

Cascadia Initiative
Cruise OC1208A *R/V Oceanus*
(Cascadia 2012 Leg 4)
August 23, 2012 - August 30, 2012
Newport, Oregon to Newport, Oregon



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Background

As part of the 2009 American Recovery and Reinvestment Act (ARRA) spending, NSF's Earth Sciences (EAR) and Ocean Sciences (OCE) divisions each received \$5M in facility-related investment. The funds are targeted toward Facilities that support EarthScope and MARGINS science objectives, with an initial emphasis on onshore/offshore studies of the Cascadia margin. The ARRA funds have been used by UNAVCO, IRIS, and OBSIP to improve seismic and geodetic datasets in the Cascadia region including improvements to real-time GPS capabilities, densification of the onshore seismic networks, and the construction and deployment of an array of 60 ocean-bottom seismographs (OBS) for offshore community experiments.

The Cascadia Initiative (CI) is an onshore/offshore seismic and geodetic experiment that addresses questions ranging from the structure of the megathrust and its potential for large earthquakes to volcanic arc structure, and to the formation, deformation and hydration of the Juan de Fuca and Gorda plates. An article in the GeoPRISMS Newsletter (Spring 2011, issue No. 26) described CI scientific objectives, the outcome of an open community workshop held in October 2010 to develop deployment plans for the offshore component of the experiment, and formation of the Cascadia Initiative Expedition Team (CIET). Over its planned 4-year data acquisition period, the offshore portion of the Cascadia Initiative will involve the deployment and recovery of ~280 OBSs at ~160 different sites and a total of about 14 cruises.

Cruise Objectives and Assessment

The cruise objective was to deploy 25 of the Year 2 OBS array designed by the community by deploying 25 Ocean Bottom Seismographs (OBS) in a broad array extending from south of the Mendocino Fracture Zone, onto the Juan de Fuca plate, to the west of the Juan de Fuca Ridge, and north into Canadian waters. The OBS were provided by the NSF-funded U. S. National Ocean Bottom Seismograph Instrumentation Pool (OBSIP) and by WHOI. Thirteen OBS carry intermediate-period seismometers, and were built for the Amphibious Array with funding from the American Recovery and Reinvestment Act (ARRA). These instruments are deployed in a ~70 km spaced grid extending west across the Gorda and southern Juan de Fuca plates onto the Pacific plate. Ten OBS, funded by the W.M. Keck Foundation, carry broadband seismometers and strong-motion accelerometers. All 25 OBS carry a Differential Pressure Gauge (DPG). Because of their broadband response, seven of the Keck OBS were widely distributed across the Gorda and Juan de Fuca (JdF) plates to provide a reference array. These sites will be occupied during each of the four years of the Cascadia Initiative. The remaining 3 Keck OBS were placed near the Mendocino transform since they carry strong motion sensors that could record a nearby large event.

We deployed 25 OBS (Figures 1 and Table 3). Because of OBS communication problems, two OBS were deployed at one site and one lower-priority planned site had no OBS deployed. The OBS will record continuously until their recovery in 2013. The OBS will then be recovered summer 2013 and redeployed at Year 3 sites.

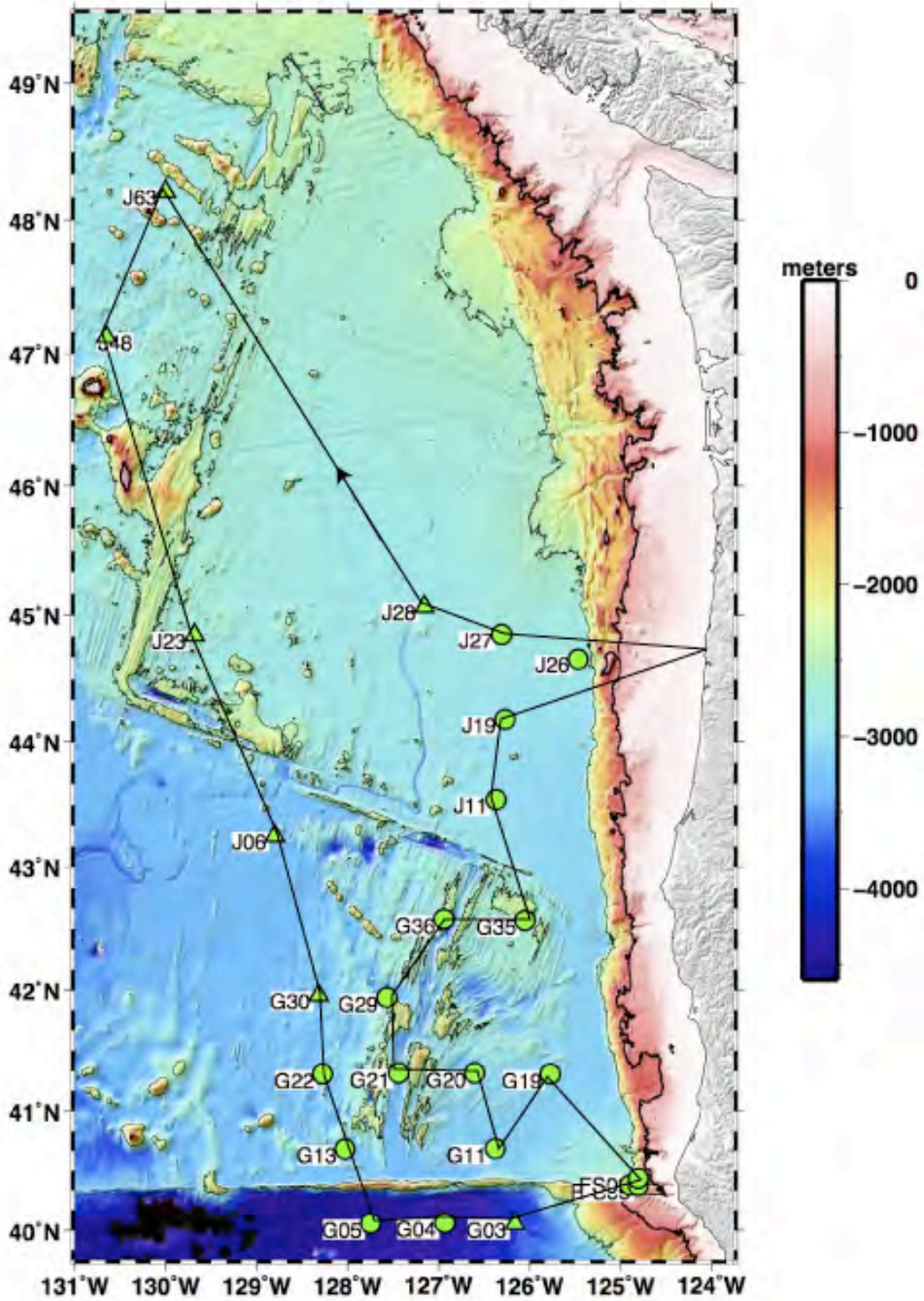


Figure 1. OC1208A cruise track.

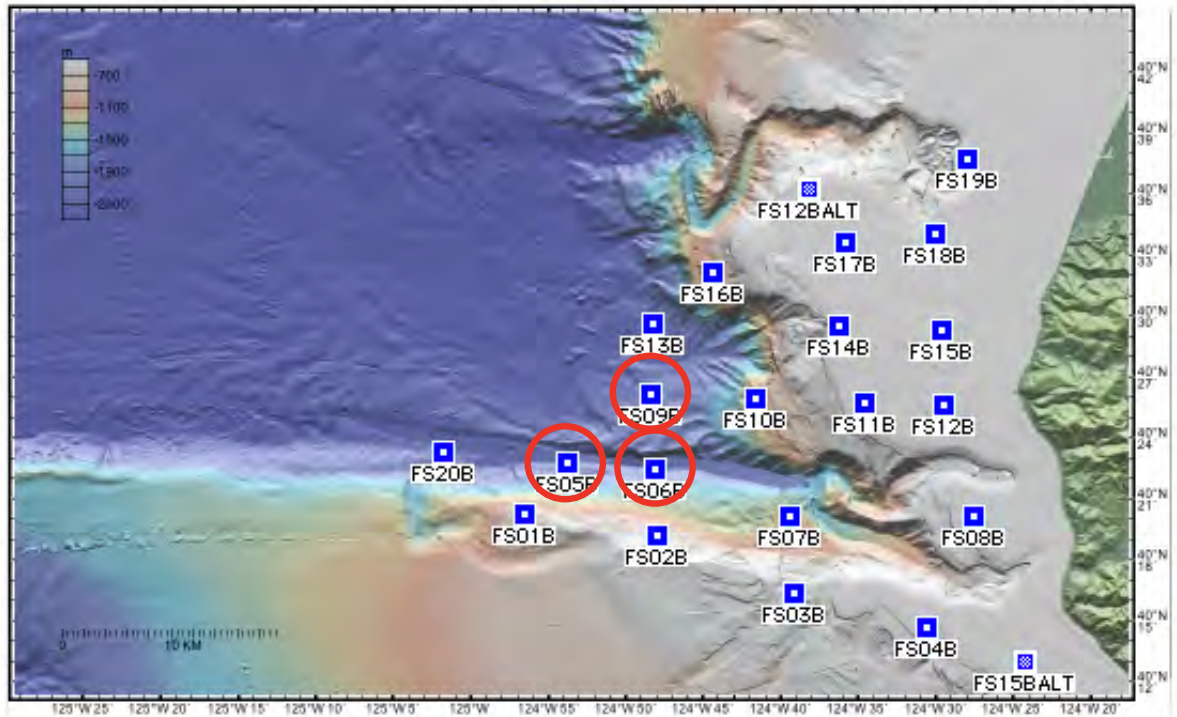


Figure 2. Three sites (red circles) in Mendocino Triple Junction array at which WHOI Keck OBSs were deployed

OC1208A Science Party

Emilie Hooft	Chief Scientist	University of Oregon
William Wilcock	Chief Scientist	University of Washington
Alan Gardner	OBS Engineer	Woods Hole Oceanographic Institution
Brian Kelley	OBS Technician	Woods Hole Oceanographic Institution
Tim Kane	OBS Technician	Woods Hole Oceanographic Institution
Daniel Kot	OBS Technician	Woods Hole Oceanographic Institution
Eunyoung Kim	Graduate Student	Seoul National University
Dax Soule	Graduate Student	University of Washington
Hogyum Kim	Undergraduate Student	Seoul National University
Michelle Richter	Undergraduate Student	Umpqua Community College
Erik Arnesen	Marine Technician	Oregon State University

OC1208A Oceanus Crew

Jeff Crews	Master
Bob Ashley	Chief Engineer
John Forgione	First Mate
Patrick Breshears	Second Mate
Colin Caskey	Engineer
Jay Jean-Bart	Engineer
Doug Beck	Bos'n
Tony Jackson	AB
Marc Simpson	AB
Kris Alberty	Cook
Taylor Williams	Steward

Cruise Narrative

This cruise was originally scheduled to depart on August 13, 2012 but this was delayed 10 days because the R/V Oceanus needed to enter they dry dock for repairs. For logistical reasons the end date of the following cruise OC1208B (Cascadia 2012 Leg 5) could not be extended beyond September 7, 2012. Thus, OC1208A and OC1208B had to work with a compressed schedule. Since it would be scientifically undesirable and logistically difficult to postpone some of the OBS deployments to later in the year, it was decided that the primary objective should be to deploy all the OBS and that acoustic surveying should be left to the recovery legs in 2013.

After studying projected timelines for both cruises it was decided that OC1208A should aim to get into port no later than 8 AM on August 31 and would work with a schedule that included a day of contingency to ensure this. The newer WHOI ARRA would be tracked acoustically to the seafloor to guard against the small possibility that the anchor would release on impact with the seafloor. The older WHOI Keck instruments with a longer record of reliable deployments would be deployed and tracked for only a few hundred meters. If the cruise proceeded more quickly than projected it might be possible to survey some of the later instruments. If the cruise proceeded more slowly some of the later WHOI ARRA instruments might be deployed without tracking to the bottom.

Three sites are identified that will be given lower priority in the event of instrument failures – first J26B which repeats a 1st year site, second J11B which lies near the footprint for the Nabelek/Braunmiller Blanco Transform deployment and third G35B which is similarly near the Nabelek/Braunmiller experiment footprint.

Saturday, August 18. The WHOI OBSIP group arrives in Newport around midday and starts working on shore to unpack and prepare the OBSs.

Sunday, August 19. WHOI OBSIP group continues working preparing the OBSs. UW group arrives in evening.

Monday, August 20. Emilie Hooft arrives in Newport. WHOI OBSIP group completes preparing OBSs with help from UW students. Hooft and Wilcock discuss cruise timeline.

Tuesday, August 21. Waiting for R/V Oceanus.

Wednesday, August 22. The R/V Oceanus reaches port at 5:30 AM. All science gear loaded and secured by late afternoon

Thursday, August 23. Safety drill at 8 AM and departure at 9 AM. Moderate seas. First OBS deployment is an ARRA at site J27

Station J27B

On Station:	8/24/2012 00:35 UTC (8/23/2012 17:35 local)
OBS Type:	WHOI ARRA - T107
Deploy Time:	8/24/2012 01:20 UTC
Deployed Position:	44° 50.8371' N, 126° 18.4445' W
Water Depth:	2843 m
OBS on Seafloor:	8/24/2012 02:14 UTC
OBS Fall Speed:	52.7 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY

Disable Acoustic Release: 8/24/2012 02:20 UTC
Depart Station: 8/24/2012 02:29 UTC
Time on Station: 1 hr 54 min

The second deployment of the day is J28, the first of 6 Kecks at reference array sites

Station J28B

On Station: 8/24/2012 05:55 UTC (8/23/2012 22:55 local)
OBS Type: WHOI Keck – S83
Deploy Time: 8/24/2012 06:34 UTC
Deployed Position: 45° 03.836' N, 127° 09.375' W
Water Depth: 2885 m
Range to which tracked 555 m
OBS on Seafloor: NOT TRACKED TO BOTTOM
OBS Fall Speed: Unknown
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/24/2012 06:53 UTC
Depart Station: 8/24/2012 07:03 UTC
Time on Station: 1 hr 8 min

Thursday, August 23. Long transit to station J63 in Canadian waters. Heading into moderate seas and the wind. Making 11 knots

Station J63B

On Station: 8/25/2012 02:37 UTC (8/24/2012 19:37 local)
OBS Type: WHOI Keck – S84
Deploy Time: 8/25/2012 02:45 UTC
Deployed Position: 48° 12.384' N, 130° 00.198' W
Water Depth: 2878 m
Range to which tracked 396 m
OBS on Seafloor: NOT TRACKED TO BOTTOM
OBS Fall Speed: Unknown
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/25/2012 02:59 UTC
Depart Station: 8/25/2012 02:59 UTC
Time on Station: 0 hr 22 min

Heading south with the wind at >12 knots. Seas are very slight. Decide to modify drop position for J48B by moving it 500 m to southeast to avoid possibility of landing on a scarp.

Friday, August 24

Station J48B

On Station: 8/25/2012 08:45 UTC (8/24/2012 01:45 local)
OBS Type: WHOI Keck – S82
Deploy Time: 8/25/2012 09:01 UTC
Deployed Position: 47° 07.667' N, 130° 38.372' W
Water Depth: 2913 m
Range to which tracked 304 m
OBS on Seafloor: NOT TRACKED TO BOTTOM

OBS Fall Speed:	Unknown
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/25/2012 09:10 UTC
Depart Station:	8/25/2012 09:13 UTC
Time on Station:	0 hr 28 min

Saturday, August 25

Seas still good. Discuss moving J23B since J23A site is between two small knolls but on inspection it is 400-500 m from each so site left unchanged

Station J23B

On Station:	8/25/2012 20:55 UTC (8/25/2012 13:55 local)
OBS Type:	WHOI Keck - S86
Deploy Time:	8/25/2012 21:10 UTC
Deployed Position:	44° 50.650' N, 129° 40.975' W
Water Depth:	2699 m
Range to which tracked	321 m
OBS on Seafloor:	NOT TRACKED TO BOTTOM
OBS Fall Speed:	Unknown
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/25/2012 21:19 UTC
Depart Station:	8/25/2012 21:23 UTC
Time on Station:	0 hr 28 min

Station J06B

On Station:	8/26/2012 05:52 UTC (8/25/2012 22:52 local)
OBS Type:	WHOI Keck - S88
Deploy Time:	8/26/2012 06:05 UTC
Deployed Position:	43° 15.088' N, 128° 48.066' W
Water Depth:	3248 m
Range to which tracked	313 m
OBS on Seafloor:	NOT TRACKED TO BOTTOM
OBS Fall Speed:	Unknown
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/26/2012 06:12 UTC
Depart Station:	8/26/2012 06:16 UTC
Time on Station:	0 hr 24 min

There were breakdowns associated with the ships main computer system starting on Aug 25th and only resolved near the end of Aug 28th. Specifically, ship navigation was not logged in the data acquisition system (DAS) from 11:04 to ~18:00 UTC on Aug 25th and from Aug 25th 21:45 to Aug 28th ~21:00 UTC. Fortunately during this time ship GPS and gyro were logged by the ADCP system.

Sunday, August 26

Brief delay at site G30 because breaker tripped on knuckle crane. Seas continue to be slight.

Station G30B

On Station:	8/26/2012 13:12 UTC (8/26/2012 06:12 local)
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OBS Type:	WHOI Keck – S81
Deploy Time:	8/26/2012 13:26 UTC
Deployed Position:	41° 57.308' N, 128° 19.123' W
Water Depth:	3133 m
Range to which tracked	488 m
OBS on Seafloor:	NOT TRACKED TO BOTTOM
OBS Fall Speed:	Unknown
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/26/2012 13:39 UTC
Depart Station:	8/26/2012 13:46 UTC
Time on Station:	0 hr 34 min

Station G22B

On Station:	8/26/2012 16:53 UTC (8/26/2012 09:53 local)
OBS Type:	WHOI ARRA – T108
Deploy Time:	8/26/2012 17:19 UTC
Deployed Position:	41° 18.451' N, 128° 16.505' W
Water Depth:	3053 m
Range to which tracked	3057 m
OBS on Seafloor:	8/26/2012 18:19
OBS Fall Speed:	51 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/26/2012 18:21 UTC
Depart Station:	8/26/2012 18:23 UTC
Time on Station:	1 hr 30 min

Getting noticeably warmer as we head south. Sunny and pleasant of the back deck

Station G13B

On Station:	8/26/2012 21:32 UTC (8/26/2012 14:32 local)
OBS Type:	WHOI ARRA – T105
Deploy Time:	8/26/2012 21:44 UTC
Deployed Position:	40° 40.956' N, 128° 01.735' W
Water Depth:	3232 m
Range to which tracked	3226 m
OBS on Seafloor:	8/26/2012 22:41 UTC
OBS Fall Speed:	57 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/26/2012 22:43 UTC
Depart Station:	8/26/2012 22:46 UTC
Time on Station:	1 hr 30 min

A flag is placed on OBS G13B to test whether this will make daytime recoveries easier without affecting data quality. Flags are planned for three other sites.

