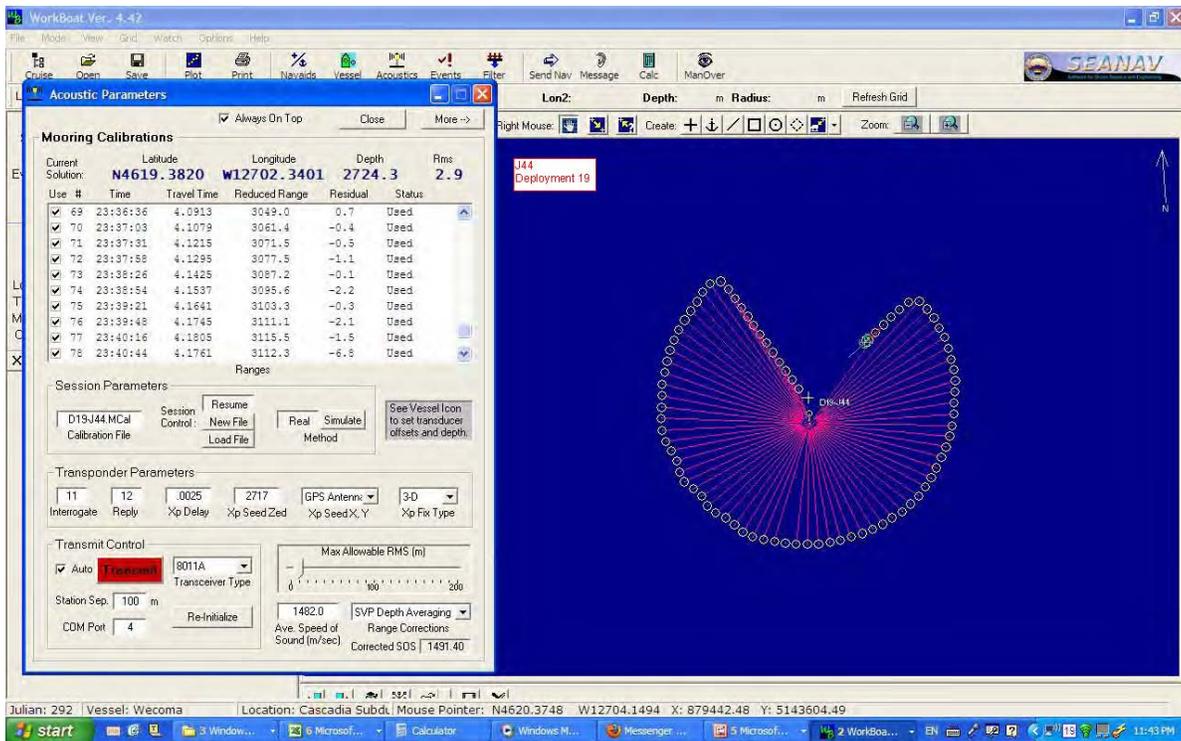
D15-Y1M1



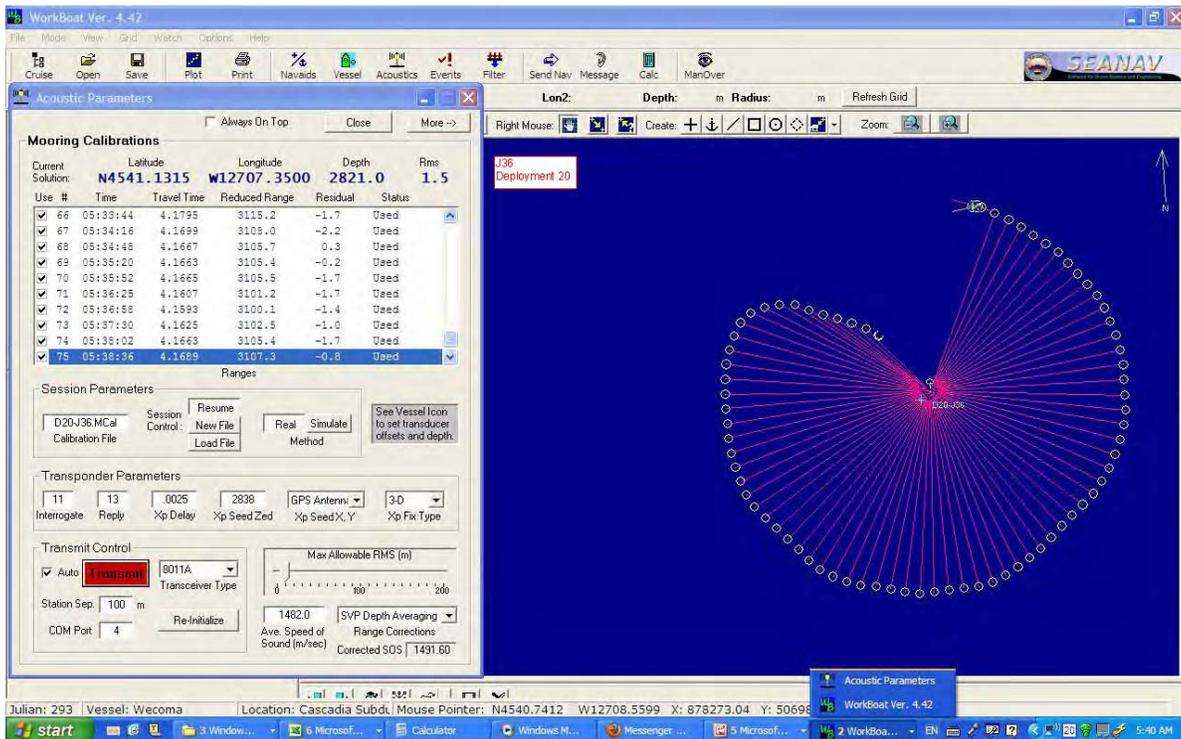
D16-Y1M3



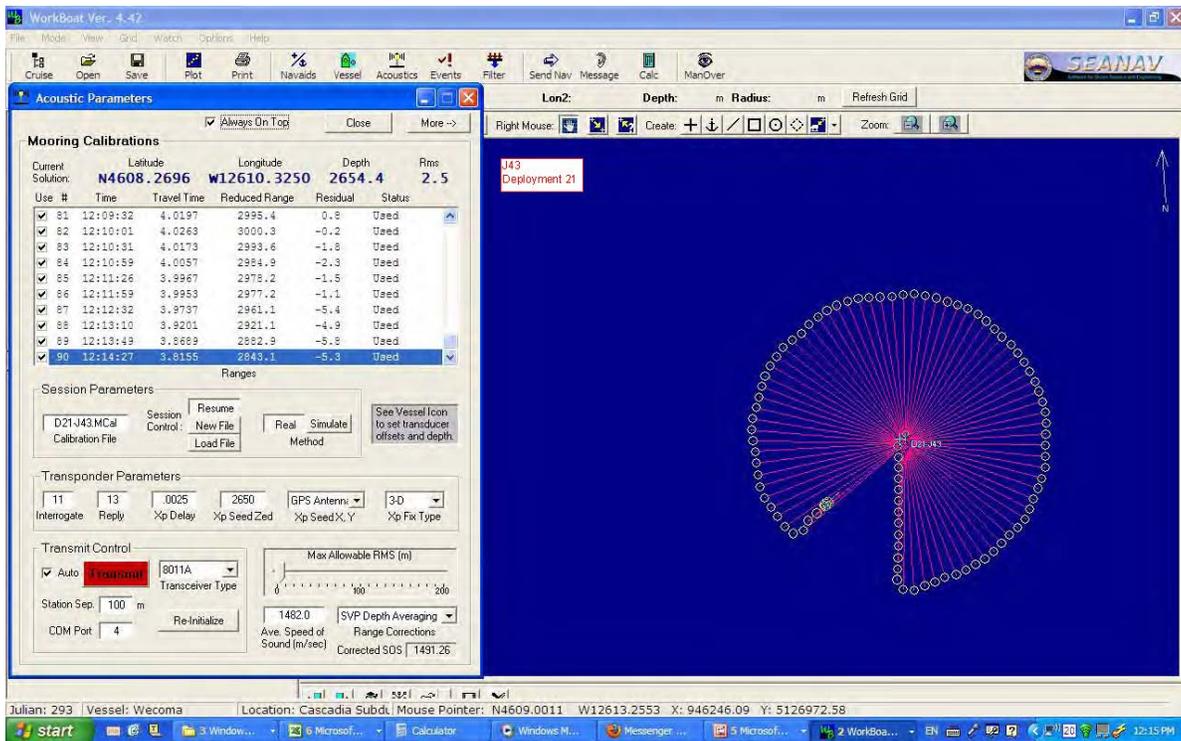
D19-J44



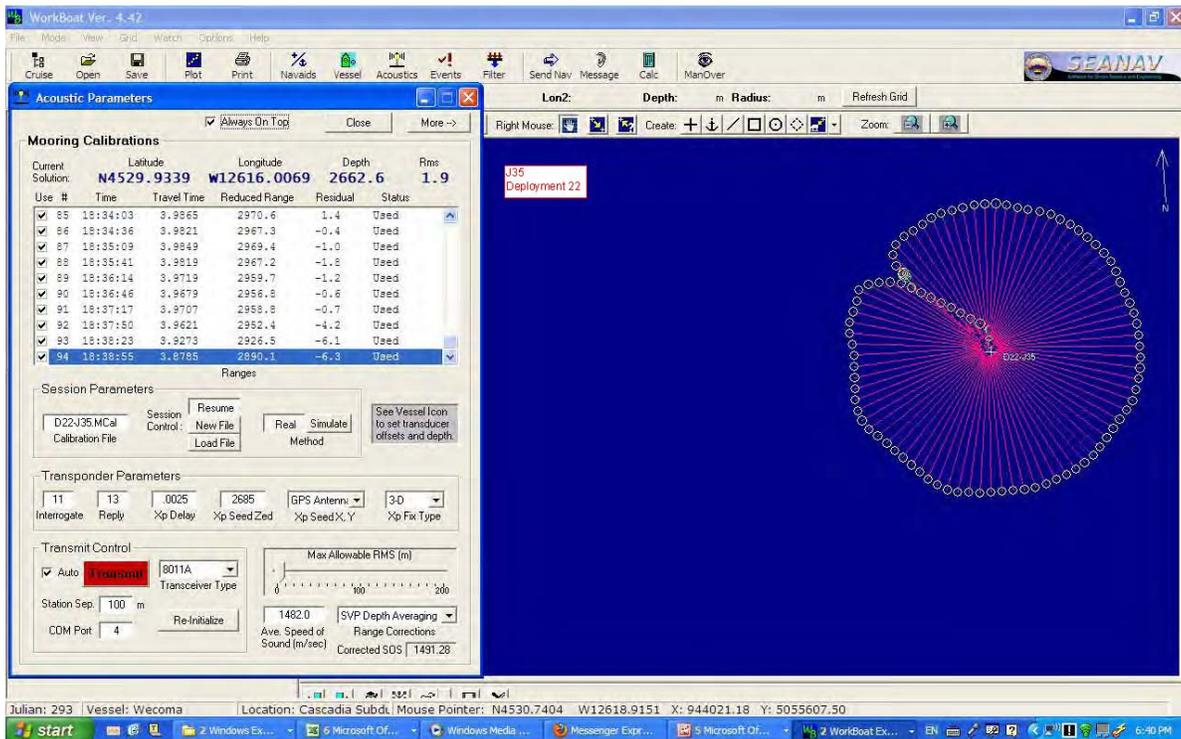
D20-J36



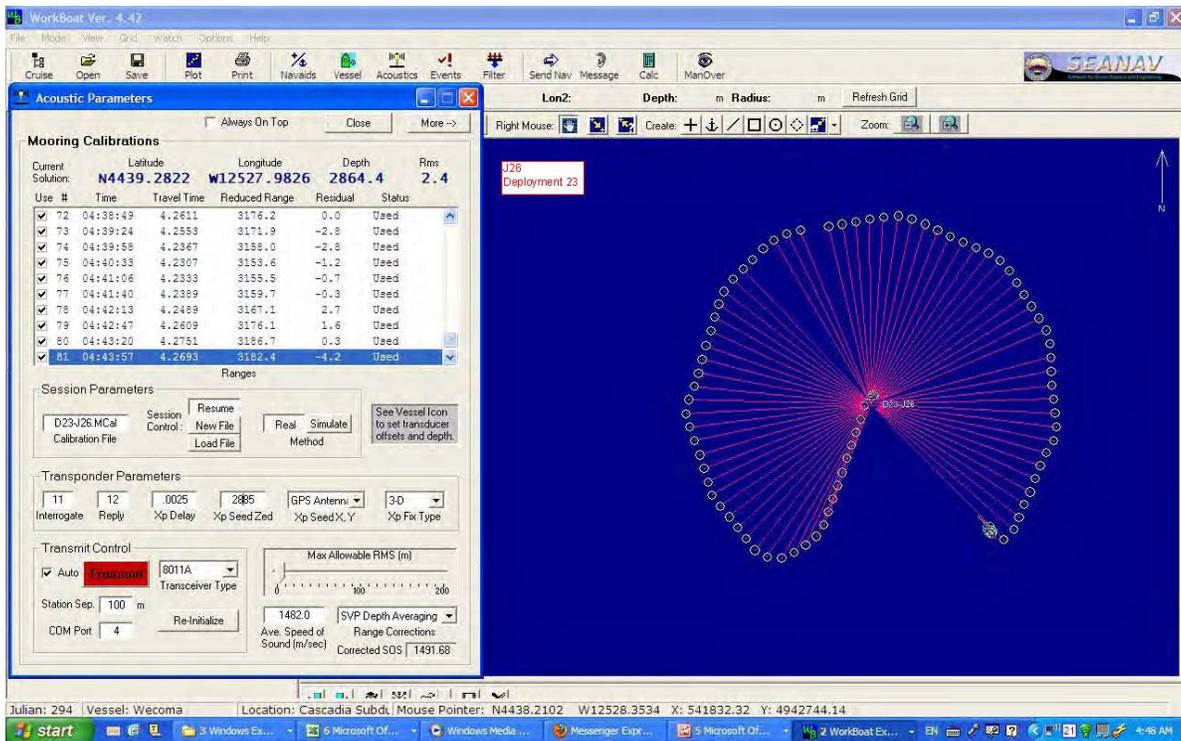
D21-J43



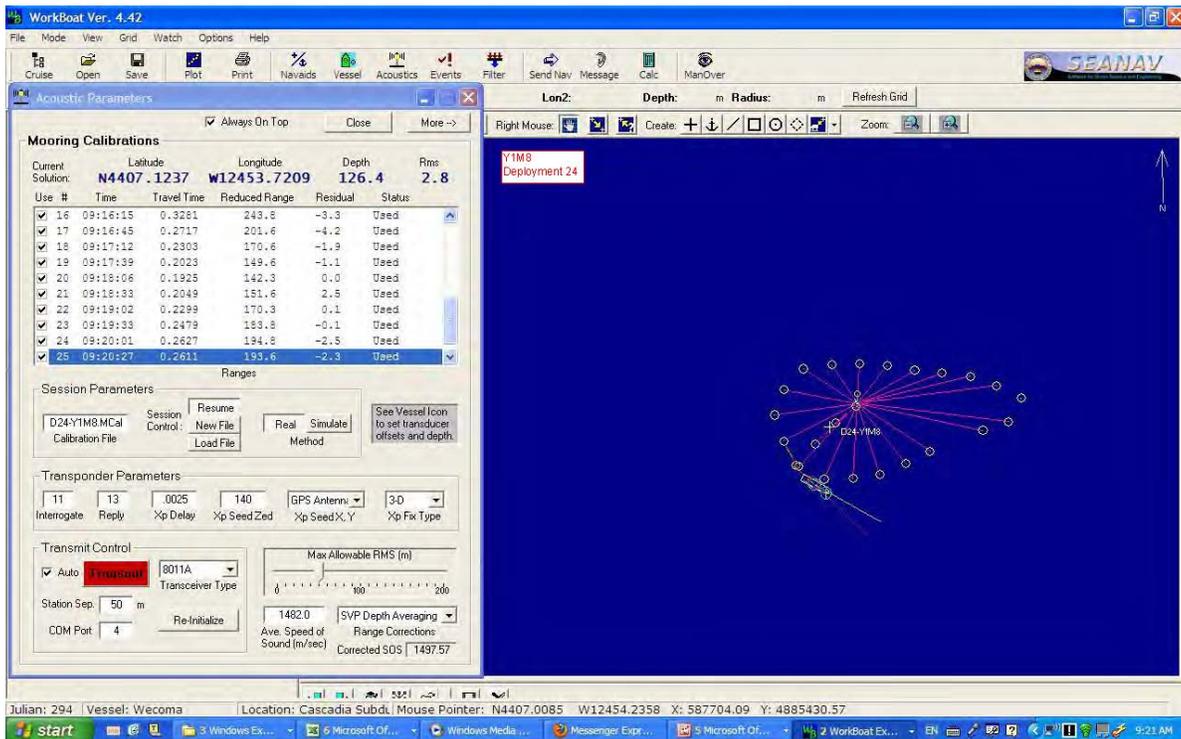
D22-J35



D23-J26



D24-Y1M8



D25-J25

WorkBoat Ver. 4.42

File Mode View Grid Watch Options Help

SEANAV

Acoustic Parameters

Lon2: Depth: m Radius: m Refresh Grid

