Site C0010[1]

Expedition 332 Scientists[2]

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Background and objectives

Integrated Ocean Drilling Program (IODP) Site C0010, drilled during IODP Expedition 319, is located on the continental slope near the updip terminus of the megasplay fault, ~3.5 km north of previously drilled and cored IODP Site C0004 (Expedition 319 Scientists, 2010) (Figs. **F1**, **F2**). The latter was drilled with measurement while drilling and a limited suite of logging-while-drilling tools (geoVISION resistivity tool and gamma ray) to a total depth of 555 meters below seafloor (mbsf) and cased to 515 mbsf in preparation for later installation of a permanent long-term borehole monitoring system (LTBMS) (Fig. **F3**) (Expedition 319 Scientists, 2010). The casing included two casing screens that span the megasplay fault at ~407 mbsf, which provide hydraulic access to the fault zone for monitoring of pore fluid pressure and temperature and fluid sampling. The borehole was instrumented on 23 August 2009 by setting a Baker Hughes A3 Lok-Set retrievable casing packer seal (bridge plug) inside the casing above the screens at ~364 mbsf, with a third-party temporary instrument package (SmartPlug) deployed below the seal, in order to maximize scientific use of the borehole in the intervening time between drilling and future permanent observatory installation (Fig. **F3**) (Expedition 319 Scientists, 2010).

The SmartPlug measured pore pressure and temperature at the megasplay fault zone, as well as a hydrostatic reference at the seafloor. This is done by using two pressure transducers: one downward-looking sensor open to the megasplay fault through the casing screens and one upward-looking sensor open to the borehole above the bridge plug and in hydraulic communication with the ocean (Expedition 319 Scientists, 2010). Additionally, four temperature sensors, one at each pressure gauge for temperature compensation, one platinum chip sensor, and one stand-alone miniature temperature logger (MTL), provide continuous temperature measurements. The data recorder was set with a 1 min sampling interval for pore pressure and platinum chip temperature measurements. The MTL was set to a 30 min sampling interval, and clocks were synchronized between the autonomous MTL logger and the SmartPlug data logger.

The operational and scientific objectives for Site C0010 during IODP Expedition 332 were to:

- Retrieve the SmartPlug and the packer assembly and download the data recorded during their deployment. The SmartPlug is a

[1]Expedition 332 Scientists, 2011. Site C0010. *In* Kopf, A., Araki, E., Toczko, S., and the Expedition 332 Scientists, *Proc. IODP,* 332: Tokyo (Integrated Ocean Drilling Program Management International, Inc.).
doi:10.2204/iodp.proc.332.103.2011
[2]Expedition 332 Scientists' addresses.

simple, robust, and inexpensive instrument for temporary borehole monitoring that may have value for future IODP expeditions. One key goal was to assess the performance of the SmartPlug after deployment through the strong Kuroshio Current, as a "proof of concept." Additionally, the SmartPlug represents the first observatory placement in the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) program. Thus, the primary scientific objective is future shore-based analysis of the pore pressure and temperature data to constrain ambient conditions and to investigate transient behavior if observed. The downloaded data will also be used to assess the efficacy of hydraulic isolation of the screened interval from the overlying ocean in order to carefully plan future LTBMS installation and completion strategy at this site.

- Deploy an upgraded version of the SmartPlug, the "GeniusPlug." The GeniusPlug is identical to the SmartPlug but also includes a 30 cm long extension containing an osmotically driven fluid sampler (OsmoSampler) to collect a time series of pore fluid samples from the megasplay fault zone for as long as 2 y (Jannasch et al., 2003) and a flow-through osmo colonization system (FLOCS) microbiology unit that consists of chambers filled with mineral and sediment substrates for examination of in situ microbial growth under controlled conditions (Orcutt et al., 2010; Wheat et al., 2011). Recovery of the GeniusPlug is planned at the time of LTBMS installation at Site C0010, as part of future NanTroSEIZE operations.

Operations

Shingu, Japan, port call

Expedition 332 began at port in Shingu, Japan, on 25 October 2010. We remained in port conducting cargo loading until 1700 h on 27 October, when the D/V *Chikyu* left port to anchor 1 nmi southeast of Shingu. Plans were to continue loading operations via supply boat (R/V *Kaiyo*), but due to deteriorating weather conditions with the approach of Typhoon Chaba, the *Chikyu* left anchorage off Shingu to evacuate from the typhoon at 1200 h on 28 October. The *Chikyu* set a course for the region around Torishima Island, ~300 nmi to the southeast, planning to arrive around 1500 h on 30 October. The *Chikyu* reached 29°52′N, 144°40′E at 0500 h on 30 October, near Soufu-gan rock, when it was decided to reverse course and return to the Site C0010 region to rendezvous with the supply boat because Typhoon Chaba reached the Shingu area earlier than predicted.