Station G05B

On Station:	8/27/2012 02:01 UTC (8/26/2012 19:01 local)
OBS Type:	WHOI ARRA – T110
Deploy Time:	8/27/2012 02:12 UTC
Deployed Position:	40° 04.176' N, 127° 44.878' W

Water Depth:	4483 m
Range to which tracked	4479 m
OBS on Seafloor:	8/27/2012 03:39 UTC
OBS Fall Speed:	53 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/27/2012 03:41 UTC
Depart Station:	8/27/2012 03:43 UTC
Time on Station:	1 hr 42 min

A flag is placed on OBS G05B.

Problem detected with differential pressure gauge on ARRA OBS T103 planned for site G04B about half an hour away from station. After swapping the cable to no effect, the DPG is swapped. If the broken DPG cannot be repaired, an instrument without a DPG will be deployed at one of the lower priority sites (The DPG was subsequently successfully repaired).

Monday, August 26th

After deployment of G04B a CTD cast and acoustic survey is planned. The CTD breaks down (no power in the winch control box) so no CTD is possible while the OBS descends. The acoustic survey commences as soon as the OBS reaches the seafloor. There are a lot of spurious times (100-200 msec) which are not eliminated by turning down the power – in retrospect should have increased ping interval. In the meantime the CTD winch is back and running (short in winch control box). The acoustic survey is followed by a CTD cast to 1000m

Station G04B

On Station:	8/27/2012 07:06 UTC (8/27/2012 00:06 local)
OBS Type:	WHOI ARRA – T103
Deploy Time:	8/27/2012 07:15 UTC
Deployed Position:	40° 03.654' N, 126° 55.992' W
Water Depth:	4379 m
Range to which tracked	4479 m
OBS on Seafloor:	8/27/2012 08:36 UTC
OBS Fall Speed:	55 m/min
Start Acoustic Survey:	8/27/2012 08:37 UTC
Disable Acoustic Release:	8/27/2012 010:20 UTC
CTD Cast #:	01
CTD Max. Depth:	1000 m
Depart Station:	8/27/2012 11:12 UTC
Time on Station:	1 hr 42 min

Nice weather and nearly calm seas continue. G03B Keck is deployed after breakfast. On check-out one of the two burn wires is defective. At launch time one of the burn wires has wire exposed where the wire joins the moulding. After replacement, the burn wires still do not check out right and the second burn wire also needs to be replaced.

Station G03B

On Station:	8/27/2012 14:51 UTC (8/27/2012 7:51 local)
OBS Type:	WHOI Keck – S89
Deploy Time:	8/27/2012 15:47 UTC

Deployed Position:	40° 03.552' N, 126° 09.764' W
Water Depth:	4071 m
Range to which tracked	339 m
OBS on Seafloor:	NOT TRACKED TO BOTTOM
OBS Fall Speed:	Unknown
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/27/2012 15:57 UTC
Depart Station:	8/27/2012 15:57 UTC
Time on Station:	1 hr 16 min

Update the locations for FS05B and FS06B so that they are in the center of the channel where it is wide enough to provide an ~700 m radius flat drop zone. Concern here about strong currents which are southward at the surface at up to 0.5 m/s and northward below 100 m at up to 0.2 m/s (Pierce et al., Deep Sea Research II, 2000). Sites appear to be further offshore than strongest N-S current. Will check the ADCP at time of deployment.

The burn wires appear to be a problem. The current batch seems particularly weak at the junction. Inspection of last year's burn wires (6 month deployment) shows corrosion on a subset - they are snapped at this junction once used. However these instruments did return. This deployment will be longer and the burnwires seem less well made. A major concern is the instruments that are currently on the seafloor (7 Kecks and 5 ARRAs). We are trying to find a way to protect/cover with epoxy the wires still in hand. We have a large batch of replacement wires on board (including all those intended for John Nabalek's expt. in Sept), but most appear poorly made. Use 5200 adhesive to repair burn wires

Decide to track FS05 to bottom to confirm that it lands in channel bottom

Station FS05B

On Station:	8/27/2012 21:22 UTC (8/27/2012 14:22 local)
OBS Type:	WHOI Keck - S80
Deploy Time:	8/27/2012 21:47 UTC
Deployed Position:	40° 23.187' N, 124° 54.008' W
Water Depth:	2325 m
Range to which tracked	2325 m
OBS on Seafloor:	8/27/2012 22:46 UTC
OBS Fall Speed:	39 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/27/2012 22:49 UTC
Depart Station:	8/27/2012 22:49 UTC
Time on Station:	1 hr 27 min

Station FS06B

On Station:	8/27/2012 23:20 UTC (8/27/2012 16:20 local)
OBS Type:	WHOI Keck - S87
Deploy Time:	8/27/2012 23:28 UTC
Deployed Position:	40° 22.820' N, 124° 47.191' W
Water Depth:	2211 m
Range to which tracked	402 m
OBS on Seafloor:	NOT TRACKED TO BOTTOM
OBS Fall Speed:	Unknown

Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/27/2012 23:39 UTC
Depart Station: 8/27/2012 23:40 UTC
Time on Station: 0 hr 20 min

Station FS09B

On Station: 8/28/2012 00:05 UTC (8/27/2012 17:05 local)
OBS Type: WHOI Keck - S85
Deploy Time: 8/28/2012 00:29 UTC
Deployed Position: 40° 26.216' N, 124° 48.449' W
Water Depth: 2143 m
Range to which tracked: 393 m
OBS on Seafloor: NOT TRACKED TO BOTTOM
OBS Fall Speed: Unknown
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/28/2012 00:38 UTC
Depart Station: 8/28/2012 00:43 UTC
Time on Station: 0 hr 38 min

Weather calm but a little foggy. Decide to deploy G19, obtain a CTD cast as it sinks then survey. OBSIP group will be up to deploy at site G11 at 8 AM.

Station G19B

On Station: 8/28/2012 06:20 UTC (8/27/2012 23:20 local)
OBS Type: WHOI ARRA - T106
Deploy Time: 8/28/2012 06:38 UTC
Deployed Position: 41° 18.484' N, 125° 46.331' W
Water Depth: 3097 m
Range to which tracked: 3086 m
OBS on Seafloor: 8/28/2012 07:37 UTC
OBS Fall Speed: 56 m/min
Start Acoustic Survey: 8/28/2012 07:40 UTC
Disable Acoustic Release: 8/28/2012 08:53 UTC
CTD Cast #: 02
CTD Max. Depth: 1000 m
Depart Station: 8/28/2012 08:56 UTC
Time on Station: 2 hr 36 min

Tuesday, August 27th

Weather continues to be good. OBSIP group rested overnight and will deploy G11B after breakfast

Station G11B

On Station: 8/28/2012 14:30 UTC (8/28/2012 07:30 local)
OBS Type: WHOI ARRA - T111
Deploy Time: 8/28/2012 15:00 UTC
Deployed Position: 40° 41.156' N, 126° 22.683' W
Water Depth: 3138 m
Range to which tracked: 3142 m
OBS on Seafloor: 8/28/2012 16:02 UTC

OBS Fall Speed: 51 m/min
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/28/2012 16:03 UTC
Depart Station: 8/28/2012 16:03 UTC
Time on Station: 1 hr 33 min

Station G20B

On Station: 8/28/2012 19:25 UTC (8/28/2012 12:25 local)
OBS Type: WHOI ARRA - T113
Deploy Time: 8/28/2012 19:33 UTC
Deployed Position: 41° 17.959' N, 126° 36.824' W
Water Depth: 3164 m
Range to which tracked: 3153 m
OBS on Seafloor: 8/28/2012 20:31 UTC
OBS Fall Speed: 54 m/min
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/28/2012 20:32 UTC
Depart Station: 8/28/2012 20:34 UTC
Time on Station: 1 hr 9 min

While approaching site for G20B and waiting for it to sink to seafloor, tsunami debris is observed. A float with Chinese writing is recovered for the Chief Scientist.

Station G21B

On Station: 8/28/2012 23:53 UTC (8/28/2012 16:53 local)
OBS Type: WHOI ARRA - T102
Deploy Time: 8/29/2012 00:01 UTC
Deployed Position: 41° 19.002' N, 127° 27.315' W
Water Depth: 3178 m
Range to which tracked: 3182 m
OBS on Seafloor: 8/29/2012 00:01 UTC
OBS Fall Speed: 52 m/min
Start Acoustic Survey: NO ACOUSTIC SURVEY
Disable Acoustic Release: 8/29/2012 01:07 UTC
Depart Station: 8/29/2012 01:10 UTC
Time on Station: 1 hr 17 min

Discussed plan for ending cruise. Will survey all remaining stations and aim to cross the bar on 8/30/12 at ~1 PM which is near the end of the first time window (if we are later than 1:30-2 PM, we will have to wait until 5:30 PM which will compress the available time for offloading).

Updated locations for G20, G21, G29 and G36 to have a ~600 m radius flat drop zone.

During deployment of G29B a tag line caught on the transponder and had to be unhooked midair with a boat hook. Conduct at CTD while OBS is falling and then an acoustic survey.

Station G29B

On Station: 8/29/2012 04:32 UTC (8/28/2012 21:32 local)
OBS Type: WHOI ARRA - T104
Deploy Time: 8/29/2012 04:41 UTC

Deployed Position:	41° 58.587' N, 127° 29.005' W
Water Depth:	3243 m
Range to which tracked	3215 m
OBS on Seafloor:	8/29/2012 05:40 UTC
OBS Fall Speed:	54 m/min
Start Acoustic Survey:	8/29/2012 05:44 UTC
Disable Acoustic Release:	8/29/2012 06:57 UTC
CTD Cast #:	03
CTD Max. Depth:	1000 m
Depart Station:	8/29/2012 06:58 UTC
Time on Station:	2 hr 26 min

OBSIP group rests. Next deployment at G36B will be at 6 AM local time

Wednesday, August 28th

The weather is still good.

G36B is deployed before breakfast. No CTD cast is done. The instrument is followed to the bottom. The acoustic survey goes well until the start of the 4th of the 5 survey legs when the OBS ceases to respond. The EdgeTech box is rebooted multiple times, all values used are checked and the parameters varied. We turn off the 4 kHz echo sounder. We attempt to communicate with the instrument using the deck transponder and the spare EdgeTech box, a completely independent system. We can hear the seafloor echo so both send and receive appear to be working. We send multiple enable commands and do not hear any response (15 chirps expected). Then we send multiple release commands, again no response. We wait the expected 1 hour and an additional 2 hours (in case of instrument flooding) but no instrument surfaces. Finally, we send multiple disable commands. The hope is that a subsequent cruise (OC1208B or Nabelek/Braunmiller) will visit and attempt to communicate acoustically with the instrument.

Another ARRA is deployed at G36B2 located ~2 km to the NNE of G36B. This means we will not deploy our lowest priority sites (J26). We turn the 4 kHz echo sounder back on. During this time the bridge continues to monitor the radio frequency of G36B. A flag is placed on OBS G36B2.

Station G36B

On Station:	8/29/2012 12:45 UTC (8/29/2012 05:45 local)
OBS Type:	WHOI ARRA - T115
Deploy Time:	8/29/2012 12:54 UTC
Deployed Position:	42° 35.044' N, 126° 54.854' W
Water Depth:	2444 m
Range to which tracked	2433 m
OBS on Seafloor:	8/29/2012 13:41 UTC
OBS Fall Speed:	52 m/min
Start Acoustic Survey:	8/29/2012 13:47 UTC
Acoustic Survey Fails:	8/29/2012 14:20 - <i>at N waypoint after 3/5 of survey</i>
Release Command Sent:	8/29/2012 15:55 - <i>no response, multiple codes sent</i> <i>Instrument does not surface - wait 3 hours.</i>
Disable Acoustic Release:	8/29/2012 18:36 UTC - <i>no response, multiple codes sent</i>
Depart Station:	8/29/2012 18:48 UTC
Time on Station:	6 hr 03 min

Station G36B2

On Station:	8/29/2012 18:49 UTC (8/29/2012 11:49 local)
OBS Type:	WHOI ARRA - T101
Deploy Time:	8/29/2012 19:23 UTC
Deployed Position:	42° 35.959' N, 126° 54.201' W
Water Depth:	2459 m
Range to which tracked	2439 m
OBS on Seafloor:	8/29/2012 20:10 UTC
OBS Fall Speed:	52 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/29/2012 20:12 UTC
Depart Station:	8/29/2012 20:14 UTC
Time on Station:	1 hr 25 min

With the delays at G36B, we no longer have time to survey the remaining sites and we will also deploy one less site. OBSIP group is keen to get in in the early afternoon before the low tide in order to facilitate offloading.

Station G35B

On Station:	8/29/2012 23:37 UTC (8/29/2012 16:37 local)
OBS Type:	WHOI ARRA - T109
Deploy Time:	8/29/2012 23:51 UTC
Deployed Position:	42° 34.059' N, 126° 03.205' W
Water Depth:	2385 m
Range to which tracked	2388 m
OBS on Seafloor:	8/30/2012 00:36 UTC
OBS Fall Speed:	55 m/min
Start Acoustic Survey:	NO ACOUSTIC SURVEY
Disable Acoustic Release:	8/30/2012 00:38 UTC
Depart Station:	8/30/2012 00:40 UTC
Time on Station:	1 hr 3 min

Deployment went smoothly at J11B but it would not respond acoustically. We were listening within a minute or so of deployment. Attempted with Teledyne Benthos Unit. Attempted with a transponder over the side. No response. On listening with headphones and Teledyne Benthos unit, Alan Gardner reports that there is a strange background noise in addition to the usual ship noise. Sent disable command multiple times at different powers. Check that it has not surfaced. There is not point releasing it - since the acoustic unit never worked it is unlikely to be a slow leak and so there is no benefit in trying to release it now as opposed to in a year's time. It may be hearing commands but if so it will release in a year's time. The hope is that a subsequent cruise (OC1208B or Nabelek/Braunmiller) will visit and attempt to communicate acoustically with the instrument.

Station J11B

On Station:	8/30/2012 05:35 UTC (8/29/2012 22:35 local)
OBS Type:	WHOI ARRA - T112
Deploy Time:	8/30/2012 05:42 UTC
Deployed Position:	43° 32.428' N, 126° 22.060' W
Water Depth:	3031 m
Range to which tracked	No response

Disable Acoustic Release:	Command sent multiple times – no response
Depart Station:	8/30/2012 06:52 UTC
Time on Station:	1 hr 17 min

A flag is placed on OBS J11B.

Thursday, August 29th

J19B deploys without problems in calm seas except that the very end of a tag line knots on the bail during deployment and is cut. No CTD cast is done. An acoustic survey is initiated but is cut short half way to head back to Newport in time to cross the bar before the tides reverse.

Station J19B

On Station:	8/30/2012 10:16 UTC (8/30/2012 03:16 local)
OBS Type:	WHOI ARRA – T114
Deploy Time:	8/30/2012 10:25 UTC
Deployed Position:	44° 10.711' N, 126° 16.232' W
Water Depth:	2981 m
Range to which tracked	2979 m
OBS on Seafloor:	8/30/2012 11:20 UTC
OBS Fall Speed:	54 m/min
Start Acoustic Survey:	8/30/2012 11:20 UTC - <i>complete 2½ of 5 legs of survey</i>
Disable Acoustic Release:	8/30/2012 12:09 UTC
Depart Station:	8/30/2012 12:11 UTC
Time on Station:	1 hr 55 min

OBS Operations

We deployed 25 OBS at 24 sites extending from south of the Mendocino Fracture Zone, onto the, to the west of the Juan de Fuca Ridge, and north into Canadian waters (Figures 1–2). We had planned to deploy at 25 sites, but because of communication issues with one OBS we deployed a second OBS at site G36 (G36B2). This meant that we did not deploy an OBS at site J26 – our lowest priority site.

Of the 25 OBS deployed, 15 were of a new WHOI design, the construction of which was funded through the American Recovery and Reinvestment Act (ARRA). The WHOI-designed ARRA OBS (Figures 3-5, Table 1) carry a Trillium Compact intermediate-period seismometer and a Cox-Deaton-Webb Differential Pressure Gauge (DPG). The Quanterra Q330 datalogger and Quanterra Baler-44 storage device are housed in a short aluminum (7075) pressure housing, while a smaller diameter but longer aluminum cylinder holds the lithium battery pack. The ARRA OBS carry a new chip-scale atomic clock (CSAC) manufactured by Symmetricom that provides significantly more accurate timing than the Seascan timebase used the other WHOI OBS. Floatation is provided by a syntactic foam pack. The remaining 10 OBS were funded by the W.M. Keck Foundation (Figure 6-7, Table 2), and carry a Guralp CMG-3T broadband seismometer, a Kinemetrics Episensor strong-motion accelerometer, and a DPG. Timing on the Keck OBS is provided by a Seascan timebase. All the OBS sampled at 50 Hz; the low pass anti-alias filters passband edge is set to a 20 Hz and stopband edge to 24 Hz.

All of the OBS were deployed off the starboard side using the Oceanus' Morgan knuckle-boom crane. Because of good weather initial OBS preparation and electronics check-out were done while underway while final checks took place when we were on site. All the ARRA OBS and one of the Keck OBS were tracked acoustically as they fell to the seafloor, for the remaining Keck OBS we confirmed that they sank to ~300 m. The deployed OBS locations are listed in Table 3 and are compared with the planned locations in Table 4.

For 5 OBS data to determine on-bottom location was obtained in the usual manner by ranging to the instrument from a number of locations at varying ranges and azimuths (Table 3). The transponder is offset 128' (39.0 m) aft from the navigation GPS and is 5 m below the water line. At one of these sites, G36B, the instrument ceased responding after the 3rd of 5 legs of the survey. At the final site, G189B, we only completed a partial survey, 2½ of 5 legs, and then departed for Newport in time to cross the bar before tides reverse. We used the ship's hull-mounted 12 kHz transducer for all acoustic communication other than on-deck testing. The Oceanus' acoustics were excellent. The remaining OBSs will be surveyed during the recovery leg and the surveyed OBS locations included in that cruise report.

One OBS transducer, at G36B, ceased replying part way through the acoustic survey and another transducer, at J11B, never communicated once in the water though it responded well on deck. In these cases communication was attempted with the deck transponder over the side and with the Teledyne Benthos Unit in the rack as well as with the deck EdgeTech box. This confirmed that the communications issues were on the OBS side and not shipboard.

