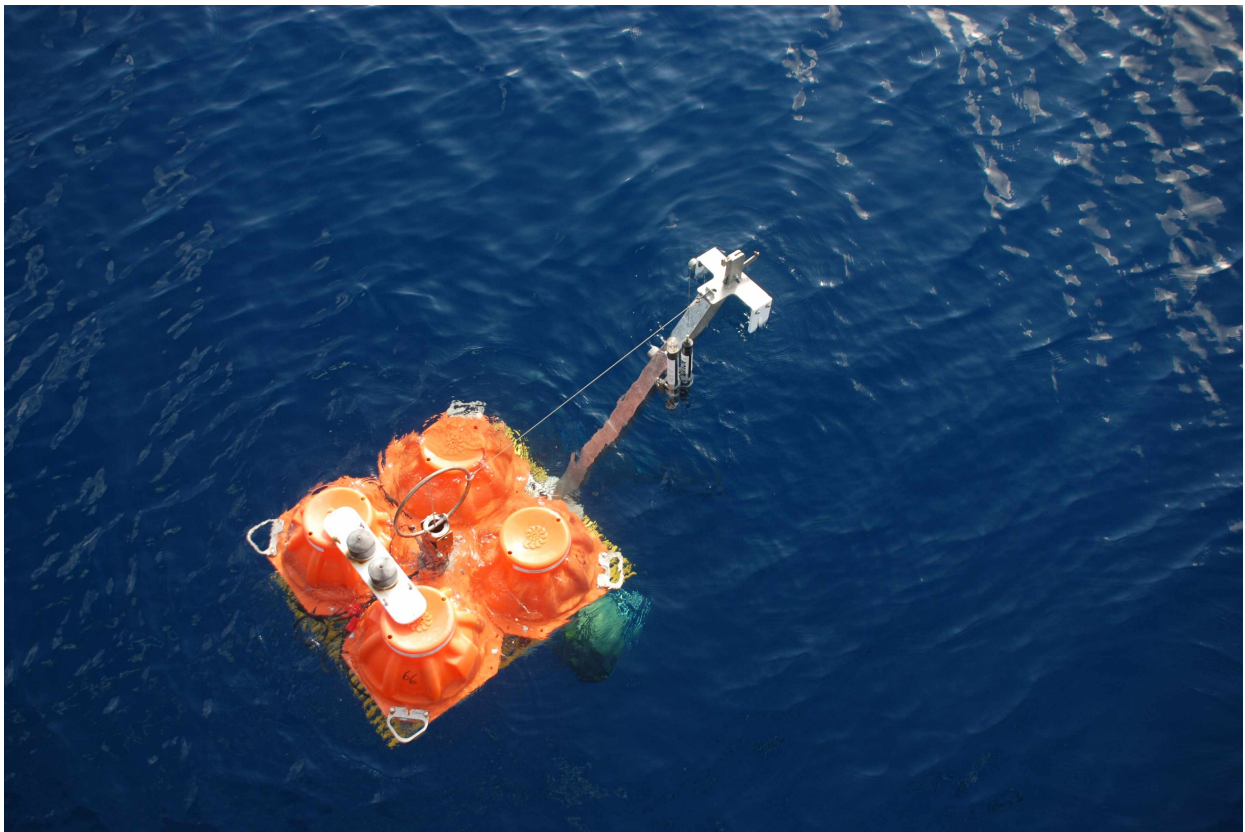


The Quebrada-Discovery-Gofar Transform Fault Experiment

Cruise Report, Leg 3: Passive Recovery

R/V Atlantis AT15-42 1/11/09-2/3/09



Project Background

The goal of this cruise was to deploy 40 ocean bottom seismometers (OBS) and 7 seafloor geodesy tripods at the Quebrada/Discovery/Gofar (QDG) transform fault system on the equatorial East Pacific Rise (EPR) for a period of 1 year to study the mechanical processes that control earthquake nucleation and the relative partitioning of seismic and aseismic fault slip. The QDG fault system is the most prolific known oceanic transform fault in terms of generating large earthquakes that are preceded by an immediate foreshock sequence. Approximately 50% of magnitude ≥ 5.0 earthquakes on these faults are preceded by a foreshock ($m > 2.5$) in the hour before the mainshock. This spectacular behavior directly reflects the fundamental mechanics of faulting and detailed recordings of the sequences can be used to test competing hypothesis about earthquake nucleation. No other oceanic transform fault can guarantee recording this behavior with a ~ 1 year deployment (the current battery limit) of OBSs. Additionally, the factors controlling whether a fault fails seismically or aseismically can be evaluated at QDG owing to the juxtaposition of three morphologically similar, high slip-rate transforms that exhibit nearly opposite styles of deformation. Earthquake locations determined from T-phases indicate that all three transforms produce abundant micro-seismicity. However, the Discovery and Gofar transforms repeatedly rupture with $M_w > 5.5$ earthquakes while the Quebrada transform has had only one event of this size in the last 25 years. This difference is best quantified in terms of the seismic slip deficit, which is roughly 80-87% for Gofar, 69-81% for Discovery and 98-99% for Quebrada. The significantly higher level of seismic activity on the Discovery than on the Quebrada is quite surprising given that Discovery is shorter and warmer. Understanding the origin of these differences in behavior should provide fundamental new insight into the physics of faulting.