Site C0010

The *Chikyu* arrived back at the rendezvous point at 0545 h on 1 November 2010, 6 nmi north of the planned position to avoid the main Kuroshio Current (Fig. **F4**). Loading continued from 0700 to 1500 h, after which the *Chikyu* moved to 1 nmi north of Site C0010 to install the remotely operated vehicle (ROV) cursor at 1900 h, preparatory to the ROV diving at 0145 h on 2 November. After deploying one transponder, the ROV was recovered on deck to troubleshoot telemetry problems with the ROV camera. After the problems were solved, the ROV dove again at 1400 h to set the three remaining transponders, and at 2045 h the ROV removed the corrosion cap and set it on the seafloor. The ROV was recovered to the surface at 2130 h, and the *Chikyu* resumed drifting to the well center for dynamic positioning (DP) calibration from 2300 h on 2 November. DP calibration was completed at 0300 h on 3 November, whereupon the *Chikyu* moved to the low-current area (LCA) 28.5 nmi northwest of Site C0010 (Fig. **F5**), arriving at 1230 h (Table **T1**). The casing packer retrieving assembly was run into the hole at that time, stopping at 1445 h to attach Accelerometer 1 ~460 m from the bottom of the bottom-hole assembly (BHA). The *Chikyu* continued running drill pipe into the hole to 1400 m drilling depth below rig floor (DRF). Meanwhile, the supply boat *Kaiyo* rendezvoused with the *Chikyu* at 1400 h to resume loading of cargo and supplies, finishing at 1600 h, after which the supply boat was released. Drifting continued while the BHA was run to 1800 m DRF, pausing to attach Accelerometer 2 to the drill pipe at ~1600 m DRF. No significant vortex-induced vibration (VIV) was observed, even while drifting in 6.0 kt current. The ROV was launched on 0215 h on 5 November when the *Chikyu* reached a position 1 nmi upstream of Hole C0010A, and the *Chikyu* reentered the hole on 1215 h. The BHA was run down in the cased hole to latch on to the bridge plug at 1730 h and then was pulled out of the hole, leaving the wellhead at 0220 h on 6 November. The BHA was pulled up to 1777 m DRF, whereupon drifting to the southeast commenced while being monitored by the ROV. Drifting continued until 1030 h, 5 nmi southeast of Hole C0010A, when the ROV was recovered and back on deck by 1200 h. Drifting to the southeast resumed in 3.6 kt current. Pulling out of the hole resumed at 0700 h on 7 November; Accelerometer 2 was removed from the drill pipe at 0821 h and Accelerometer 1 was removed at 1245 h. The SmartPlug was recovered on deck at 1403 h, removed from the bridge plug, and opened at 1500 h. Pressure data were downloaded in the Core Processing Deck laboratory at 1620 h. Once the SmartPlug was on deck, the *Chikyu* ended drifting and began moving to upstream of Site C0010 to begin the casing scraper run. At 2215 h, the *Chikyu* resumed drifting back to Site C0010 while running the scraper BHA to 480 m DRF. By 0215 h on 8 November, the scraper BHA reached 1526 m DRF; however, to avoid a slight seafloor rise, the BHA was pulled to 1000 m DRF. Running drill pipe resumed at 0700 h, reaching 2283 m DRF by 1030 h, stopping running 1 nmi upstream of Site C0010 to dive the ROV. Drifting resumed again at 1130 h, but an ROV camera malfunction (data transmission cable came loose and was cut by the ROV thruster) caused another delay while the ROV was recovered on deck, fixed, and relaunched at 2200 h. In the meantime, drill pipe was pulled back to 2000 m DRF until the ROV was back in the water. At that point, running drill pipe continued until the BHA was at 2400 m DRF (at 2330 h). At 2400 h, the scraper BHA reentered Hole C0010A, reaching 2542 m DRF (10 m above the wellhead), stabbing in and performing two scraper runs to 2933 m DRF by 0115 h on 9 November. The scraper BHA was pulled out of the hole to clear the wellhead while the ROV tried but failed to recover the corrosion cap. The decision was made to leave the present cap on the seafloor near the wellhead and install a new corrosion cap when Site C0010 operations were finished. The scraper BHA was recovered on deck at 1020 h on 9 November, whereupon the *Chikyu* moved to the LCA at 1302 h to begin running the GeniusPlug replacement into the hole. The GeniusPlug was connected to two joints of 3.5 inch tubing, and then the retrievable bridge plug and the entire BHA and running tool were rigged up and set to run into the rotary table at 1905 h. The tubing had bent while lying down, so after straightening the tubing it entered the moonpool at 1930 h on 9 November. At 0800 h on 10 November the ROV dove, and at 0952 h it inspected the BHA and GeniusPlug at 2359 m DRF. The *Chikyu* continued drifting toward Hole C0010A, and at 0904 h on 11 November was ready to reenter the wellhead. At 0930 h the ROV once again examined the BHA, including the GeniusPlug and the casing packer assembly. At 1035 h the GeniusPlug was run into the wellhead, and by 1100 h the entire BHA had been run into the wellhead. The drill pipe continued to be run into the hole, and at 1710 h the bridge plug was set and latched at 2928 m DRF (packer element center) and the running tool was released. Suspension fluid pumping (20 cm^3) began at 1724 h, after which the running tool BHA was pulled out of the hole to 2550 m DRF. The anti-VIV ropes were removed as the BHA was pulled out of the hole to 1900 m DRF while the ROV was recovered on deck with the suspension cap at 0200 h on 12 November. The running tool BHA was recovered on deck at 1100 h on 12 November while the ROV was prepared to dive with the replacement corrosion cap. The ROV dove at 1500 h to set the corrosion cap and recover the transponders, recovering the last one (of four) and returning to the cage at 2135 h, and was on deck at 2330 h. The well was completed and the *Chikyu* moved off to IODP Site C0002.

SmartPlug/GeniusPlug

Results from temporary "mini-CORK" deployments

After reentry into Hole C0010A, the latching tool connected to the retrievable bridge plug without difficulty, and the bridge plug and SmartPlug package were safely pulled out of the hole only a few hours after reentry (see **"Operations"**). On a long, careful recovery trip through the water column, the SmartPlug remained undamaged and was recovered safely on deck, detached from the running tool and bridge plug, and cleaned for opening and data download. The data were successfully secured to a laptop and transferred to an external drive for backup and subsequent processing. The data indicate successful continuous monitoring of pore pressure and temperature at a 1 min sampling interval for each of the sensors, which included three temperature sensors and two pressure transducers. The MTL also worked without problems and provided a continuous temperature record at a 30 min sampling interval. The data are presented here to provide evidence for successful deployment and data recovery, give an overview, and show a few details in the time series data set.

Pressure data

The SmartPlug placement was designed to monitor pressure and temperature at a screened interval in the formation, as well as hydrostatic pressure to be used as a reference. The screened interval included the splay fault located at ~410 mbsf, which was hydraulically separated from the seafloor by an inflatable packer that surrounded the bridge plug. The SmartPlug and bridge plug configuration is shown in Figure **F8** in the "Methods" chapter (Expedition 332 Scientists, 2011a).

An overview of the full pressure data set is shown in Figure **F6.** The pressure record surrounding deployment reflects drifting prior to entering Hole C0010A, as well as the disturbance associated with the installation (Fig. **F7**). After ~2 weeks, the formation pressure data suggest that the SmartPlug was successfully isolated from the seafloor, as indicated by a stable pressure record in excess of hydrostatic pressure. The tidal fluctuations during the rest of the SmartPlug deployment are consistent with expectations for a pressurized formation relative to hydrostatic pressure. Specifically, the tidal signature of the formation has a diminished amplitude and small phase shift when compared to the seafloor, or hydrostatic pressure (Fig. **F8**).

A cursory review of the data identified multiple pressure disturbances potentially related to seismic events, although further detrending and processing of the data are required to filter the tidal signal and resolve pressure anomalies. Despite the need for further processing, it was possible to identify the arrival of the tsunami wave that resulted from the Chile M 8.8 far-field earthquake on 27 February 2010, which arrived in southern Japan ~23.5 h after the earthquake (Fig. **F9**).

