CRUISE REPORT
Cascadia Initiative: Year 4, LEG 6
September 7-21, 2014

R/V Oceanus
CRUISE OC1409A
Newport OR - Newport OR

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OC1409A CRUISE REPORT: Cascadia Initiative Year 4, LEG 6

Mission:

Deploy 29 Lamont-Doherty Earth Observatory Ocean-bottom Seismometers (OBSs) of 3 different types:

- 8 Trawl-Resistant Mount (TRM) shallow-water OBS with Trillium compact 3-component seismometer, absolute pressure gauge (APG), acoustic release/pop-up buoy attached to TRM via line. These are deployed at depths shallower than 200m (nominal). Referred to as TRMP in this document.
- 11 TRM shallow-water OBSs with Trillium compact 3-component and APG installed at depths from 200-1000m (nominal). These are referred to as TRM in this document. Both TRMPs and TRMs are lowered to bottom using a UNOLS winch pool heave-compensated winch from Woods Hole.
- 10 LDEO deep water OBSs with APG. Deploy over waist deck and release in water, instruments then drift to ocean floor. Referred to as ARRA in this document.

Recover 15 LDEO OBS of Long-Period type (LDEO-LP). An acoustic signal tells the instrument to release its ballast weights. It then rises to the surface and is hooked and winched onto the waist deck.

Outcomes:

All objectives of the mission were successfully accomplished.

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PARTICIPANTS:

Science Party:
Magali Barba, Cal Poly
Andrew Barclay, LDEO
Carlos Becerril, LDEO
William Burns, Leidos
John Clapp, LDEO
Brian Cook, OSU
Alex de Moor, OSU
Stephen Hicks, U. Liverpool
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Walter Masterson, LDEO
Daryl Swensen, OSU
Anne Trehu, OSU

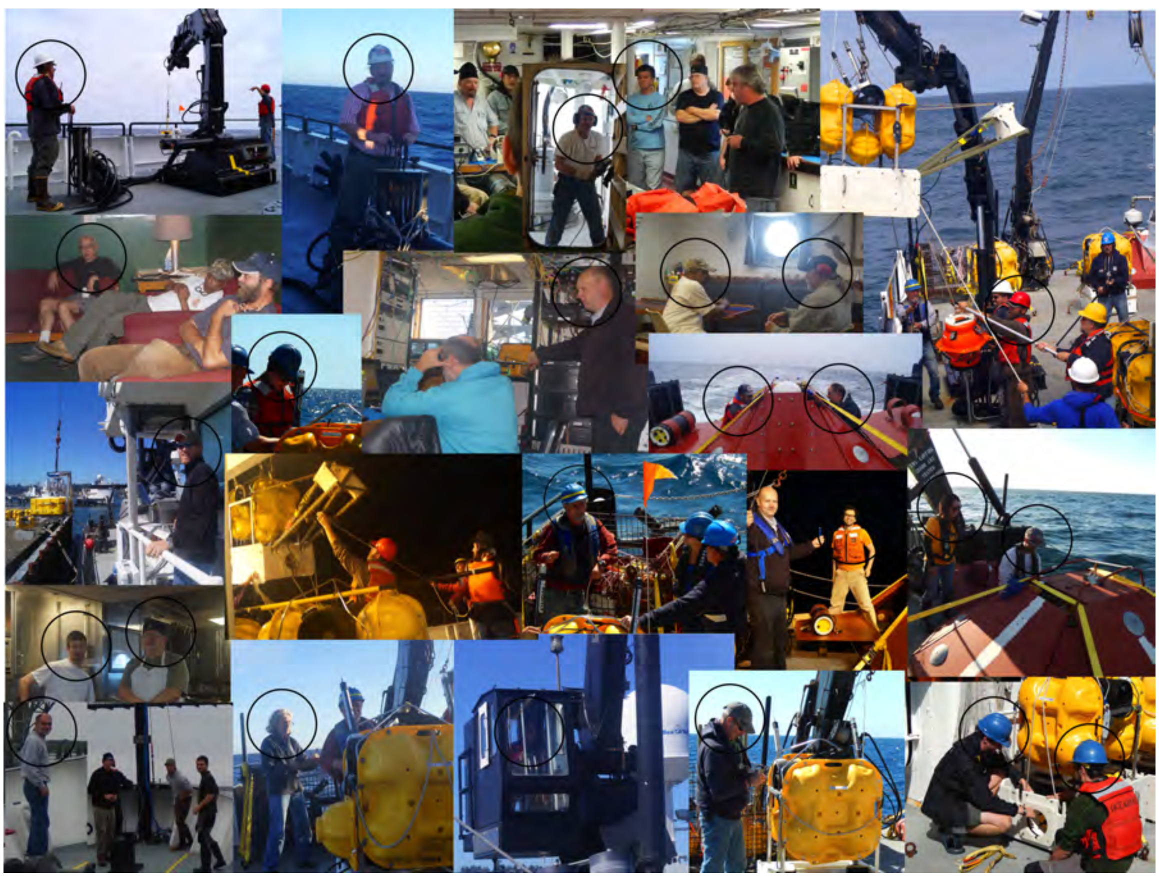
Ship's Crew:
Jeff Crews, Captain
Todd Dussault, First Mate
Tony Monocandilos, Second Mate
Bob Cruise, Chief Engineer
Jacques Jean Bart, Engineer
Chip Millard, Engineer
Gene Otto, AB
Marc Simpson, AB
Patrick Breshears, AB
John Vanderbeck, Cook
Sean Guss, Assistant Cook

Abbreviations: Cal Poly - California State Polytechnic University--Pomona, LDEO - Lamont-Doherty Earth Observatory; OSU - Oregon State University; UO - University of Oregon; U. Liverpool – University of Liverpool, UK.

OC1409A Science Party:

front row: Walt Masterson, Carlos Becerril, Jeremy Schultz, Anne Trehu, Maggie Barba
second row: Ted Koczynski, Bill Burns, John Clapp, Dean Livelybrooks, Andrew Barclay, Brian Cook

Science Party and Crew at work:



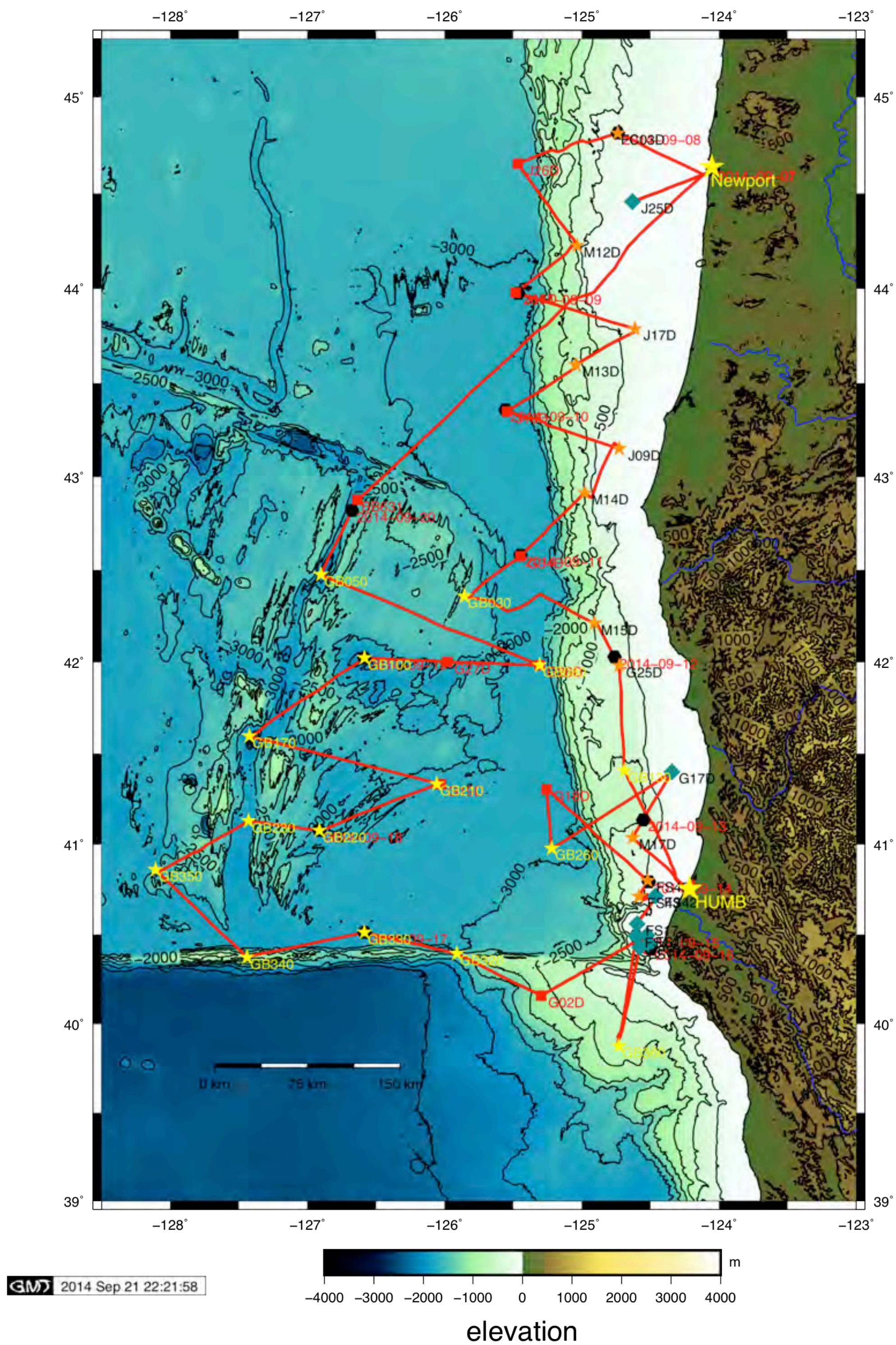


Figure 1. Track map for OC1409A showing locations of deployed TRMs (orange stars), TRM-Ps (teal diamonds), LDEO ARRAs (red squares) and recovered LDEO-LP instruments (yellow stars). Red line is the ship track; the position at the beginning of each day is shown by a black hexagon. The focused array is shown on the next page.

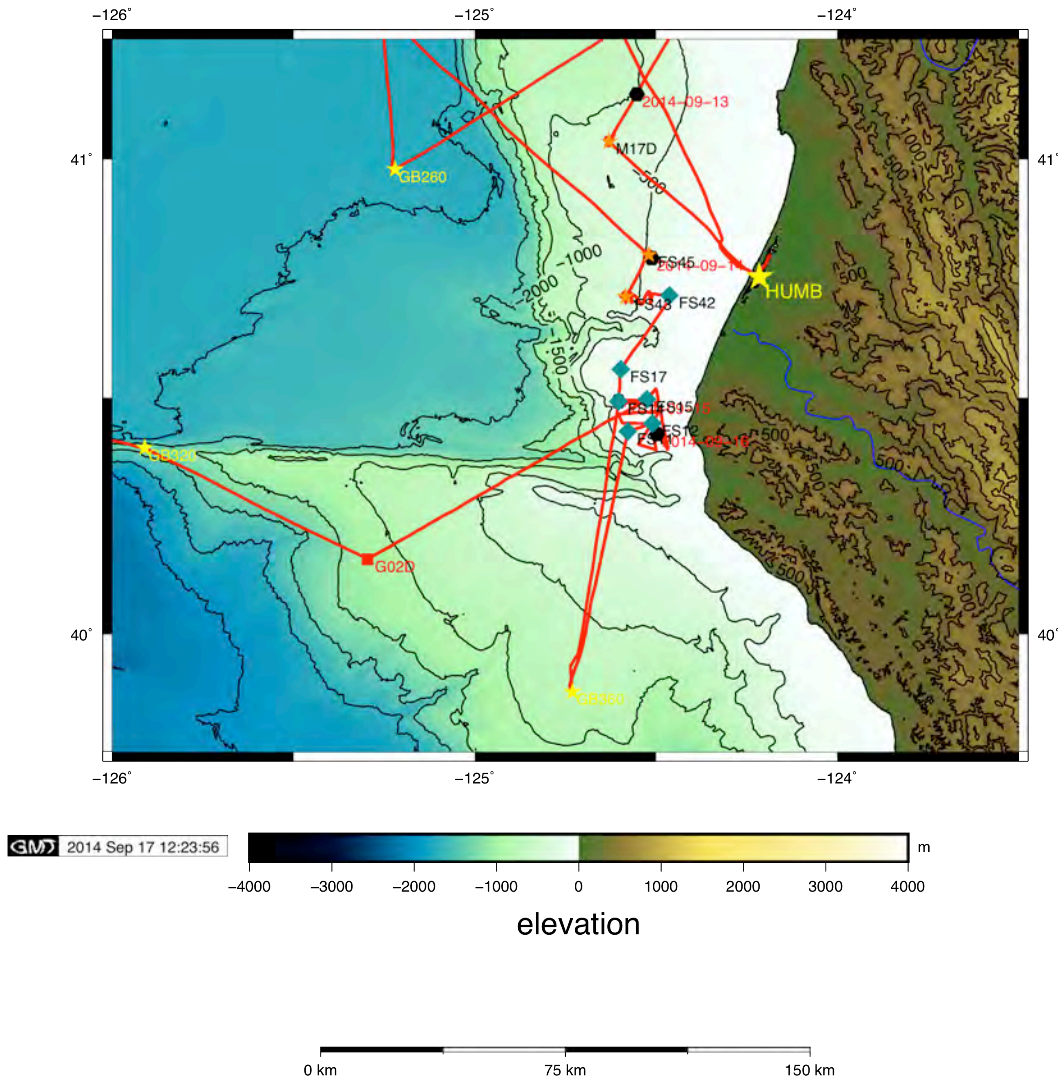


Figure 2. Map of the track for OC1409A: focused array detail.

Table captions:

Table 1. Planned station locations for OC1409A. For actual deployment locations and depths, as determined from acoustic surveys or from the wire position for shallow TRM deployments, see Table 2. For deployments, the latitude, longitude and depth are from the acoustic surveys conducted when the instruments were deployed in 2013.

Table 2. Deployment locations for OC1409A. The planned latitude, longitude and depth are the same as in Table 1, except that they are listed as decimal degrees. The survey locations are considered the best location at the present time. For TRMs to be recovered by ROV in 2015, these locations may be updated. Three types of location method were used: 3D and 2D solutions from an acoustic survey and SS (Shallow Site) for a relocation given by the geometrical offset between the GPS antenna and the wire for TRM deployments in water too shallow for an acoustic survey. This offset is also taken into account for the 2D and 3D acoustic survey solutions. For 3D solutions, the depth observed on the echosounder (generally the 3.5 kHz) as well as the calculated depth is given. The assumed water velocity for solutions from the acoustic surveys was 1489 m/s. The assumed velocity for depths from the echosounder was 1500 m/s. The difference in assumed velocity of sound in water explains much of the difference between the two depth values. The comments column also indicates which instruments were deployed with low gain. (i.e. all instruments deployed prior to the Humboldt Bay port stop. See cruise narrative for more explanation.) For more details about deployments, see the Cruise Narrative in this document and the Cruise E-log available on the R2R web site. A summary of the offset calculation for shallow water TRMs is giving in Appendix 1. Images of the screen for acoustic survey solutions are given in Appendix 2.

Table 3. OBS recovery locations, preliminary assessment of data quality and measured clock drifts. Positive drift means that the OBS clock was fast. The positions are the same as in Table 1 but expressed in decimal degrees. The depth provided from the 2013 acoustic surveys are compared to those observed by echosounding at the site during the recovery.

Table 1. Positions of stations during OC1409A.

Site Number	Station Name	Latitude Degree N	Latitude Minute	Longitude Degree W	Longitude Minute	Type	Depth (m)
1	FC03D	44	48.816	124	44.28	TRM	422
2	J26D	44	39.3	125	27.984	ARRA	2856
28	FS15	40	29.796	124	31.476	TRMP	55
3	M12D	44	13.632	125	2.124	TRM	971
4	J18D	43	58.77	125	28.92	ARRA	3025
5	J17D	43	47.268	124	36.798	TRM	296
6	M13D	43	35.856	125	2.64	TRM	993
7	J10D	43	20.928	125	32.676	ARRA	3074
8	J09D	43	9.09	124	43.626	TRM	251
9	M14D	42	54.84	124	58.656	TRM	988
10	G34D	42	34.399	125	26.875	ARRA	3103
11	GB030	42	21.486	125	51.387	LDEO-LP	2608
12	M15D	42	12.654	124	54.462	TRM	936
13	G25D	41	58.871	124	43.593	TRM	682
14	GB130	41	24.467	124	41.428	LDEO-LP	1070
15	HUMB	40	45.226	124	12.912	Port	NA
16	M17D	41	2.226	124	37.794	TRM	734
17	G17D	41	24.000	124	20.646	TRMP	95
18	GB260	40	58.739	125	13.193	LDEO-LP	3079
19	G18D	41	18.271	125	15.429	ARRA	3108
20	FS45	40	48.000	124	31.200	TRM	493
21	FS43	40	42.720	124	35.040	TRM	720
22	FS42	40	42.900	124	27.780	TRMP	94
23	FS17	40	33.576	124	35.820	TRMP	150
24	FS14	40	29.532	124	36.234	TRMP	141
25	GB360	39	52.663	124	43.780	LDEO-LP	1303
26	FS11	40	25.740	124	34.650	TRMP	124
27	FS12	40	26.730	124	30.624	TRMP	58
29	G02D	40	9.523	125	17.782	ARRA	1736
30	GB320	40	23.644	125	54.667	LDEO-LP	2268
31	GB330	40	30.723	126	35.073	LDEO-LP	3151
32	GB340	40	22.403	127	26.423	LDEO-LP	1776
33	GB350	40	51.634	128	6.435	LDEO-LP	3300
34	GB230	41	7.825	127	25.768	LDEO-LP	3309
35	GB220	41	4.620	126	54.807	LDEO-LP	2991
36	GB210	41	20.003	126	3.401	LDEO-LP	3088
37	G19D	41	19.968	126	1.692	ARRA	3104
38	GB170	41	35.793	127	25.420	LDEO-LP	3444
39	GB100	42	1.392	126	35.054	LDEO-LP	3578
40	G27D	42	0.111	125	58.885	ARRA	2924
41	GB080	41	59.044	125	18.476	LDEO-LP	3099
42	G26D	41	59.044	125	18.476	ARRA	3099
43	GB050	42	28.488	126	54.102	LDEO-LP	4031
44	BB631	42	52.655	126	38.195	ARRA	3330
45	J25D	44	27.396	124	37.854	TRMP	134

Table 2. OBS deployments during OC1409A. See page 8 for extended caption.