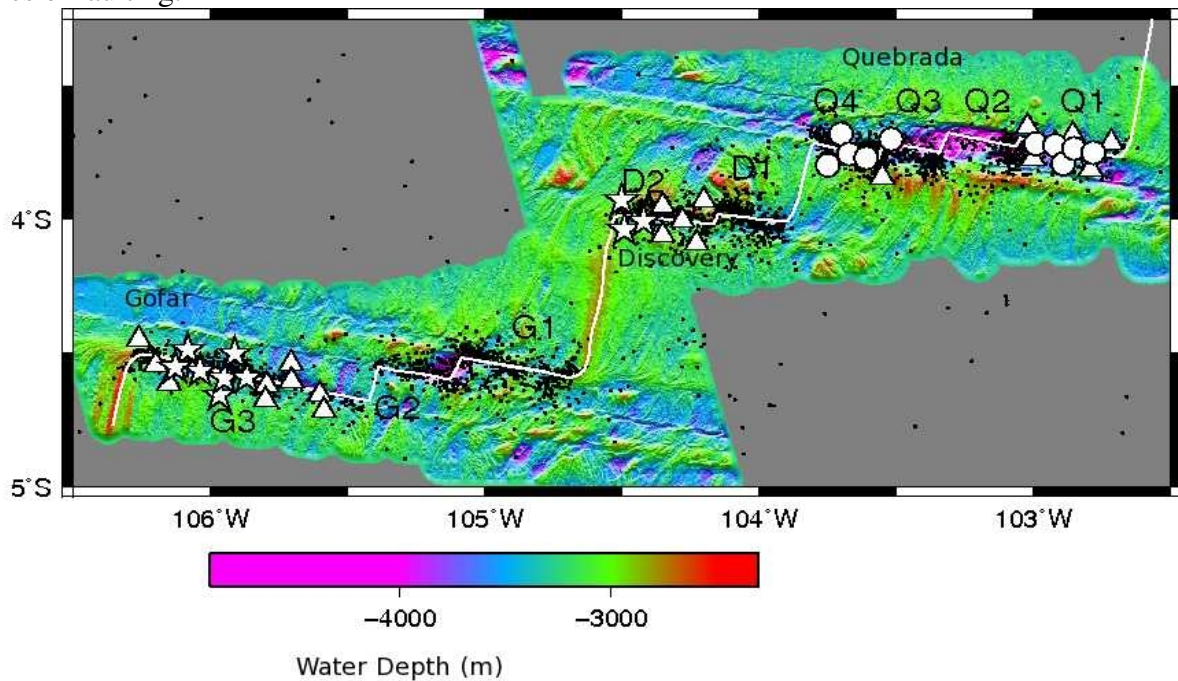


Figure 1. Map of the QDG OBS deployment. Stars are Keck OBSs, triangles are NSF broadband, and circles are NSF short period instruments.

In December of 2007, we deployed the array of ocean bottom seismometers shown in Figure 1, as well as an array of seafloor geodesy tripods with a much smaller footprint (few km) on the Discovery transform. There were three types of OBSs: 20 broadband seismometers from the national OBS instrument pool (OBISP), 10 short period OBSIP instruments, and 10 instruments funded by the Keck Foundation that carried both a broadband seismometer and a strong-motion accelerometer. The distribution of instruments is shown in Figure 1.

Science Party

The science party consisted of:

Jeff McGuire	Chief Scientist	WHOI
Ken Peal	Engineer	WHOI
Rob Handy	Engineer	WHOI
Tom Crook	Engineer	WHOI
Dan Kot	Engineer	WHOI
Margaret Boettcher	Scientist	UNH
Emily Roland	Scientist	MIT-WHOI

OBS Recoveries

The primary task of this cruise was to recover 40 WHOI ocean bottom seismometers. At each station the Edgetech deckbox communicated with the OBS using the hull transducer. In general acoustics were very clear. There were two short-period OBSs on the Quebrada fault that we were not able to communicate with at all. The other 45 instruments all released their anchor and lifted off from the bottom as a result of the first (and only) burn command sent from the deck box. Often it was clear that the OBS had left the bottom within just a few minutes after the burn command was sent, and always at the end of the burn (15 minutes). Before releasing the 30 instruments with a broadband Guralp sensor, we sent the command to lock the seismometer's masses. In many cases this did not work because the battery voltage was already below the instrument's threshold and hence it was already locked and shutdown (all 10 Kecks) or because of corrosion on the sensor cable to the Guralp (many of the NSF broadbands). The rise rates were in the range of 40-45 m/min for the broadbands. On the broadbands and Keck's the recovery radios and flashers almost always were working. Several of the short-period instruments had flashers and radios that did not operate. These instruments were found visually by the bridge, often with the aid of the spotlight and their reflective tape.

In general, it took about 15-20 minutes between when an instrument was spotted on the surface and when it was on deck. All instruments were retrieved with the starboard crane. Typically Dan Kot, Rob Handy, and the SSSG tech on duty were responsible for hooking the lines onto the instrument. We had very calm seas and overall the recoveries went extremely smoothly.



Figure 2. Bosun Wayne Bailey directs the retrieval of a OBSIP broadband OBS while SSSG tech Allison Heater attaches a tag line.