Data surrounding the instrument recovery provide additional confirmation that the packer had successfully isolated the formation. Figure **F10** illustrates the disturbance in the hydrostatic pressure (seafloor) associated with the reentry of the drill string prior to removing the bridge plug. The relative quiescence of the formation data prior to removing the bridge plug indicates hydraulic isolation from the overlying disturbance.

Temperature data

The SmartPlug incorporates four different temperature sensors: one stand-alone MTL, one temperature sensor in the pressure housing (platinum chip), and one thermistor in each of the pressure transducers. An overview of the temperature data gathered during the 15 month period is given in Figure **F11.**

The initial deployment phase is marked by strong temperature variations, differing in amplitude as well as frequency. All temperature sensors show the same curve progression and almost the same temperature except for the pressure housing temperature, which is ~0.6°C higher. Afterward, all sensors simultaneously register a sudden increase in temperature, followed by steep incline to up to <2°C. A day later, the temperature starts rising, and at 13°C, the temperature data split apart again, indicating that the SmartPlug reached its final depth and was sealed by the bridge plug.

The following main deployment phase shows a curve progression typical for the onset of equilibration in the borehole. The beginning is marked by a strong increase of 0.07°C/day within the first 30 days after installation of the SmartPlug was completed. Afterward, the slope of the temperature curve decreases significantly until the temperature rise reaches one-hundredth of the starting rate 305 days after deployment. Data indicate that complete equilibrium was not reached.

Similar to the initial portion of the deployment phase, the final part of the recovery phase is clearly visible in the data, with the former trend of the temperature curve ending with an abrupt, strong decrease of overall temperature followed by a sudden increase.

When comparing data from the different temperature sensors, the sensors in the hydrostatic reference pressure transducer and the MTL show nearly identical values. The temperature measured by the sensor monitoring pressure in the formation (i.e., megasplay fault branch) is slightly elevated, which may be realistic. In contrast, the platinum chip mounted inside the pressure housing shows consistently higher temperatures than the other three thermistors, ranging ~0.6°C above the other curves (Fig. **F11**). A problem with calibration is most likely the cause for the different temperatures within the SmartPlug casing.

When taking a closer look at the main deployment phase (Fig. **F12**), a temperature decay is visible in the MTL data at ~182 days, which was not registered by the other temperature sensors. After 295 days, a negative peak lasting 1.5 days is visible in the MTL temperature, which is less prominent in the other data sets. The shift back to higher temperatures was registered by the thermistors in both pressure transducers, too, whereas the sensor in the platinum chip in the pressure housing experienced a drop in temperature. The reason for these anomalies remains unclear at this point.

Vortex-induced vibration measurements

The *Chikyu* was maneuvered into the LCA to begin lowering the running tool to recover the SmartPlug and set the GeniusPlug instruments (see Fig. **F4**). Two accelerometer instruments were attached to the drill string, and ropes were additionally fastened to reduce vibration in the upper ~500 m of water column. Accelerometer 1 was attached at 461 m DRF (just above the BHA) at 1520 h on 3 November 2010 and Accelerometer 2 was attached at 1598 m DRF at 0530 h on 4 November. Drifting to Site C0010 began at 2100 h on 3 November at the speed of ~1 kt. For details, refer to **"Operations."**

Acceleration data were collected to monitor VIV on the drill pipe once SmartPlug retrieval at Site C0010 was started. Hence, a record when drifting in and reentering without the bridge plug/SmartPlug, as well as a data set with the assembly attached to the end of the string, were collected. The timeline of acceleration data collected during these operations is shown in Figure F13.

Acceleration shocks caused by the drill pipe contacting the rotary table during lowering and pulling up the drill string were measured by the attached accelerometer. The peak to peak amplitudes of the shocks reached ~1.5 g. When the accelerometer was closer to the rotary table at the beginning of the lowering drill pipes, the peak to peak amplitude became 6 g with higher horizontal acceleration than vertical (Fig. F13). The difference between signals recorded during lowering and pulling up drill pipes may be explained by the horizontal acceleration during pulling up drill pipes having been lower (peak to peak amplitude = 0.5 g) than during lowering. Two other shocks were measured during the reentry and SmartPlug retrieval. The shock amplitude during reentry exceeded 2.5 g. These acceleration measurements suggests that shocks endured while lowering near the rotary table and during reentry have to be considered to further reduce sensor damage.

During drifting (yellow shading in Fig. F13), two types of vibrations are observed in the acceleration data on the drill pipe. One is VIV, which corresponds to the drifting speed and the drifting angle between drifting direction and sea current. By attaching rope along the drill string, the amplitude of VIV was successfully reduced to <1 g. The results show the vertical components of the accelerometer are much lower than the horizontal components. The second type of vibration observed is shocks caused by the drill pipe slamming into the rotary table during lowering and pulling up, which is actually similar to those observed during lowering pipe (see above). Although this signal is less regular in nature, it may reach larger magnitudes depending on the strength of the impact.

From VIV monitoring over a period of several days during Site C0010 operations, the following three conclusions can be drawn for long-term borehole monitoring system installation at Site C0002:

1. The BHA should be lowered in the LCA, with the relative current speed being as low as possible.
2. Drifting speed should be kept as low as possible (should be well below 1 kt).
3. Drifting angle between drifting direction and sea current should be kept as small as possible (and definitely <45°).

Discussion

The discussion about Site C0010 reviews VIV data from the SmartPlug during the recovery run, examines the performance of the drill string with ropes attached to it, and compares the data to earlier data from the dummy run with the first-generation instrument carrier at Site C0010 during Expedition 319 in 2009. We also look at the performance and overall value of using a temporary mini-CORK firmly mounted near the screened casing section of the megasplay fault for 15 months.