OC1409A Station Number	Site Name	Planned Latitude	Planned Longitude	Planned Depth, m	Instrument type	Survey Latitude	Survey Longitude	Method	Depth , m	Survey RMS, ms	Comments
1	*FC03D*	*44.81360*	*-124.73800*	*422*	*TRM*	*44.813285*	*-124.738318*	*2D*	*432*	*8.6*	*low gain*
2	*J26D*	*44.65500*	*-125.46640*	*2856*	*ARRA*	*44.657678*	*-125.467035*	*2D*	*2880*	*7.6*	*low gain*
3	*M12D*	*44.22720*	*-125.03540*	*971*	*TRM*	*44.227000*	*-125.035260*	*2D*	*950*	*na*	*no survey screen shot; low gain*
4	*J18D*	*43.97950*	*-125.48200*	*3025*	*ARRA*	*43.977253*	*-125.481397*	*3D*	*3039/3060*	*2.7*	*low gain*
5	*J17D*	*43.78780*	*-124.61330*	*296*	*TRM*	*43.787260*	*-124.613425*	*2D*	*285*	*11.6*	*low gain*
6	*M13D*	*43.59760*	*-125.04400*	*993*	*TRM*	*43.597320*	*-125.044638*	*2D*	*990*	*11.0*	*low gain*
7	*J10D*	*43.34880*	*-125.54460*	*3074*	*ARRA*	*43.348497*	*-125.545077*	*3D*	*3076/3093*	*1.7*	*low gain*
8	*J09D*	*43.15150*	*-124.72710*	*251*	*TRM*	*43.151395*	*-124.727096*	*SS*	*252*	*na*	
9	*M14D*	*42.91400*	*-124.97760*	*988*	*TRM*	*42.913585*	*-124.977930*	*3D*	*1000/994*	*10.0*	*survey saved as M13D 4; low gain*
10	*G34D*	*42.57332*	*-125.44792*	*3103*	*ARRA*	*42.572323*	*-125.448578*	*3D*	*3074/3103*	*17.4*	*low gain*
12	*M15D*	*42.21090*	*-124.90770*	*936*	*TRM*	*42.210673*	*-124.907450*	*3D*	*930/936*	*6.9*	*low gain*
13	*G25D*	*41.98118*	*-124.72654*	*682*	*TRM*	*41.981126*	*-124.726679*	*SS*	*688*	*na*	*no survey (transponder not responding); low gain; relocated following SS procedure*
16	*M17D*	*41.03710*	*-124.62990*	*734*	*TRM*	*41.036958*	*-124.629837*	*2D*	*749*	*74.0*	*survey saved as G17D*
17	*G17D*	*41.40000*	*-124.34410*	*95*	*TRMP*	*41.399611*	*-124.433193*	*SS*	*99*	*na*	
19	*G18D*	*41.30452*	*-125.25716*	*3108*	*ARRA*	*41.304675*	*-125.255845*	*3D*	*3107/3150*	*3.0*	
20	*FS45D*	*40.80000*	*-124.52000*	*493*	*TRM*	*40.799990*	*-124.520245*	*2D*	*477*	*50.9*	
21	*FS43D*	*40.71200*	*-124.58400*	*720*	*TRM*	*40.711938*	*-124.583875*	*3D*	*717/720*	*9.7*	
22	*FS42D*	*40.71500*	*-124.46300*	*94*	*TRMP*	*40.715095*	*-124.463103*	*SS*	*95*	*na*	
23	*FS17D*	*40.55960*	*-124.59700*	*150*	*TRMP*	*40.559769*	*-124.596999*	*SS*	*145*	*na*	
24	*FS14D*	*40.49220*	*-124.60390*	*141*	*TRMP*	*40.492342*	*-124.603917*	*SS*	*145*	*na*	
26	*FS11D*	*40.42900*	*-124.57750*	*124*	*TRMP*	*40.428534*	*-124.577497*	*SS*	*150*	*na*	
27	*FS12D*	*40.44550*	*-124.51040*	*58*	*TRMP*	*40.445633*	*-124.510457*	*SS*	*55*	*na*	
28	*FS15D*	*40.49660*	*-124.52460*	*55*	*TRMP*	*40.496390*	*-124.524697*	*SS*	*56*	*na*	
29	*G02D*	*40.15871*	*-125.29636*	*1736*	*ARRA*	*40.160343*	*-125.297707*	*3D*	*1736/1745*	*1.2*	
37	*G19D*	*41.33280*	*-126.02820*	*3104*	*ARRA*	*41.331580*	*-126.027870*	*3D*	*3082*	*na*	*no APG on this instrument; no survey screen shot*
40	*G27D*	*42.00186*	*-125.98141*	*2924*	*ARRA*	*42.001268*	*-125.981650*	*3D*	*2934/2943*	*3.0*	
42	*G26D*	*41.98406*	*-125.30793*	*3099*	*ARRA*	*41.983815*	*-125.308270*	*3D*	*3091/3116*	*2.4*	
44	*BB631*	*42.87758*	*-126.63659*	*3330*	*ARRA*	*42.878702*	*-126.634370*	*3D*	*3310/3330*	*6.2*	
45	*J25D*	*44.45660*	*-124.63090*	*134*	*TRMP*	*44.456704*	*-124.631025*	*SS*	*136*	*na*	

Table 3. OBS data recovery during OC1409A. All recoveries were of LDEO-LP instruments. For more details about recoveries, see the Cruise Narrative in this document and the Cruise E-log available on the R2R web site. Clock drift is OBS time minus actual time (positive fast).

OC1409 A Station Number	Site Name	Decimal Latitude	Decimal Longitude	Depth from GMRT, m	Depth from 3.5 kHz	Clock Drift , s	First Day, 2013	Last Day, 2014	DPG	H1	H2	Z	Comments
11	GB030	42.35810	-125.85645	2608	2630	0.602999	307	253	e	g	g	g	Z and H1 may be reversed. Low gain on seismometer channels.
14	GB130	41.40778	-124.69047	1070	1070	1.072990	304	254	e	g	g	g-f	intermittent data on Z; noisy on H1 and H2.
18	GB260	40.97898	-125.21988	3079	3000	1.014000	305	255	e	vg	vg	vg-g	some artifacts on
25	GB360	39.87771	-124.72967	1303	1300	1.007997	304	258	e	e	e	e	tidal currents seen on horizontals
30	GB320	40.39407	-125.91111	2268	2292	0.415998	290	259	e	?	?	?	
31	GB330	40.51205	-126.58454	3151	3173	0.734002	289 2201	259 2025	e	?	?	?	
32	GB340	40.37339	-127.44039	1776	1796	1.569005			nd	nd	nd	nd	Sensor partially flooded.
33	GB350	40.86057	-128.10725	3300	3325	-0.827996	288 0953	260 1657	e-vg	g-f	g-f	g-f	artifacts on all seismometer channels.
34	GB230	41.13042	-127.42947	3309	3330	0.264998	288 0210	260 0527	vg	vg	vg	vg	need to evaluate further
35	GB220	41.07700	-126.91345	2991	3007	-0.640998	289 1255	260 1346	e	?	?	?	
36	GB210	41.33338	-126.05668	3088	3113	1.304006	306 0516	260 1728	e	?	?	?	
38	GB170	41.59655	-127.42367	3444		0.785004	306 2000	261 0814	e	e	e	e	
39	GB100	42.02321	-126.58423	3578		1.444008	307 0736	261 1949	e	e	e	e	
41	GB080	41.98406	-125.30793	3099		1.317994	305 0134	261 1841	e	?	?	e	
43	GB050	42.47480	-126.90169	4031		0.278990	286 1516	262 0153	nd	nd	p	p	possibly some snippets of data on Z, but flat-lined on DPG and H1 and only spikes on H2.

CRUISE NARRATIVE:

Day 1, September 7, 2014 (JD 250-251):

R/V Oceanus left Newport, OR, at 11:00 PDT (1800 GMT) after the science party had its orientation meeting followed by a fire and boat drill for all hands. We practiced donning survival suits. Trehu found an open switchblade in the foot of her suit. Fortunately the blade was parallel to the floor and did not cut either the suit or her foot. Weather was excellent - cool, foggy with calm seas.

We arrived at Site **FC03A** at 2117 GMT. Deployment of the first TRM went smoothly. TRM deployments entail lowering the unit to the ocean floor attached to 3/8" dyneema line wound on a heave-compensating winch. After aft deployment to the water under the extended A-frame, line is let out until the winch registers >10m, then heave-compensation is employed for the duration of the drop. TRMs and TRMPs are lowered at approx. 12 meters/minute, and slung so that unit is tipped on side to combat 'wallowing' back and forth during the drop. When the unit arrives at the ocean floor, extra line is payed out. The unit is queried for orientation, and once proper orientation is verified, a series release is employed to disconnect line. Line is initially pulled with heave compensation on, and eventually turned off to allow more rapid line recovery. We surveyed location for TRM and TRMP instruments with ship traveling a cross pattern over the unit while pinging. Surveys are only conducted for instruments in >200 m of water. For water depths <200 m, the position of the line when the OBS is on the seafloor is considered the best estimate of location. Eventually, the location determined by ROV Jason on recovery will be considered to be the best estimate of the instrument location.

We then transited to Site **J26D** to deploy the first ARRA OBS. No major hiccups - the unit was prepped on the waist deck astern of the Morgan Crane, which was used to winch it overboard and set it in the water. Instrument was then released and drifted to bottom at a rate of about 44 meters/minute. Unit was pinged to check descent. ARRA deployments are surveyed with a circular ship track with a diameter matching instrument depth, with remotely-controlled ORE Offshore Deck Box pinging through ship's 12.5KHz transducer. M-Cal software controlled pinging, with a GPS feed from the ship, and constructed instrument position. This method of surveying will be used for all ARRA deployments.

We discovered that the e-log from a previous cruise was still open from a previous OBS deployment cruise. Rather than risk loosing the e-log option, we added entries to this log. The next day, however, we found that they had not been saved. We started a new log in the early hours of day 2 and then transferred important entries from day one into the oc1409a e-log (identified by "backfill" on the comment line. Oc1409A e-log seems to be operating smoothly.

Day 2, September 8, 2014 (JD 251-252):

After a slow (~5 kt) transit to allow for rest time, we arrived at Site **M12D** for deployment of a TRM, arriving at 07:04 PDT (1404Z) time. Some prep work on sensor and battery packages was completed at the end of J26D deployment, so as to facilitate timely deployment of M12D. Deployment otherwise went smoothly, lowering time was somewhat lengthy owing to deployment depth of ~971 m and somewhat slow winch payout speed. After completing standard TRM(X) cross survey, left site at 12:19 PDT, in transit to J18D.

Arrived at **J18D** at 14:17 PDT (2117Z). This was an ARRA deployment and it went smoothly. After prep work and standard deployment over side, nominal drop time was 65 minutes, followed by standard ARRA (deepwater) circle survey. It was noted that bridge crew made an excellent, very circular track with diameter of within 15m of depth of instrument. Departed at 17:29 PDT to transit to J17D.

Arrived at **J17D** at 18:55 PDT. This is a TRM site, with water depth of 285m (nominal - see table for the best estimate of instrument depth). TRM deployment was standard, lowered to bottom in about 30 minutes. Afterwards, deck work placed the next TRM frame under the A-frame and ARRA position for future deployment, then standard TRM survey. Off station at 00:10 the next morning, slow cruise to next station with Lamont crew doing TRM prep work for expedient, breakfast-time deploy.

Day 3, September 9, 2014 (JD 252-253):

After a slow transit to **M13D**, arrived at station at 06:13 PDT time; instrument was deployed at breakfast. This is a TRM deployment at ~990m depth, so lowering TRM at ~11 m/minute took about 90 minutes. Instrument was surveyed in standard cross track, then deck work set up both the next ARRA site and a TRM frame for late day deployment. Departed site at 11:12 PDT time and transited to J10D.

Arrived at **J10D** at 13:30 to install ARRA instrument in 3080m of water. No problems with deployment (student 'pulled the line' to release instrument into water). Instrument on the bottom 15:29. Seas were mounting somewhat, ~4' swell. 3km circle survey undertaken, and issues with surveying software and control of the deck box entailed surveying 1.5 circles to complete. Departed station at 17:20 and transitted to J09D.

J09D was a TRM install in 251m of water off Cape Blanco. This instrument was (intentionally) installed without a transponder, so we took special care to record ship's position when instrument was lowered into water and when it was reported at bottom. In particular, on bottom at 201409100407Z, ship's GPS recorded as 43.151682, -124.727070, heading ~1°EofN, depth sounding of ~252m when ship arrived at station. Installation appeared to go smoothly. Deck work and TRM prep for next mornings's site followed.

Day 4, September 10, 2014 (JD 253-254):

Deployment of site **M14D**, a TRM site in ~990m on the mid-slope began at first light. Depoyment was uneventful. The instrument was in the water at 08:06 PDT, the acoustic ranging survey began at 10:09 PDT (1709Z), and the survey was completed and transit began to the next site at 11:20 PDT (1820Z).

We arrived at site **G34D**, an ARRA OBS in 3104 m on the Juan de Fuca plate at 14:09 PDT (2109Z). After completing instrument set up and repositioning to be on site, the OBS was in the water and released at 15:26 PDT (2226Z) and on the seafloor at 16:39 PDT (2339Z).

Winds had been picking up and seas had been building all day. During the acoustic survey, while in the trough, the fantail was battered and several of the ARRA frames that were being stored on the starboard side along the rail near the lab were damaged and became loose. After temporarily stopping the survey to resecure the frames and assess the damage, surveying was restarted. Four frames had been damaged, one quite severely. It was decided to "cannibalize" LDEO-LP instruments (to be recovered) to replace damaged parts in order to deploy the full complement of instruments planned.

The survey at G34D was completed at 19:54 PDT (0254Z) and transit began to our first recovery site. By the time we arrived at **GB030** at 22:08 PDT (0508Z) waves had decreased somewhat and the decision was made to proceed with the recovery. The recovery went smoothly and was completed by 00:40 PDT (0740Z). Transit began to site M15D on the continental slope for an early morning TRM preparation and deployment.

Day 5, September 11, 2014 (JD 254-255):

We arrived at **M15D** at 06:50 PDT (1350Z), and instrument preparation began. Sea state had improved. Deployment of M15D was delayed when a corroded/broken pin was found on the data logger connector that needed to be replaced. Assembly of the TRM for site G25D and repair of the broken ARRA frames were done in parallel with preparation of M15D so that the next deployment would require less time on site. G25D was assembled while on the rack, which facilitated some manoeuvres (although shin guards would have been welcome). Instrument was inthe water at 12:55 PDT (1955Z). Deployment was uneventful thereafter, and we left the station at 15:50 PDT (2250Z) after release, winch spooling, deck work and survey, cruising to G25D.

G25D was another TRM deployment in shallower water (682m nominal). Much of the setup work had been completed while on station at M15D. After arriving on station at 17:18 PDT, the instrument was in the water at 18:35 PDT (0135Z, JD 255). Lowering to bottom, release and winch spooling were all uneventful. However, the transponder was unresponsive for surveying, despite it having passed deck testing just before deployment. After ~30 minutes of trials, including swapping deck boxes, it was concluded to not survey instrument and proceed on to next station, an LDEO-LP recovery. This was the 3rd failure of transponders (all tested on deck) for this cruise, and we are at this point wondering about their high failure rates after deployment.

Left G25D at 2018 PDT and cruised to station **GB130,** arriving at 2318 PDT (0618Z). The LDEO-LP was interogated and given the signaled to release ballast. Instrument rose in approximately 27 minutes. Foggy conditions meant that the RDF beacon was used to initially approach the instrument. Instrument was brought alongside starboard and retrieved by hooking to the Morgan crane line, stablized with tag lines, and brought aboard. Instrument was partially deconstructed to retrieve logger and sensor package. We left the site at 0104 PDT (08:04Z) to travel to Humboldt Harbour and to retrieve 8 TRM popup shells that had been delivered by truck the day before. This stop was required because there was not enough deck space to hold all the shells at once.

Day 6, September 12, 2014 (JD 255-256):

We arrived at dock (Schneider Dock and Intermodal Facility: 707.445.3080) in Humbolt/Eureka at 09:03 PDT (1603Z). Off-loaded storage frames for TRM shells that had already been deployed and on-loaded 8 pop-up TRM frames with storage frames. We also took advantage of this stop to swap personnel. Alex de Moor left the ship to do reconnaissance of onshore sites that will be deployed in October to complement the OBS array. Jeremy Schultz drove a field truck to Eureka for Alex and joined the shipboard party. We left dock at 10:40 PDT (1740Z) and transited to next site, M17D, a TRM deployment.

Arrived at **M17D** at 13:20 PDT (2020Z) and immediately began to deploy the TRM in 734m (nominal) water. Prep work on dock ensured that the instrument was in the water promptly (13:34 PDT) and winched to the seafloor. All went smoothly from there, and we left the station at 16:25 PDT.

A decision was made, in light of an anticipated 4-day window of good weather, to revise station order so as to begin deployment of TRMs in the focussed array (dubbed the 'pop-up patch') off Cape Mendocino as soon as possible. Revised route will include previously-planned deployment of G17D, a pop-up TRM, followed by a night-time recovery of deeper-water GB260, then a morning deployment of an ARRA instrument (G18D). From there the plan is to transit SE to the pop-up patch, the 7 shallow-water instruments comprising our deployments for the Mendocino focused array (MFA).

Unfortunately an error was discovered in an add-on, small amplifier board constructed to combat saturation of A/D converters from large signals (e.g. >M3.0 earthquakes along the Mendocino Fracture Zone). These saturations were observed in data acquired during the 2012-13 deployment of the MFA. The boards were purpose-built to better match amplified signal feeds into the A/D so that maximum input range (+/- 5V) would rarely be exceeded. The fault entailed a manufacturing mistake involving use of the wrong resistor (varying by a factor of ten from design specifications) employed in a voltage divider meant to bias amplifier circuits. The Lamont crew had enough of the correct micro-resistors in their stores to effect a mid-cruise modifcation and replace the incorrect resistors, a non-trivial task while at sea. A modified board was tested for the correct results, and boards were modified for the remaining cruise (stations deployed after G17D).

Arrived at **G17D** at 18:34 PDT (0134 JD 256), a TRM pop-up site in 95m (nominal) water NW of Eureka, California. TRM-P frame had been prepared during the survey of the previous site, so deployment went quickly up until unit was raised below A-frame to lower into water. A random cross-swell hit the ship, causing roll that bounced the instrument off both A-frame legs, breaking the burn wire holding up the sensor and causing it to fall (approx. 3m) to deck. This necessitated lowering the unit, installing a different sensor package and replacing the burn wire. Even with this delay, we managed to lower unit to bottom, haul winch line, do deck work and survey the site in order to depart at 20:14 PDT.