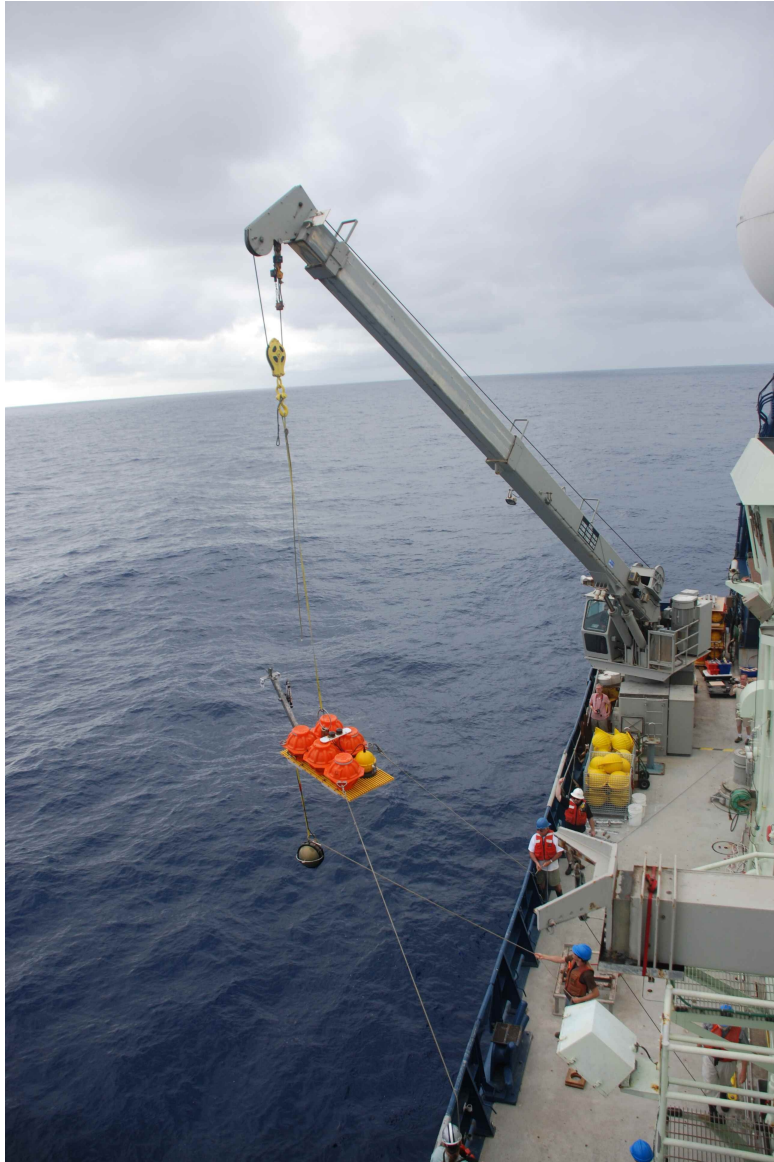


Figure 3. A Keck OBS is lifted out of the Pacific and onto the starboard deck of the Atlantis.

Site Number	OBS I.D.	Station Latitude (deg)	Station Latitude (min)	Station Latitude (hemi)	Station Longitude (deg)	Station Longitude (min)	Station Longitude (hemi)	Station Latitude (decimal degrees)	Station Longitude (decimal degrees)	Station Depth (m)	Type
G01	S73	4	27.094	S	106	15.627	W	-4.45157	-106.26045	3209	NSF
G02	S72	4	32.790	S	106	11.953	W	-4.54650	-106.19922	3050	NSF
G03	S70	4	36.966	S	106	8.988	W	-4.61610	-106.14980	3187	NSF
G04	S82	4	33.32	S	106	7.6	W	-4.55528	-106.12662	3170	KECK
G05	S80	4	29.44	S	106	4.81	W	-4.49072	-106.08010	3558	KECK
G06	S85	4	34.17	S	106	2.16	W	-4.56943	-106.03593	3601	KECK
G07	S86	4	39.55	S	105	58.11	W	-4.65912	-105.96848	3195	KECK
G08	S88	4	35.77	S	105	56.89	W	-4.59617	-105.94812	3358	KECK
G09	S84	4	30.13	S	105	54.58	W	-4.50218	-105.90973	3258	KECK
G10	S83	4	35.59	S	105	52.01	W	-4.59318	-105.86687	3395	KECK
G11	S46	4	37.23	S	105	47.51	W	-4.62055	-105.79175	3238	NSF
G12	S65	4	40.67	S	105	48	W	-4.67783	-105.80000	3192	NSF
G13	S14	4	32.4	S	105	42.39	W	-4.54003	-105.70645	3402	NSF
G14	S37	4	36.3	S	105	42.14	W	-4.60505	-105.70240	3926	NSF
G15	S30	4	39.4	S	105	36.06	W	-4.65665	-105.60095	3313	NSF
G16	S74	4	43.01	S	105	35.06	W	-4.71690	-105.58425	2961	NSF
D01	S87	4	0.55	S	104	25.16	W	-4.00915	-104.41933	3269	KECK
D02	S81	3	55.88	S	104	29.96	W	-3.93128	-104.49925	3020	KECK
D03	S89	4	2.49	S	104	29.51	W	-4.04157	-104.49182	3031	KECK
D04	S71	4	3.58	S	104	21.09	W	-4.05958	-104.35152	3124	NSF
D05	S67	4	5.43	S	104	13.69	W	-4.09057	-104.22820	3088	NSF
D06	S66	3	55.83	S	104	11.95	W	-3.93045	-104.19912	3241	NSF
D07	S68	4	0.35	S	104	16.69	W	-4.00590	-104.27813	3238	NSF
D08	S38	3	57.08	S	104	21.08	W	-3.95127	-104.35128	2681	NSF
Q01	D29	3	47.89	S	103	44.97	W	-3.79820	-103.74952	3391	D2
Q02	D18	3	40.79	S	103	42.01	W	-3.67988	-103.70010	3653	D2
Q03	D41	3	45.27	S	103	40.23	W	-3.75443	-103.67057	3845	D2
Q04	D58	3	46.18	S	103	36.55	W	-3.76968	-103.60917	3315	D2
Q05	D56	3	41.97	S	103	31.05	W	-3.69955	-103.51755	3632	D2
Q06	S19	3	50.31	S	103	32.96	W	-3.83842	-103.54927	2961	NSF
Q07	S28	3	46.13	S	103	0.1	W	-3.76875	-103.00173	3910	NSF
Q08	S01	3	39.21	S	103	1.19	W	-3.65357	-103.01975	3036	NSF
Q09	S20	3	41.01	S	102	51.33	W	-3.68347	-102.85550	3309	NSF
Q10	S33	3	42.68	S	102	42.86	W	-3.71128	-102.71425	3344	NSF
Q11	S48	3	48.53	S	102	47.37	W	-3.80882	-102.78953	3348	NSF
Q12	D60	3	44.96	S	102	46.79	W	-3.74925	-102.77982	3874	D2
Q13	D21	3	47.56	S	102	53.41	W	-3.79258	-102.89010	3368	D2
Q14	D16	3	44.04	S	102	51.02	W	-3.73407	-102.85038	3822	D2
Q15	D35	3	43.33	S	102	55.19	W	-3.72217	-102.91980	3680	D2
Q16	D17	3	42.96	S	102	59.4	W	-3.71603	-102.99007	4126	D2

Table 1. Final Surveyed OBS locations.

OBS Data Recorded

The short period OBSs had a nominal battery life of ~8 months while the broadband and Keck instruments had a nominal life of 12 months. 30 of the instruments recorded essentially their full dataset based on the data availability statements from the Q330 datalogger (i.e. Seismograms not yet checked by eye for bad channels, etc). 2 instruments were not recovered, 4 instruments were recovered with a fault that prevented recovery of data availability information (likely due to corrosion problems). The details are given in table 2.