VIV

As briefly outlined in Expedition 319 Scientists (2010), a dummy run of the long-term borehole monitoring system sensor carrier with three instruments failed during Expedition 319. VIV was very strong (see data example from the initial phase of drifting toward Site C0010; Fig. F14), particularly during the later part of the record. As a result, instruments were lost or damaged, and countermeasures had to be taken thereafter. Foremost, these included the attachment of four lines of ropes to the drill string in the uppermost 500 m of water column to break the turbulent flow in the wake of the drill string. This strategy was tested on land in a wave tank at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in early 2010, at sea during a limited test run aboard the *Chikyu,* and then adopted as a standard operation on the *Chikyu.* When comparing the Expedition 332 three-component acceleration data at Site C0010 (see Fig. F13) to the older record, it can be seen that with the ropes attached during 2010 operations, acceleration was well below ±1 g despite the fact that the absolute speed (i.e., ship speed–current speed) exceeded 1 kt. By comparison, conditions at Site C0002 a few weeks later enabled a more careful drifting operation with lower absolute drifting velocities ~0.5 kt (see **"Vortex-induced vibration measurements"** in the "Site C0002" chapter [Expedition 332 Scientists, 2011b]). Figure F20 in the "Site C0002" chapter (Expedition 332 Scientists, 2011b) illustrates that VIV in both *x*- and *y*-directions were even lower than those encountered at Site C0010.

SmartPlug

The SmartPlug placement was designed to monitor pressure and temperature at a screened interval in the formation where the megasplay intersects, as well as to monitor hydrostatic pressure to be used as a reference. Time series data during deployment, and particularly during instrument recovery, provide additional confirmation that the packer had successfully isolated the formation (Fig. F10). A cursory review of the data identified multiple pressure disturbances potentially related to far-field seismic events, although postcruise detrending and processing of the data are required to better resolve and quantify pressure anomalies. Still, given the rather low sampling interval of 60 s, these signals are textbook examples of seismic arrivals and tsunami arrivals (e.g., Fig. **F9**). Similarly, the tidal forcing record shows dampening of signals in the tight, somewhat overpressured formation. Results have to be treated with caution because it looks as if the borehole has not yet equilibrated 15 months postdrilling. The temperature record is a less powerful tool for drawing conclusions; however, good resolution was achieved and individual events causing temperature excursions were identified (Fig. **F12**).

In summary, it can be said that having had a chance to successfully install the SmartPlug was a great achievement for the following reasons. First, the instrument turned out to be sufficiently robust to withstand the strong (>5 kt) Kuroshio Current and remained undamaged at conditions where the first-generation instrument carrier and components attached to it were destroyed and damaged (Expedition 319 Scientists, 2010). Second, the data quality of the simple SmartPlug is astonishing and is mainly hampered by the fact that borehole equilibration was not reached during the deployment period. Third, having been able to establish the first long-term monitoring system in the NanTroSEIZE program is a significant step forward toward the more sophisticated permanent observatories planned within the complex drilling project.

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Figure F1. Detailed map showing locations of IODP Sites C0001, C0003, C0004, C0008, and C0010. IL = in-line, XL = cross-line.

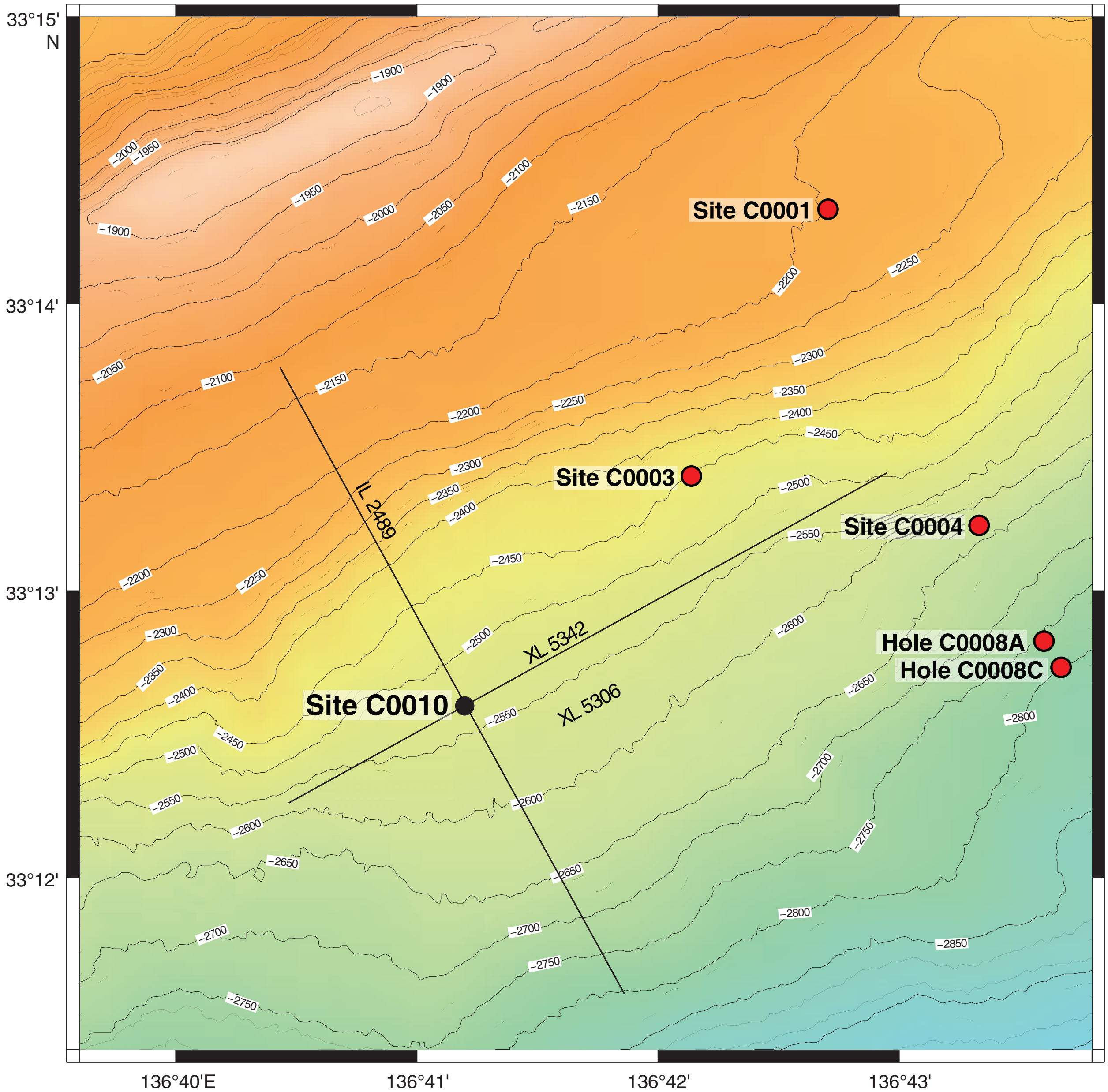

Figure F2. Seismic in-line (IL) and cross-line (XL) profiles across Site C0010. For position of profiles, see Figure **F1.** VE = vertical exaggeration.