Day 7, September 13, 2014 (JD 256-257):

Arrived at LDEO-LP station **GB260** at 00:11 PDT (0711Z). Woke up unit on sea floor and sent burn command to release ballast weights. An initially slow instrument rise evolved into normal rise rates (~44m/minute) after about 15 minutes. Instrument came to surface in foggy weather and was spotted however on port side. Recovery was accomplished and instrument was set on the waist deck at 02:17 PDT (0917Z). Instrument was secured until morning for deconstruction, and we sailed to next station.

Arrived at ARRA deployment site **G18D** at 07:24 PDT (1424Z), after planned slow transit to allow break for science crew. Instrument was preparation was completed, and the OBS was in the water at 09:10 PDT (1610Z). Descent to ocean floor then took 1 hr 11 min, to a depth of 3108m (nominal). An acoustic survey to determine position on the seafloor required approximately 1 more hour. Transponder was set to sleep mode and we began transit to the 'pop-up patch' off Cape Mendocino.

Arrived at station **FS45D**, and a TRM was deployed in 493m (nominal) water. Instrument was in the water at 15:30 PDT, and was lowered to bottom using the heave-comp. winch. The rest of the deployment was uneventful and we began transit to the next station at 18:19 PDT (0119Z).

Arrived at station **FS43D**, another non-popup TRM, at 19:21 PDT (0221Z). Deployed instrument in 720m water depth (nominal) in normal manner. Completed all elements of deployment at 22:41 PDT. Held station all night to allow for prep work on next two pop-up TRMs, with work completed at approximately 00:00. Held station until early morning then transited to next station, FS42D, at TRM pop-up.

Day 8, September 14, 2014 (JD 257-258):

FS42D was deployed in approximately 95 m of water without incident. It was in the water at 08:53 PDT and we began transit to the next site at 09:12 PDT. No acoustic survey was done because of the shallow depth.

FS17D was deployed in ~144 m of water at 12:00 PDT. The sensor cable connector to the data logger had a loose locking ring. A stability harness was made using zip ties. Otherwise deployment occurred without incident. Weather is very cooperative - foggy with calm seas.

FS14D was deployed in ~145 m of water at 17:45 PDT. Deployment went smoothly. We then transited to our southernmost site, GB360, which was a recovery.

GB360 was recovered without incident from ~1311 m water depth and was on board at 22:21 PDT. The time and ships position when the release signal was acknowledged was not recorded. We then began the transit back to the pop-up patch with one instrument ready to go at daybreak.

Day 9, September 15, 2014 (JD 258-259):

We arrived at site **FS11D** at 07:04 PDT, the TRM-P was in the water at 08:41 PDT, and we began a short 3.5 and 12 kHz survey of the shelf at 4-5 kts while the next TRM-P was being prepared. Topography of the shelf in this region is not well known as indicated by numerous mismatches between various data sets. Very little swath bathymetry is available from the shelf, and we have been acquiring data over the past 2 Cascadia Initiative deployment cruises to map a transition from smooth to rough seafloor that may represent a submerged shoreline that is potentially a marker for long-term deformation.

Site FS12D was shifted ~x m NW from its originally planned position to avoid rough topography of Blunts Reef. We arrived at station at 11:42 PDT (1842Z) and undertook an uneventful deployment. We left station at 16:40 PDT.

Site FS15D was also shifted ~x m NW to avoid Blunts Reef, putting it in 55 m of water rather than 30 m. Between stations FS11D, FS12D and FS15D, while instruments were beig prepared for deployment. we collected 3.5KHz data to characterize the transition from rough to smoother topography in this region. We arrived on station FS15D at 20:57 PDT (0357Z) to begin deployment of the final TRM within the Mendocino Fracture Zone focused array. The deployment went smoothly and we left the station at 22:53 PDT.

Day 10, September 16, 2014 (JD 259-260):

We arrived at station **G02D**, an ARRA deployment in 1740m (nominal) depth on the continental shelf just south of the Mendocino Fracture zone at 07:14 PDT (1414Z). A smooth deployment followed by surveying left us leaving station at 09:33 PDT.

The next task is to recover 7 LDEO-LPs deployed outboard along the Mendocino Fracture Zone, Gorda Ridge, and on the Gorda Plate. We proceeded west to:

Site **GB320 r**ecovery was uneventful. We arrived on station at 12:21 and left at 13:45 (both PDT), a very efficient recovery of an instrument in ~2268m of water.

Recovery of Site **GB330** was also uneventful. We arrived at station at 16:31 PDT, woke up the instrument, gave command to burn wire and drop ballast. The instrument started rising from the floor (3151m depth nominal) about 20 minutes after the burn command, floated up at the normal rate of ~44 m/minute, and was recovered. We left station at 18:55 PDT (0155Z).

Recovery of Site GB 340 was more problematic. We arrived on station at 22:31 PDT and gave the burn command. The instrument remained on the ocean floor (~1776m depth). We gave, successively, 2 more internal hydrophone burn commands, followed by a 4th (and external) command without results. More burn commands were given. After approximately 1 hour, the instrument began rising, but at a nominal rate of 20m/minute. Range sounding of the instrument as it rose indicated even lower rise rates, though it was eventually sighted on surface at 01:06 PDT (0806Z). After some maneuvering in somewhat rising seas and rain, we were able to recover the instrument. After recovery, it was ascertained that the sensor enclosure had partially flooded, hence the slow rise rate.

Day 11, September 17, 2014 (JD 260-261):

We arrived at Site **GB350** at 06:00 PDT. Instrument released without complication. Initially the rise rate was ~20 m/min, but then the 2nd weight was dropped and the rise rate increased to 44 m/min. Instrument was predicted to be on the surface at 08:00 PDT and arrived on schedule. Recovery proceeded normally, and we were underway to the next site at 08:58 PDT. Seas have been picking up and transit is in the trough. Forecast is that it should not gt much worse and should get better soon.

We arrived at Site **GB230** at 11:54 PDT (1854Z), woke the instrument and signalled it to burn wires, drop ballasts and rise. It began to rise approx. 15 minutes after first burn signal, and rose at the typical rate of 40 m/minute. Instrument surfaced on rising seas and swell, and was recovered without incident.

Sites **GB220** and **GB210** were also recovered normally in moderately rough seas resulting from 24 hrs of 20 kt winds.

Day 12, September 18, 2014 (JD 261-262):

Site G19D was deployed normally near where GB210 had been recovered. Deployment went smoothly. The survey was completed at 04:18 PDT, and a relatively long, 62 nm transit to recovery site GB170 began.

We proceeded on to **Site GB170**, an LDEO-LP recovery in 3444m (nominal) water. Recovery went smoothly in spite of rough seas and we left station at 12:08 PDT to transit to the next station.

We arrived at **Site GB100** at 16:00 PDT. Another smooth recovery, and we were underway to the next sites 1 hr and 12 minutes later. Average time on site for both ARRA deployments and LDEO-LP recoveries has been 2 - 2.5 hrs. We note that several instruments initially began rising at a slow rate of ~20 m/min, indicating that only one weight had dropped, but that the second weight eventually dropped in all cases. The instrument with a partially flooded sensor sphere (not surprisingly) had a slower rise rate than the others and was lower in the water when it surfaced.

We arrived at **Site G27D** at 20:40 PDT for another ARRA deployment. Again, it went smoothly. Seas had calmed down quite a bit, and we enjoyed a spectacular sunset while approaching the site. Deployment went smoothly, and we were underway for the next site - which included both a recovery and a deployment - 3 hours later.

Day 13, September 19, 2014 (JD 262-263):

We arrived at ARRA deployment **site G26D** and recovery **site GB080** at 02:15 PDT. The recovery and deployment were combined so that one instrument was sinking while another was rising, with the deployed instrument set over the side first. This required some extra work and careful record keeping while switching the ranging box from one to the other, but economized time and worked well. The recovered instrument was on board at 04:57 PDT and the ranging survey for the deployed instrument was completed at approximately 06:30 PDT. We then started a relatively long (~7 hr) transit to the penultimate site before our port stop in Newport, giving the LDEO crew a well-deserved rest.

At **station GB050** we recovered an LDEO-LP instrument in 4031m (nominal) water depth. This was the deepest recovery or deployment of the cruise. While the instrument was rising to the surface we did deck work and prepped the next (and final) ARRA deployment. GB050 was on surface at approximately 14:39 PDT (2139Z) and we were underway to the next station shortly thereafter.

BB631 deployment commenced at 17:22 PDT. Preparation of the LDEO ARRA were completed and the instrument was in the water at 18:51 PDT (0151Z). Descent to the deployment depth of 3330m (nominal) took about 65 minutes. A movie of initial descent from the surface was captured using a waterproof camera ('GoCamera'). The deployment was surveyed using a combined circle/cross track in order to minimize the impact of topographic shielding. We left station at 21:22 PDT.

Day 14, September 20, 2014 (JD 263-264):

Arrived in Newport at 11:30 PDT (1830Z). Spent the afternoon packing and offloading. The damaged and repaired sensor package destined for J25D was tested and repaired.

Day 15, September 21, 2014 (JD 264-265):

A short trip with a skeleton crew (Barba, Becerril, Clapp, Livelybrooks) to deploy **Site J25D**, a TRMP in 143 m of water, leaving port at 07:05 PDT. We arrived on station at 09:28 PDT. Some difficulties were encountered with the logger unit which Becerril repaired. Otherwise the deployment went well in rising seas and freshening (>20 knot) winds. We departed station without survey (as depth was too shallow) at 11:25 PDT.

Data Access:

OBS data will be accessable through the IRIS DMC (network code 7D) as soon as final corrections have been applied. Data are in the DMC both as a continuous low-pass filtered data stream (3 Hz high cut) and as an unfiltered but possibly redacted data stream.

This cruise report, the electronic cruise log, navigation, ADCP, and echosounding data are available through the Rolling Deck to Repository (R2R) web site for cruise OC1409A.

Station-num 8
Station-code J09D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30 m in direction of back-bearing)
In-water	2014/09/10	04:36	43.151628 -124.727053	005	185	43.151359 -124.727085
On-seafloor	2014/09/10	04:57	43.151682 -124.727070	005	185	43.151413 -124.727102
Released	2014/09/10	04:57	43.151682 -124.727070	005	185	43.151413 -124.727102

Mean-location 43.151395 -124.727096

Station-num 13
Station-code G25D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30 m in direction of back-bearing)
In-water	2014/09/12	01:35	41.980992 -124.726460	124	304	41.981143 -124.726761
On-seafloor	2014/09/12	02:35	41.981013 -124.726608	171	351	41.981279 -124.726665
Released	2014/09/12	02:38	41.981097 -124.726458	155	335	41.981342 -124.726611

Mean-location 41.981255 -124.726679

Station-num 17
Station-code G17D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30 m in direction of back-bearing)
In-water	2014/09/13	02:52	41.399030 -124.344318	207	027	41.399270 -124.344155
On-seafloor	2014/09/13	03:00	41.399897 -124.344288	205	025	41.400142 -124.344136
Released	2014/09/13	03:03	41.399155 -124.344358	191	011	41.399420 -124.344289

Mean-location 41.399611 -124.344193

Station-num 22
Station-code FS42D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30 m in direction of back-bearing)
In-water	2014/09/14	15:53	40.714833 -124.463040	167	347	40.715096 -124.463040
On-seafloor	2014/09/14	16:03	40.714835 -124.463035	164	344	40.715094 -124.463133
Released	2014/09/14	16:03	40.714835 -124.463035	164	344	40.715094 -124.463133

Mean-location 40.715095 -124.463102

Station-num 23
Station-code FS17D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/14	19:00	40.559542 -124.597153	206	026	40.559784 -124.596997
On-seafloor	2014/09/14	19:12	40.559483 -124.597075	192	012	40.559747 -124.597001
Released	2014/09/14	19:14	40.559512 -124.597078	193	013	40.559775 -124.596998

Mean-location 40.559769 -124.596999

Station-num 24
Station-code FS14D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/15	00:33	40.492160 -124.604165	211	031	40.492391 -124.603982
On-seafloor	2014/09/15	00:46	40.492065 -124.604012	201	021	40.492317 -124.603885
Released	2014/09/15	00:48	40.492065 -124.604012	201	021	40.492317 -124.603885

Mean-location 40.492342 -124.603917

Station-num 26
Station-code FS11D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/15	15:41	40.428832 -124.577662	196	016	40.429091 -124.577564
On-seafloor	2014/09/15	15:58	40.428143 -124.577463	170	350	40.428409 -124.577525
Released	2014/09/15	15:59	40.427842 -124.577305	164	344	40.428101 -124.577403

Mean-location 40.428534 -124.577497

Station-num 27
Station-code FS12D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/15	23:08	40.445412 -124.510460	186	006	40.445680 -124.510423
On-seafloor	2014/09/15	23:15	40.445372 -124.510637	195	015	40.445673 -124.510368
Released	2014/09/15	23:15	40.445285 -124.510673	195	015	40.445546 -124.510581

Mean-location 40.445633 -124.510457

Station-num 28
Station-code FS15D

Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/16	05:37	40.496160 -124.524897	210	030	40.496394 -124.524720
On-seafloor	2014/09/16	05:41	40.496113 -124.524975	208	028	40.496351 -124.524808
Released	2014/09/16	05:43	40.496203 -124.524767	215	035	40.496424 -124.524564

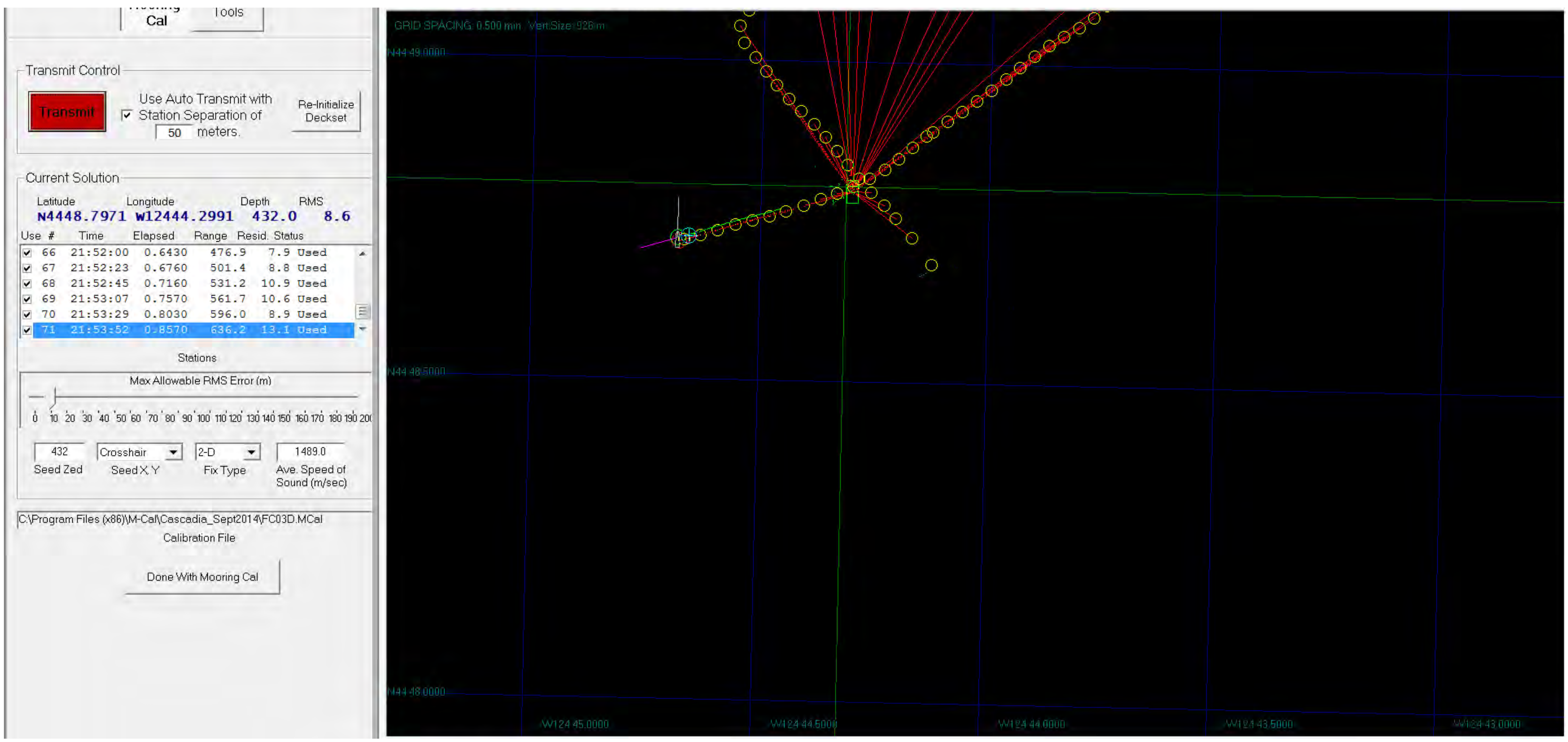
Mean-location 40.496390 -124.524697

Station-num 45
Station-code J25D

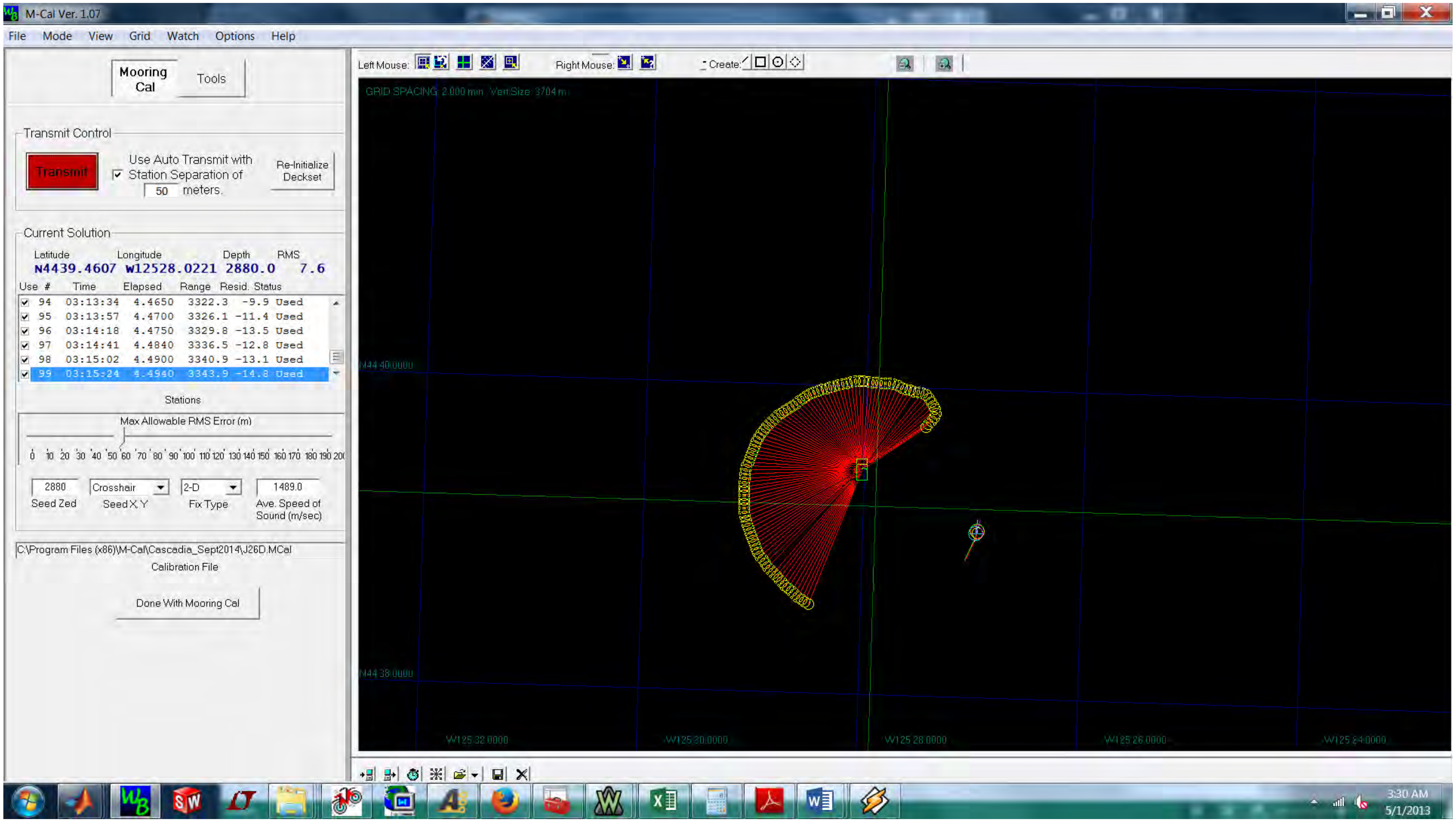
Status type	Date	Time	Ship's location	Bearing	Back-bearing	Winch location (30m in direction of back-bearing)
In-water	2014/09/21	18:04	44.456550 -124.630907	145	325	44.456771 -124.631124
On-seafloor	2014/09/21	18:15	44.456498 -124.630870	145	325	44.456719 -124.631087
Released	2014/09/21	18:17	44.456398 -124.630648	145	325	44.456619 -124.630865
Mean-location						44.456703 -124.631025