Table 1. Keck OBS Configuration

Site Number	OBS I.D.	Guralp CMG-3T S/N	DPG S/N	DPG Version	Kinometrics Episensor Number	WHOI Episensor Board	Q330 Tag I.D.	Q330 Firmware Version	Baler Tag I.D.	Baler Firmware Version	QEP-1 Tag I.D.	EP-ADC-1 Tag I.D.	Seascan Timbase	Edgetech Acoustic Release Board #1	Int.Repl. (kHz)	Edgetech Acoustic Release Board #2	Int.Repl. (kHz)	Novatech VHF Radio S/N	Radio Frequency (MHz)
FS05B	S80	T3G38	6010	6.3	2867	11	2006	1.145	6392	2.26	117267	116633	110	31642	11/1.5	31653	11/2	V10-089	159.48
G30B	S81	T33996	6014	6.3	2864	08	2007	1.145	6393	2.26	117246	116635	133	31665	11/2	31654	11/3	V10-090	159.48
J48B	S82	T3L04	6009	6.3	2797	01	2140	1.145	6394	2.26	117244	116637	1040	31644	11/3	31630	11/2	18051	160.725
J28B	S83	T3G37	35	6.0	2836	03	2009	1.145	6395	2.26	117245	116636	318	31645	11/1.5	31656	11/3	U03-085	160.725
J63B	S84	T3L02	6022	6.3	2865	02	2010	1.145	6396	2.26	117274	116625	1043	31657	11/3	31646	11/2	U03-086	160.725
FS09B	S85	T3G30	6005	6.3	2862	09	2011	1.145	6397	2.26	117268	116638	1044	31647	11/3	31658	11/2	V10-084	159.48
J23B	S86	T3J97	6016	6.3	2870	05	2012	1.145	6398	2.26	117269	116631	1050	31648	11/1.5	31659	11/2	U03-073	154.585
FS06B	S87	T3L46	48	6.0	2866	07	2015	1.145	6399	2.26	117273	116652	1213	31666	11/2	31663	11/1.5	V10-088	159.48
J06B	S88	T3K51	6011	6.3	2863	04	2016	1.145	6514	2.26	117271	116639	1217	31650	11/2	31661	11/3	V10-092	159.48
G03B	S89	T3G41	6017	6.3	2868	10	2188	1.145	6401	2.26	117272	116634	1221	31651	11/1.5	31662	11/3	U03-093	160.785

Table 2. ARRA OBS Configuration

Site Number	OBS I.D.	Nanometrics Trillium Compact S/N	DPG S/N	DPG Version	Q330 Tag I.D.	Q330 Firmware Version	Baler Tag I.D.	Baler Firmware Version	CSAC S/N	Edgetech Acoustic Release Board	Int.Repl (kHz)	Novatech VHF Radio S/N	Radio Frequency (MHz)
G36B2	T101	3024	43	old	4512	1.145	16503	BALER 44-20120425-W	1104CS00303	35744	11/3	V10-094	160.785
G21B	T102	3001	60	old	4513	1.145	16500	BALER 44-20120425-W	1103CS00255	35731	11/3	V03-071	154.585
G04B	T103	3007	5	6.2	4514	1.145	16498	BALER 44-20120425-W	1104CS00354	35743	11/3	V03-090	160.785
G29B	T104	3006	6004	6.3	4515	1.145	17062	BALER 44-20120425-W	1106CS00447	35738	11/3	Y05-016	160.785
G13B	T105	3029	004	6.2	4516	1.145	16501	BALER 44-20120425-W	1104CS00379	35747	11/3	U03-072	154.585
G19B	T106	3022	56	old	4517	1.145	16502	BALER 44-20120425-W	1102CS00239	35745	11/3	V10-093	160.785
J27B	T107	3004	042	6	4518	1.145	16499	BALER 44-20120425-W	1104CS00304	35740	11/3	V10-086	159.48
G22B	T108	3002	012	6.2	4519	1.145	71951	BALER 44-20120425-W	1101CS00193	35748	11/3	V03-075	154.585
G35B	T109	3008	44	old	4520	1.145	16504	BALER 44-20120425-W	1104CS00362	35733	11/3	U03-091	160.785
G05B	T110	3023	54	old	4521	1.145	16512	BALER 44-20120425-W	1104CS00353	35741	11/3	U03-075	159.48
G11B	T111	3018	5	6	4522	1.145	16286	BALER 44-20120425-W	1106CS00594	35735	11/3	Y05-014	160.725
J11B	T112	3027	2	6	4523	1.145	16497	BALER 44-20120425-W	1104CS00372	35739	11/3	V03-094	160.785
G20B	T113	3020	45	old	4524	1.145	16511	BALER 44-20120425-W	1103CS00281	35732	11/3	U03-082	160.725
J19B	T114	3021	49	old	4525	1.145	17061	BALER 44-20120425-W	1102CS00227	35734	11/3	U03-080	159.48

Table 3. Deployed OBS Locations

Deployment Order	Site Number	OBS I.D.	Drop Date (UTC)	Drop Time (UTC)	Drop Latitude (decimal Deg)	Drop Longitude (decimal Deg)	Drop Latitude (Deg)	Drop Latitude (Min)	Drop Latitude (Hemi)	Drop Longitude (Deg)	Drop Longitude (Min)	Drop Longitude (Hemi)	Drop Water Depth (m)	Comments
1	J27B	T107	8/24/2012	1:20	44.8473	-126.3074	44	50.837	N	126	18.445	W	2843	
2	J28B	S83	8/24/2012	6:34	45.0639	-127.1563	45	3.836	N	127	9.375	W	2885	
3	J63B	S84	8/25/2012	2:45	48.2064	-130.0033	48	12.384	N	130	0.198	W	2878	
4	J48B	S82	8/25/2012	9:01	47.1278	-130.6395	47	7.667	N	130	38.372	W	2913	
5	J23B	S86	8/25/2012	21:10	44.8442	-129.6829	44	50.650	N	129	40.975	W	2699	
6	J06B	S88	8/26/2012	6:05	43.2515	-128.8011	43	15.088	N	128	48.066	W	3248	
7	G30B	S81	8/26/2012	13:26	41.9551	-128.3187	41	57.308	N	128	19.123	W	3133	
8	G22B	T108	8/26/2012	17:19	41.3075	-128.2751	41	18.451	N	128	16.505	W	3053	
9	G13B	T105	8/26/2012	21:44	40.6826	-128.0289	40	40.956	N	128	1.735	W	3232	Flag added to OBS
10	G05B	T110	8/27/2012	2:12	40.0696	-127.7480	40	4.176	N	127	44.878	W	4483	Flag added to OBS
11	G04B	T103	8/27/2012	7:15	40.0609	-126.9332	40	3.654	N	126	55.992	W	4379	Acoustic survey done
12	G03B	S89	8/27/2012	15:47	40.0592	-126.1627	40	3.552	N	126	9.764	W	4071	
13	FS05B	S80	8/27/2012	21:47	40.3865	-124.9001	40	23.187	N	124	54.008	W	2325	
14	FS06B	S87	8/27/2012	23:28	40.3803	-124.7865	40	22.820	N	124	47.191	W	2211	
15	FS09B	S85	8/28/2012	0:29	40.4369	-124.8075	40	26.216	N	124	48.449	W	2143	
16	G19B	T106	8/28/2012	6:38	41.3081	-125.7722	41	18.484	N	125	46.331	W	3097	Acoustic survey done
17	G11B	T111	8/28/2012	15:00	40.6859	-126.3781	40	41.156	N	126	22.683	W	3138	
18	G20B	T113	8/28/2012	19:33	41.2993	-126.6137	41	17.959	N	126	36.824	W	3164	
19	G21B	T102	8/29/2012	0:01	41.3167	-127.4553	41	19.002	N	127	27.315	W	3178	
20	G29B	T104	8/29/2012	4:41	41.9765	-127.4834	41	58.587	N	127	29.005	W	3243	Acoustic survey done
21	G36B	T115	8/29/2012	12:54	42.5841	-126.9142	42	35.044	N	126	54.854	W	2444	Acoustic survey fails after 3rd of 5 legs
22	G36B2	T101	8/29/2012	19:23	42.5993	-126.9034	42	35.959	N	126	54.201	W	2459	Flag added to OBS
23	G35B	T109	8/29/2012	23:51	42.5677	-126.0534	42	34.059	N	126	3.205	W	2385	
24	J11B	T112	8/30/2012	5:42	43.5405	-126.3677	43	32.428	N	126	22.060	W	3031	Flag added to OBS
25	J19B	T114	8/30/2012	10:25	44.1785	-126.2705	44	10.711	N	126	16.232	W	2981	Partial acoustic survey: 2½ of 5 legs

Table 4. Planned and Deployed OBS Locations

Planned Site	Planned Latitude	Planned Longitude	Planned Depth, m	Deployed Site	Drop Latitude (decimal Deg)	Drop Longitude (decimal Deg)	Drop Latitude (Deg)	Drop Latitude (Min)	Drop Latitude (Hemi)	Drop Longitude (Deg)	Drop Longitude (Min)	Drop Longitude (Hemi)	Drop Water Depth (m)	Distance from Planned Site (meters)
J27	44.8474	-126.3080	2823	J27B	44.8473	-126.3074	44	50.837	N	126	18.445	W	2843	5
J28	45.0636	-127.1564	2867	J28B	45.0639	-127.1563	45	3.836	N	127	9.375	W	2885	4
J63	48.2065	-130.0033	2882	J63B	48.2064	-130.0033	48	12.384	N	130	0.198	W	2878	1
J48	47.1317	-130.6526	2988	J48B	47.1278	-130.6395	47	7.667	N	130	38.372	W	2913	106
J23	44.8440	-129.6825	2655	J23B	44.8442	-129.6829	44	50.650	N	129	40.975	W	2699	4
J06	43.2515	-128.8010	3224	J06B	43.2515	-128.8011	43	15.088	N	128	48.066	W	3248	1
G30	41.9550	-128.3193	3124	G30B	41.9551	-128.3187	41	57.308	N	128	19.123	W	3133	5
G22	41.3075	-128.2749	2889	G22B	41.3075	-128.2751	41	18.451	N	128	16.505	W	3053	2
G13	40.6827	-128.0290	3201	G13B	40.6826	-128.0289	40	40.956	N	128	1.735	W	3232	1
G05	40.0586	-127.7506	4467	G05B	40.0696	-127.7480	40	4.176	N	127	44.878	W	4483	123
G04	40.0610	-126.9333	4387	G04B	40.0609	-126.9332	40	3.654	N	126	55.992	W	4379	1
G03	40.0591	-126.1625	4113	G03B	40.0592	-126.1627	40	3.552	N	126	9.764	W	4071	2
FS05	40.38072	-124.89719	2250	FS05B	40.3865	-124.9001	40	23.187	N	124	54.008	W	2325	68
FS06	40.37457	-124.80289	2200	FS06B	40.3803	-124.7865	40	22.820	N	124	47.191	W	2211	151
FS09	40.43602	-124.80634	2050	FS09B	40.4369	-124.8075	40	26.216	N	124	48.449	W	2143	14
G19	41.3080	-125.7725	3090	G19B	41.3081	-125.7722	41	18.484	N	125	46.331	W	3097	3
G11	40.6857	-126.3776	3129	G11B	40.6859	-126.3781	40	41.156	N	126	22.683	W	3138	5
G20	41.3139	-126.6066	3050	G20B	41.2993	-126.6137	41	17.959	N	126	36.824	W	3164	171
G21	41.3137	-127.4409	3272	G21B	41.3167	-127.4553	41	19.002	N	127	27.315	W	3178	123
G29	41.9371	-127.5698	3408	G29B	41.9765	-127.4834	41	58.587	N	127	29.005	W	3243	828
G36	42.5779	-126.9434	2316	G36Ba	42.5841	-126.9142	42	35.044	N	126	54.854	W	2444	245
				G36B2	42.5993	-126.9034	42	35.959	N	126	54.201	W	2459	401
G35	42.5675	-126.0534	2363	G35B	42.5677	-126.0534	42	34.059	N	126	3.205	W	2385	2
J11	43.5404	-126.3678	3031	J11B	43.5405	-126.3677	43	32.428	N	126	22.060	W	3031	1
J19	44.1786	-126.2711	2977	J19B	44.1785	-126.2705	44	10.711	N	126	16.232	W	2981	5
J26	44.6547	-125.4664	2864	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS	No OBS

Table 5. CTD Locations and Depths

CTD Number	Station Name	Deployment Date	Deployment Time (UTC)	CTD Station Latitude (deg)	CTD Station Latitude (min)	CTD Station Latitude (hemi)	CTD Station Longitude (deg)	CTD Station Longitude (min)	CTD Station Longitude (hemi)	CTD Station Latitude (decimal degrees)	CTD Station Longitude (decimal degrees)	CTD Max Depth (m)	Filename
1	G04B	8/27/12	10:25	40	3.662	N	126	56.002	W	40.0610	-126.9334	1000	cast01sound_spdderived.csv
2	G19B	8/28/12	6:55	41	18.48	N	125	46.351	W	41.3080	-125.7725	1000	cast02sound_spdderived.csv
3	G29B	8/29/12	5:00	41	58.585	N	127	29.012	W	41.9764	-127.4835	1000	cast03sound_spdderived.csv

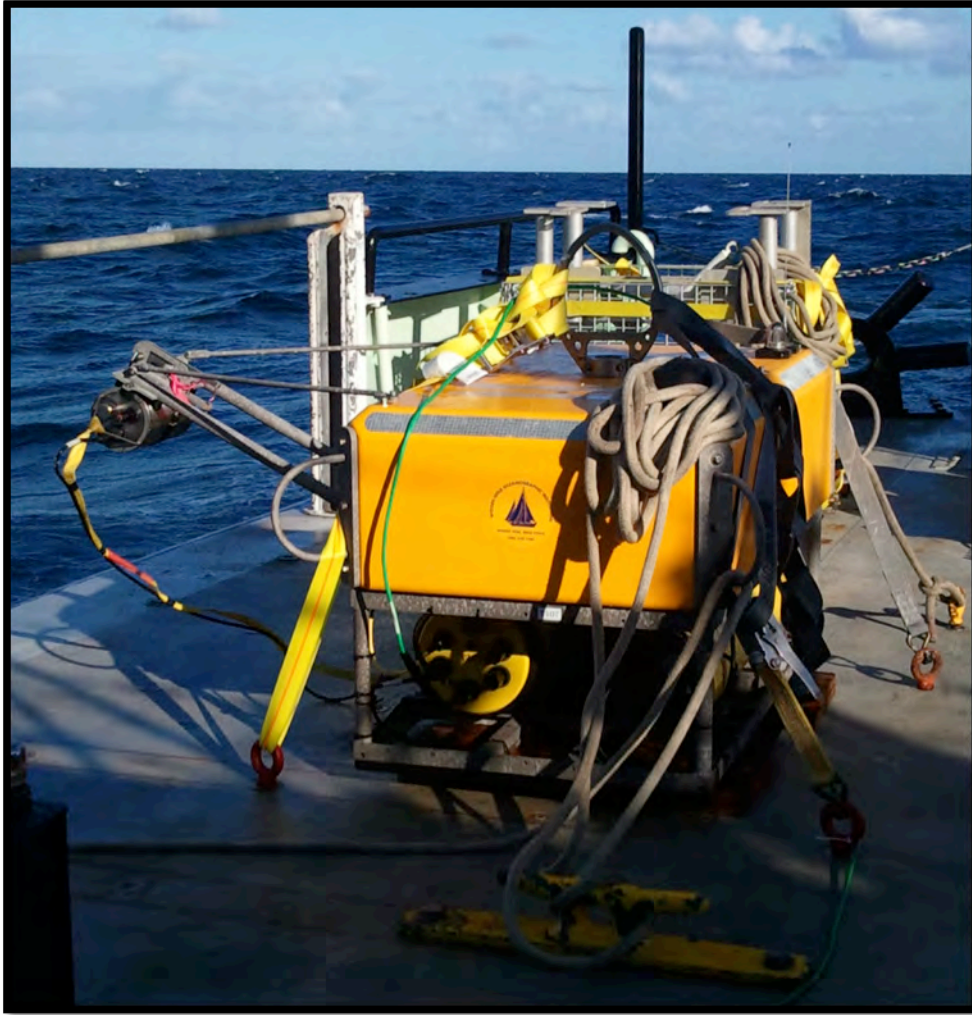


Figure 3. A WHOI ARRA OBS ready for deployment.



Figure 4. Deploying a WHOI ARRA OBS.

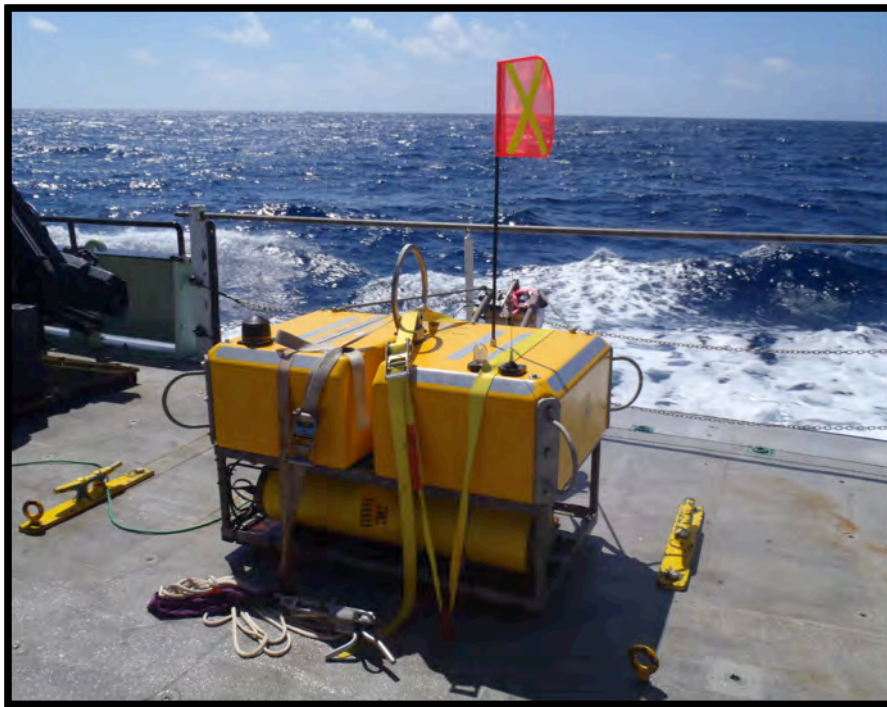


Figure 5. A flag was added to WHOI ARRA OBSs at stations G13B, G05B, G36B2, and J11B.



Figure 6. Preparing a WHOI Keck OBS.