Right Mouse: Create: + ↓ / □ ○ ⊕ ⊖ ⊗ ⊘ Zoom: [Icons]

Mooring Calibrations

Current Solution: Latitude **N4428.3710** Longitude **W12437.2968** Depth **142.8** Rms **1.8**

| Use # | Time | Travel Time | Reduced Range | Residual | Status |
|-------------------------------------|-------------|-------------|---------------|----------|----------|
| <input checked="" type="checkbox"/> | 11 18:12:02 | 0.2705 | 200.5 | 1.1 | Used |
| <input checked="" type="checkbox"/> | 12 18:12:26 | 0.2661 | 198.7 | 2.5 | Used |
| <input checked="" type="checkbox"/> | 13 18:12:50 | 0.2665 | 197.5 | 2.6 | Used |
| <input checked="" type="checkbox"/> | 14 18:13:15 | 0.2615 | 193.7 | 1.3 | Used |
| <input checked="" type="checkbox"/> | 15 18:13:42 | 0.2475 | 183.3 | -0.3 | Used |
| <input checked="" type="checkbox"/> | 16 18:14:11 | 0.2223 | 164.4 | -2.6 | Used |
| <input checked="" type="checkbox"/> | 17 18:14:39 | 0.2069 | 152.9 | -0.5 | Used |
| <input checked="" type="checkbox"/> | 18 18:15:05 | 0.2125 | 157.1 | 0.1 | Used |