Appendix 2: Screen shots of output during relocation of instruments through acoustic surveys. For depth >1000 m, a circle with radius approximately equal to the water depth was used. For depths between 250 and 1000 m, an x-shaped survey was used. For depths <250 m, no acoustic survey was done. Data from these surveys can be obtained from the LDEO OBSIP.

FC03D

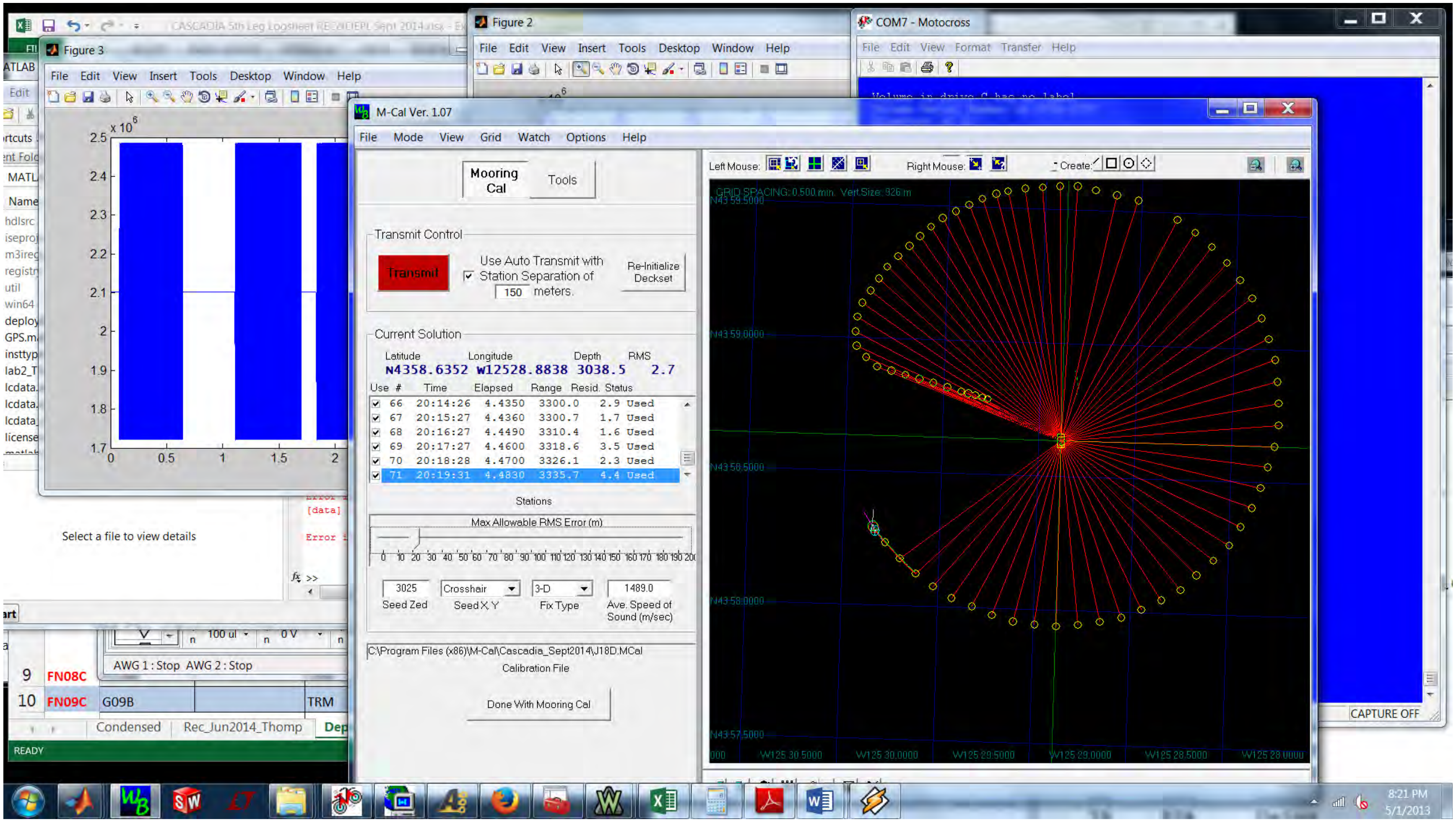


J26D



M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 50 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4439.4607 W12528.0221 2880.0 7.6
Use # Time Elapsed Range Resid. Status
94 03:13:34 4.4650 3322.3 -9.9 Used
95 03:13:57 4.4700 3326.1 -11.4 Used
96 03:14:18 4.4750 3329.8 -13.5 Used
97 03:14:41 4.4840 3336.5 -12.8 Used
98 03:15:02 4.4900 3340.9 -13.1 Used
99 03:15:24 4.4940 3343.9 -14.8 Used
Stations
Max Allowable RMS Error (m)
2880
Seed Zed
Crosshair
Seed X,Y
2-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\J26D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING 2.000 min Vert Size 3704 m
N44 40.0000
N44 38.0000
W125 32.0000
W125 30.0000
W125 28.0000
W125 26.0000
W125 24.0000
3:30 AM
5/1/2013

J18D



M-Cal Ver. 1.07
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4358.6352 W12528.8838 3038.5 2.7
Use # Time Elapsed Range Resid. Status
66 20:14:26 4.4350 3300.0 2.9 Used
67 20:15:27 4.4360 3300.7 1.7 Used
68 20:16:27 4.4490 3310.4 1.6 Used
69 20:17:27 4.4600 3318.6 3.5 Used
70 20:18:28 4.4700 3326.1 2.3 Used
71 20:19:31 4.4830 3335.7 4.4 Used
Stations
Max Allowable RMS Error (m)
3025
Seed Zed
Crosshair
Seed X,Y
3-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\J18D.MCal
Calibration File
Done With Mooring Cal
Figure 3
Figure 2
COM7 - Motocross

J17D

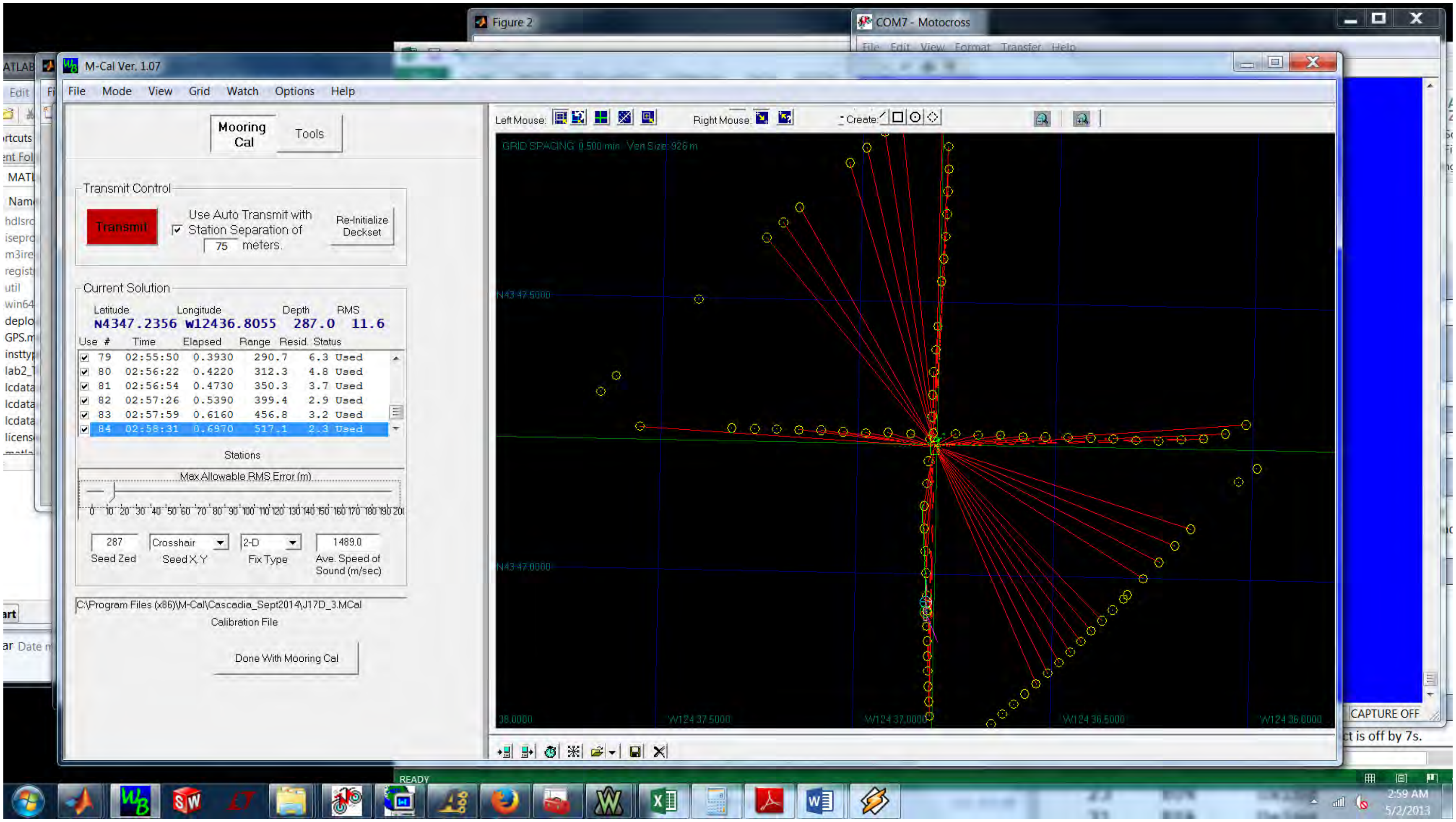
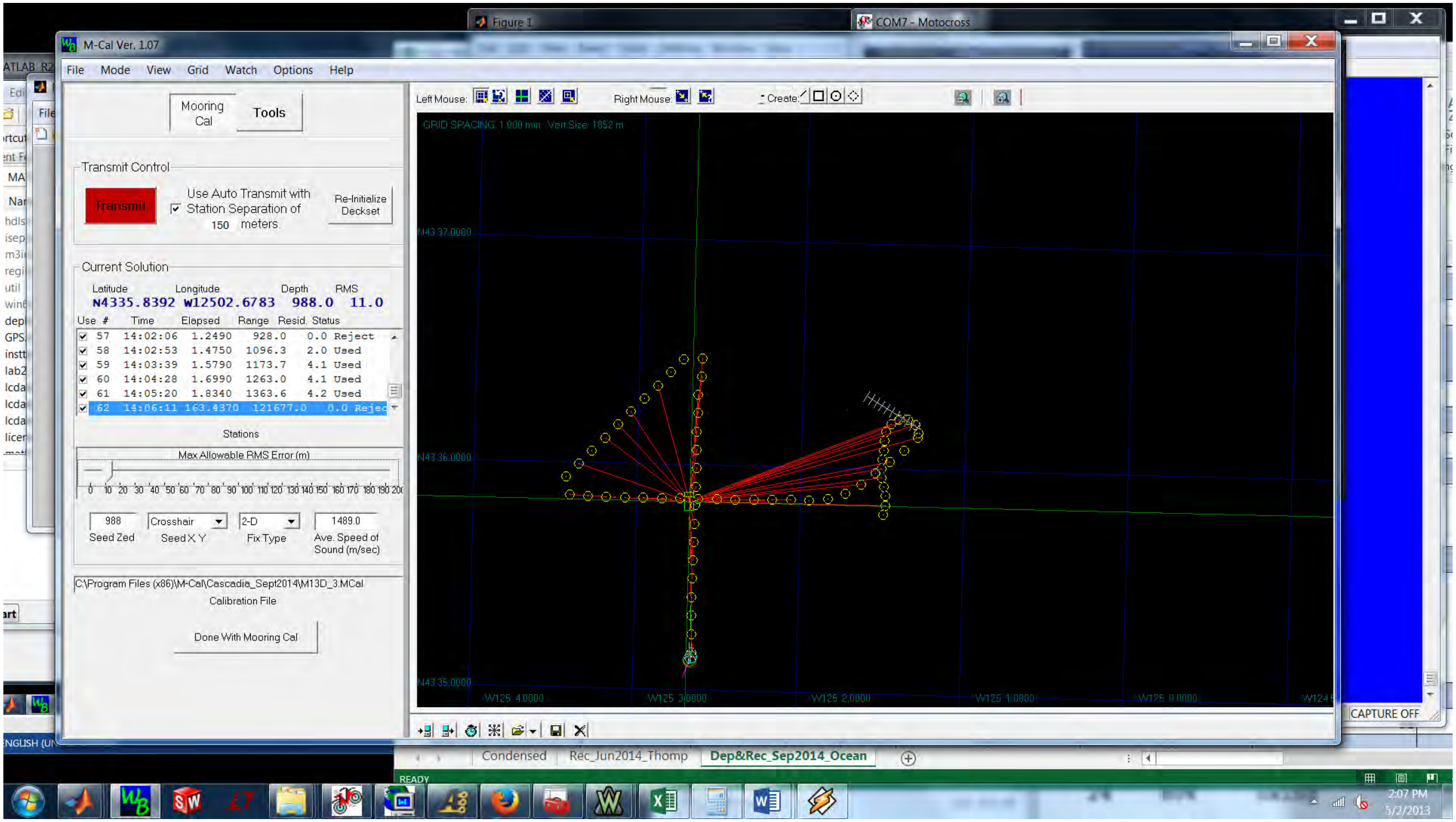
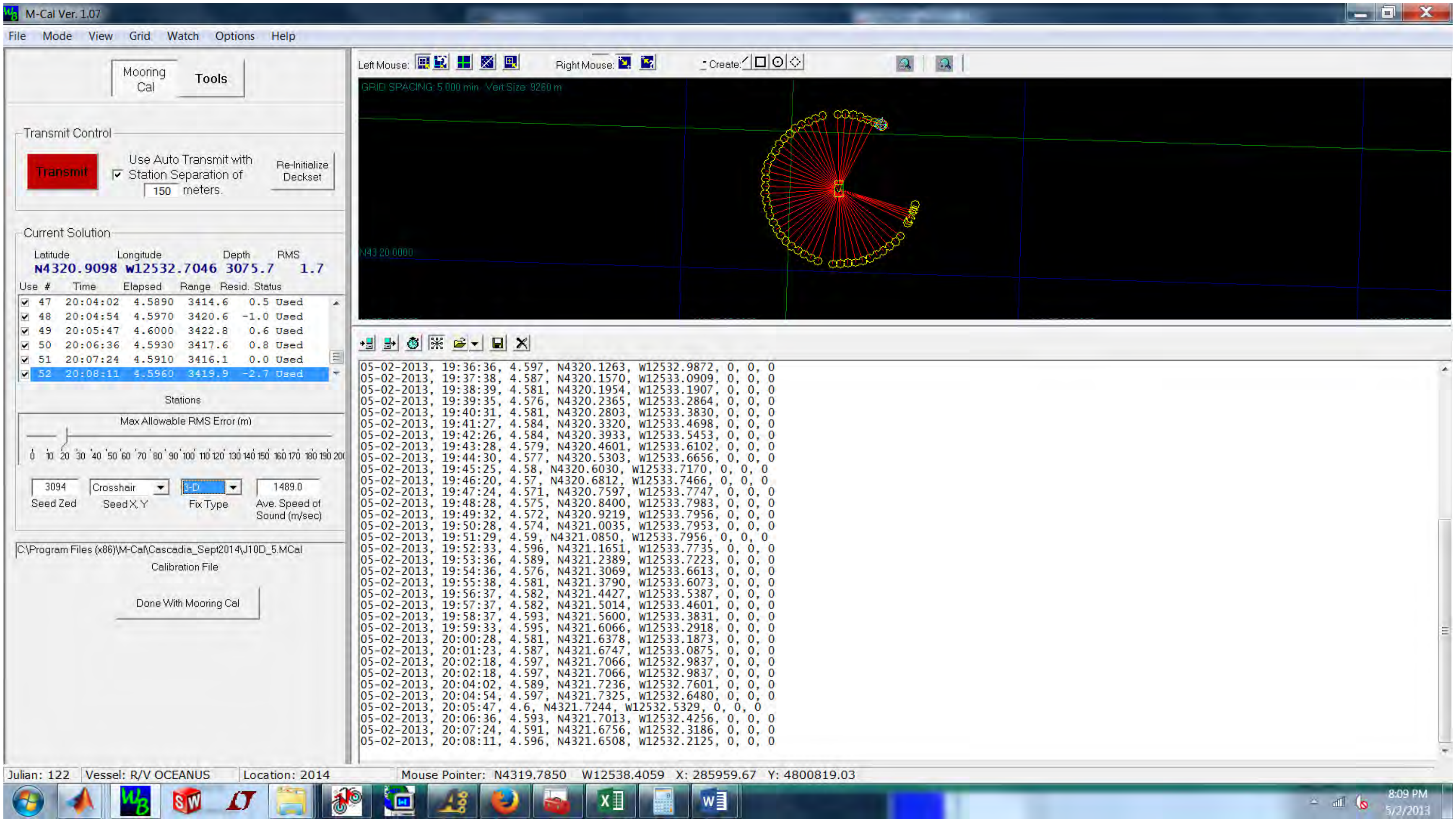