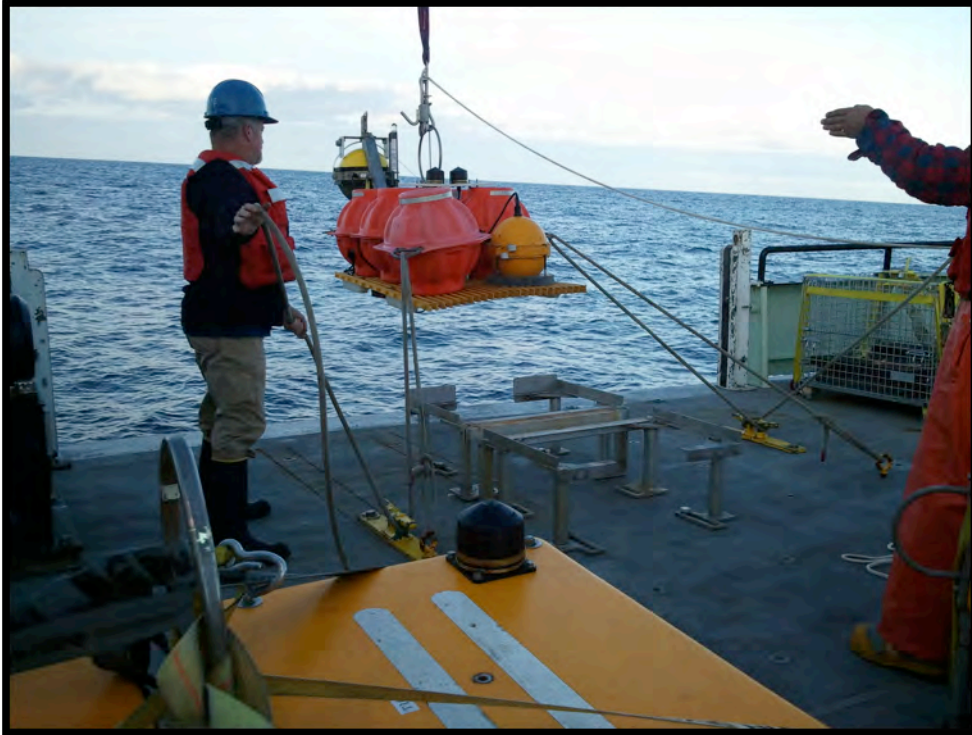
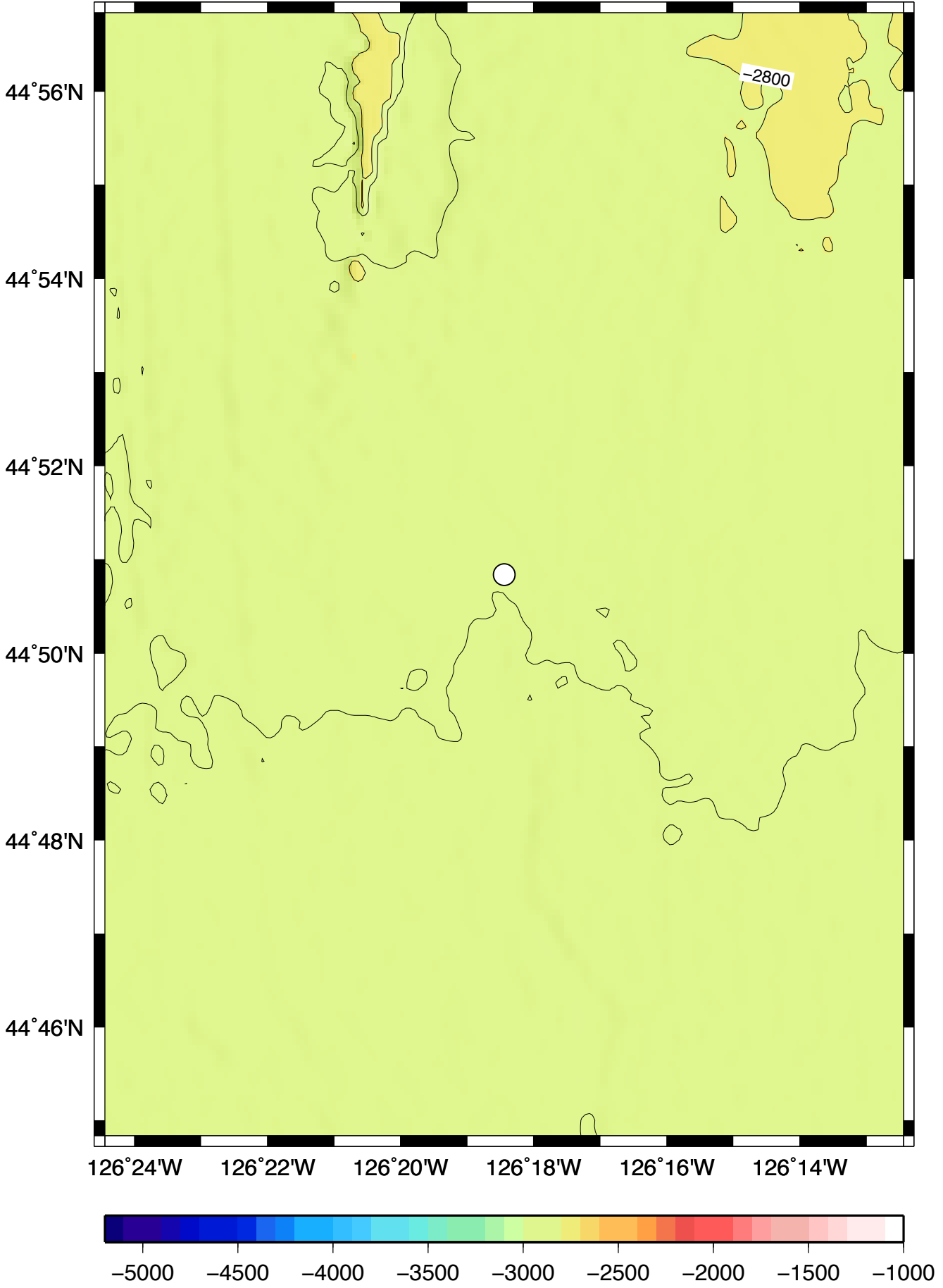


Figure 7. Deploying a WHOI Keck OBS.

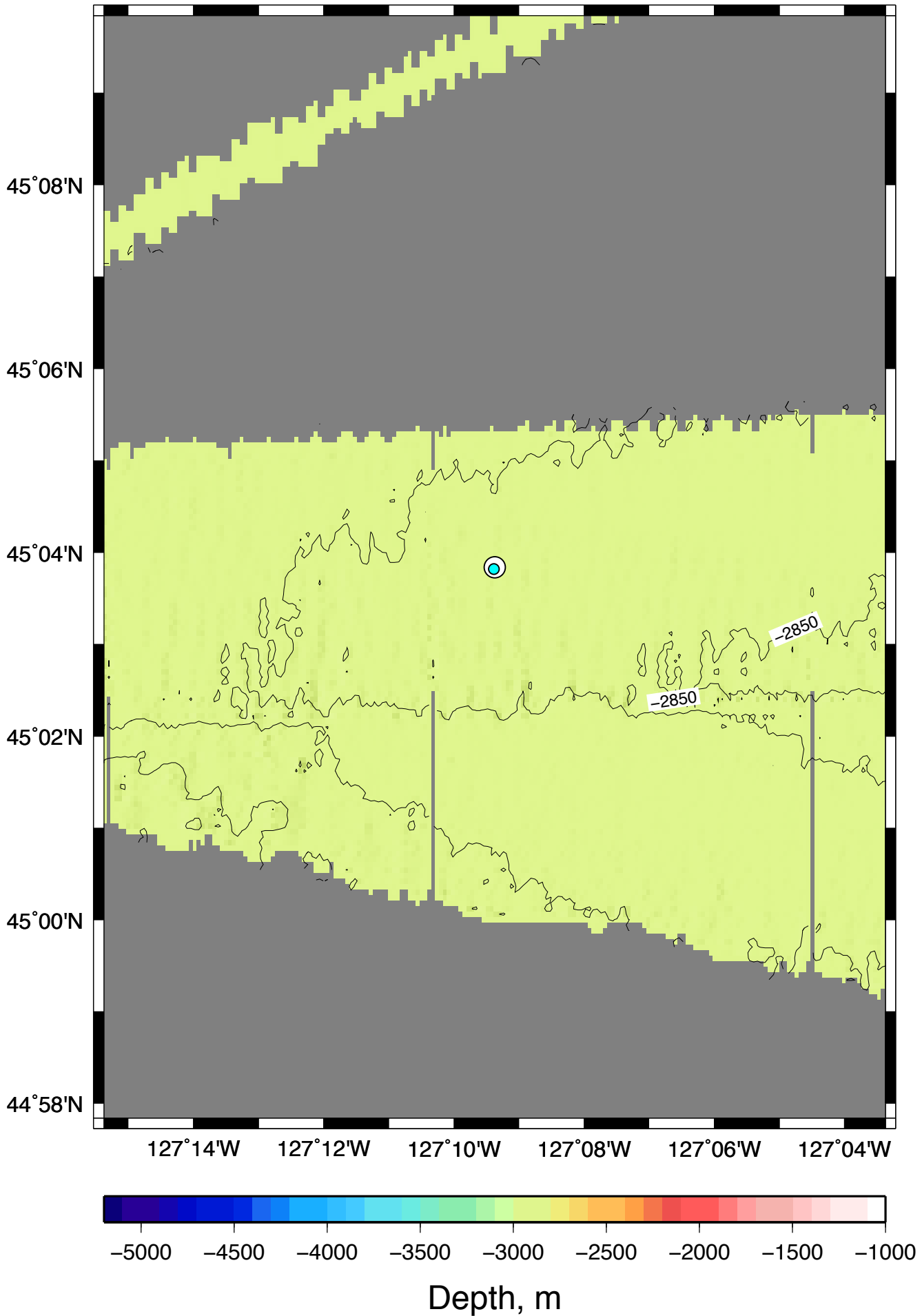
Acknowledgements

This cruise was supported by the U.S. National Science Foundation. We thank Captain Jeff Crews, Chief Engineer Bob Ashley, and the officers and crew of the *R/V Oceanus* for helping to make this shortened cruise a success. Shipboard technician Erik Arnesen provided considerable help with shipboard data systems and ensured OBS deck operations and CTD deployments went smoothly.

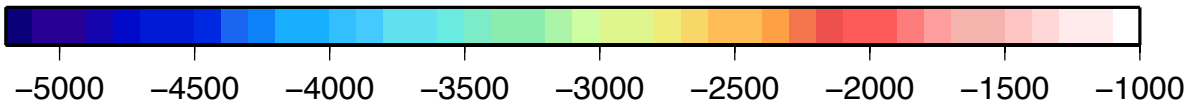
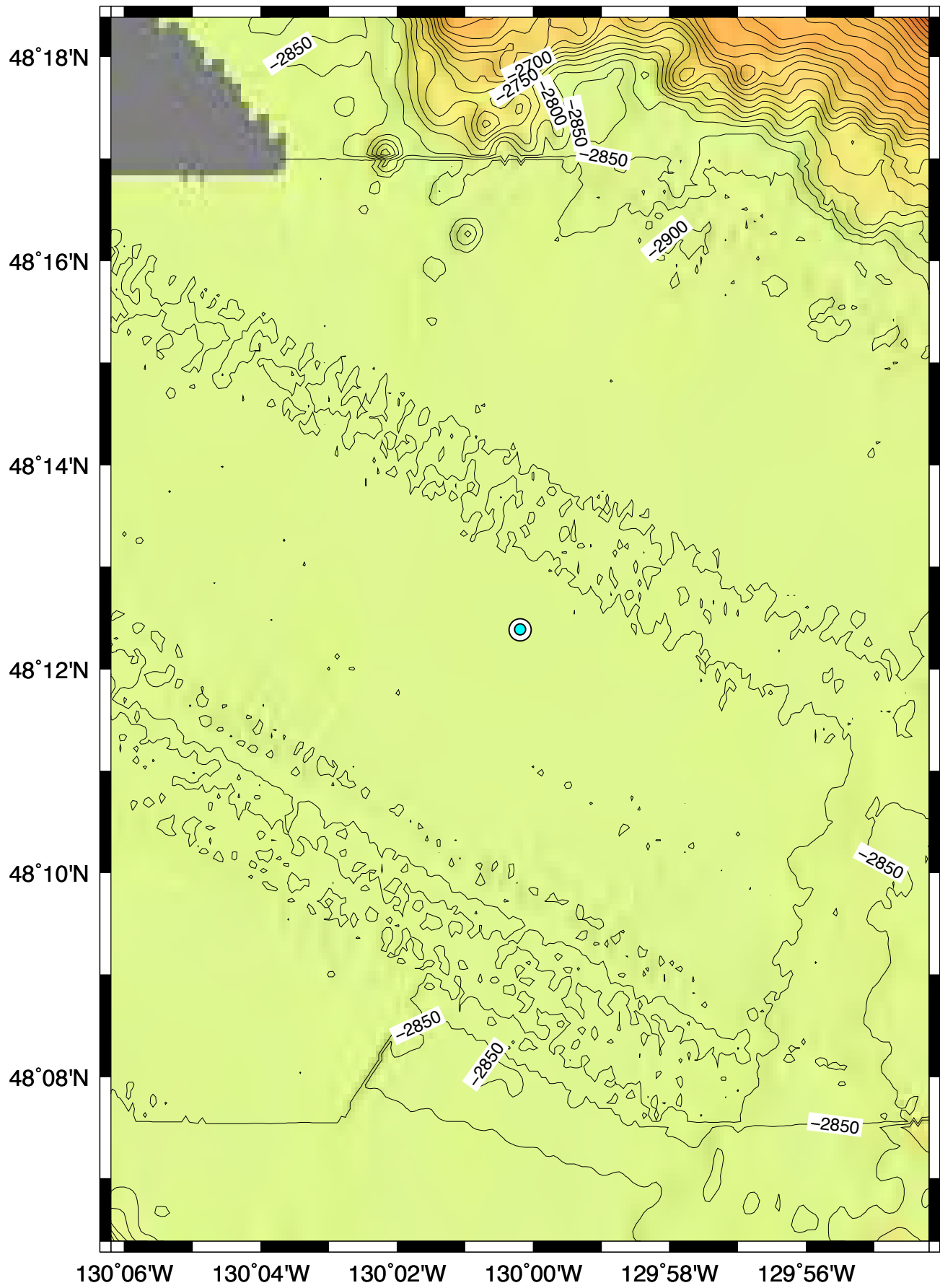
J27B Drop Site



J28B Drop Site (J28A in cyan)

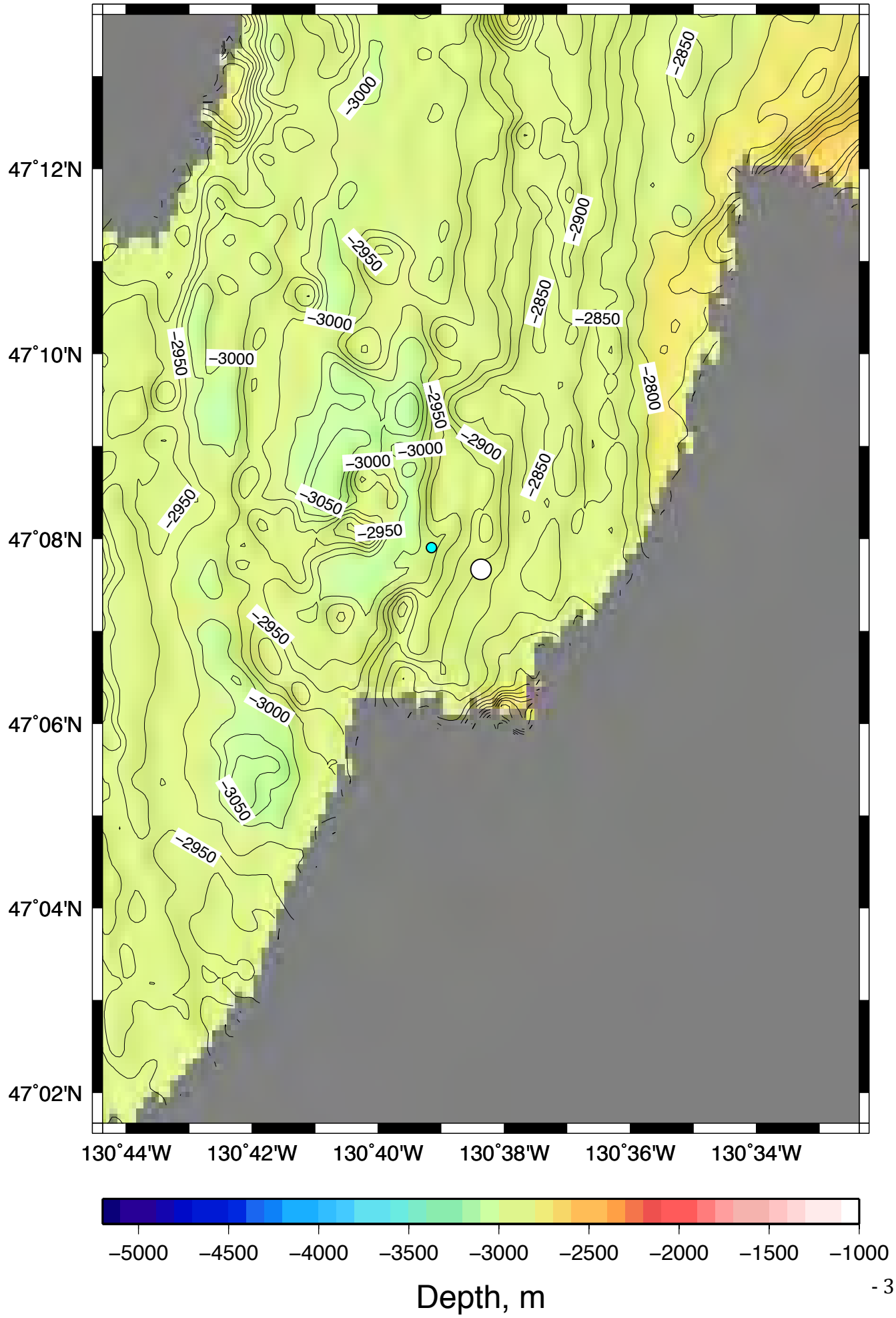


J63B Drop Site (J63A in cyan)