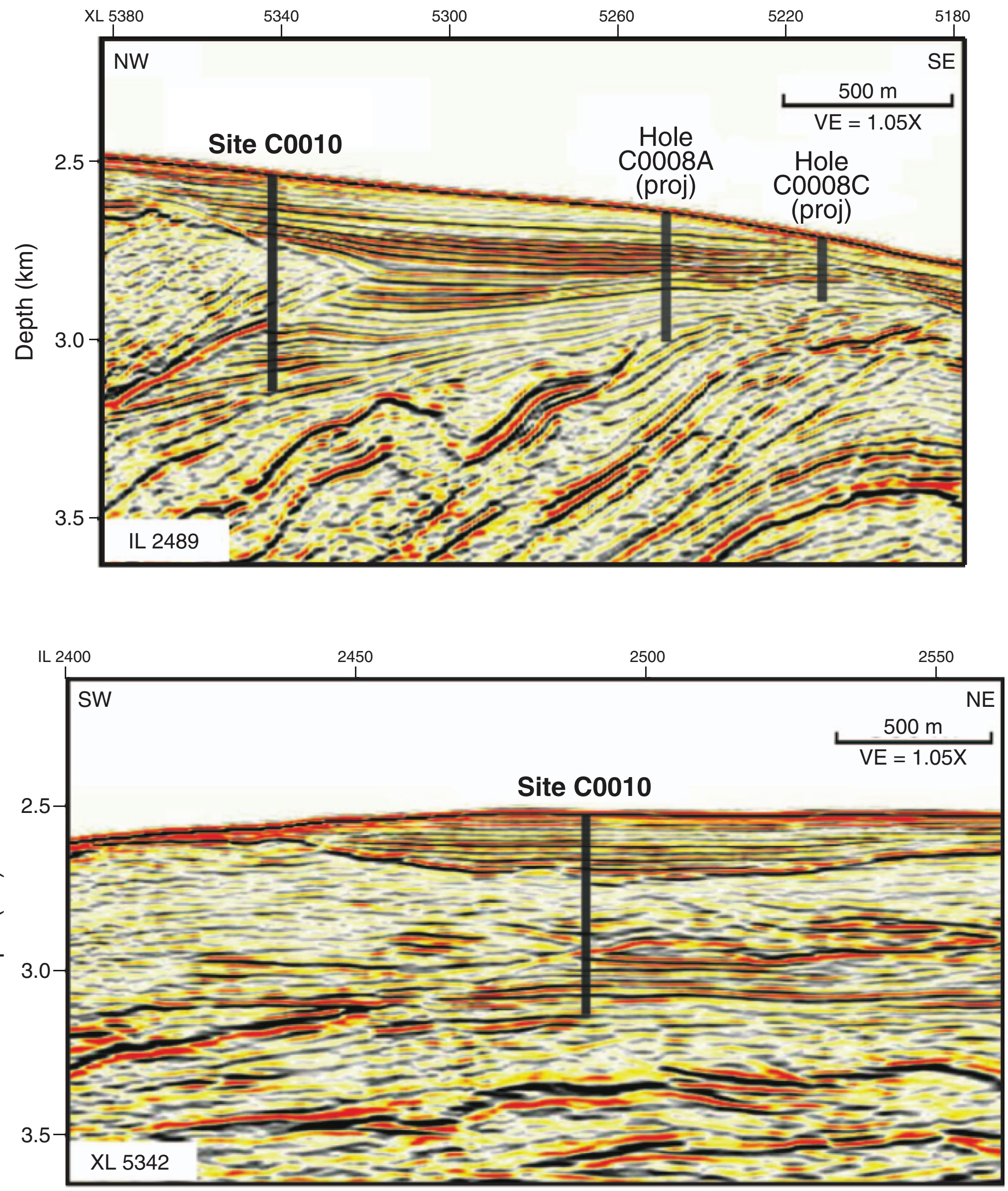

Figure F3. Schematic cross section showing casing and screen configuration and SmartPlug/GeniusPlug location, Site C0010.

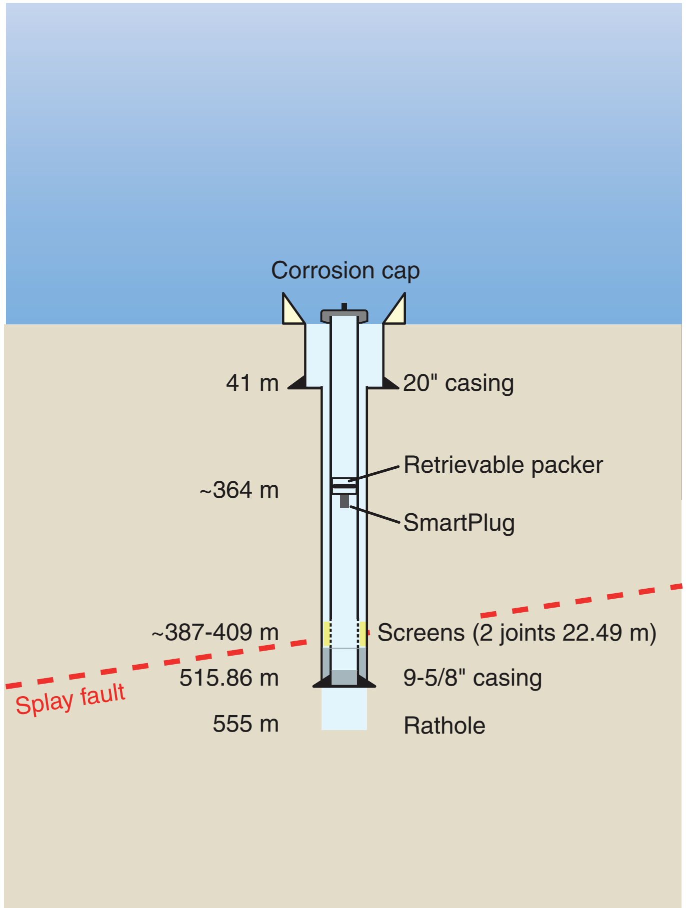

Figure F4. Kuroshio Current speeds and NanTroSEIZE drill sites. Three sites were monitored with acoustic current Doppler profiler current meters, showing the vertical current profile (left) and the current track (right) on the dates indicated for each site.