Figure 2
COM7 - Motocross
M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 75 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4347.2356 W12436.8055 287.0 11.6
Use # Time Elapsed Range Resid. Status
79 02:55:50 0.3930 290.7 6.3 Used
80 02:56:22 0.4220 312.3 4.8 Used
81 02:56:54 0.4730 350.3 3.7 Used
82 02:57:26 0.5390 399.4 2.9 Used
83 02:57:59 0.6160 456.8 3.2 Used
84 02:58:31 0.6970 517.1 2.3 Used
Stations
Max Allowable RMS Error (m)
287 Seed Zed
Crosshair Seed X,Y
2-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\J17D_3.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
N43 47.5000
N43 47.0000
W124 37.5000
W124 37.0000
W124 36.5000
W124 36.0000
CAPTURE OFF
READY
2:59 AM
5/2/2013

M13D

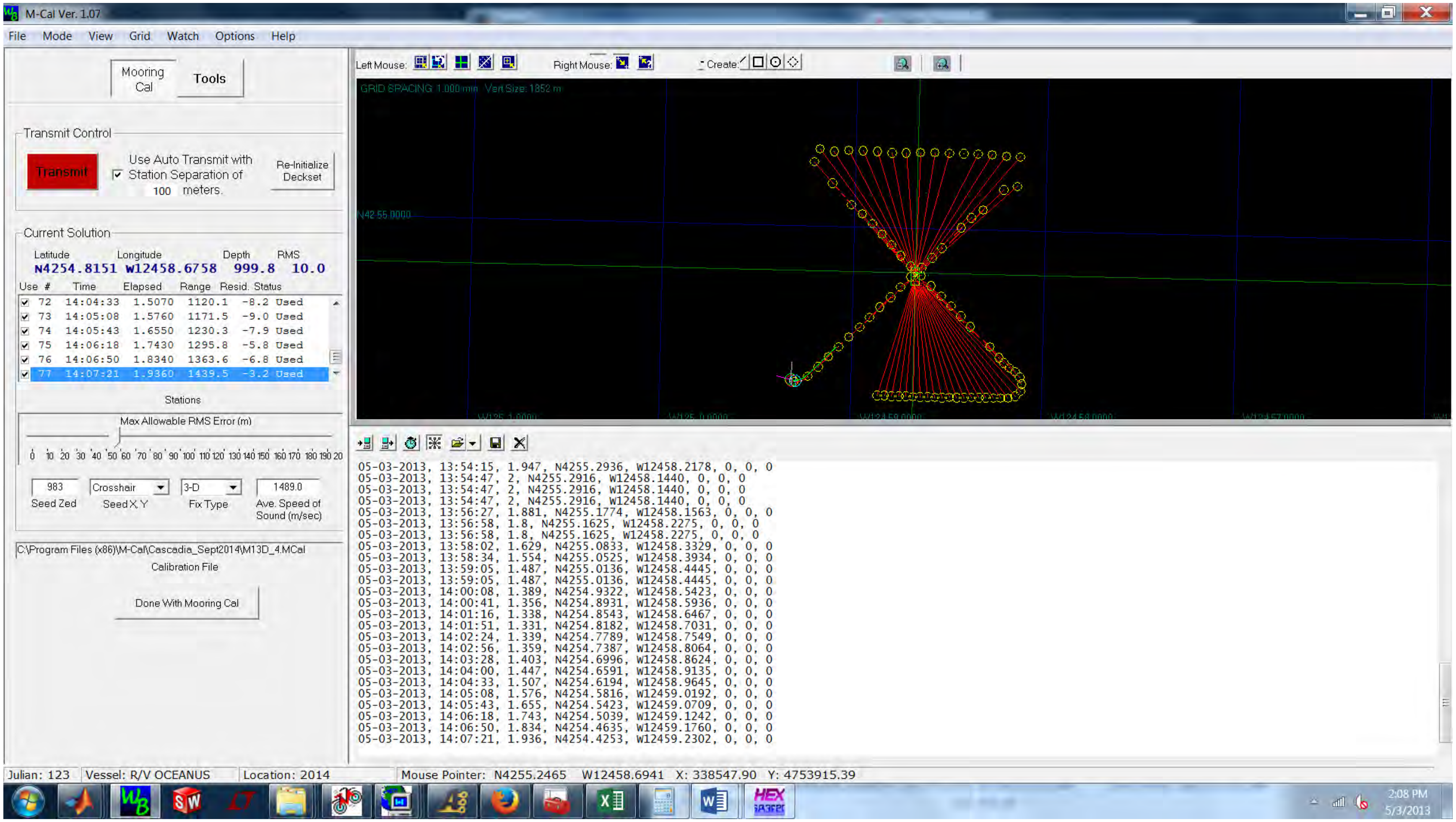

M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4335.8392 W12502.6783 988.0 11.0
Use # Time Elapsed Range Resid. Status
57 14:02:06 1.2490 928.0 0.0 Reject
58 14:02:53 1.4750 1096.3 2.0 Used
59 14:03:39 1.5790 1173.7 4.1 Used
60 14:04:28 1.6990 1263.0 4.1 Used
61 14:05:20 1.8340 1363.6 4.2 Used
62 14:06:11 163.4370 121677.0 0.0 Rejec
Stations
Max Allowable RMS Error (m)
988 Seed Zed
Crosshair Seed X Y
2-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\M13D_3.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create
Figure 1
COM7 - Motocross
CAPTURE OFF
Condensed
Rec_Jun2014_Thomp
Dep&Rec_Sep2014_Ocean
READY
2:07 PM
5/2/2013

J10D

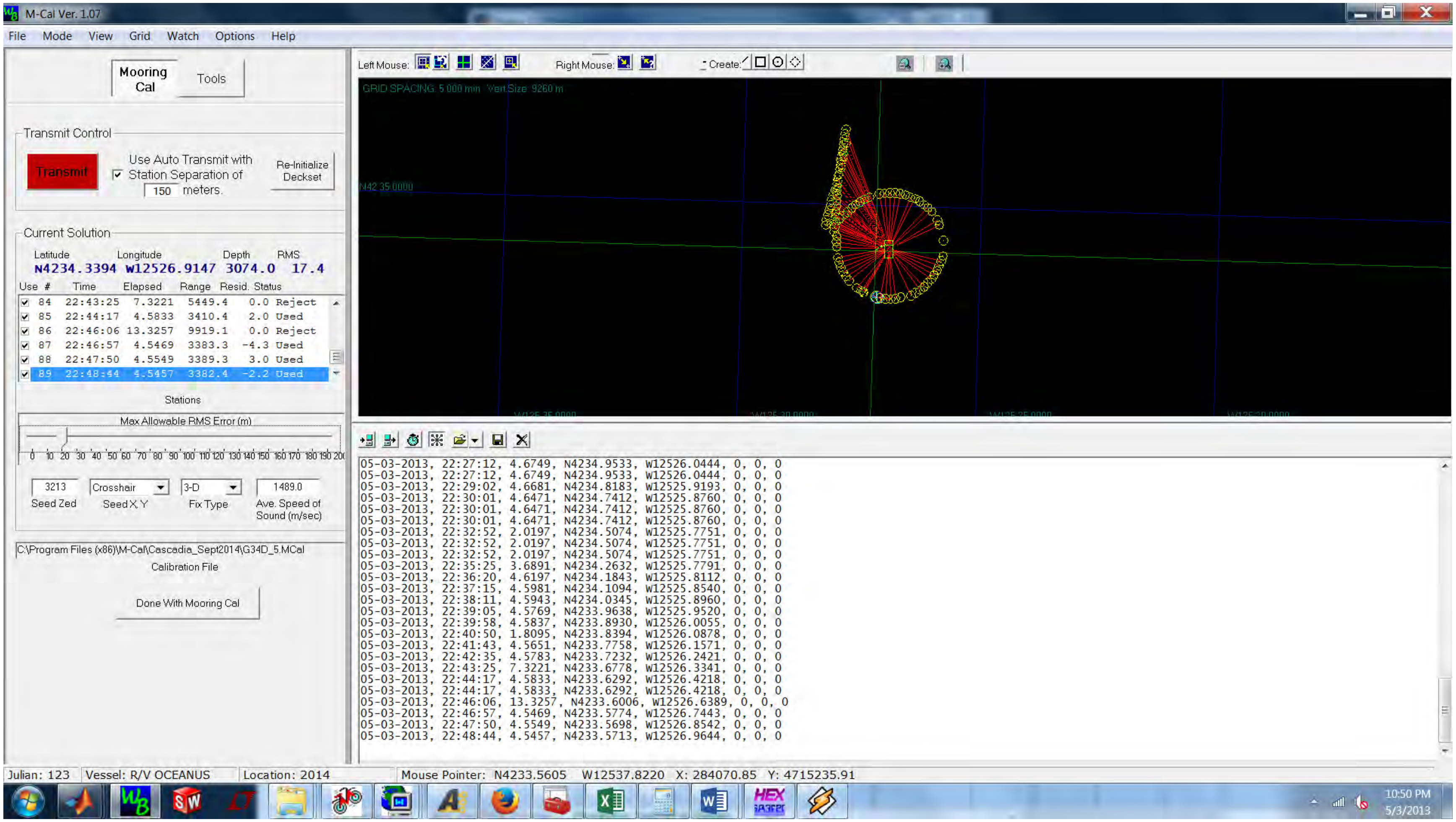


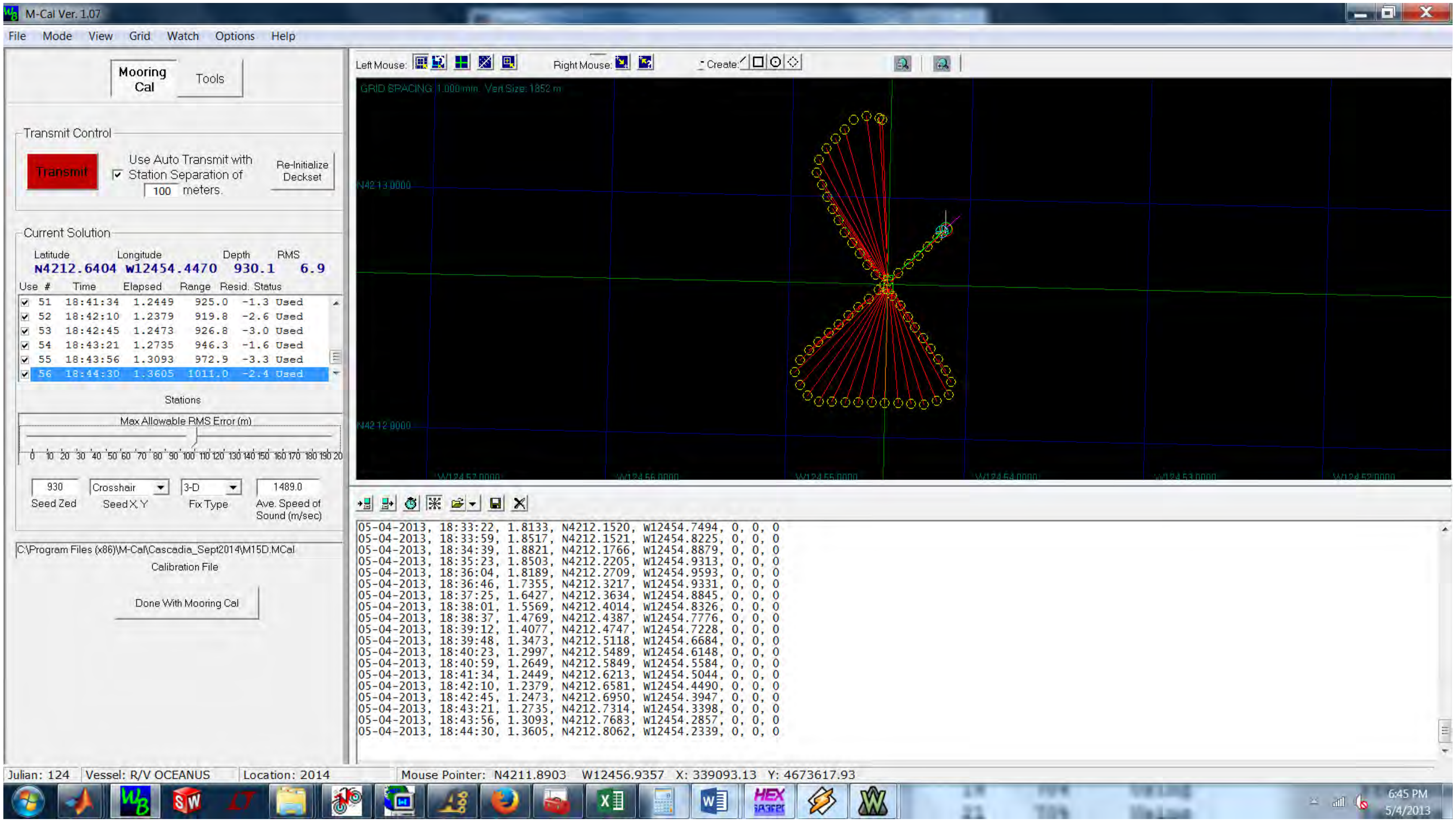
M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4320.9098 W12532.7046 3075.7 1.7
Use # Time Elapsed Range Resid. Status
47 20:04:02 4.5890 3414.6 0.5 Used
48 20:04:54 4.5970 3420.6 -1.0 Used
49 20:05:47 4.6000 3422.8 0.6 Used
50 20:06:36 4.5930 3417.6 0.8 Used
51 20:07:24 4.5910 3416.1 0.0 Used
52 20:08:11 4.5960 3419.9 -2.7 Used
Stations
Max Allowable RMS Error (m)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
3094 Seed Zed
Crosshair Seed X,Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\J10D_5.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 5.000 min. Vert Size: 9260 m
N43 20.0000
05-02-2013, 19:36:36, 4.597, N4320.1263, W12532.9872, 0, 0, 0
05-02-2013, 19:37:38, 4.587, N4320.1570, W12533.0909, 0, 0, 0
05-02-2013, 19:38:39, 4.581, N4320.1954, W12533.1907, 0, 0, 0
05-02-2013, 19:39:35, 4.576, N4320.2365, W12533.2864, 0, 0, 0
05-02-2013, 19:40:31, 4.581, N4320.2803, W12533.3830, 0, 0, 0
05-02-2013, 19:41:27, 4.584, N4320.3320, W12533.4698, 0, 0, 0
05-02-2013, 19:42:26, 4.584, N4320.3933, W12533.5453, 0, 0, 0
05-02-2013, 19:43:28, 4.579, N4320.4601, W12533.6102, 0, 0, 0
05-02-2013, 19:44:30, 4.577, N4320.5303, W12533.6656, 0, 0, 0
05-02-2013, 19:45:25, 4.58, N4320.6030, W12533.7170, 0, 0, 0
05-02-2013, 19:46:20, 4.57, N4320.6812, W12533.7466, 0, 0, 0
05-02-2013, 19:47:24, 4.571, N4320.7597, W12533.7747, 0, 0, 0
05-02-2013, 19:48:28, 4.575, N4320.8400, W12533.7983, 0, 0, 0
05-02-2013, 19:49:32, 4.572, N4320.9219, W12533.7956, 0, 0, 0
05-02-2013, 19:50:28, 4.574, N4321.0035, W12533.7953, 0, 0, 0
05-02-2013, 19:51:29, 4.59, N4321.0850, W12533.7956, 0, 0, 0
05-02-2013, 19:52:33, 4.596, N4321.1651, W12533.7735, 0, 0, 0
05-02-2013, 19:53:36, 4.589, N4321.2389, W12533.7223, 0, 0, 0
05-02-2013, 19:54:36, 4.576, N4321.3069, W12533.6613, 0, 0, 0
05-02-2013, 19:55:38, 4.581, N4321.3790, W12533.6073, 0, 0, 0
05-02-2013, 19:56:37, 4.582, N4321.4427, W12533.5387, 0, 0, 0
05-02-2013, 19:57:37, 4.582, N4321.5014, W12533.4601, 0, 0, 0
05-02-2013, 19:58:37, 4.593, N4321.5600, W12533.3831, 0, 0, 0
05-02-2013, 19:59:33, 4.595, N4321.6066, W12533.2918, 0, 0, 0
05-02-2013, 20:00:28, 4.581, N4321.6378, W12533.1873, 0, 0, 0
05-02-2013, 20:01:23, 4.587, N4321.6747, W12533.0875, 0, 0, 0
05-02-2013, 20:02:18, 4.597, N4321.7066, W12532.9837, 0, 0, 0
05-02-2013, 20:02:18, 4.597, N4321.7066, W12532.9837, 0, 0, 0
05-02-2013, 20:04:02, 4.589, N4321.7236, W12532.7601, 0, 0, 0
05-02-2013, 20:04:54, 4.597, N4321.7325, W12532.6480, 0, 0, 0
05-02-2013, 20:05:47, 4.6, N4321.7244, W12532.5329, 0, 0, 0
05-02-2013, 20:06:36, 4.593, N4321.7013, W12532.4256, 0, 0, 0
05-02-2013, 20:07:24, 4.591, N4321.6756, W12532.3186, 0, 0, 0
05-02-2013, 20:08:11, 4.596, N4321.6508, W12532.2125, 0, 0, 0
Julian: 122 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4319.7850 W12538.4059 X: 285959.67 Y: 4800819.03
8:09 PM
5/2/2013