Site	Type	Time on	Time off	% of 8/12 months
Q1	D2	12/30/07	08/11/08	95%
Q2	D2	12/27/07	08/27/08	100%
Q3	D2	12/27/07	08/15/08	95%
Q4	D2	Not	Recovered	0%
Q5	D2	12/30/07	07/22/08	80%
Q6	NSF-R1	12/27/07	01/16/09	100%
Q7	NSF-R1	Unknown		??
Q8	NSF-R1	12/27/07	09/03/09	67%
Q9	NSF-R1	12/27/07	01/15/09	100%
Q10	NSF-R1	12/27/07	12/06/08	92%
Q11	NSF-R1	Unknown		??
Q12	D2	01/03/08	07/03/08	75%
Q13	D2	12/30/07	08/21/08	95%
Q14	D2	12/29/07	09/16/08	100%
Q15	D2	12/30/07	08/15/08	95%
Q16	D2	Not	Recovered	0%
D1	Keck	12/25/07	12/30/08	100%
D2	Keck	12/27/07	01/01/09	100%
D3	Keck	12/26/07	12/31/08	100%
D4	NSF-R2	12/26/07	01/17/09	100.00%
D5	NSF-R2	12/26/07	01/20/09	100%
D6	NSF-R2	12/26/07	01/19/09	100%
D7	NSF-R2	12/28/07	01/19/09	100%
D8	NSF-R1	12/27/07	01/18/09	100%
G1	NSF-R2	12/23/07	05/29/09	40.00%
G2	NSF-R2	12/23/07	01/24/09	100.00%
G3	NSF-R2	12/23/07	01/23/09	100%
G4	Keck	12/23/07	12/28/09	100.00%
G5	Keck	12/23/07	12/28/09	100.00%
G6	Keck	12/23/07	12/26/08	100%
G7	Keck	12/24/07	12/15/08	100.00%
G8	Keck	12/24/07	12/19/08	100%
G9	Keck	12/24/07	12/19/08	100%
G10	Keck	12/25/07	12/07/08	95%

G11	NSF-R1	Unknown		??
G12	NSF-R2	12/24/07	01/21/09	100%
G13	NSF-R1	12/26/07	01/21/09	100%
G14	NSF-R1	12/24/07	01/21/09	100%
G15	NSF-R1	Unknown		??
G16	NSF-R2	12/26/07	01/20/09	100%

The September 18, 2008 Mw 6.0 Gofar Transform Earthquakes

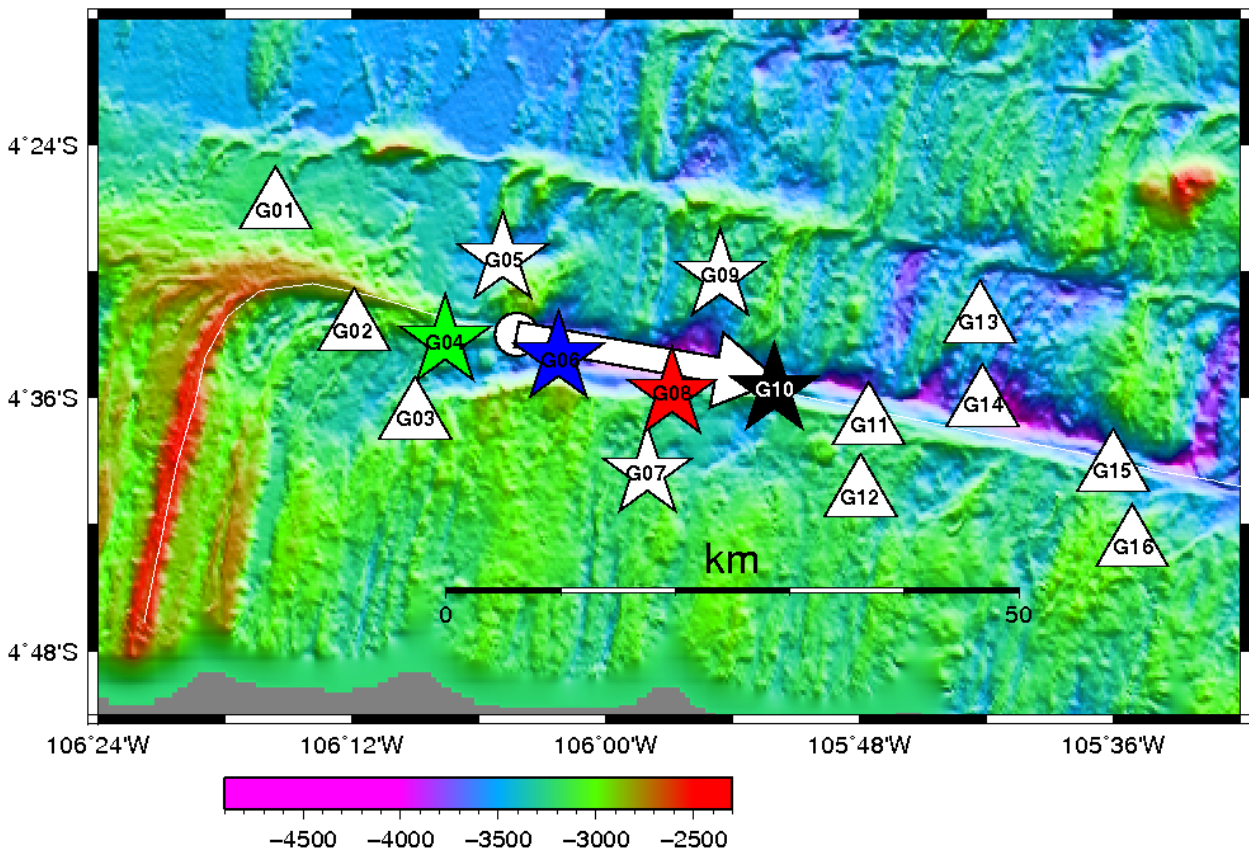


Figure 4. Map of the deployment on the Gofar Transform fault. Stars are Keck instruments and triangles are NSF-OBSIP broadband instruments. The white circle shows a rough estimate of the epicenter of the September 18th Mw 6.0 earthquake. From inspection of the accelograms at stations G04, G06, G08, G10 it appears that the rupture propagated primarily unilaterally to the east. These stations are colorcoded to match the seismograms in Figure 5.