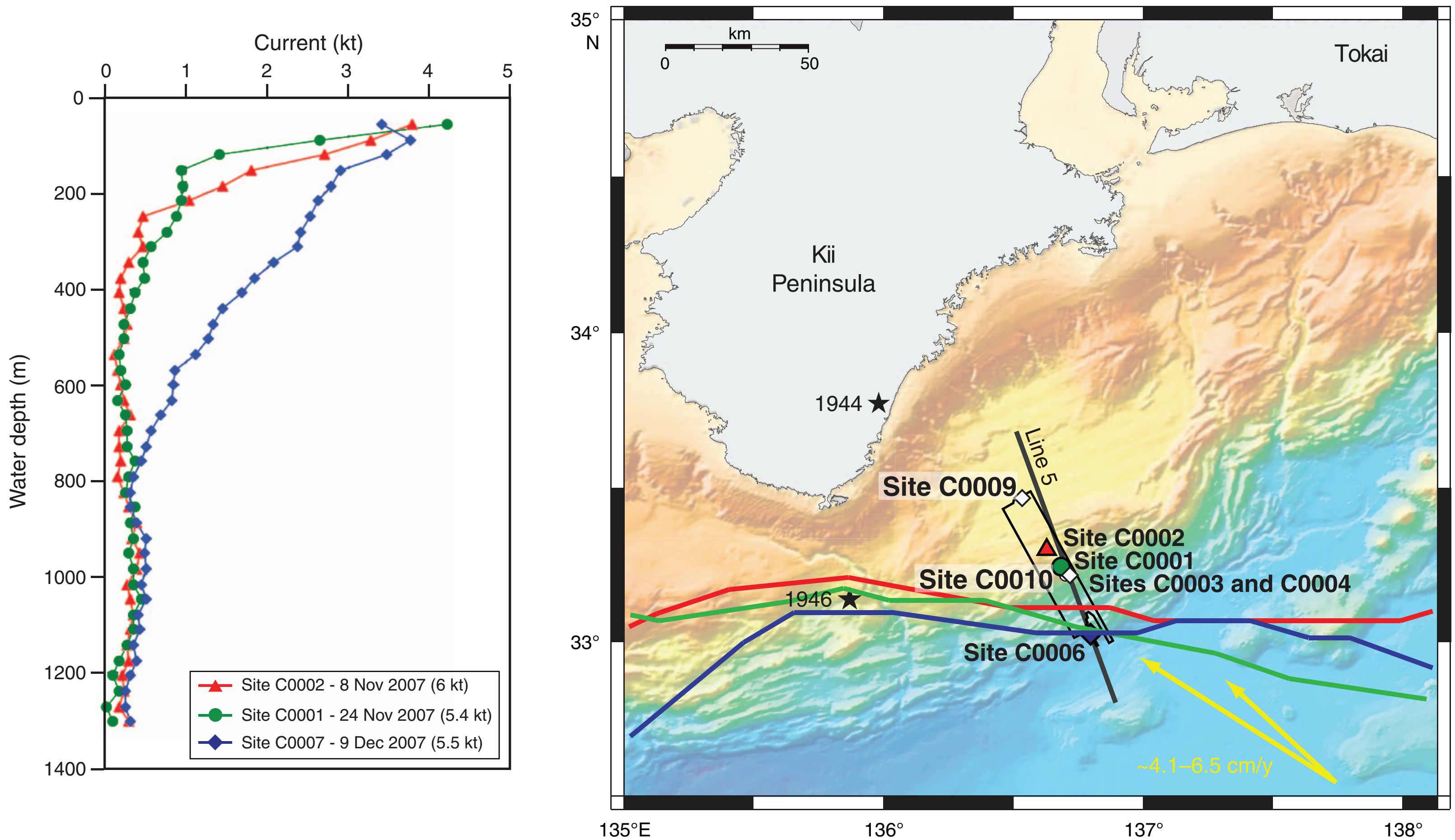

Figure F5. Cartoon describing Kuroshio Current drifting protocol for the *Chikyu*, Site C0010. The *Chikyu* starts in the low-current area (LCA), begins (A) lowering the drill string, then (B) begins attaching the anti-VIV ropes, enters the current, and then (C) lowers the final section of the drill string before reentering the site (yellow star). Once operations are finished, the *Chikyu* moves out of the current and then back upstream to the LCA to continue operations.

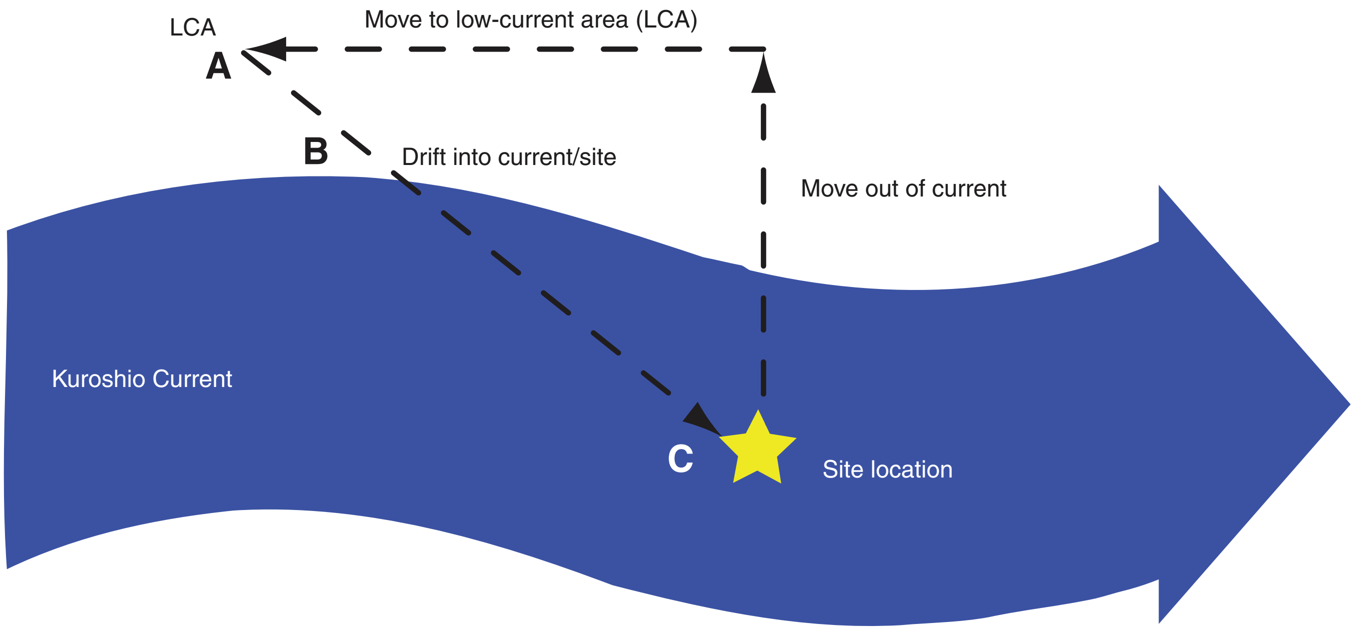

Figure F6. Pressure record showing 15 month deployment period as well as logging that occurred predeployment and postrecovery, Site C0010. Deployment on 7 Aug 2009.