M14D


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Left Mouse:
Right Mouse:
Create:
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 100 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4254.8151 W12458.6758 999.8 10.0
Use # Time Elapsed Range Resid. Status
72 14:04:33 1.5070 1120.1 -8.2 Used
73 14:05:08 1.5760 1171.5 -9.0 Used
74 14:05:43 1.6550 1230.3 -7.9 Used
75 14:06:18 1.7430 1295.8 -5.8 Used
76 14:06:50 1.8340 1363.6 -6.8 Used
77 14:07:21 1.9360 1439.5 -3.2 Used
Stations
Max Allowable RMS Error (m)
983
Seed Zed
Crosshair
Seed X,Y
3-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\M13D_4.MCal
Calibration File
Done With Mooring Cal
05-03-2013, 13:54:15, 1.947, N4255.2936, W12458.2178, 0, 0, 0
05-03-2013, 13:54:47, 2, N4255.2916, W12458.1440, 0, 0, 0
05-03-2013, 13:54:47, 2, N4255.2916, W12458.1440, 0, 0, 0
05-03-2013, 13:54:47, 2, N4255.2916, W12458.1440, 0, 0, 0
05-03-2013, 13:56:27, 1.881, N4255.1774, W12458.1563, 0, 0, 0
05-03-2013, 13:56:58, 1.8, N4255.1625, W12458.2275, 0, 0, 0
05-03-2013, 13:56:58, 1.8, N4255.1625, W12458.2275, 0, 0, 0
05-03-2013, 13:58:02, 1.629, N4255.0833, W12458.3329, 0, 0, 0
05-03-2013, 13:58:34, 1.554, N4255.0525, W12458.3934, 0, 0, 0
05-03-2013, 13:59:05, 1.487, N4255.0136, W12458.4445, 0, 0, 0
05-03-2013, 13:59:05, 1.487, N4255.0136, W12458.4445, 0, 0, 0
05-03-2013, 14:00:08, 1.389, N4254.9322, W12458.5423, 0, 0, 0
05-03-2013, 14:00:41, 1.356, N4254.8931, W12458.5936, 0, 0, 0
05-03-2013, 14:01:16, 1.338, N4254.8543, W12458.6467, 0, 0, 0
05-03-2013, 14:01:51, 1.331, N4254.8182, W12458.7031, 0, 0, 0
05-03-2013, 14:02:24, 1.339, N4254.7789, W12458.7549, 0, 0, 0
05-03-2013, 14:02:56, 1.359, N4254.7387, W12458.8064, 0, 0, 0
05-03-2013, 14:03:28, 1.403, N4254.6996, W12458.8624, 0, 0, 0
05-03-2013, 14:04:00, 1.447, N4254.6591, W12458.9135, 0, 0, 0
05-03-2013, 14:04:33, 1.507, N4254.6194, W12458.9645, 0, 0, 0
05-03-2013, 14:05:08, 1.576, N4254.5816, W12459.0192, 0, 0, 0
05-03-2013, 14:05:43, 1.655, N4254.5423, W12459.0709, 0, 0, 0
05-03-2013, 14:06:18, 1.743, N4254.5039, W12459.1242, 0, 0, 0
05-03-2013, 14:06:50, 1.834, N4254.4635, W12459.1760, 0, 0, 0
05-03-2013, 14:07:21, 1.936, N4254.4253, W12459.2302, 0, 0, 0
Julian: 123
Vessel: R/V OCEANUS
Location: 2014
Mouse Pointer: N4255.2465 W12458.6941 X: 338547.90 Y: 4753915.39
2:08 PM
5/3/2013

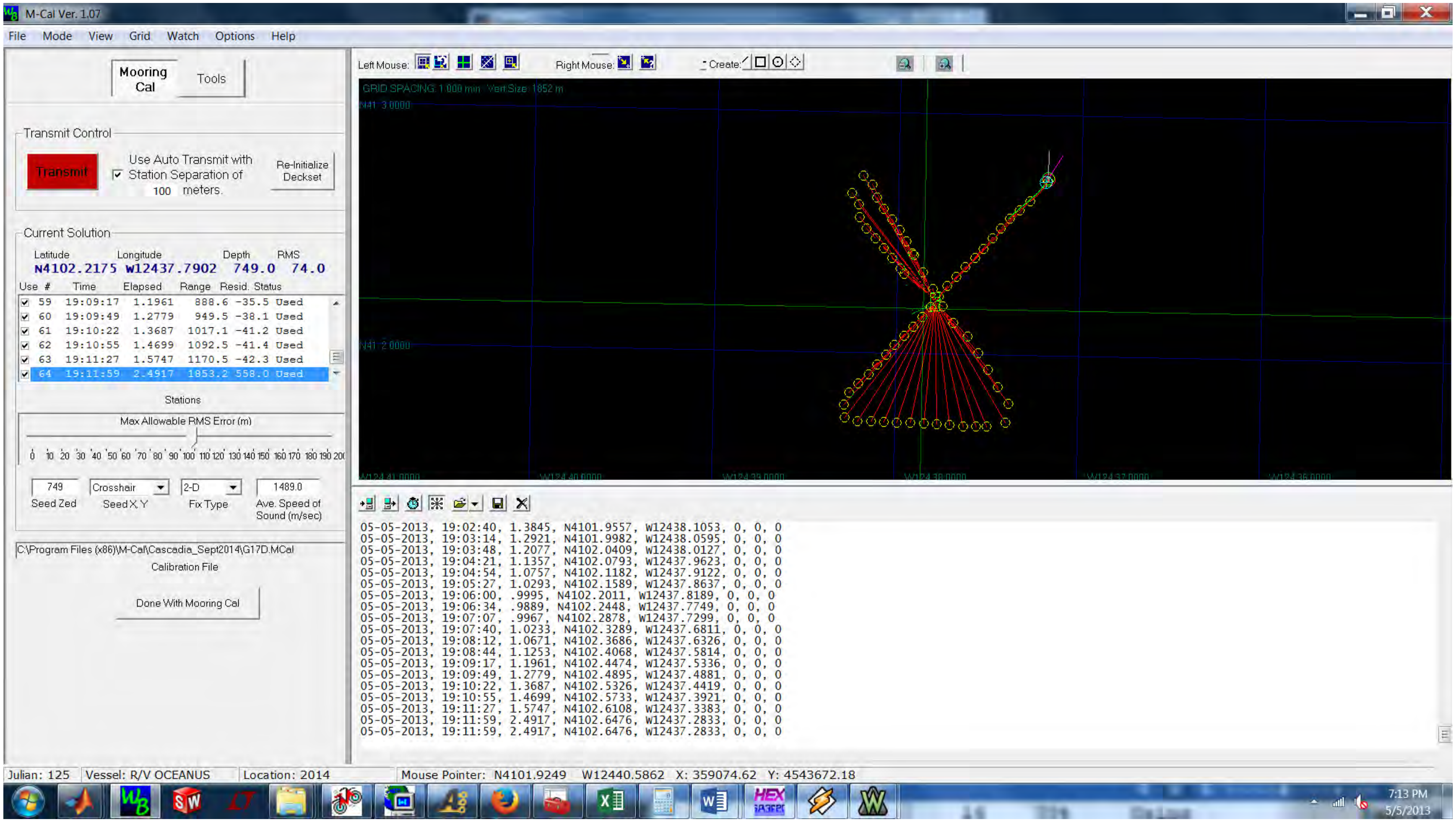
G34D

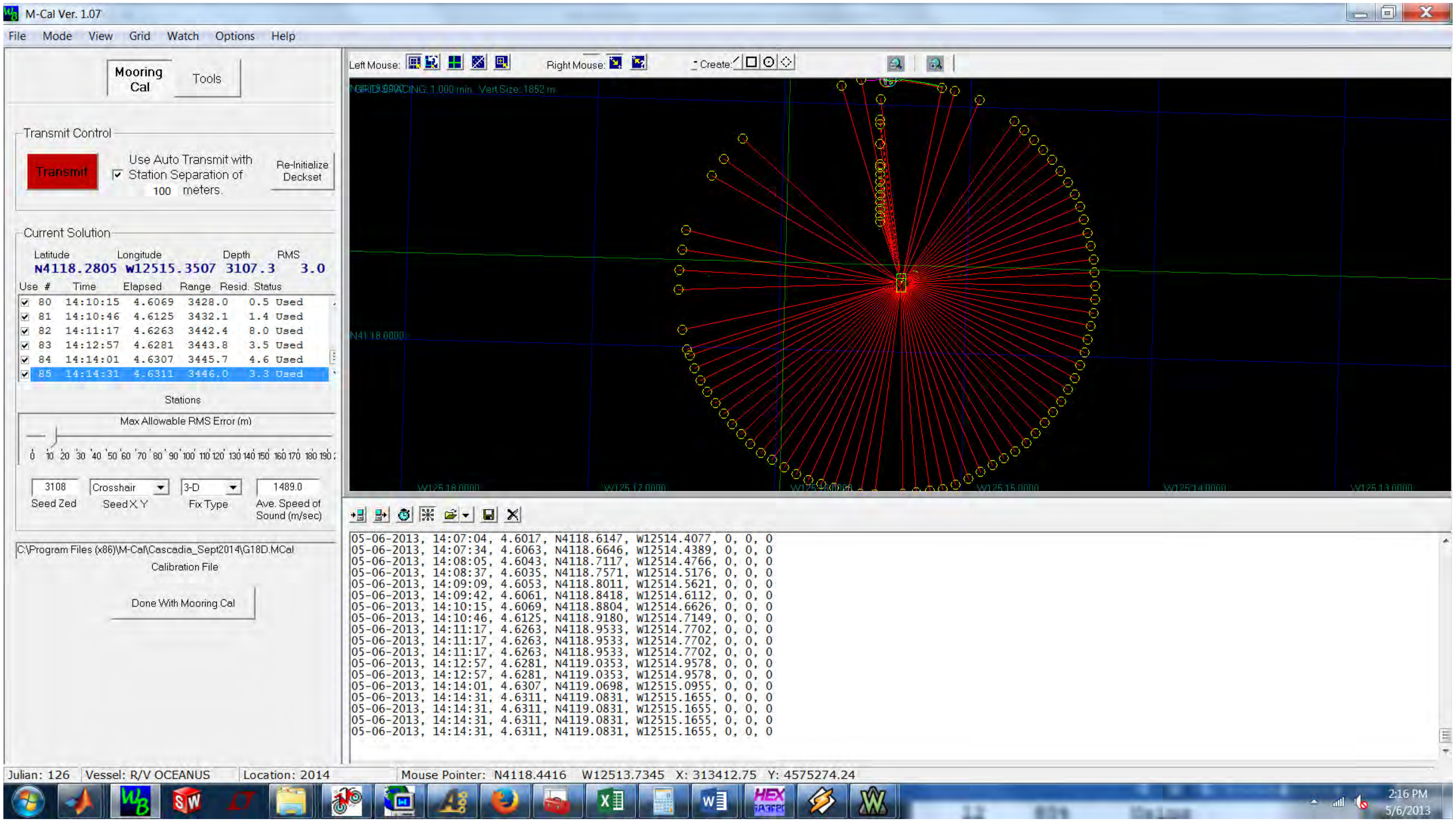

M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4234.3394 W12526.9147 3074.0 17.4
Use # Time Elapsed Range Resid. Status
84 22:43:25 7.3221 5449.4 0.0 Reject
85 22:44:17 4.5833 3410.4 2.0 Used
86 22:46:06 13.3257 9919.1 0.0 Reject
87 22:46:57 4.5469 3383.3 -4.3 Used
88 22:47:50 4.5549 3389.3 3.0 Used
89 22:48:44 4.5457 3382.4 -2.2 Used
Stations
Max Allowable RMS Error (m)
3213
Seed Zed
Crosshair
Seed X,Y
3-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\G34D_5.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 5.000 min Vert Size: 9260 m
N42 35.0000
05-03-2013, 22:27:12, 4.6749, N4234.9533, W12526.0444, 0, 0, 0
05-03-2013, 22:27:12, 4.6749, N4234.9533, W12526.0444, 0, 0, 0
05-03-2013, 22:29:02, 4.6681, N4234.8183, W12525.9193, 0, 0, 0
05-03-2013, 22:30:01, 4.6471, N4234.7412, W12525.8760, 0, 0, 0
05-03-2013, 22:30:01, 4.6471, N4234.7412, W12525.8760, 0, 0, 0
05-03-2013, 22:30:01, 4.6471, N4234.7412, W12525.8760, 0, 0, 0
05-03-2013, 22:32:52, 2.0197, N4234.5074, W12525.7751, 0, 0, 0
05-03-2013, 22:32:52, 2.0197, N4234.5074, W12525.7751, 0, 0, 0
05-03-2013, 22:32:52, 2.0197, N4234.5074, W12525.7751, 0, 0, 0
05-03-2013, 22:35:25, 3.6891, N4234.2632, W12525.7791, 0, 0, 0
05-03-2013, 22:36:20, 4.6197, N4234.1843, W12525.8112, 0, 0, 0
05-03-2013, 22:37:15, 4.5981, N4234.1094, W12525.8540, 0, 0, 0
05-03-2013, 22:38:11, 4.5943, N4234.0345, W12525.8960, 0, 0, 0
05-03-2013, 22:39:05, 4.5769, N4233.9638, W12525.9520, 0, 0, 0
05-03-2013, 22:39:58, 4.5837, N4233.8930, W12526.0055, 0, 0, 0
05-03-2013, 22:40:50, 1.8095, N4233.8394, W12526.0878, 0, 0, 0
05-03-2013, 22:41:43, 4.5651, N4233.7758, W12526.1571, 0, 0, 0
05-03-2013, 22:42:35, 4.5783, N4233.7232, W12526.2421, 0, 0, 0
05-03-2013, 22:43:25, 7.3221, N4233.6778, W12526.3341, 0, 0, 0
05-03-2013, 22:44:17, 4.5833, N4233.6292, W12526.4218, 0, 0, 0
05-03-2013, 22:44:17, 4.5833, N4233.6292, W12526.4218, 0, 0, 0
05-03-2013, 22:46:06, 13.3257, N4233.6006, W12526.6389, 0, 0, 0
05-03-2013, 22:46:57, 4.5469, N4233.5774, W12526.7443, 0, 0, 0
05-03-2013, 22:47:50, 4.5549, N4233.5698, W12526.8542, 0, 0, 0
05-03-2013, 22:48:44, 4.5457, N4233.5713, W12526.9644, 0, 0, 0
Julian: 123
Vessel: R/V OCEANUS
Location: 2014
Mouse Pointer: N4233.5605 W12537.8220 X: 284070.85 Y: 4715235.91
10:50 PM
5/3/2013


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 100 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4212.6404 W12454.4470 930.1 6.9
Use # Time Elapsed Range Resid. Status
51 18:41:34 1.2449 925.0 -1.3 Used
52 18:42:10 1.2379 919.8 -2.6 Used
53 18:42:45 1.2473 926.8 -3.0 Used
54 18:43:21 1.2735 946.3 -1.6 Used
55 18:43:56 1.3093 972.9 -3.3 Used
56 18:44:30 1.3605 1011.0 -2.4 Used
Stations
Max Allowable RMS Error (m)
930
Seed Zed
Crosshair
Seed X Y
3-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\M15D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
05-04-2013, 18:33:22, 1.8133, N4212.1520, W12454.7494, 0, 0, 0
05-04-2013, 18:33:59, 1.8517, N4212.1521, W12454.8225, 0, 0, 0
05-04-2013, 18:34:39, 1.8821, N4212.1766, W12454.8879, 0, 0, 0
05-04-2013, 18:35:23, 1.8503, N4212.2205, W12454.9313, 0, 0, 0
05-04-2013, 18:36:04, 1.8189, N4212.2709, W12454.9593, 0, 0, 0
05-04-2013, 18:36:46, 1.7355, N4212.3217, W12454.9331, 0, 0, 0
05-04-2013, 18:37:25, 1.6427, N4212.3634, W12454.8845, 0, 0, 0
05-04-2013, 18:38:01, 1.5569, N4212.4014, W12454.8326, 0, 0, 0
05-04-2013, 18:38:37, 1.4769, N4212.4387, W12454.7776, 0, 0, 0
05-04-2013, 18:39:12, 1.4077, N4212.4747, W12454.7228, 0, 0, 0
05-04-2013, 18:39:48, 1.3473, N4212.5118, W12454.6684, 0, 0, 0
05-04-2013, 18:40:23, 1.2997, N4212.5489, W12454.6148, 0, 0, 0
05-04-2013, 18:40:59, 1.2649, N4212.5849, W12454.5584, 0, 0, 0
05-04-2013, 18:41:34, 1.2449, N4212.6213, W12454.5044, 0, 0, 0
05-04-2013, 18:42:10, 1.2379, N4212.6581, W12454.4490, 0, 0, 0
05-04-2013, 18:42:45, 1.2473, N4212.6950, W12454.3947, 0, 0, 0
05-04-2013, 18:43:21, 1.2735, N4212.7314, W12454.3398, 0, 0, 0
05-04-2013, 18:43:56, 1.3093, N4212.7683, W12454.2857, 0, 0, 0
05-04-2013, 18:44:30, 1.3605, N4212.8062, W12454.2339, 0, 0, 0
Julian: 124
Vessel: R/V OCEANUS
Location: 2014
Mouse Pointer: N4211.8903 W12456.9357 X: 339093.13 Y: 4673617.93
6:45 PM
5/4/2013