| <input checked="" type="checkbox"/> | 19 18:15:29 | 0.2407 | 175.2 | 1.6 | Used |
| <input checked="" type="checkbox"/> | 20 18:15:54 | 0.6307 | 469.9 | 0.0 | Rejected |

Ranges

Session Parameters

D25J25 MCal Calibration File

Resume Control: New File Load File Real Simulate Method

See Vessel Icon to set transducer offsets and depth.

Transponder Parameters

11 13 0025 145 GPS Antenn. 3D

Interrogate Reply Xp Delay Xp Seed Zed Xp Seed X,Y Xp Fix Type

Transmit Control

Auto Transmit 8011A Transceiver Type

Station Sep. 50 m Re-Initialize

CDM Port 4

Max Allowable RMS (m) 0 100 200

Ave. Speed of Sound (m/sec) 1482.0 SVP Depth Averaging

Range Corrections Corrected SOS | 1496.10

Julian: 294 Vessel: Wecoma Location: Cascadia Subdi | Mouse Pointer: N4428.3938 W12437.5408 X: 609305.49 Y: 4925354.03

start [Icons] CETT_Leq2 OBS Surveys WorkBoat Ver. 4.42 Acoustic Parameters EN 6:16 PM

Appendix 3: CTD collected at station J42

16 Oct 2011, Dziak Cast_001.cnv