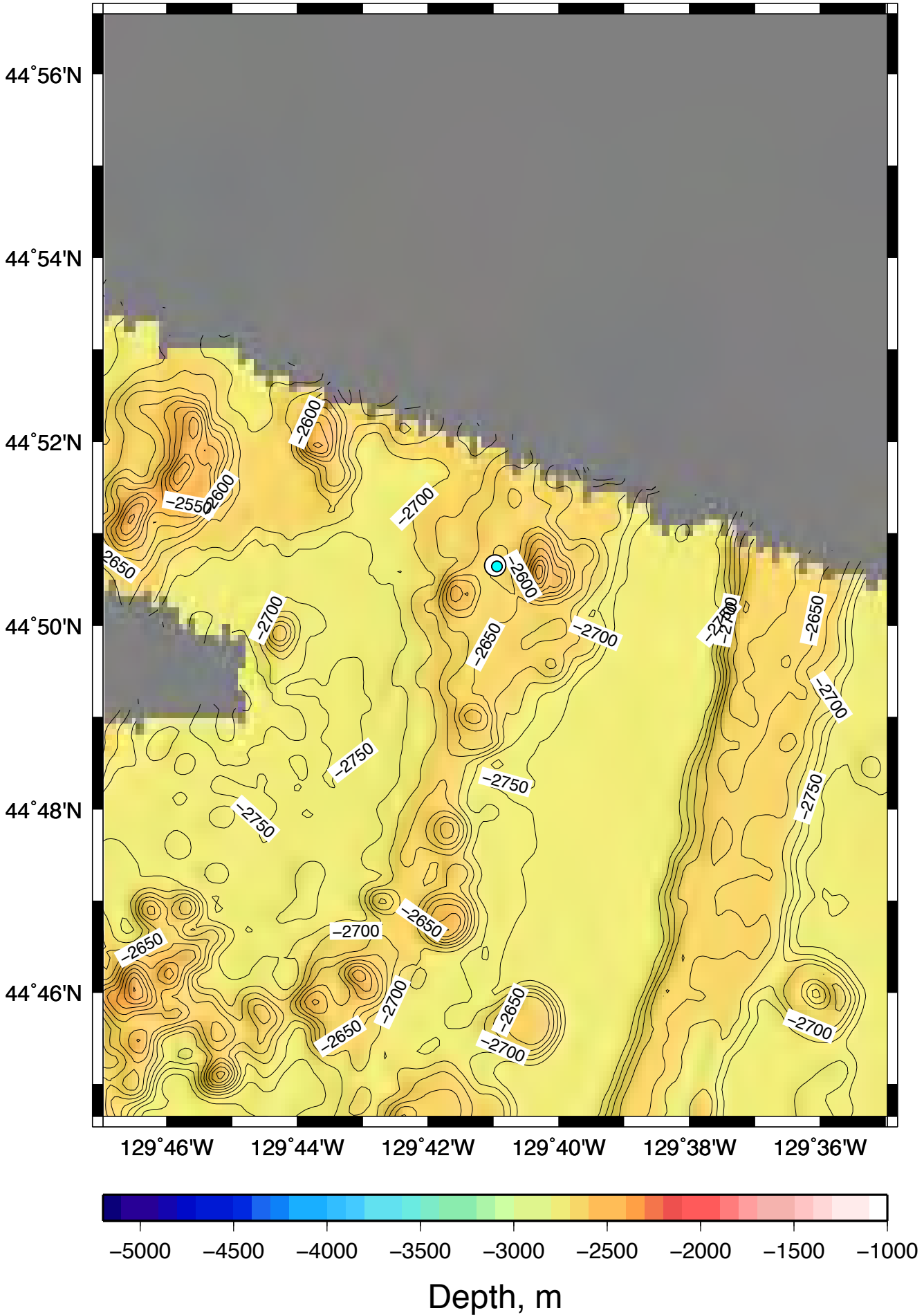


Depth, m

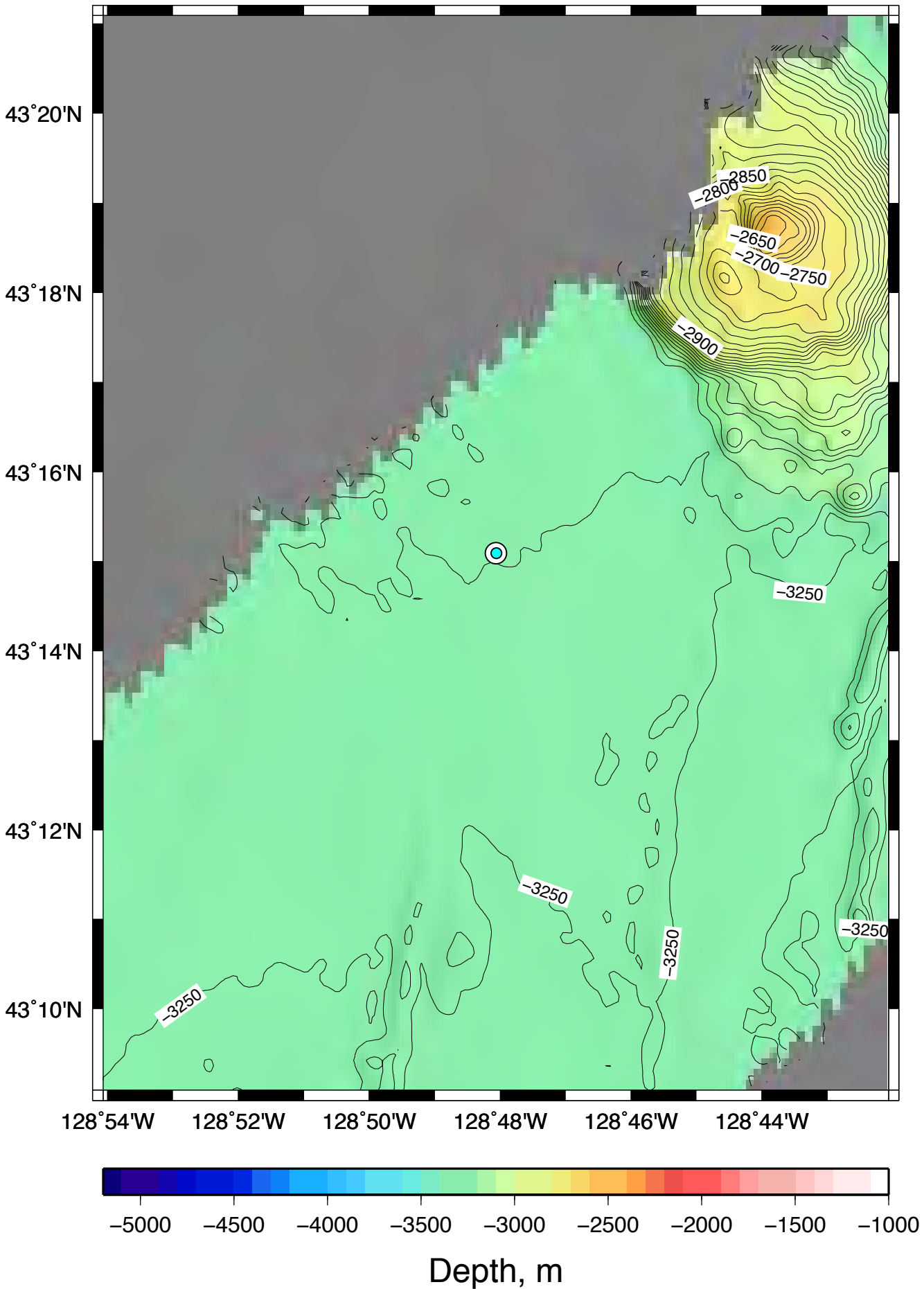
J48B Drop Site (J48A in cyan)



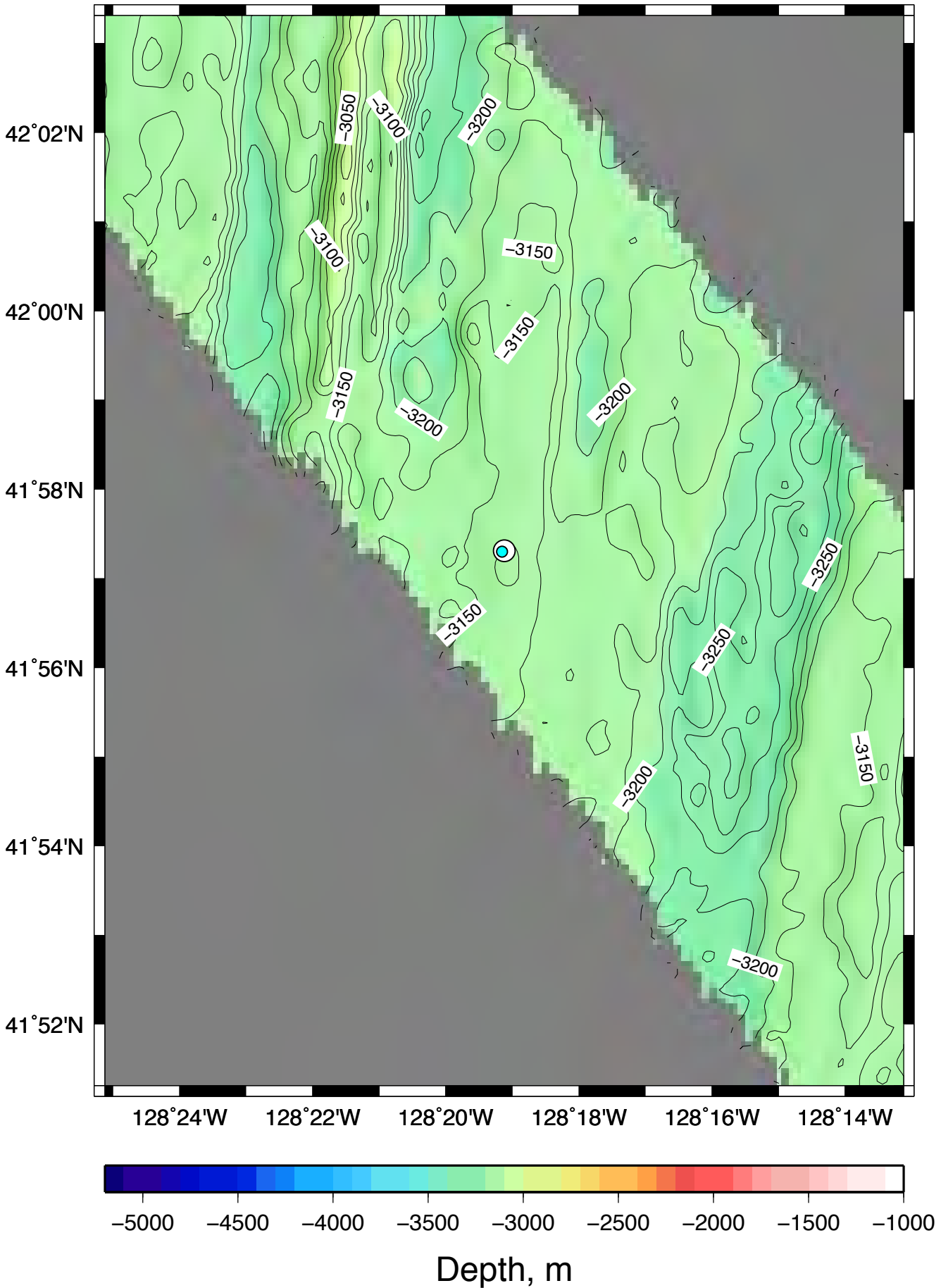
J23B Drop Site (J23A in cyan)



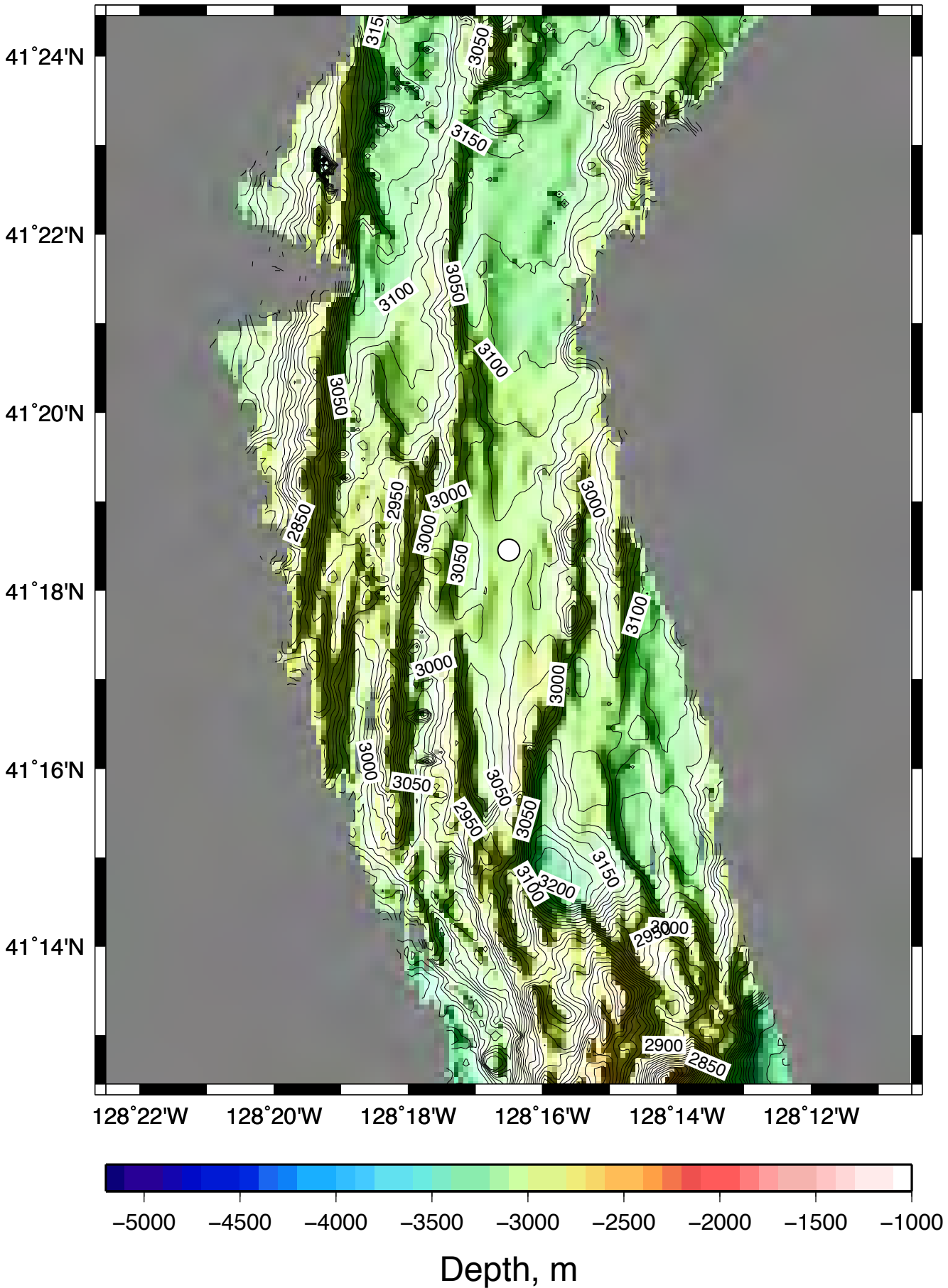
J06B Drop Site (J06A in cyan)



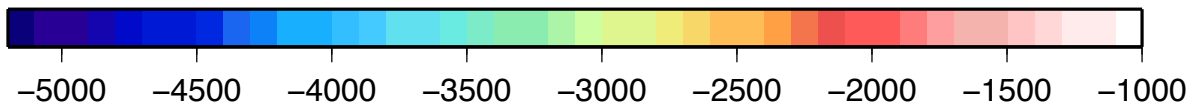
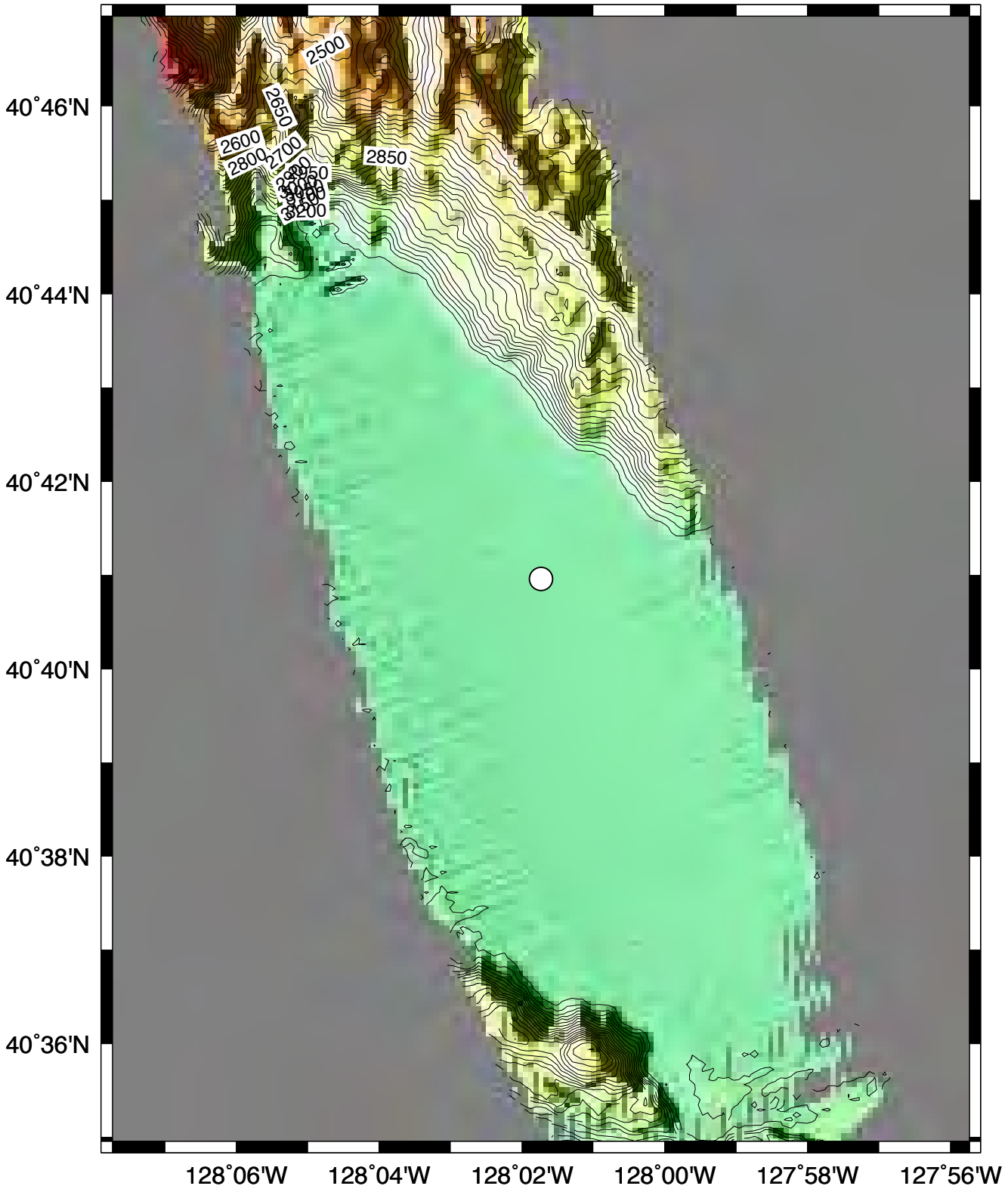
G30B Drop Site (G30A in cyan)