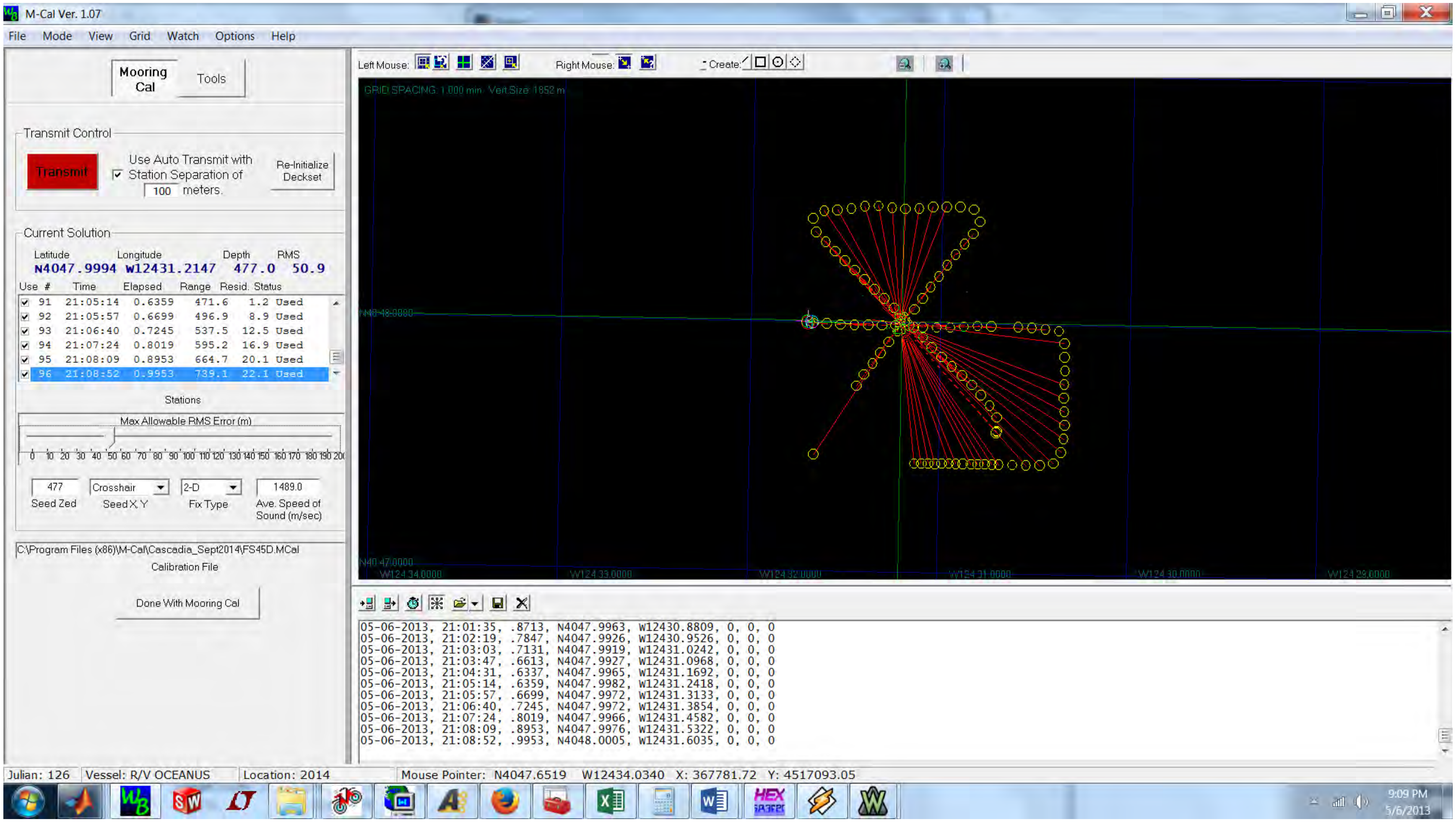
M15D

M17D (file is mislabeled as G17D)

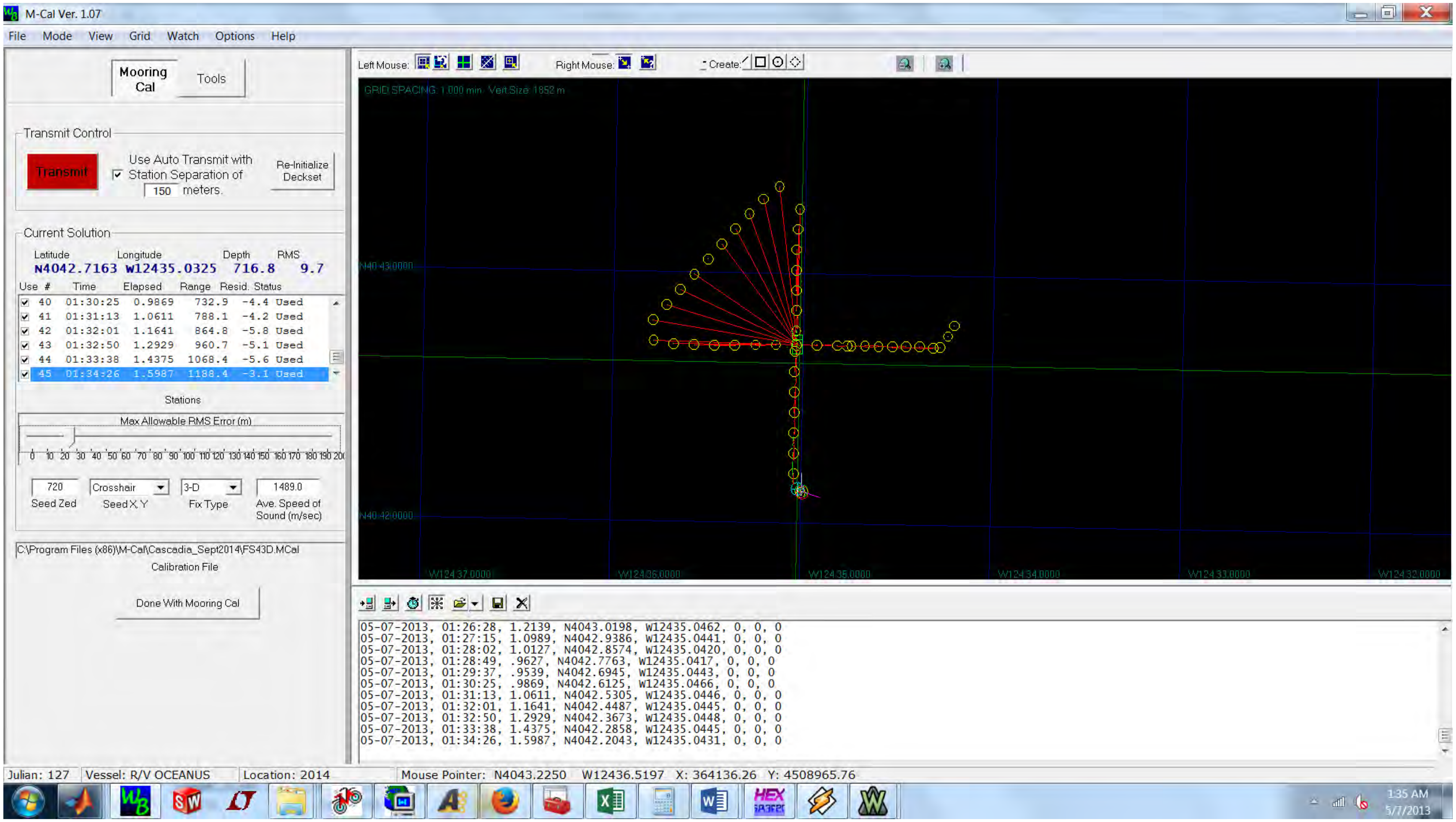



M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 100 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4118.2805 W12515.3507 3107.3 3.0
Use # Time Elapsed Range Resid. Status
80 14:10:15 4.6069 3428.0 0.5 Used
81 14:10:46 4.6125 3432.1 1.4 Used
82 14:11:17 4.6263 3442.4 8.0 Used
83 14:12:57 4.6281 3443.8 3.5 Used
84 14:14:01 4.6307 3445.7 4.6 Used
85 14:14:31 4.6311 3446.0 3.3 Used
Stations
Max Allowable RMS Error (m)
3108
Seed Zed
Crosshair
Seed X Y
3-D
Fix Type
1489.0
Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\G18D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
05-06-2013, 14:07:04, 4.6017, N4118.6147, W12514.4077, 0, 0, 0
05-06-2013, 14:07:34, 4.6063, N4118.6646, W12514.4389, 0, 0, 0
05-06-2013, 14:08:05, 4.6043, N4118.7117, W12514.4766, 0, 0, 0
05-06-2013, 14:08:37, 4.6035, N4118.7571, W12514.5176, 0, 0, 0
05-06-2013, 14:09:09, 4.6053, N4118.8011, W12514.5621, 0, 0, 0
05-06-2013, 14:09:42, 4.6061, N4118.8418, W12514.6112, 0, 0, 0
05-06-2013, 14:10:15, 4.6069, N4118.8804, W12514.6626, 0, 0, 0
05-06-2013, 14:10:46, 4.6125, N4118.9180, W12514.7149, 0, 0, 0
05-06-2013, 14:11:17, 4.6263, N4118.9533, W12514.7702, 0, 0, 0
05-06-2013, 14:11:17, 4.6263, N4118.9533, W12514.7702, 0, 0, 0
05-06-2013, 14:11:17, 4.6263, N4118.9533, W12514.7702, 0, 0, 0
05-06-2013, 14:12:57, 4.6281, N4119.0353, W12514.9578, 0, 0, 0
05-06-2013, 14:12:57, 4.6281, N4119.0353, W12514.9578, 0, 0, 0
05-06-2013, 14:14:01, 4.6307, N4119.0698, W12515.0955, 0, 0, 0
05-06-2013, 14:14:31, 4.6311, N4119.0831, W12515.1655, 0, 0, 0
05-06-2013, 14:14:31, 4.6311, N4119.0831, W12515.1655, 0, 0, 0
05-06-2013, 14:14:31, 4.6311, N4119.0831, W12515.1655, 0, 0, 0
05-06-2013, 14:14:31, 4.6311, N4119.0831, W12515.1655, 0, 0, 0
Julian: 126 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4118.4416 W12513.7345 X: 313412.75 Y: 4575274.24
2:16 PM
5/6/2013

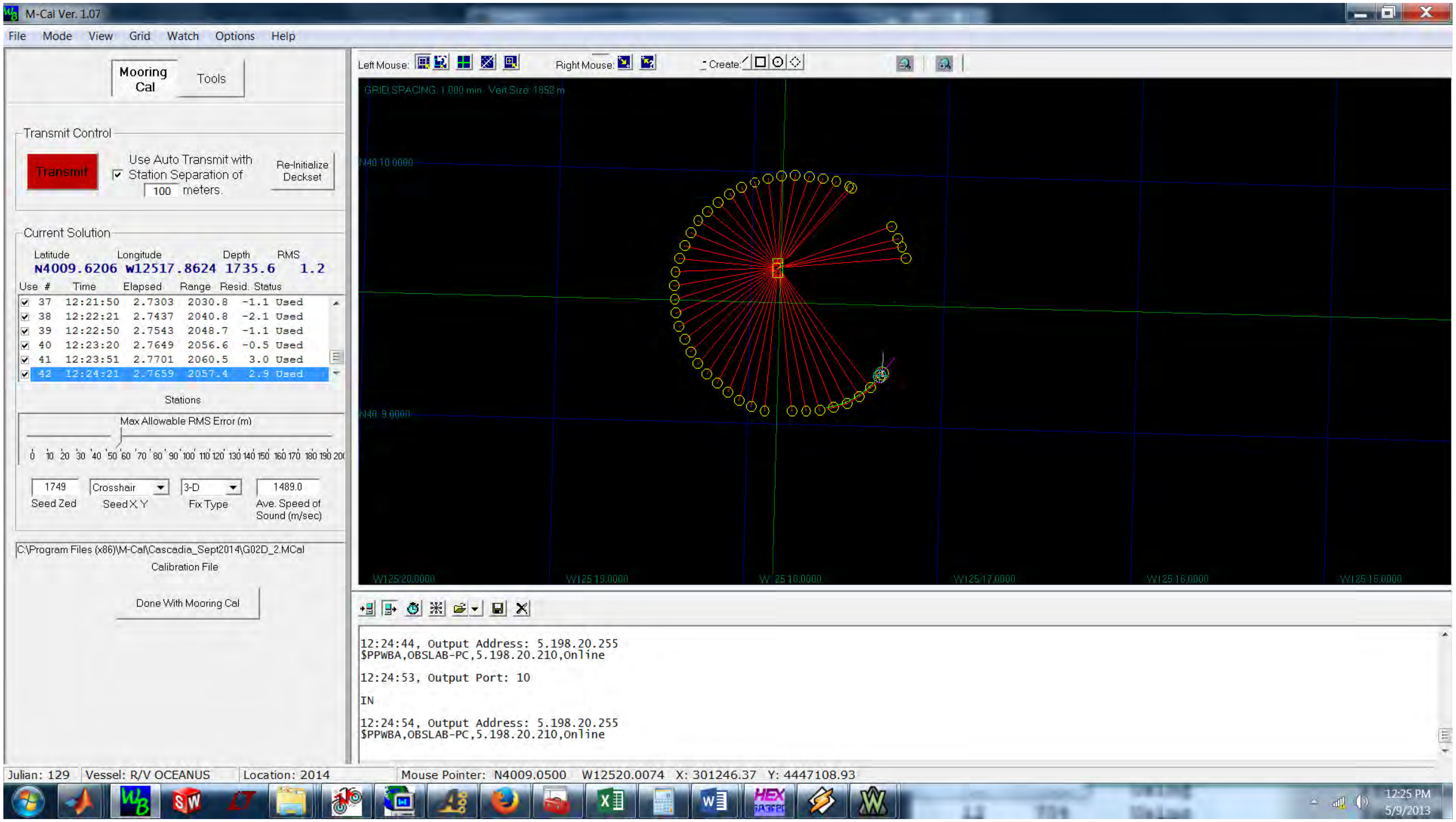
G18D


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 100 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4047.9994 W12431.2147 477.0 50.9
Use # Time Elapsed Range Resid. Status
91 21:05:14 0.6359 471.6 1.2 Used
92 21:05:57 0.6699 496.9 8.9 Used
93 21:06:40 0.7245 537.5 12.5 Used
94 21:07:24 0.8019 595.2 16.9 Used
95 21:08:09 0.8953 664.7 20.1 Used
96 21:08:52 0.9953 739.1 22.1 Used
Stations
Max Allowable RMS Error (m)
477 Seed Zed
Crosshair Seed X Y
2-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\FS45D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 1.000 min. Vert Size: 1852 m
N40 48.0000
N40 47.0000
W124 34.0000
W124 33.0000
W124 32.0000
W124 31.0000
W124 30.0000
W124 29.0000
05-06-2013, 21:01:35, .8713, N4047.9963, W12430.8809, 0, 0, 0
05-06-2013, 21:02:19, .7847, N4047.9926, W12430.9526, 0, 0, 0
05-06-2013, 21:03:03, .7131, N4047.9919, W12431.0242, 0, 0, 0
05-06-2013, 21:03:47, .6613, N4047.9927, W12431.0968, 0, 0, 0
05-06-2013, 21:04:31, .6337, N4047.9965, W12431.1692, 0, 0, 0
05-06-2013, 21:05:14, .6359, N4047.9982, W12431.2418, 0, 0, 0
05-06-2013, 21:05:57, .6699, N4047.9972, W12431.3133, 0, 0, 0
05-06-2013, 21:06:40, .7245, N4047.9972, W12431.3854, 0, 0, 0
05-06-2013, 21:07:24, .8019, N4047.9966, W12431.4582, 0, 0, 0
05-06-2013, 21:08:09, .8953, N4047.9976, W12431.5322, 0, 0, 0
05-06-2013, 21:08:52, .9953, N4048.0005, W12431.6035, 0, 0, 0
Julian: 126 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4047.6519 W12434.0340 X: 367781.72 Y: 4517093.05
9:09 PM
5/6/2013

FS45D

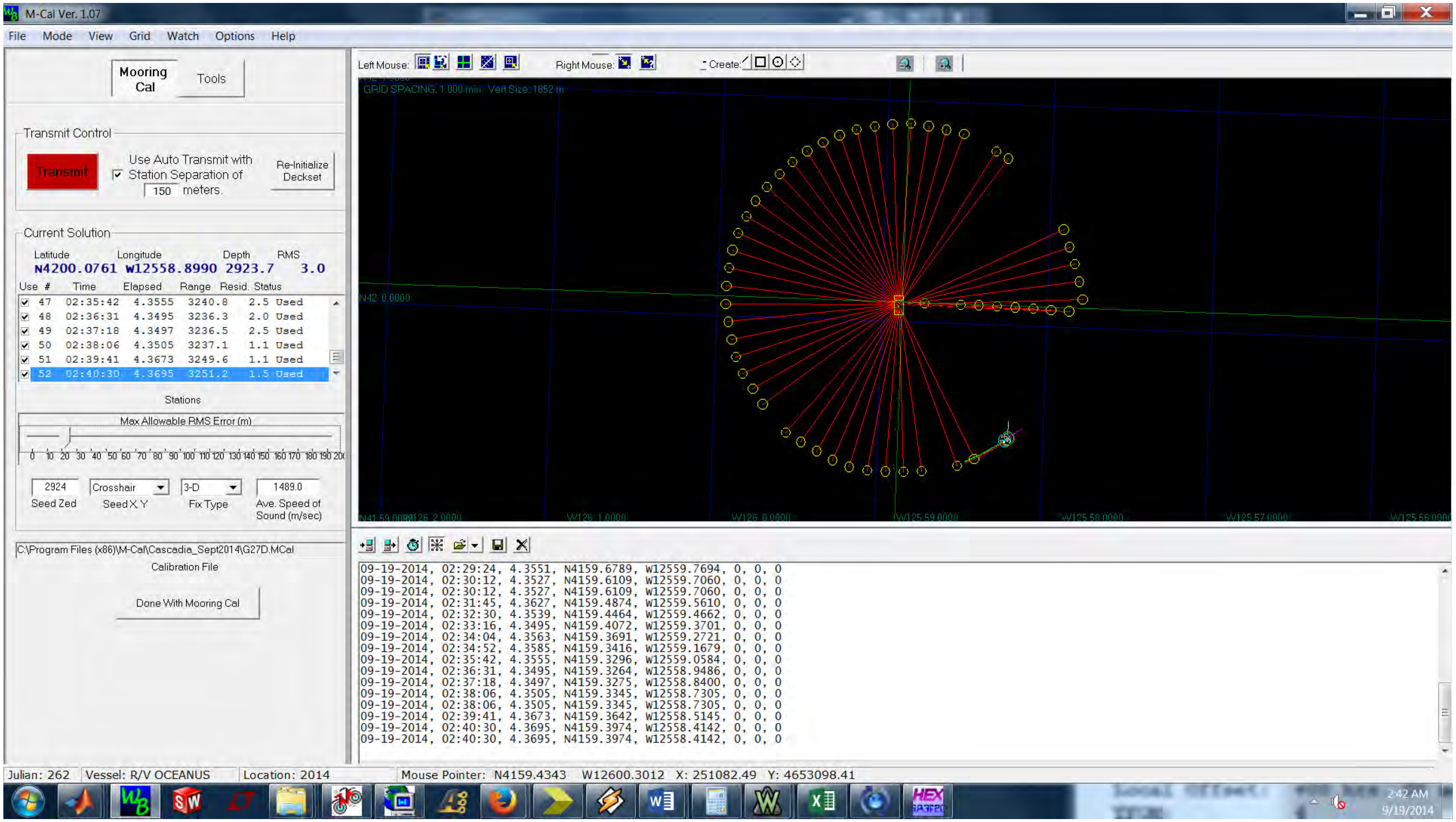

M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4042.7163 W12435.0325 716.8 9.7
Use # Time Elapsed Range Resid. Status
40 01:30:25 0.9869 732.9 -4.4 Used
41 01:31:13 1.0611 788.1 -4.2 Used
42 01:32:01 1.1641 864.8 -5.8 Used
43 01:32:50 1.2929 960.7 -5.1 Used
44 01:33:38 1.4375 1068.4 -5.6 Used
45 01:34:26 1.5987 1188.4 -3.1 Used
Stations
Max Allowable RMS Error (m)
720 Seed Zed
Crosshair Seed X Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\FS43D.MCal
Calibration File
Done With Mooring Cal
05-07-2013, 01:26:28, 1.2139, N4043.0198, W12435.0462, 0, 0, 0
05-07-2013, 01:27:15, 1.0989, N4042.9386, W12435.0441, 0, 0, 0
05-07-2013, 01:28:02, 1.0127, N4042.8574, W12435.0420, 0, 0, 0
05-07-2013, 01:28:49, .9627, N4042.7763, W12435.0417, 0, 0, 0
05-07-2013, 01:29:37, .9539, N4042.6945, W12435.0443, 0, 0, 0
05-07-2013, 01:30:25, .9869, N4042.6125, W12435.0466, 0, 0, 0
05-07-2013, 01:31:13, 1.0611, N4042.5305, W12435.0446, 0, 0, 0
05-07-2013, 01:32:01, 1.1641, N4042.4487, W12435.0445, 0, 0, 0
05-07-2013, 01:32:50, 1.2929, N4042.3673, W12435.0448, 0, 0, 0
05-07-2013, 01:33:38, 1.4375, N4042.2858, W12435.0445, 0, 0, 0
05-07-2013, 01:34:26, 1.5987, N4042.2043, W12435.0431, 0, 0, 0
Julian: 127 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4043.2250 W12436.5197 X: 364136.26 Y: 4508965.76
1:35 AM
5/7/2013