09/18/2008 M_w 6.0 Gofar Earthquake: Horizontal Component Velocity Records

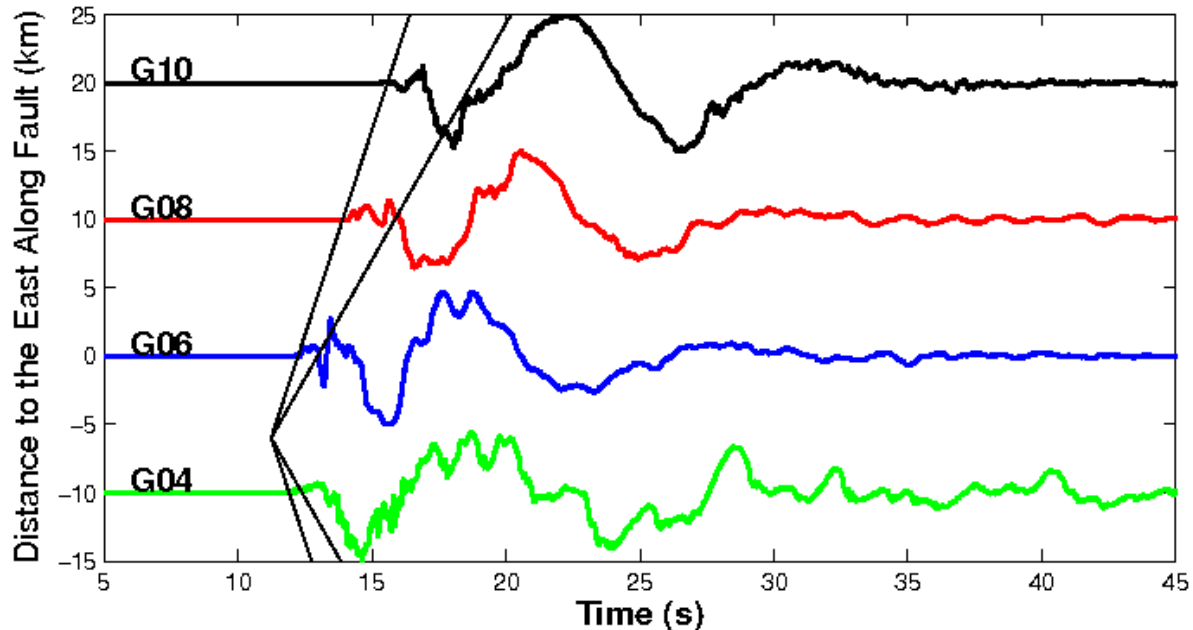


Figure 5. Horizontal component accelograms from the September 18th event. They have been time corrected and filtered between 20 s and 15 Hz. The earliest arrivals are at station G06 and G04 indicating the epicenter was on the western end of the fault. The stations to the east G08 G10 appear to be in the forward direction while station G04 appears to be in the backward direction. Thus, it was likely a dominantly unilateral rupture to the east. The black lines are at the P and S-wave speeds for the gabbro layer roughly.

Geodesy Deployments

We recovered the 7 acoustic ranging tripods that were deployed on the Discovery transform fault. Their positions are given in table 1. Instruments C1, P1, P2, P3, and P5 were recovered without incident. The transponders ascended at a rate of 45 m/min. C1 ascended at a rate of 35 m/min. Transceiver C2 had a small leak in the instrument ball. When it was recovered, there was about 3 inches of water in the bottom of the ball and the batteries had shorted out. We were able to recover the flash memory card and read it. The data indicate that C2 took data all the way till the end of the deployment. The electronics were clearly damaged but may be salvageable. It's not clear whether C2 leaked before it was released or only upon release. The instrument ball on P4 also leaked and was completely full of water. The data on C2 indicate that P4 stopped transmitting in May 2008. Thus, it may have leaked relatively early on in the deployment.

All of the instruments passed a vacuum check test on 12/14/2007 aboard the Thomas Thompson prior to deployment. P2, P5, and C2 were all recovered on the Thompson and redeployed so that doesn't appear to be the cause of C2's problems. Overall it's not clear what the problem was but it likely involved

the seal and/or some minor cracks in the glass ball.

Inst.	Surv. Lat. Deg.	Survey Lon Deg.	Grid Depth	Decimal Lat	Decimal Lon	Drop Lat	Drop Lon	Modem	Drift	Azim
C1	-3.9930	-104.4422	-3624	-3 59.58	-104 26.53	-3.9927	-104.4395	oadr 2	298	263
C2	-3.99645	-104.4473	-3455	-3 59.787	-104 26.684	-3.9958	-104.4447	oadr 1	68	184
P1	-3.9895	-104.4373	-3616	-3 59.37	-104 26.24	-3.9895	-104.4348	NA	286	268
P2	-3.9957	-104.4430	-3543	-3 59.744	-104 26.579	-3.9953	-104.4422	NA	94	239
P3	-3.9886	-104.4440	-3571	-3 59.318	-104 26.641	-3.9871	-104.4348	NA	235	260
P4	-3.9949	-104.4445	-3543	-3 59.691	-104 26.673	-3.9945	-104.4436	NA	110	250
P5	-3.9910	-104.4486	-3458	-3 59.46	-104 26.913	-3.9905	-104.4476	NA	121	239

Table 1. Final Tripod Positions from Thompson cruise.