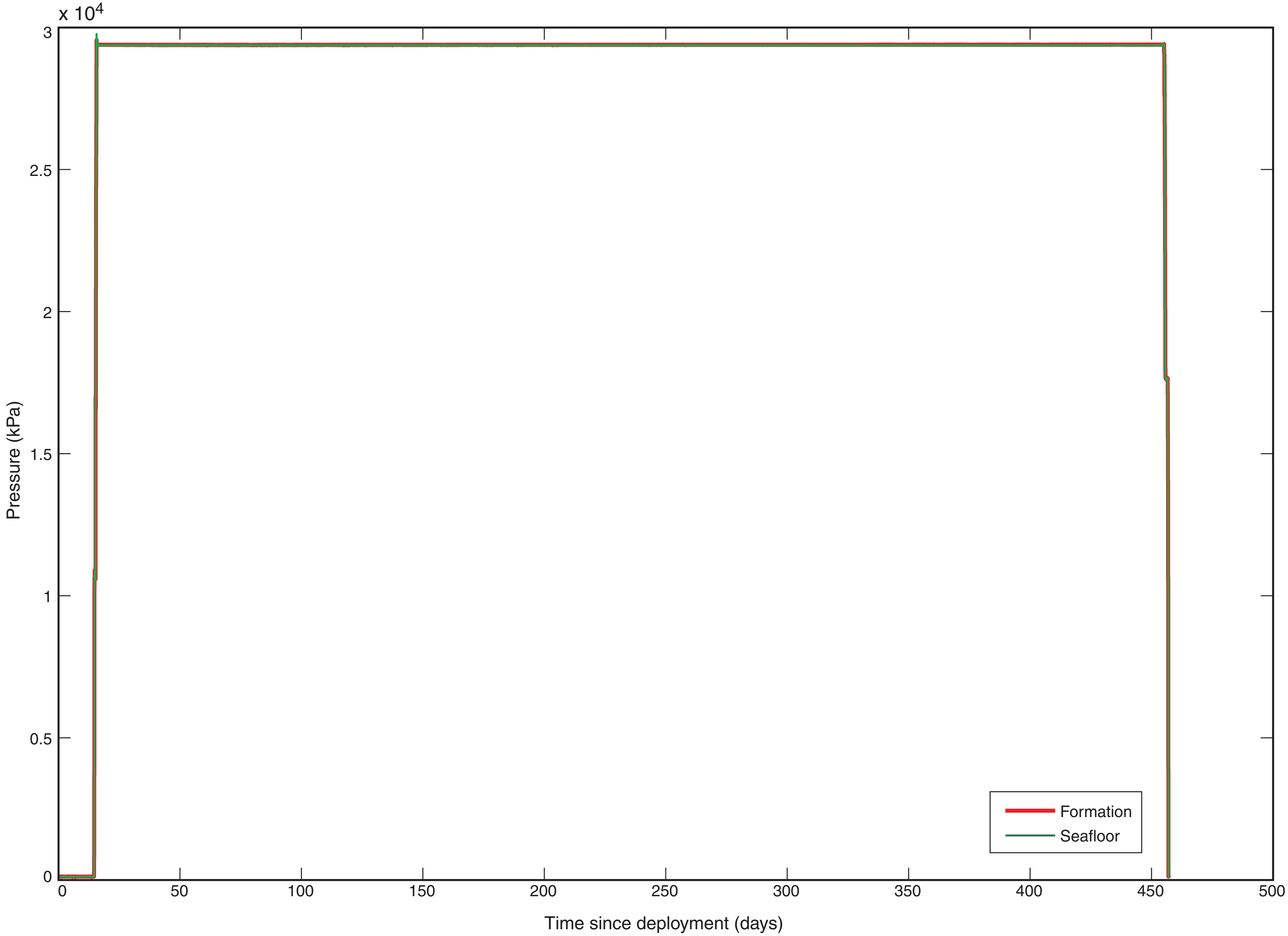

Figure F7. Data collected during "drifting" and eventual deployment of SmartPlug, Site C0010. Hydraulic separation of the two sensors is evidenced by lack of formation response after packer was inflated and before bridge plug was sealed.