FS43D

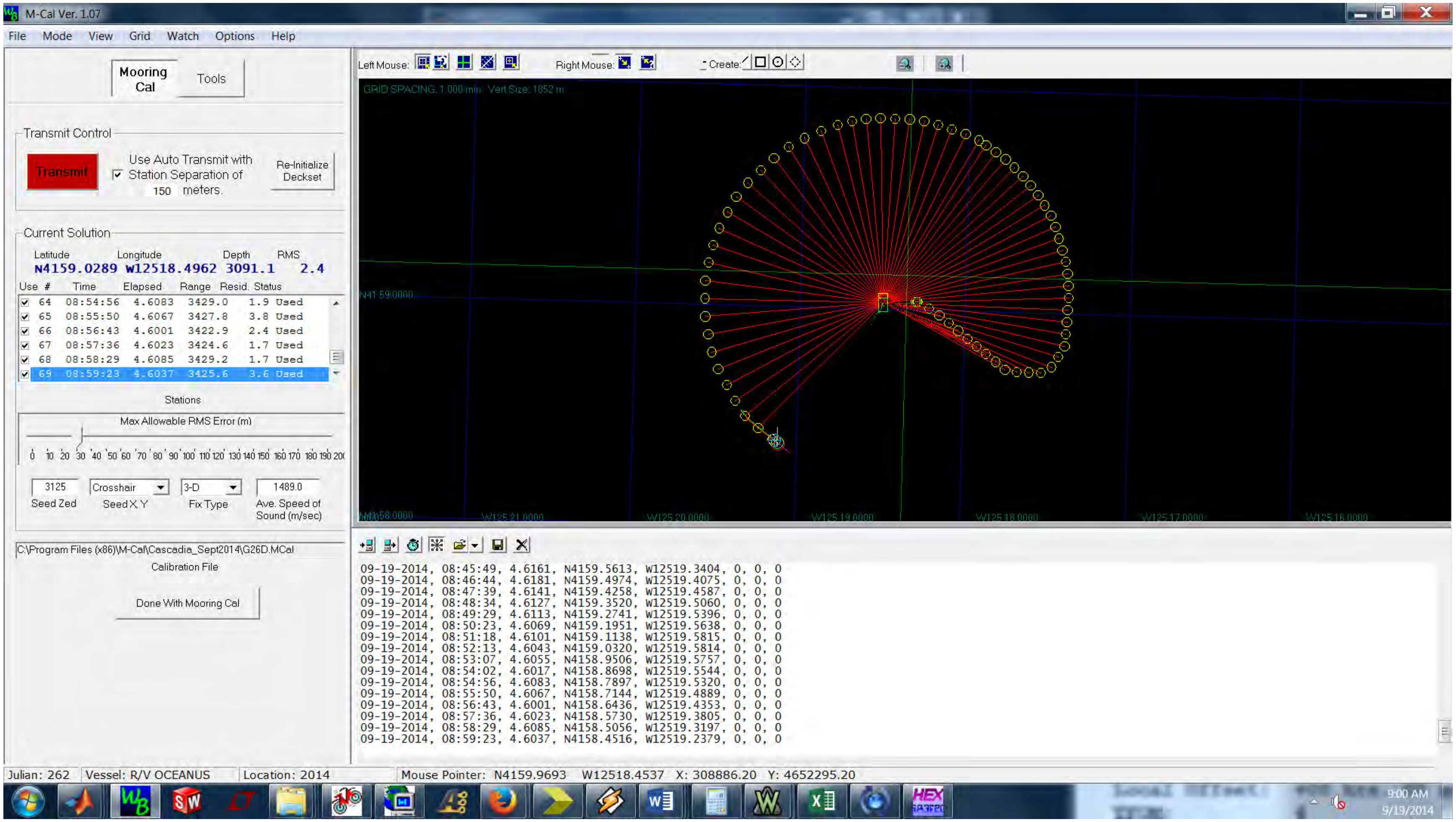


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 100 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4009.6206 W12517.8624 1735.6 1.2
Use # Time Elapsed Range Resid. Status
37 12:21:50 2.7303 2030.8 -1.1 Used
38 12:22:21 2.7437 2040.8 -2.1 Used
39 12:22:50 2.7543 2048.7 -1.1 Used
40 12:23:20 2.7649 2056.6 -0.5 Used
41 12:23:51 2.7701 2060.5 3.0 Used
42 12:24:21 2.7659 2057.4 2.9 Used
Stations
Max Allowable RMS Error (m)
1749 Seed Zed
Crosshair Seed X Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\G02D_2.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 1.000 min. Vert Size: 1852 m
N40:10.0000
N40: 9.0000
W125:20.0000
W125:19.0000
W125:18.0000
W125:17.0000
W125:16.0000
W125:15.0000
12:24:44, Output Address: 5.198.20.255
$PPWBA,OBSLAB-PC,5.198.20.210,Online
12:24:53, Output Port: 10
IN
12:24:54, Output Address: 5.198.20.255
$PPWBA,OBSLAB-PC,5.198.20.210,Online
Julian: 129 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4009.0500 W12520.0074 X: 301246.37 Y: 4447108.93
12:25 PM
5/9/2013

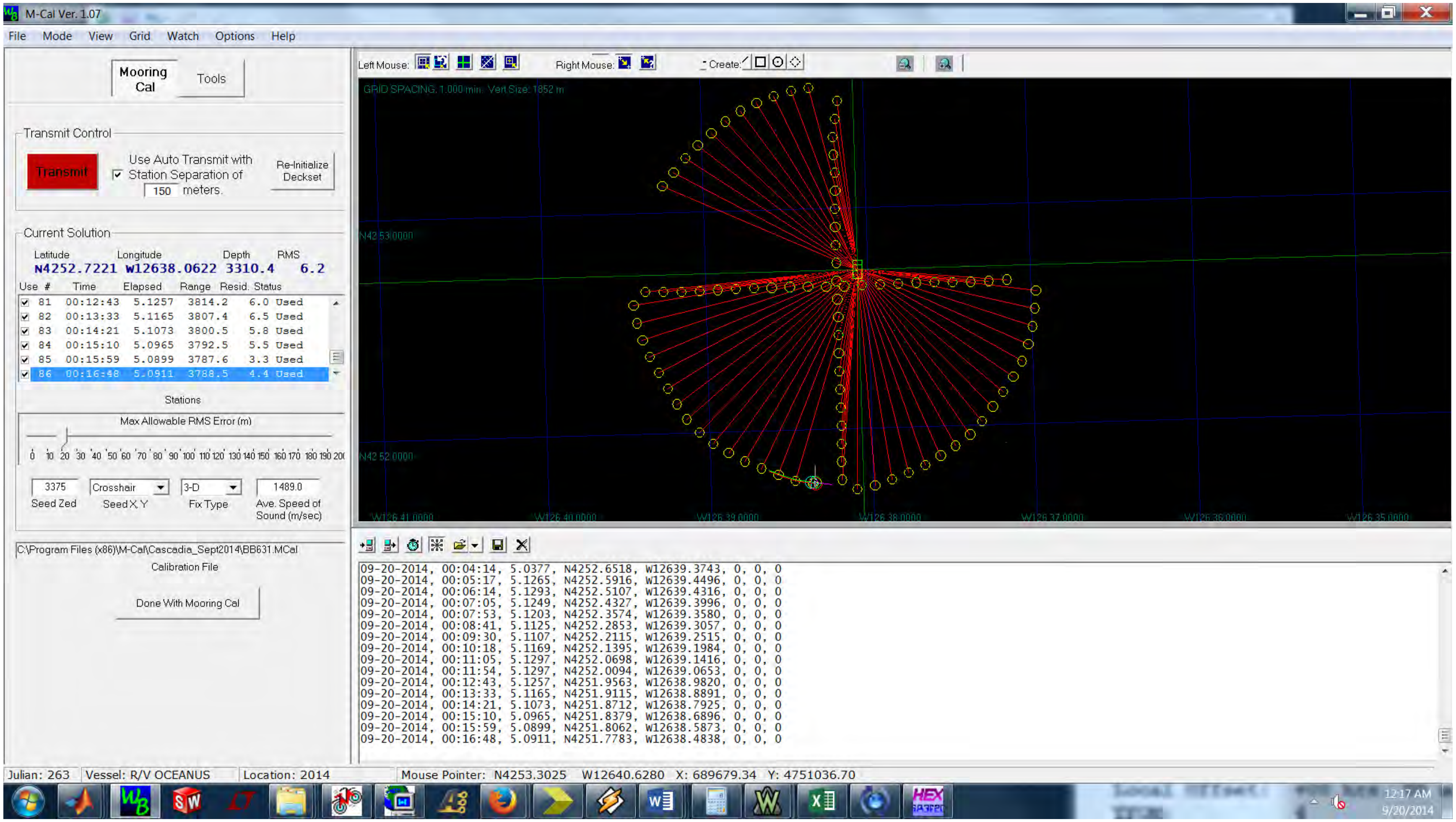
G02D


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4200.0761 W12558.8990 2923.7 3.0
Use # Time Elapsed Range Resid. Status
47 02:35:42 4.3555 3240.8 2.5 Used
48 02:36:31 4.3495 3236.3 2.0 Used
49 02:37:18 4.3497 3236.5 2.5 Used
50 02:38:06 4.3505 3237.1 1.1 Used
51 02:39:41 4.3673 3249.6 1.1 Used
52 02:40:30 4.3695 3251.2 1.5 Used
Stations
Max Allowable RMS Error (m)
2924 Seed Zed
Crosshair Seed X Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\G27D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 1.000 min. Vert Size: 1852 m
N42 0.0000
09-19-2014, 02:29:24, 4.3551, N4159.6789, W12559.7694, 0, 0, 0
09-19-2014, 02:30:12, 4.3527, N4159.6109, W12559.7060, 0, 0, 0
09-19-2014, 02:30:12, 4.3527, N4159.6109, W12559.7060, 0, 0, 0
09-19-2014, 02:31:45, 4.3627, N4159.4874, W12559.5610, 0, 0, 0
09-19-2014, 02:32:30, 4.3539, N4159.4464, W12559.4662, 0, 0, 0
09-19-2014, 02:33:16, 4.3495, N4159.4072, W12559.3701, 0, 0, 0
09-19-2014, 02:34:04, 4.3563, N4159.3691, W12559.2721, 0, 0, 0
09-19-2014, 02:34:52, 4.3585, N4159.3416, W12559.1679, 0, 0, 0
09-19-2014, 02:35:42, 4.3555, N4159.3296, W12559.0584, 0, 0, 0
09-19-2014, 02:36:31, 4.3495, N4159.3264, W12558.9486, 0, 0, 0
09-19-2014, 02:37:18, 4.3497, N4159.3275, W12558.8400, 0, 0, 0
09-19-2014, 02:38:06, 4.3505, N4159.3345, W12558.7305, 0, 0, 0
09-19-2014, 02:38:06, 4.3505, N4159.3345, W12558.7305, 0, 0, 0
09-19-2014, 02:39:41, 4.3673, N4159.3642, W12558.5145, 0, 0, 0
09-19-2014, 02:40:30, 4.3695, N4159.3974, W12558.4142, 0, 0, 0
09-19-2014, 02:40:30, 4.3695, N4159.3974, W12558.4142, 0, 0, 0
Julian: 262 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4159.4343 W12600.3012 X: 251082.49 Y: 4653098.41
2:42 AM
9/19/2014

G27D


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4159.0289 W12518.4962 3091.1 2.4
Use # Time Elapsed Range Resid. Status
64 08:54:56 4.6083 3429.0 1.9 Used
65 08:55:50 4.6067 3427.8 3.8 Used
66 08:56:43 4.6001 3422.9 2.4 Used
67 08:57:36 4.6023 3424.6 1.7 Used
68 08:58:29 4.6085 3429.2 1.7 Used
69 08:59:23 4.6037 3425.6 3.6 Used
Stations
Max Allowable RMS Error (m)
3125 Seed Zed
Crosshair Seed X Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\G26D.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 1.000 min Vert Size: 1852 m
N41 59.0000
W125 21.0000
W125 20.0000
W125 19.0000
W125 18.0000
W125 17.0000
W125 16.0000
09-19-2014, 08:45:49, 4.6161, N4159.5613, W12519.3404, 0, 0, 0
09-19-2014, 08:46:44, 4.6181, N4159.4974, W12519.4075, 0, 0, 0
09-19-2014, 08:47:39, 4.6141, N4159.4258, W12519.4587, 0, 0, 0
09-19-2014, 08:48:34, 4.6127, N4159.3520, W12519.5060, 0, 0, 0
09-19-2014, 08:49:29, 4.6113, N4159.2741, W12519.5396, 0, 0, 0
09-19-2014, 08:50:23, 4.6069, N4159.1951, W12519.5638, 0, 0, 0
09-19-2014, 08:51:18, 4.6101, N4159.1138, W12519.5815, 0, 0, 0
09-19-2014, 08:52:13, 4.6043, N4159.0320, W12519.5814, 0, 0, 0
09-19-2014, 08:53:07, 4.6055, N4158.9506, W12519.5757, 0, 0, 0
09-19-2014, 08:54:02, 4.6017, N4158.8698, W12519.5544, 0, 0, 0
09-19-2014, 08:54:56, 4.6083, N4158.7897, W12519.5320, 0, 0, 0
09-19-2014, 08:55:50, 4.6067, N4158.7144, W12519.4889, 0, 0, 0
09-19-2014, 08:56:43, 4.6001, N4158.6436, W12519.4353, 0, 0, 0
09-19-2014, 08:57:36, 4.6023, N4158.5730, W12519.3805, 0, 0, 0
09-19-2014, 08:58:29, 4.6085, N4158.5056, W12519.3197, 0, 0, 0
09-19-2014, 08:59:23, 4.6037, N4158.4516, W12519.2379, 0, 0, 0
Julian: 262 Vessel: R/V OCEANUS Location: 2014
Mouse Pointer: N4159.9693 W12518.4537 X: 308886.20 Y: 4652295.20
9:00 AM
9/19/2014

G26D


M-Cal Ver. 1.07
File Mode View Grid Watch Options Help
Mooring Cal
Tools
Transmit Control
Transmit
Use Auto Transmit with Station Separation of 150 meters.
Re-Initialize Deckset
Current Solution
Latitude Longitude Depth RMS
N4252.7221 W12638.0622 3310.4 6.2
Use # Time Elapsed Range Resid. Status
81 00:12:43 5.1257 3814.2 6.0 Used
82 00:13:33 5.1165 3807.4 6.5 Used
83 00:14:21 5.1073 3800.5 5.8 Used
84 00:15:10 5.0965 3792.5 5.5 Used
85 00:15:59 5.0899 3787.6 3.3 Used
86 00:16:48 5.0911 3788.5 4.4 Used
Stations
Max Allowable RMS Error (m)
3375 Seed Zed
Crosshair Seed X Y
3-D Fix Type
1489.0 Ave. Speed of Sound (m/sec)
C:\Program Files (x86)\M-Cal\Cascadia_Sept2014\BB631.MCal
Calibration File
Done With Mooring Cal
Left Mouse:
Right Mouse:
Create:
GRID SPACING: 1.000 min Vert Size: 1852 m
N42 53.0000
N42 52.0000
W126 41.0000
W126 40.0000
W126 39.0000
W126 38.0000
W126 37.0000
W126 36.0000
W126 35.0000
09-20-2014, 00:04:14, 5.0377, N4252.6518, W12639.3743, 0, 0, 0
09-20-2014, 00:05:17, 5.1265, N4252.5916, W12639.4496, 0, 0, 0
09-20-2014, 00:06:14, 5.1293, N4252.5107, W12639.4316, 0, 0, 0
09-20-2014, 00:07:05, 5.1249, N4252.4327, W12639.3996, 0, 0, 0
09-20-2014, 00:07:53, 5.1203, N4252.3574, W12639.3580, 0, 0, 0
09-20-2014, 00:08:41, 5.1125, N4252.2853, W12639.3057, 0, 0, 0
09-20-2014, 00:09:30, 5.1107, N4252.2115, W12639.2515, 0, 0, 0
09-20-2014, 00:10:18, 5.1169, N4252.1395, W12639.1984, 0, 0, 0
09-20-2014, 00:11:05, 5.1297, N4252.0698, W12639.1416, 0, 0, 0
09-20-2014, 00:11:54, 5.1297, N4252.0094, W12639.0653, 0, 0, 0
09-20-2014, 00:12:43, 5.1257, N4251.9563, W12638.9820, 0, 0, 0
09-20-2014, 00:13:33, 5.1165, N4251.9115, W12638.8891, 0, 0, 0
09-20-2014, 00:14:21, 5.1073, N4251.8712, W12638.7925, 0, 0, 0
09-20-2014, 00:15:10, 5.0965, N4251.8379, W12638.6896, 0, 0, 0
09-20-2014, 00:15:59, 5.0899, N4251.8062, W12638.5873, 0, 0, 0
09-20-2014, 00:16:48, 5.0911, N4251.7783, W12638.4838, 0, 0, 0
Julian: 263 Vessel: R/V OCEANUS Location: 2014 Mouse Pointer: N4253.3025 W12640.6280 X: 689679.34 Y: 4751036.70
12:17 AM
9/20/2014

BB631