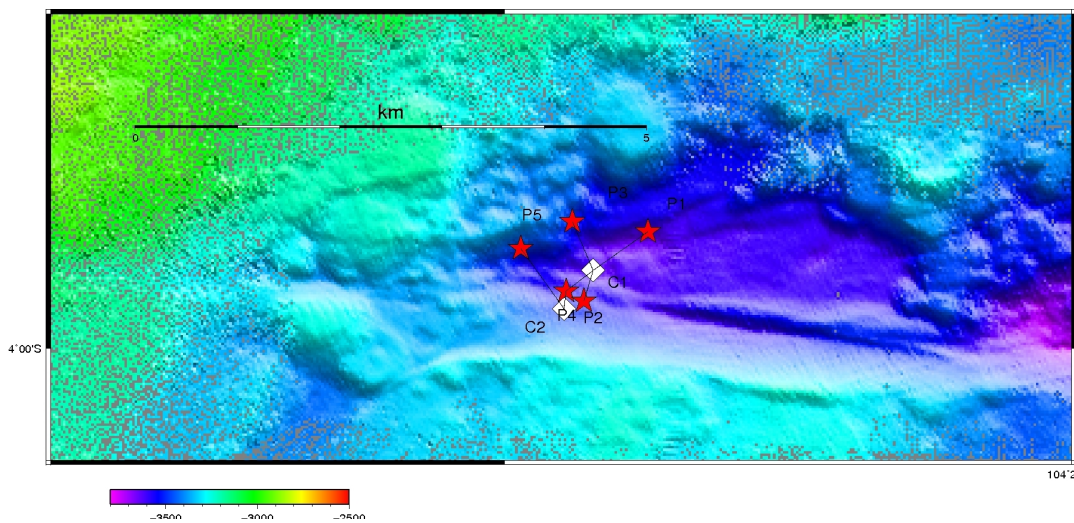
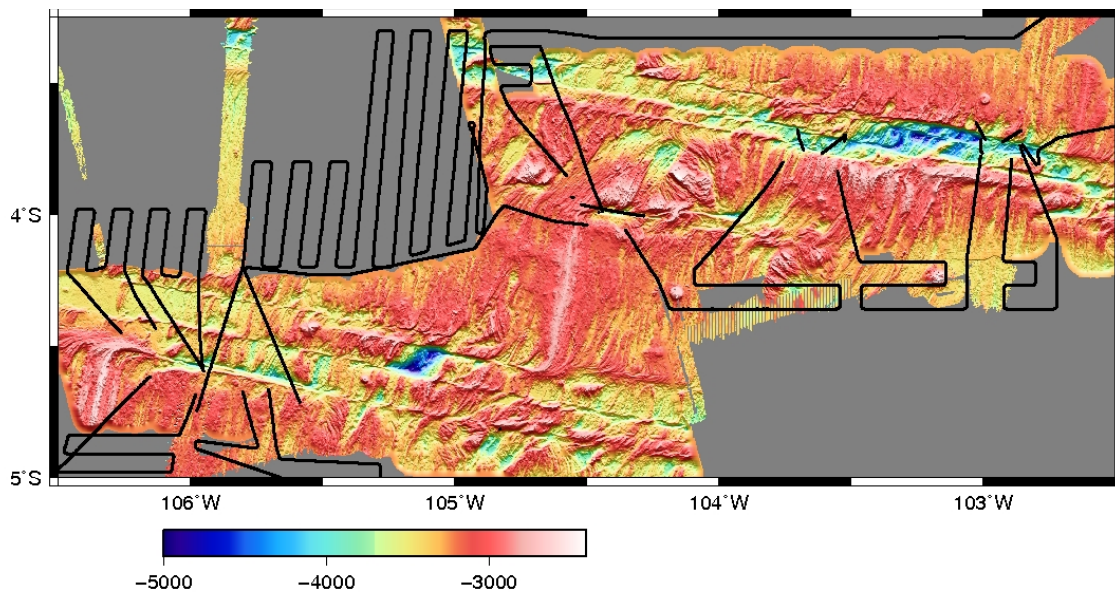


Figure 6. Map of the Tripod Locations.

Multibeaming

We performed a series of multibeam surveys to fill in gaps in the existing bathymetry data for the general area surrounding the QDG fault system. Figure 8 shows our multibeam tracks relative to the pre-existing multibeam data.



Log:

1/11/2009

09:00 Left Puerto Ayora On time. No Pilot Necessary
12:00 Making 13 knots easy

1/12/2009

08:00 Making 13.5 knots. New ETA is 18:30 on 1/13
09:00 Multibeam turned on.

1/13/2009

1/14/2009

02:51:10 At station for OBS Q10
02:51:55 OBS Enable confirmed
02:55:00 trouble with mass lock command, waited through 15 minute cycle
03:13:45 1st Burn command sent; confirmed after 15 minutes
03:30:00 instrument at 2760: rising
04:30:00 Rough on surface time (no notification from bridge)
04:52:10 Instrument on deck
04:57:15 Depart Station
07:20:14 Debrief finished. Leap second found.

07:23:00 Enable OBS Q12 (D2)
07:28:37 First Burn Command Sent
08:34:00 Sited on surface using the spotlight. Neither the radio or the flasher functioned.
08:58:08 Instrument on deck
09:06:00 Depart Station

09:41:00 On station for OBS Q11 (NSF)
10:31:33 OBS Q11 enabled
10:37:58 OBS Q11 release command sent
10:39:00 GPS clock on OBS Q12 seems to have finally locked. Data until July.

10:54:40 OBS Q11 at 2718m: rising
11:54:15 Q11 on surface from radio signal
11:55:00 Q11 spotted
12:05:00 Q11 clipped
12:07:59 Q11 on deck
12:22:50 Depart station
12:23:55 Start Multibeam

13:16:05 On station for OBS Q14 (D2)
13:28:52 Enable Q14
13:32:47 Send release command to Q14
14:31:20 Spotted on surface. No Radio transmission.
14:41:25 Q14 on deck.
14:51:59 Depart Station.

14:53:10 Multibeam on. Heading off to multibeam.

16:57:44 Slowing to 4 knots for an XBT
17:45:00 Updated vertical water velocity profile in seabeam using XBT measurement.
19:25:00 FOG - Gyro changed from ~150 degrees. Had been influencing multibeam ship heading header info. Will need to be corrected in Sea Beam header.

1/15/2009

00:03:00 Finished multibeam and on station for OBS Q13
00:03:56 Enable Q13
00:07:24 Send release command to Q13
00:26:56 OBS Q13 at 2388 m rising at apprx. 76 m/min
01:03:44 Spotted on surface. No Radio transmission. Strobe functioning.
01:16:55 Q13 on deck.
01:31:31 Depart Station for Waypoint 07

02:05:00 On station for Q15
03:49:09 Q15 enabled
03:51:57 First burn command sent. No movement.
04:12:53 Second burn command sent.
05:09:37 Q15 on the surface (radio signal).
05:15:30 Q15 spotted.
05:32:59 Q15 on deck.