G22B Drop Site

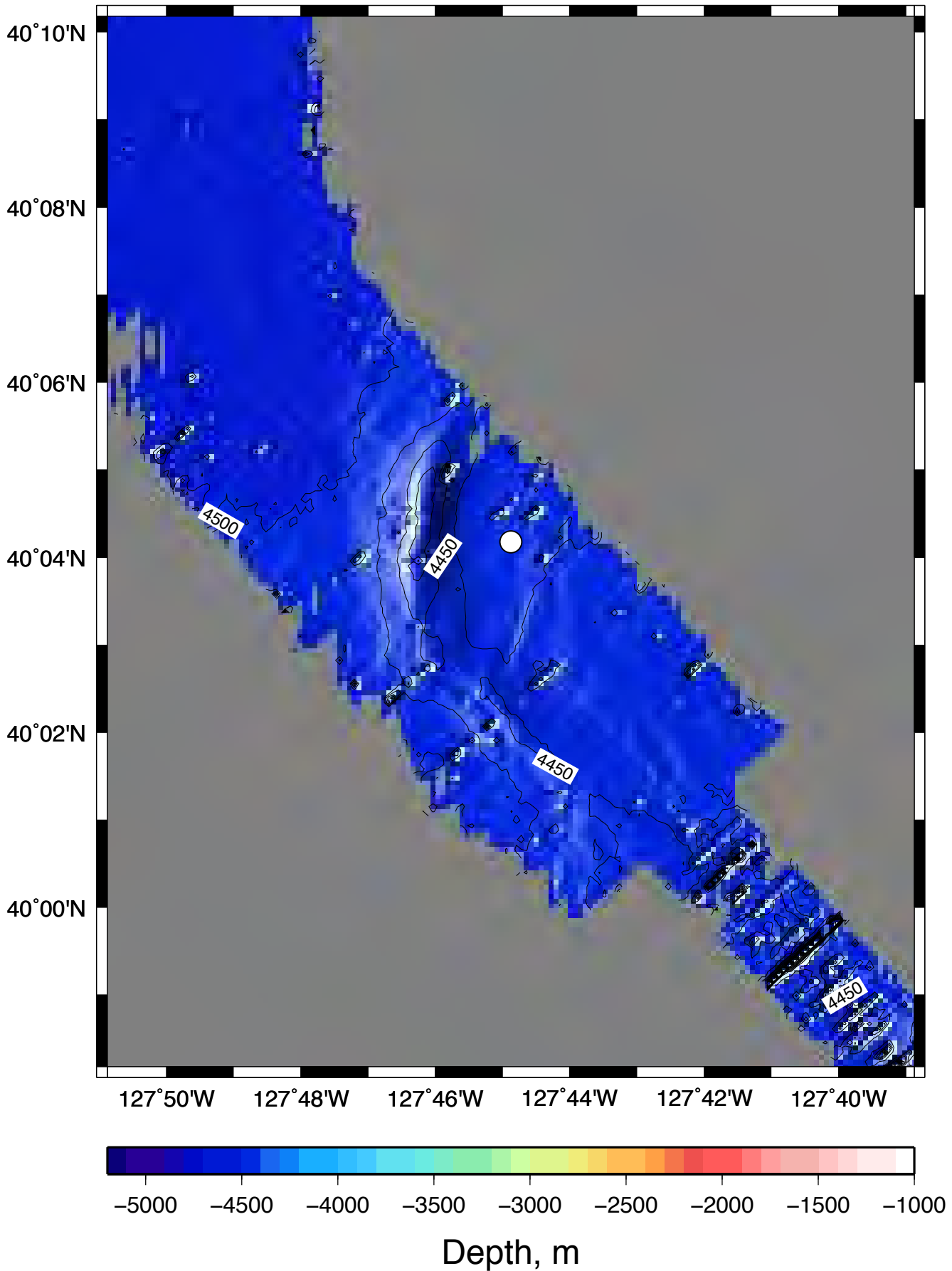


G13B Drop Site

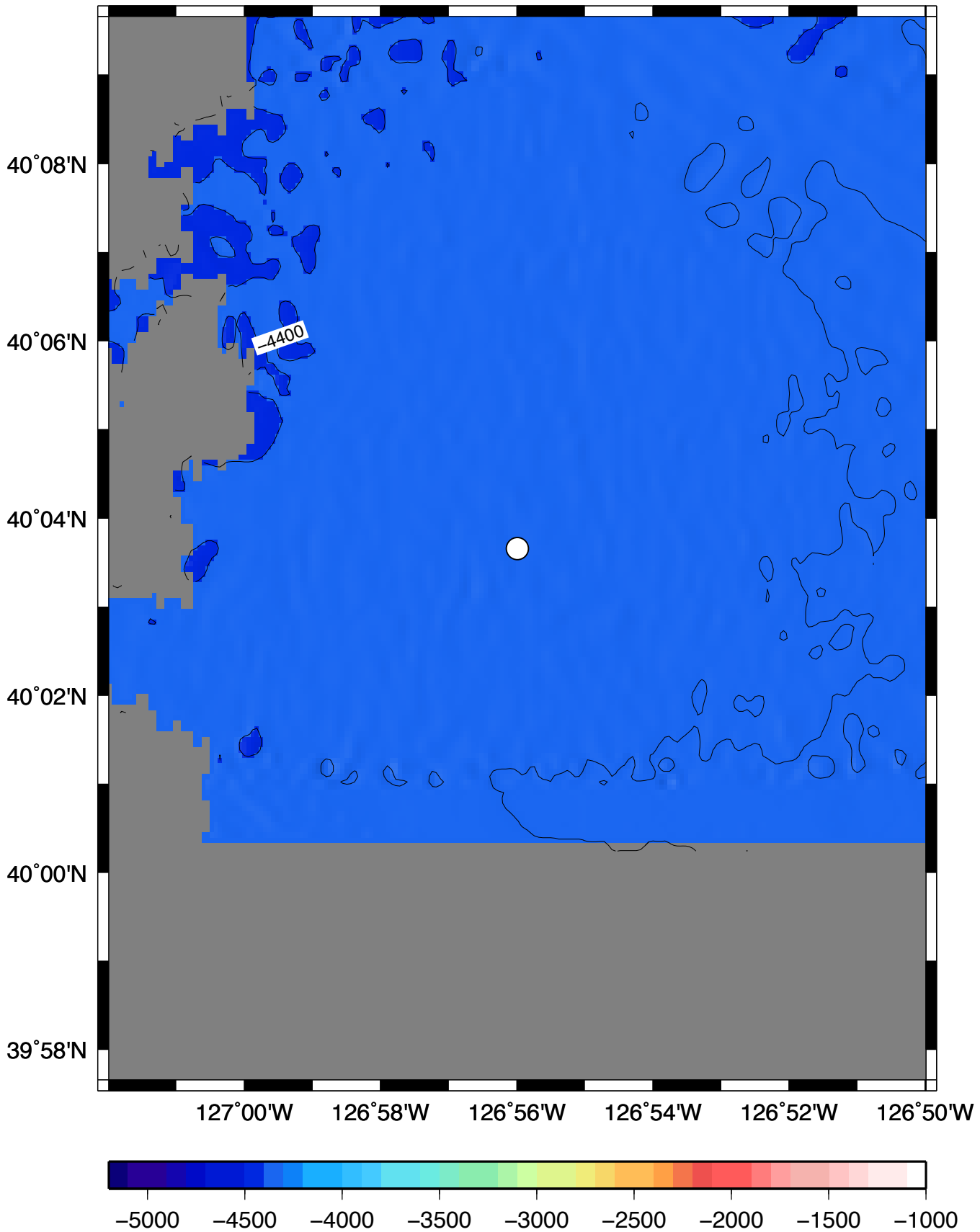


Depth, m

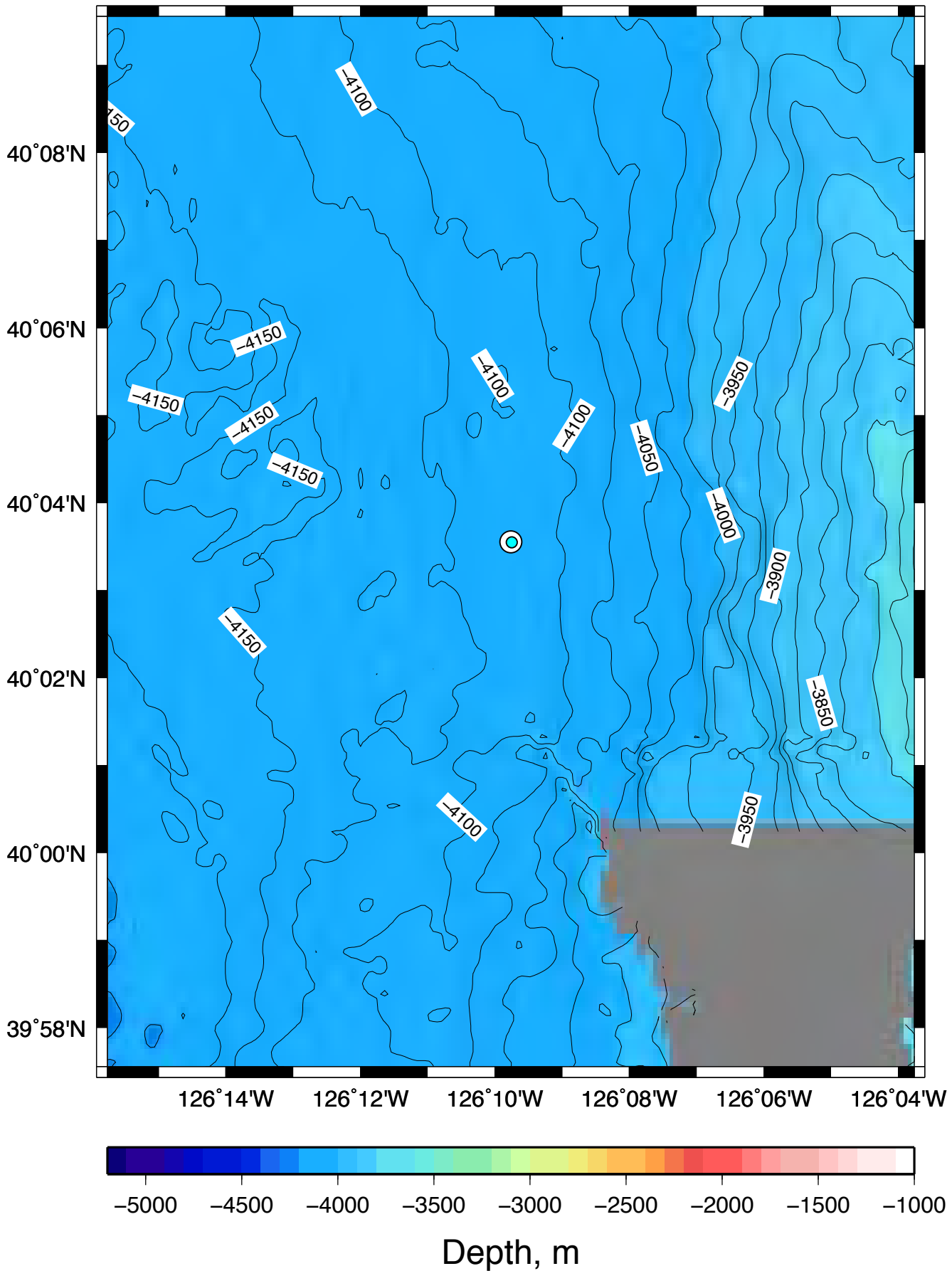
G05B Drop Site



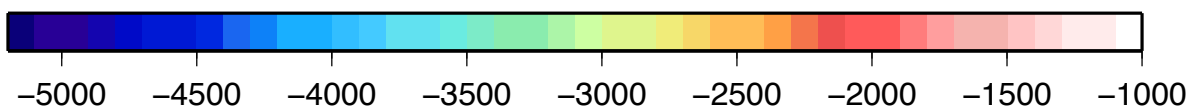
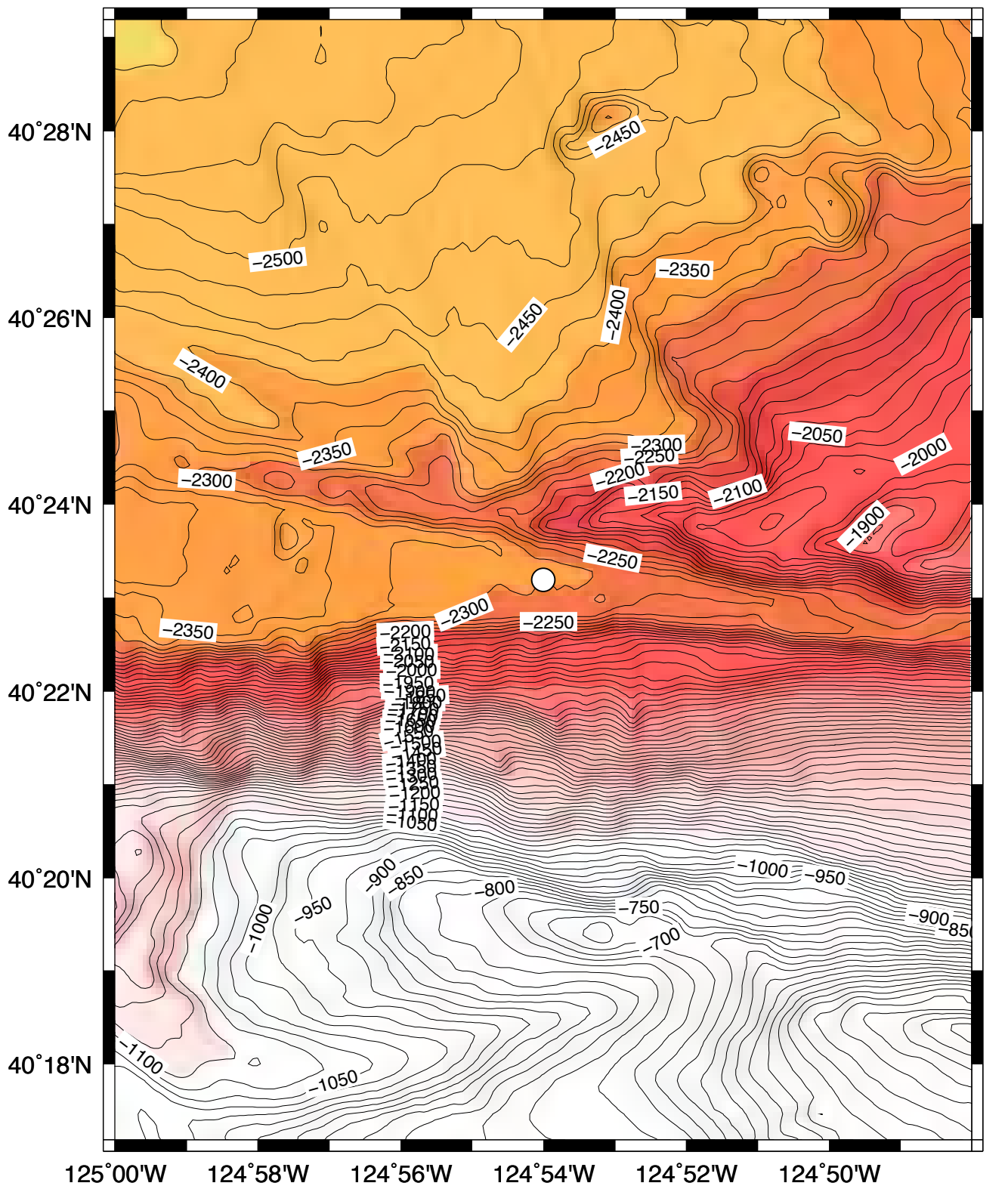
G04B Drop Site



G03B Drop Site (G03A in cyan)

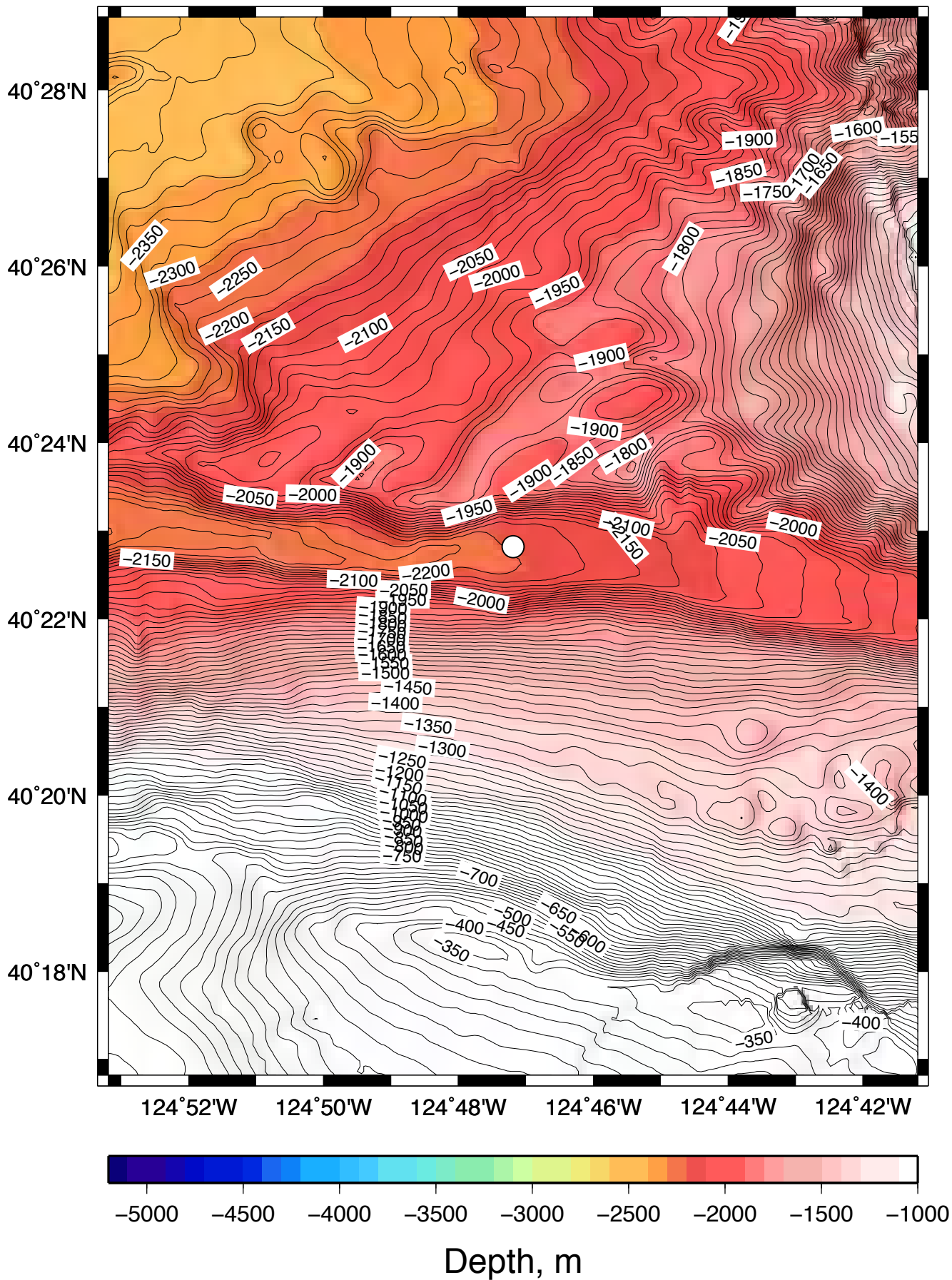


FS05B Drop Site

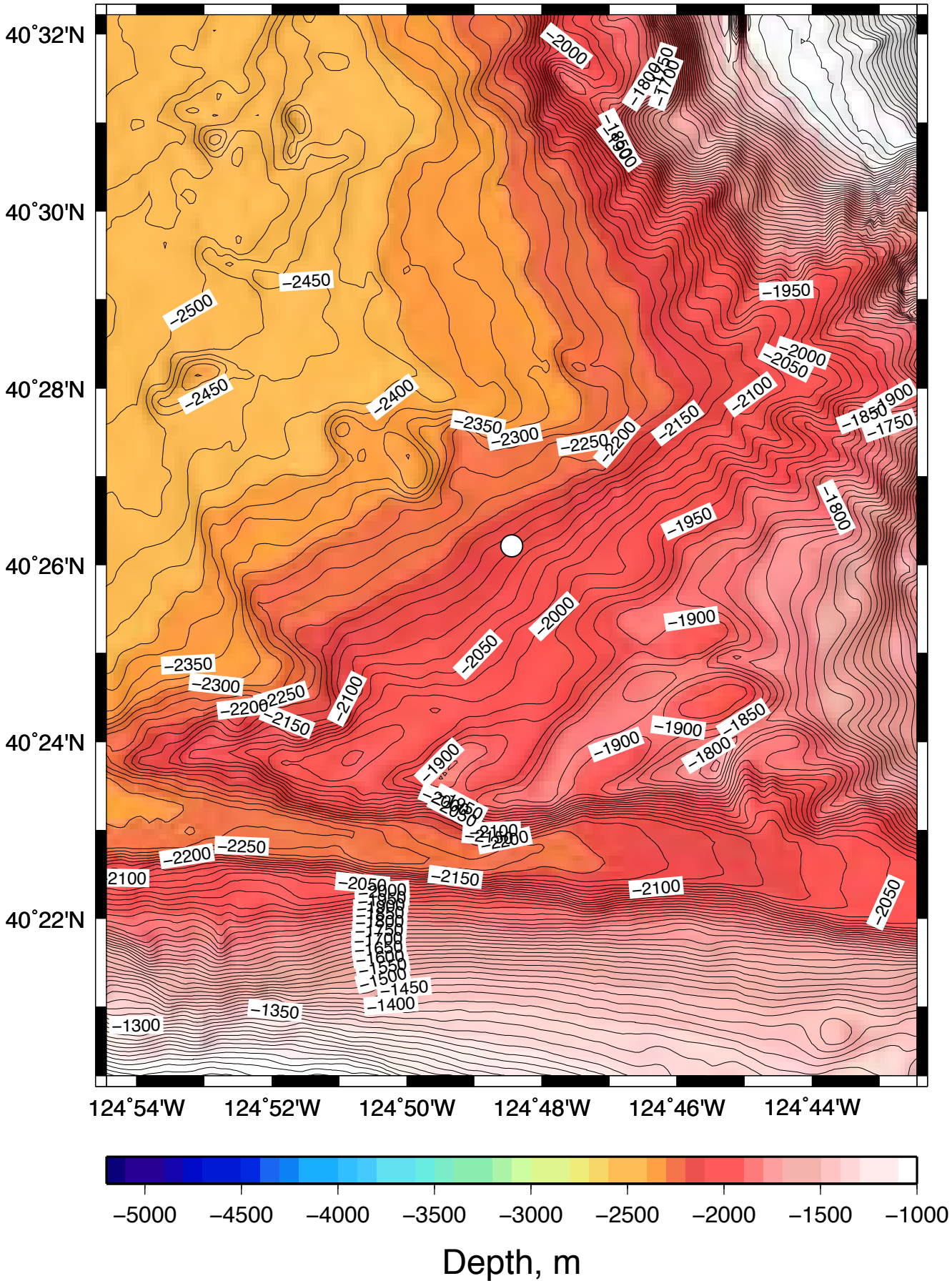


Depth, m

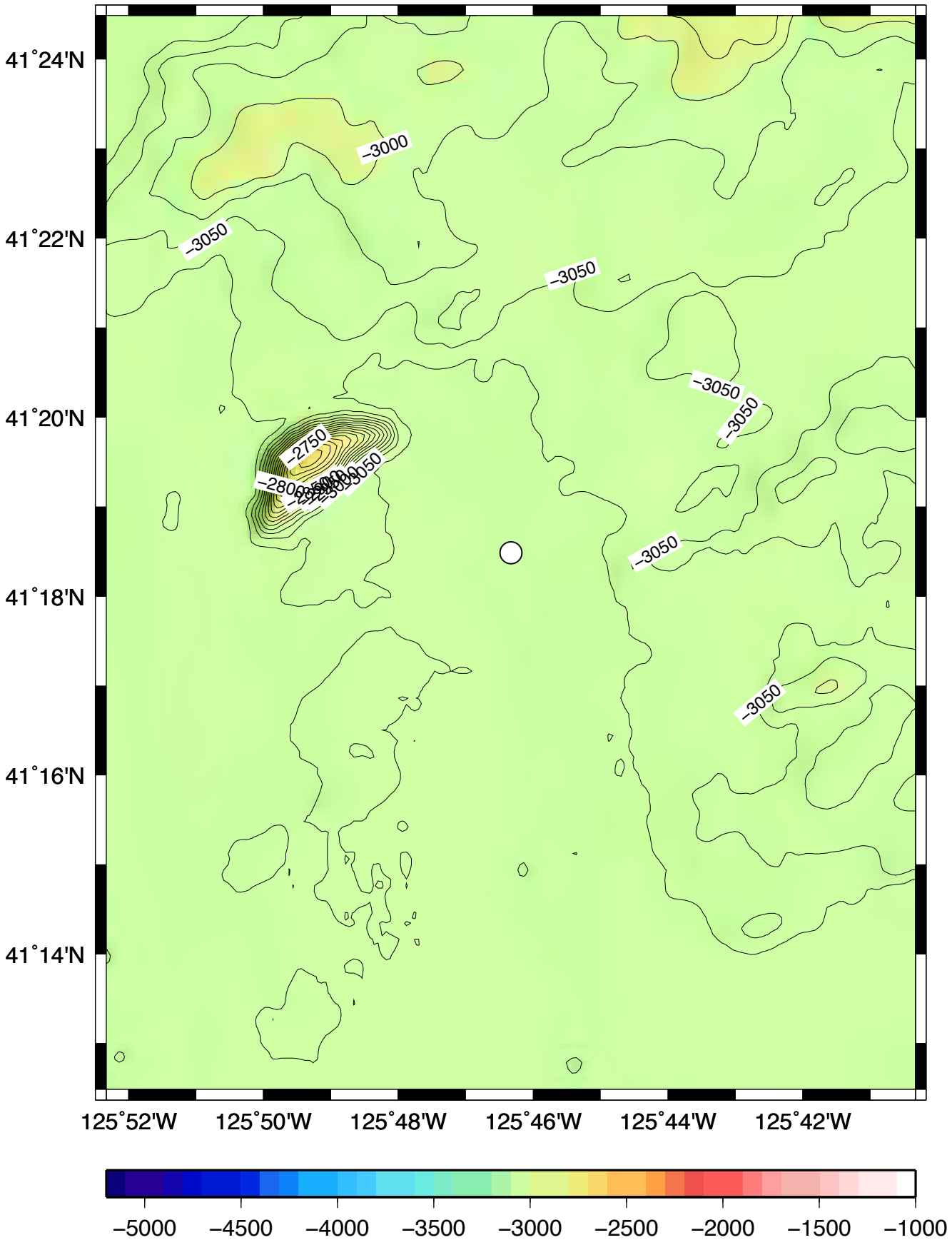
FS06B Drop Site



FS09B Drop Site

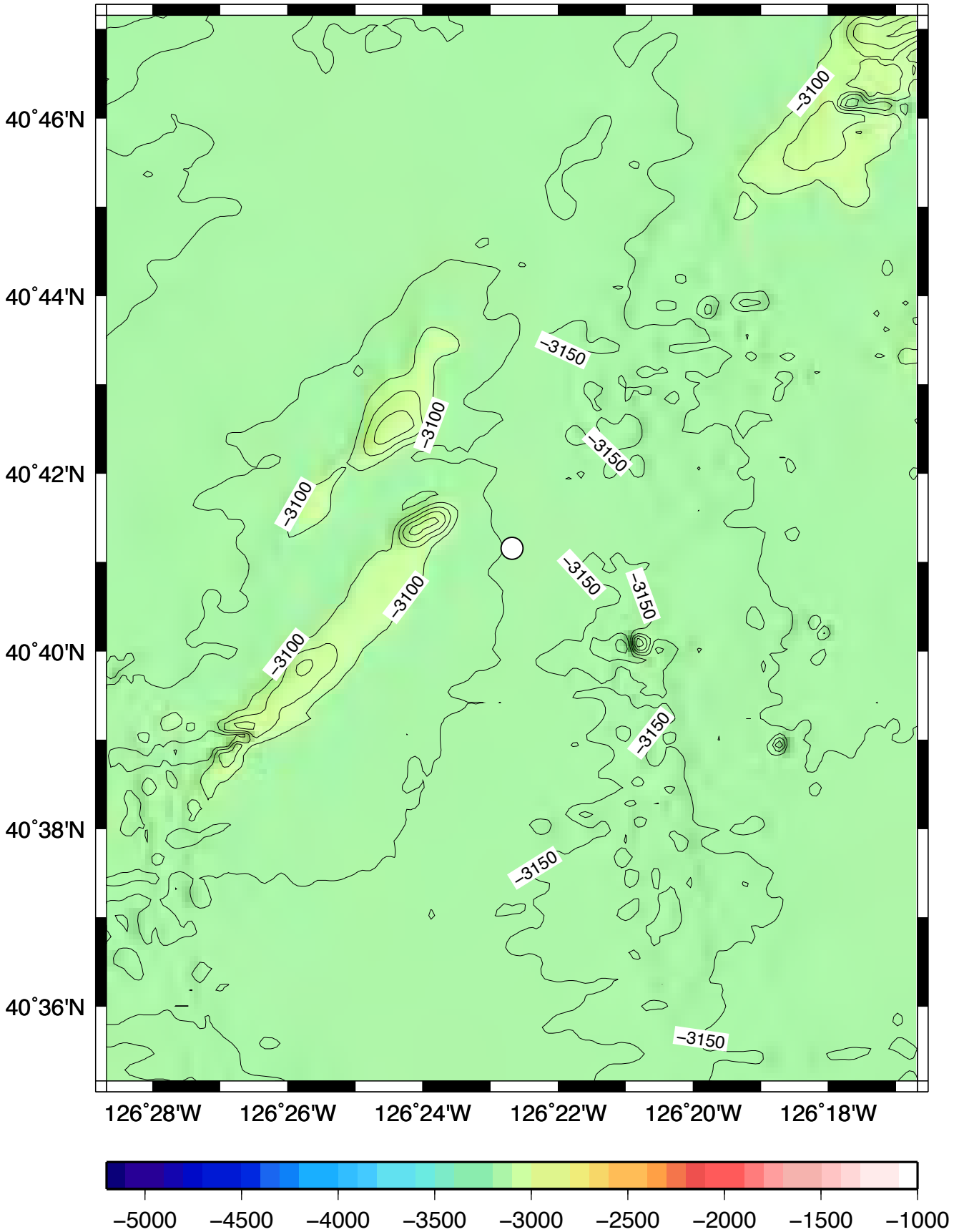


G19B Drop Site

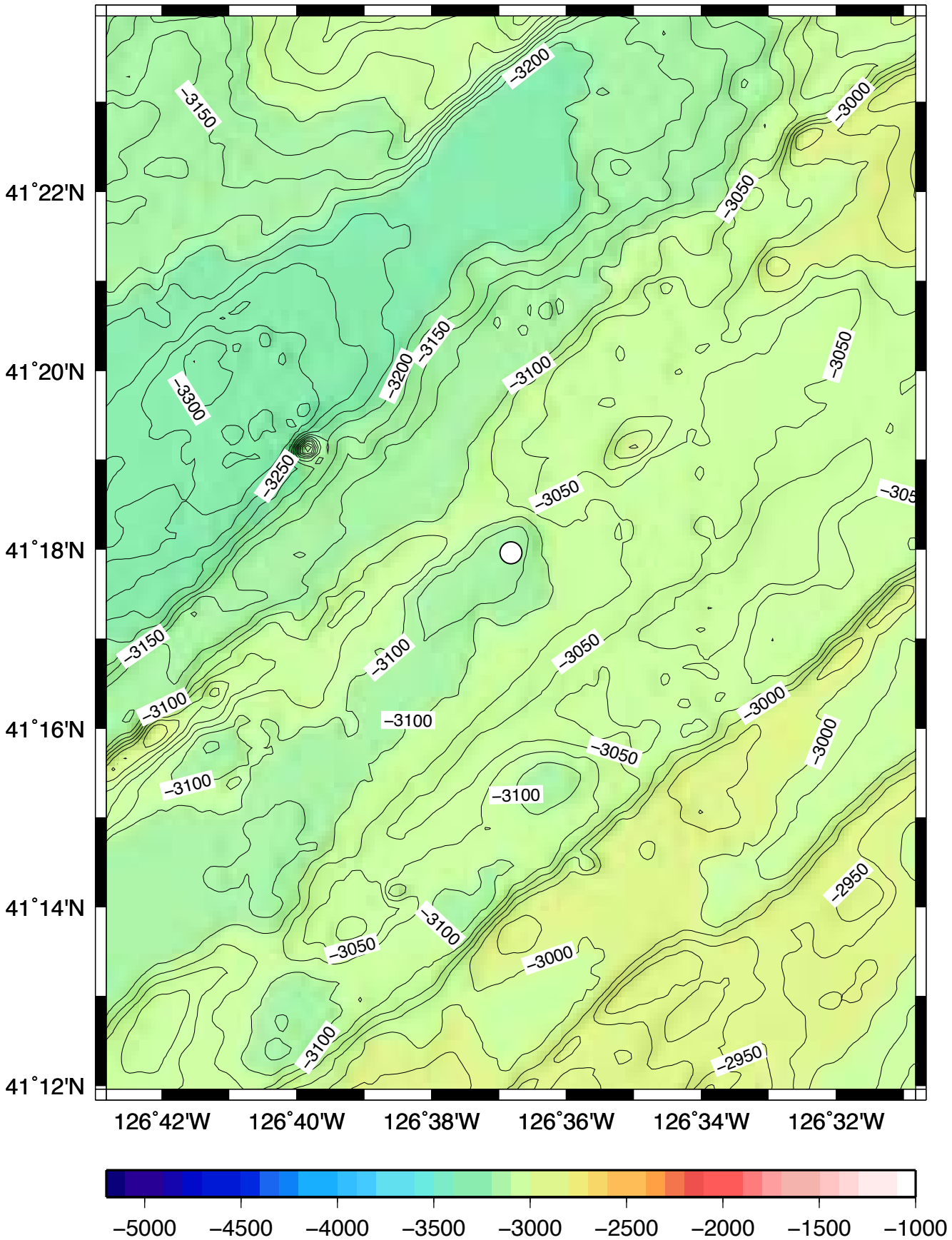


Depth, m

G11B Drop Site

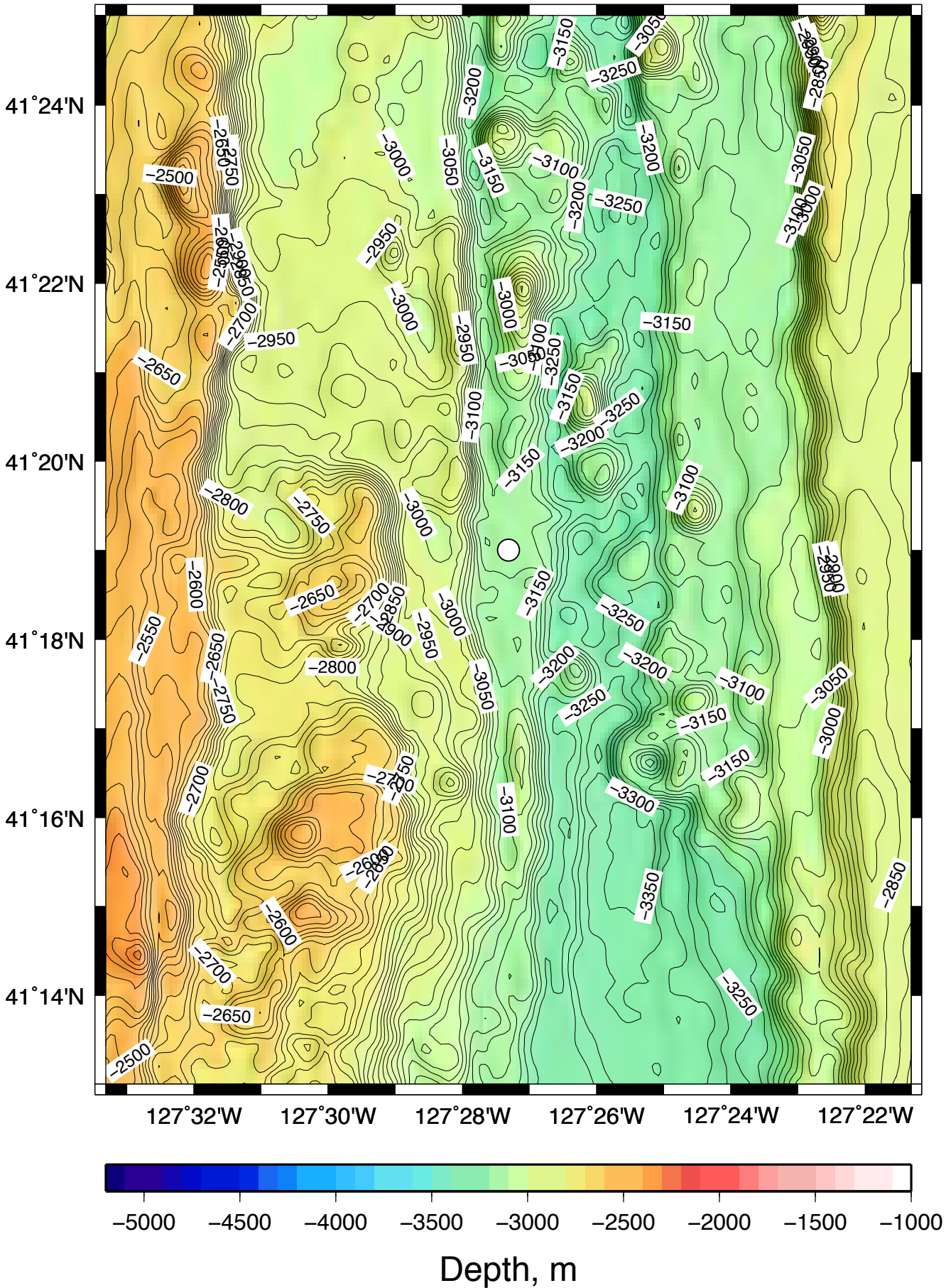


G20B Drop Site