06:00:00 On station for Q09 (D2)
07:18:29 Q09 enabled.
07:27:24 Q09 released.
08:43:26 Q09 on surface (radio signal).
08:44:00 Q09 spotted.
09:13:05 Q09 on deck.
09:25:00 Depart for next station.

10:26:45 On station for Q08 (NSF)
10:40:57 Enable command sent. No Response. Threshold was set too high.
10:45:06 Q08 enabled.
10:46:20 Q08 locked.
10:49:44 Q08 released.
12:01:34 Q08 on surface (radio signal).
12:02:00 Q08 spotted.
12:22:00 Q08 on deck.
12:27:34 Depart station.

13:08:24 On station for Q16
14:04:11 Sent first enable command for Q16. No Response.
14:52:50 Moved off to the South and then Back to the waypoint to try different angles.
15:11:33 Sent first burn command. No Response.
17:01:19 Departing station without Q16.

17:33:36 At station Q07
17:33:36 Sent first enable: Guralp was "not ready"
17:40:00 Sent first burn:
17:55:26 Burn ends; instrument rising
19:09:00 Instrument on surface: visual and radio working.
19:21:00 Instrument on deck
19:30:00 Depart for multibeaming.
19:34:00 Multibeam on

1/16/2009

06:51:18 On station for Q06.
06:53:39 Enable Q06.
06:56:49 Unlock Q06.

07:02:10	Release Q06.
08:13:00	On surface (radio signal).
08:29:18	Q06 on deck.
08:34:00	Depart station.
09:49:19	On station for Q05
10:28:03	Q05 enabled.
10:30:38	Q05 released.
11:25:30	Q05 spotted on surface, radio signal was very very weak.
11:41:09	Q05 on deck.
11:51:04	Depart station.
12:44:44	On station for Q04
13:59:41	Tried to enable Q04. No response. Continued to try for another ~1 hour to enable.
14:47:00	Sent first burn command. No response. Continued for 15 minutes.
15:50:00	Departed station without Q04.
16:05:53	Enabled Q03.
16:14:36	Release command sent to Q03. Tom's a rebel.
16:15:45	On station for Q03.
16:29:59	Burn finished
17:18:41	On Surface (radio)
17:21:25	Spotted on surface
17:30:19	On Deck
17:35:00	Depart Q03
18:12:00	On station for Q02
18:30:57	Instrument Enabled by anxious Mr. Crook
19:31:00	Clock check of Q03 finished
19:31:50	1 st burn command sent to Q02.
20:27:00	Q02 spotted on surface
20:38:53	Q02 on deck
21:00:00	Q01 on station
21:58:35	Instrument Enabled
22:01:00	Release Burn Started
22:16:47	Burn ends
22:52:00	Sighted on surface, RDF working
22:00:00	On deck
22:10:00	Underway for multibeam surveying

1/17/2009

11:06:40 On station for D04 -first NSF-R2
11:14:22 Enabled: 15 pings
11:16:08 Lock sent at 11:16:08: finished after 3 minutes w/7 pings.. worked.
11:22:09 First burn time
11:26:00 approximate liftoff time
12:42:00 D04 On surface: radio and flasher working
12:54:00 On deck
13:13:15 Depart D04

14:00:00 On station for D01 -first KECK
14:31:57 Enabled: 7 pings
14:34:59 Lock command sent: 7 pings
14:40:00 Burn command sent: 7 pings
14:42:51 D01 is rising at about 35 m/min
16:18:21 Received Radio signal and visually spotted
16:31:00 D01 on deck
16:32:34 Depart station

16:56:10 On station for C1, waiting for clock check on D01
18:04:37 Instrument enabled, no response (as expected?)
18:10:50 release command sent; rising confirmed by ranging
20:00:00 Spotted on surface
20:14:30 On Deck
20:21:40 Depart station

20:29:54 On Station for Tripod C2
20:31:54 Enable command sent, no response (as expected for 8242?), but could then range to it.
20:33:44 release command sent; confirmed rising by ranging
22:21:00 lost contact with it. On surface?
22:32:00 visual id on surface.

23:00:00 watchstander mcguire falls down on the job and stops taking notes.

1/18/2009

01:32:00 D08 recovered on deck

11:35:35 On station for Tripod DP1
11:57:17 instrument enabled (waited for sunrise)
12:03:06 release command sent; confirmed rising
13:24:58 spotted on surface;
13:42:00 recovered on deck
13:49:38 depart

14:00:00 On station for Tripod DP2
14:01:00 enable command sent, no response;
14:03:58 release command sent; confirmed rising by ranging
15:26:58 spotted on surface
15:41:00 on deck
15:45:20 depart site

15:57:00 On station for Tripod DP3
15:57:08 Enable command sent; rising confirmed;
15:58:00 rise rate of transceiver ~43 m/min
17:21:50 spotted on surface
17:38:00 On deck
17:48:00 depart site.

18:28:52 On Station For D08
18:29:06 enabled: Guralp ready
18:39:51 Start Lock
18:42:40 End Lock: Guralp locked.
18:44:59 Begin Burn
19:00:34 Burn ends: ranging indicates rising
19:50:00 Spotted on surface: radio working

Following times for D06 are approximate except for surface time:

20:30:00 On Station for D07, OBS S68 (NSF-R2) waypoint 19

1/19/2009

OBS S68, Station D07 Waypoint 19, continued:

01:40:00 Enable command sent – 15 ping confirmation
01:45:00 Guralp Lock command sent – no confirmation received from lock command
02:00:00 Release command sent – no confirmation received from burn command
03:12:52 Spotted on surface: radio working

05:45:00 Multibeaming turned off because we're not going to transit fast enough to reach the edge of the grid. So we're just going to sit on station.

21:00:00 On station for Tripod DP5, waypoint 29
21:01:00 Enable command sent; no enable confirmation, but ranging weakly to ~3481 m
21:07:13 Burn command sent, very weak acoustic confirmation. Think instrument is rising.
21:17:25 Second burn command is sent just in case, rise rate assumed ~43 m/min
Acoustics improve as instrument rises – potentially topography interference.
22:28:27 spotted on surface
22:46:30 On deck
22:51:29 depart site.