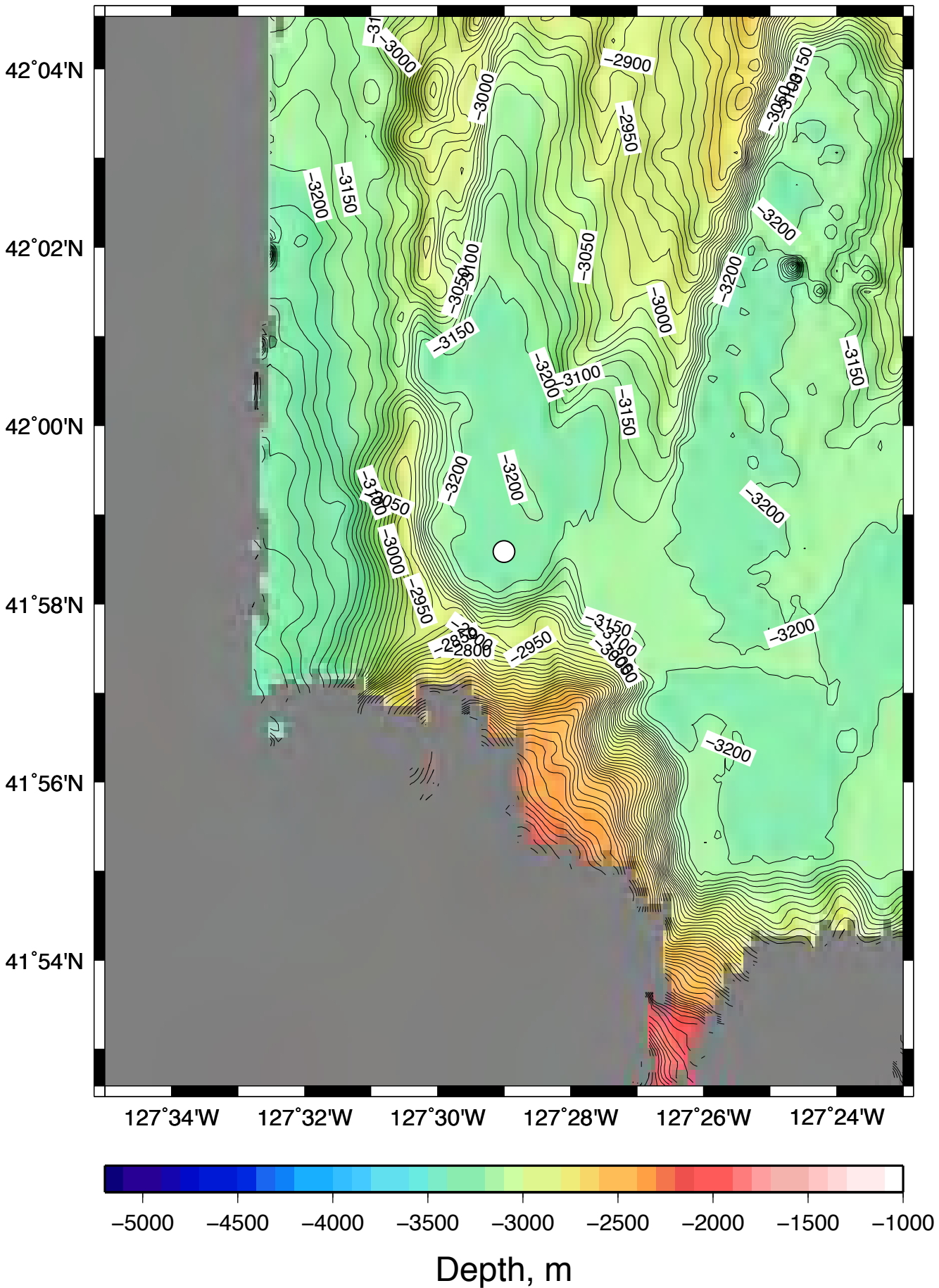


Depth, m

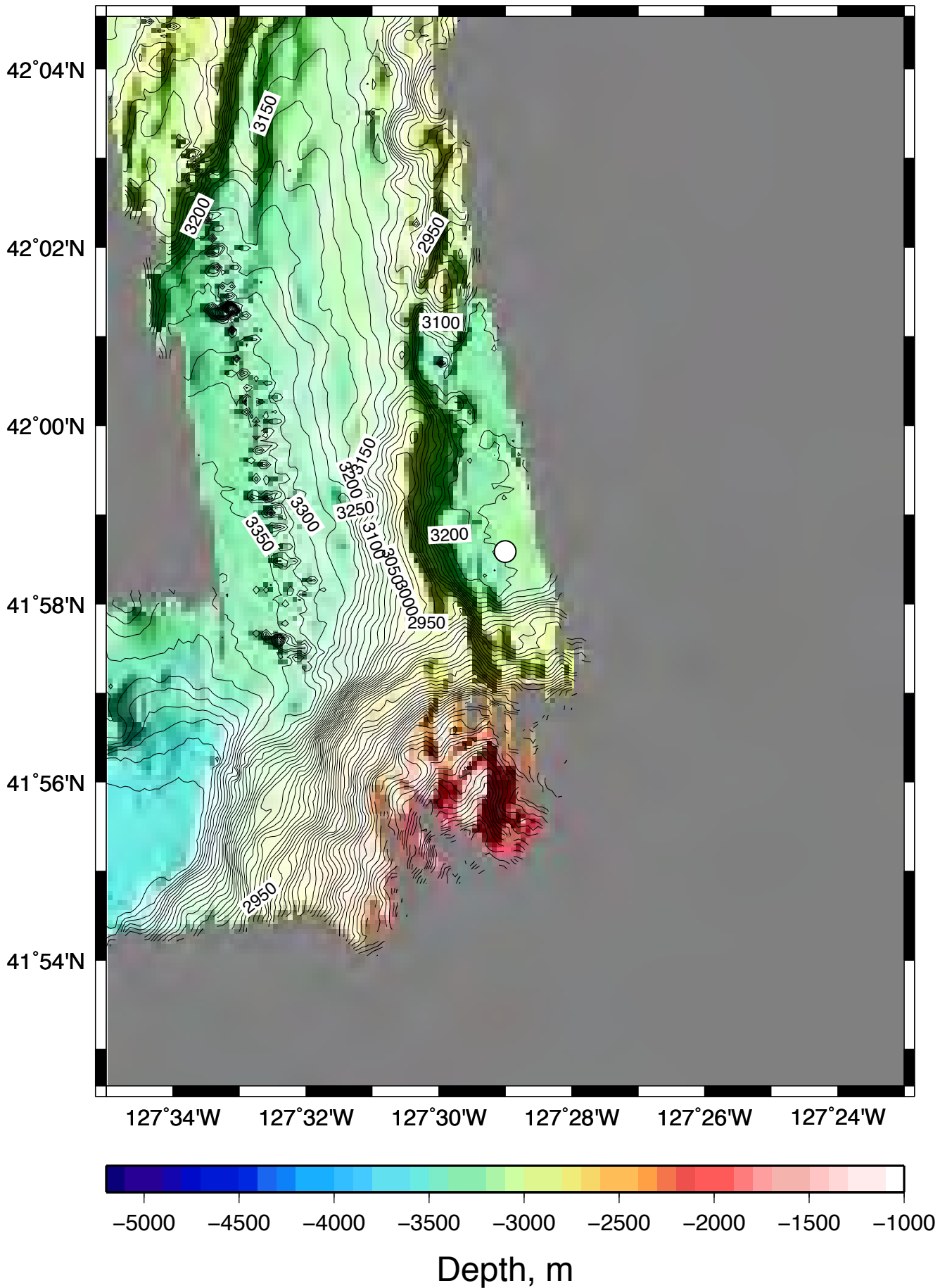
G21B Drop Site



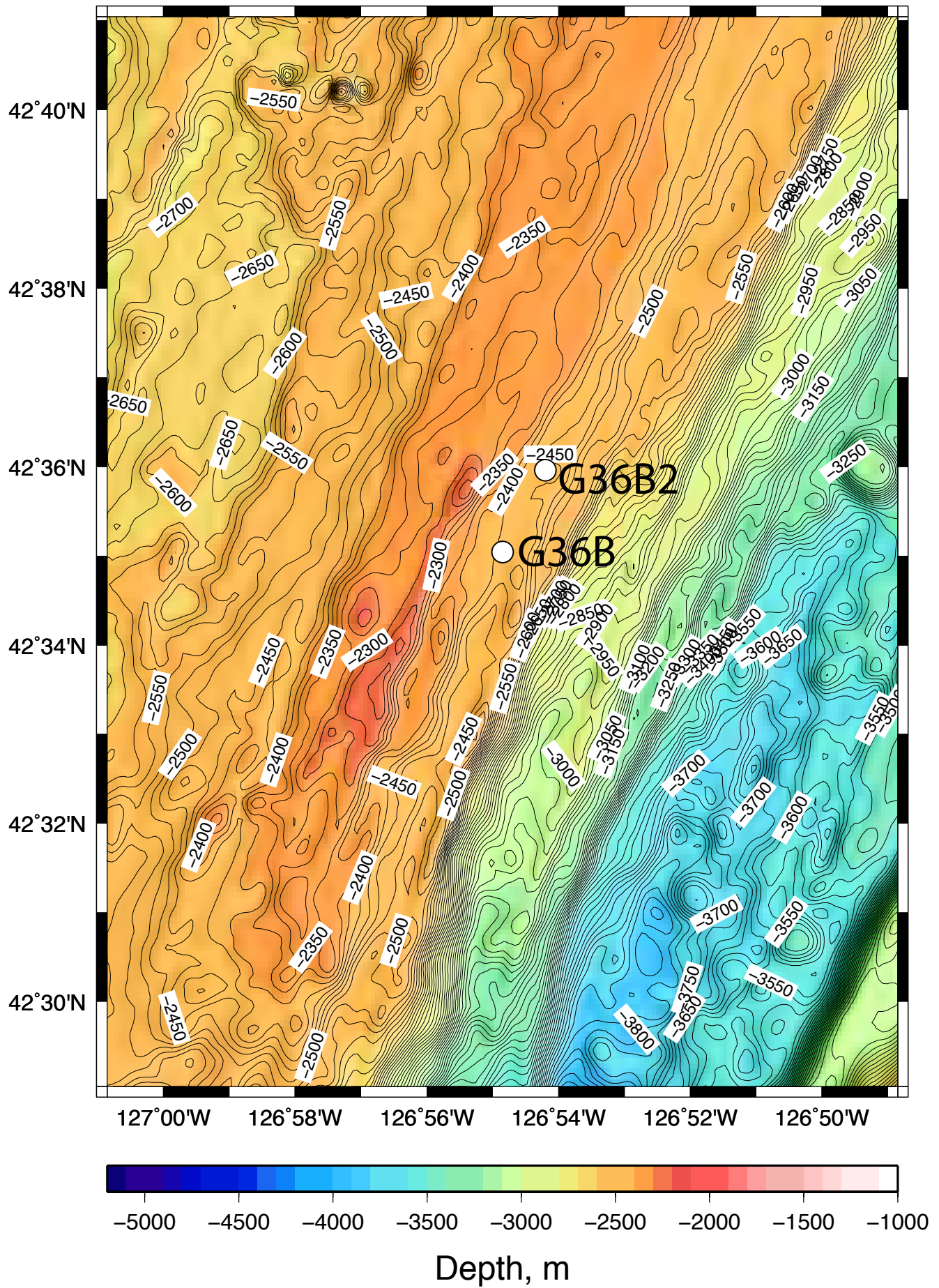
G29B Drop Site



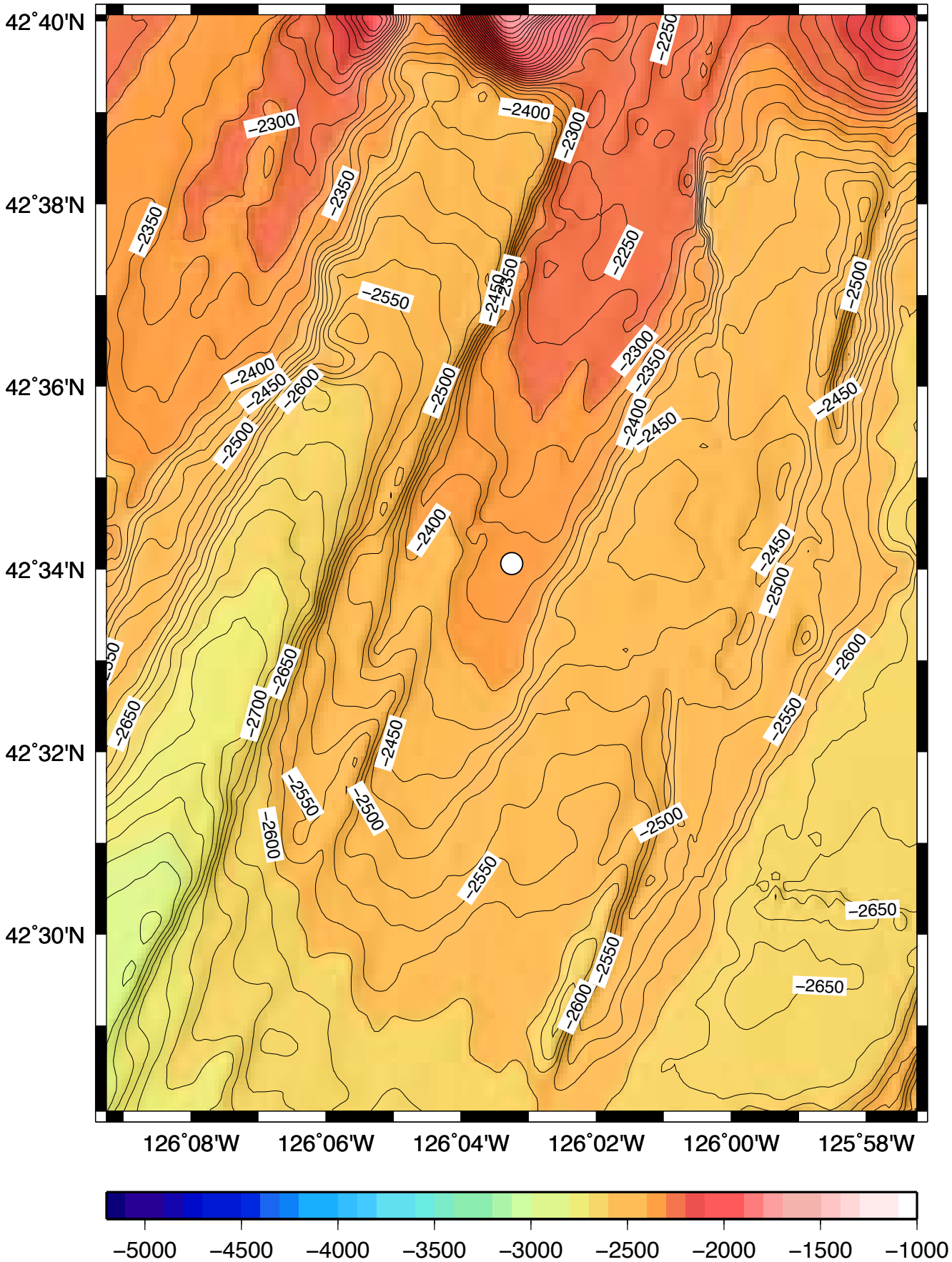
G29B Drop Site (Thompson Bathymetry)



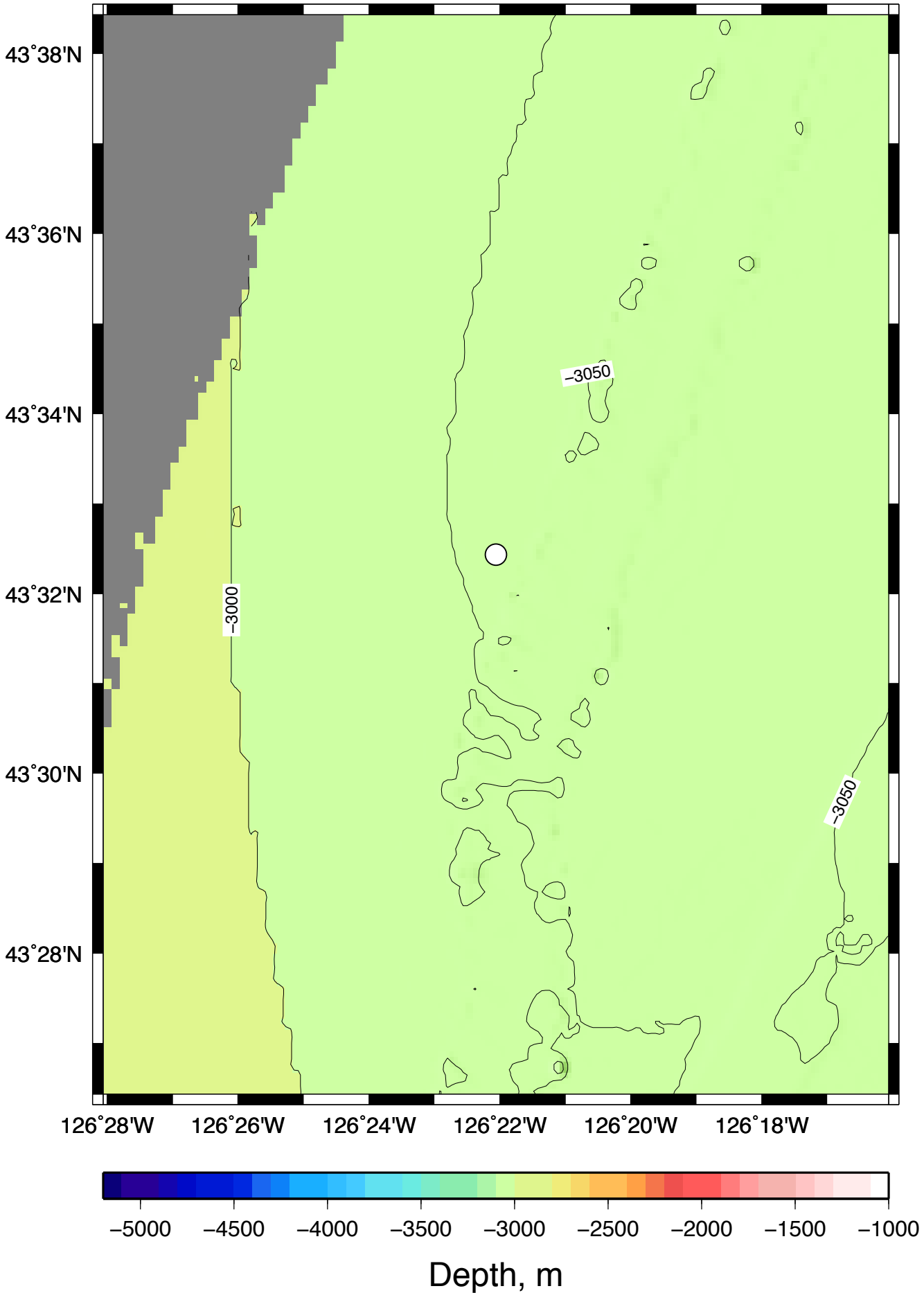
G36B & G36B2 Drop Sites



G35B Drop Site



J11B Drop Site



J19B Drop Site