09:23:30 On station for Tripod DP4, waypoint
Instrument is already ranging without enable – depth 3575
12:39:56 Enable command sent; no enable confirmation
12:31:19 Burn command sent, 15 ping confirmation
Instrument is rising VERY slowly – estimated rise rate ~ 7-10 m/min
12:36:37 Second burn command is sent just in case
20:11:23 Spotted on Surface. Instrument drifted very far in 7+ hour rise:
Initial waypoint location: 03 59.691 S 104 26.673 W
Recovery location: 04 0.103 S 104 26.596 W
20:34:50 On deck

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00:22:12 On station at D05, OBS S67
00:22:55 Enable command sent; 15 ping confirmation

00:24:15 Lock command sent: 15 ping confirmation
00:29:17 Burn command sent: 7 ping confirmation
01:40:20 spotted on surface
01:52:40 On deck

03:38:24 On station at D03, OBS S74, waypoint 30
03:38:51 Enable command sent; 7 ping confirmation
03:41:48 Lock command sent to Gurlap, 7 ping response
03:44:01 End of lock confirmation received, 7 pings (locked for approximately 2 minutes)
03:44:57 Burn command sent, 7 ping confirmation
03:49:28 Instrument starts to rise – between 36-40m/min
05:17:00 spotted on surface
05:28:30 On deck
05:35:00 depart site.

05:35:00 Begin Multibeam course for the night, plan to be back on station at approximately 16:00

16:08:34 On station G16.
16:13:34 Enable command sent, 15 pings
16:16:04 Lock command sent, 7 pings
16:21:23 Burn command sent, about a 2 minute burn before releasing
17:33:00 On surface (radio signal and visual)
17:47:00 On deck.
17:49:00 Depart station.

18:17:00 On station G15.
18:42:29 Enable command sent, 7 pings.
18:43:59 Lock command sent
19:08:07 Burn command sent, 7 pings
20:29:42 On surface, radio working.

21:44:14 On station G13.
21:45:30 Enable command sent, ~15 pings
21:47:30 Lock command sent
21:52:03 Burn command sent, 7 pings
23:09:10 On surface (visual and radio signal)
23:19:20 On deck.
23:22:40 Depart station.

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00:10:00 On Station G14.
00:43:14 Enable command sent, 15 pings
00:45:59 Lock command sent, 7 pings
00:50:23 Burn command sent
02:23:01 On surface (from visual and radio signal)
22:33:30 OBS on deck. Baler is having trouble with offloading the data.

13:23:00 On station G12 (OBS S65, Waypoint 37)
13:30:49 Enable command sent, 7 pings
13:33:11 Lock command sent, 7 pings after 6 minutes, locked
13:44:30 Burn command sent
14:56:00 On surface, both visual and radio signal
15:12:00 G12 on deck
15:13:20 Depart station.

15:41:00 Approximate time on Station G11
-----We were doing the fire drill and didn't write much down for this instrument

18:21:10 On surface (radio working, and visual)
18:25:04 On deck.
18:25:42 Depart station.

19:00:00 On station G10.
19:14:14 Enable command sent, 7 pings
19:16:25 Lock command sent, 7 pings, 15 minutes
19:38:00 Held off for a while to fix a corroded cable
21:08:37 Burn command sent, 7 pings
22:49:00 On surface (radio and visual)
22:58: 45 On deck.

23:00:00 Start multibeam survey.

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12:30:00 On station G08.
12:35:00 Ken wanted to work on cables.
14:00:50 Enable command sent, 7 pings

14:02:32 Lock command sent, 7 pings in less than 15 minutes
14:06:18 Burn command sent, 7 pings
15:47:30 On surface (radio and visual)
15:59:09 On deck and filled with mud!
15:59:01 Depart station.

17:00:00 On station G09
17:39:20 Enable command sent, 7 pings
18:00:05 Lock command sent, 15 minute wait
18:15:20 Burn finished.
19:37:45 On surface (visual and radio signal)
19:50:30 On deck.

21:00:00 On station G06
21:14:12 Enable command sent, 7 pings
21:16:03 Lock command sent, confirmed after 2 minutes
23:52:38 On surface (radio signal and visual)
00:07:22 On deck.

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14:09:40 On station G03
14:11:40 Enable command sent, 15 pings
14:13:45 Lock command sent, confirmation after 3 minutes
14:17:43 Burn command sent, 7 pings
15:34:30 On surface (visual and radio signal)
15:49:40 On deck
15:50:30 Depart station

17:10:47 On station G07 (OBS S86, Waypoint 41)
17:17:03 Enable command sent, 7 pings
17:20:30 Lock command sent, 7 pings after 2 minutes, locked
17:23:49 Burn command sent
16:54:45 On surface, both visual and radio signal
17:10:20 G07 on deck
17:11:35 Depart station.

17:40:00 On station G04 (OBS S82, Waypoint 44)
20:44:17 Enable command sent, 7 pings

20:46:17 Lock command sent, 7 pings after 2 minutes, locked
20:49:40 Burn command sent
22:24:50 On surface, both visual and radio signal
22:40:20 G04 on deck
22:45:00 Depart station.

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23:30:00 On station G05 (OBS S80, Waypoint 43)
00:12:00 Enable command sent, 7 pings
00:14:20 Lock command sent, 7 pings after 2 minutes, locked
00:18:00 Burn command sent
02:04:50 On surface, both visual and radio signal
20:16:15 G05 on deck
20:40:00 Depart station.

12:00:00 On station G01 (OBS S73, Waypoint 47)
13:00:00 Enable command sent, 15 pings
13:20:12 Lock command sent, 15 pings, lock lasted full 15 minutes, 12 pings at 15 min confirm.
13:41:35 Burn command sent, 15 pings
14:06:00 On surface, both visual and radio signal
14:20:00 G01 on deck
14:22:00 Depart station.

15:00:00 On station G02 (OBS S72, Waypoint 46)
18:50:00 Enable command sent, 15 pings
18:51:45 Lock command sent, 15 pings, lock lasted full 15 minutes, 12 pings at 15 min confirm.
18:08:00 Burn command sent
~19:20:00 On surface, both visual and radio signal
~19:40:00 G02 on deck
~19:42:00 Robbie is hosed off by Jeff and Emiliy
19:44:00 Depart station.

1/25/2009

All Day multibeaming

1/26/2009

All Day multibeaming