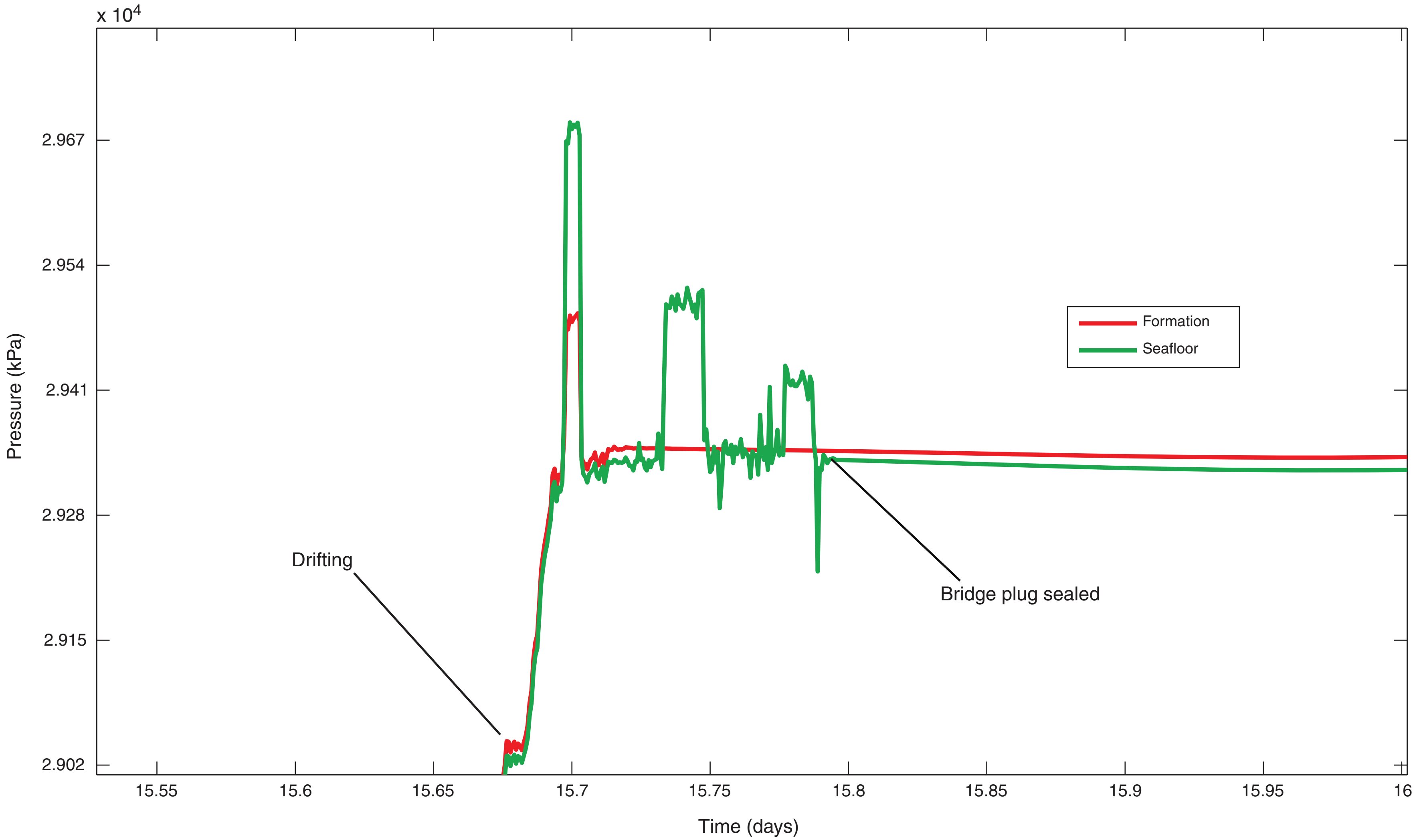

Figure F8. Two months of pressure data showing characteristic tidal forcing, Site C0010. Note diminished amplitude in formation data relative to seafloor (hydrostatic) response.

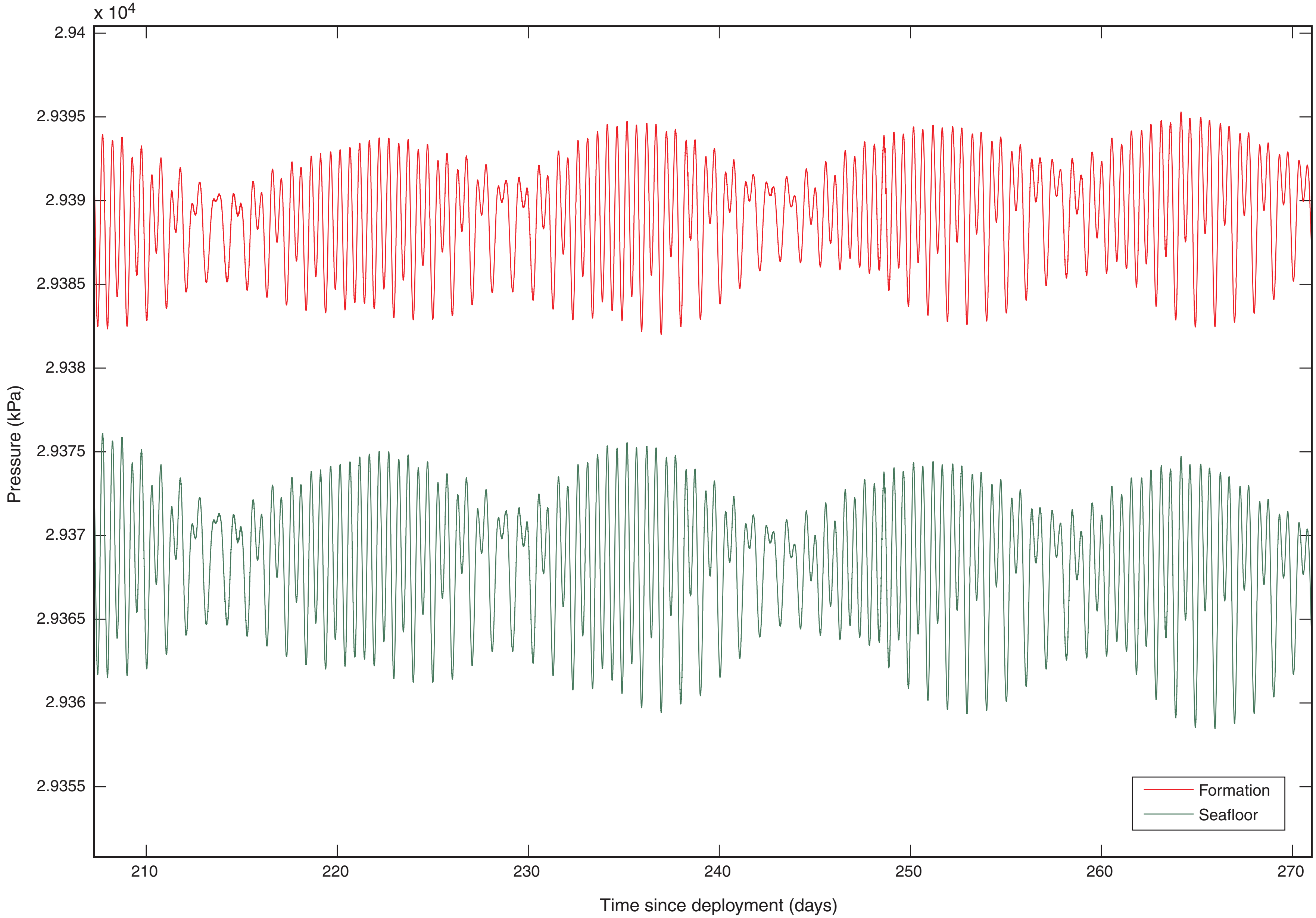

Figure F9. Both sensors register a high-frequency response ~1 h after Chile M 8.8 earthquake (EQ) on 27 February 2010 and an additional anomaly correlated with the arrival of the tsunami wave (23.5 h later), Site C0010.

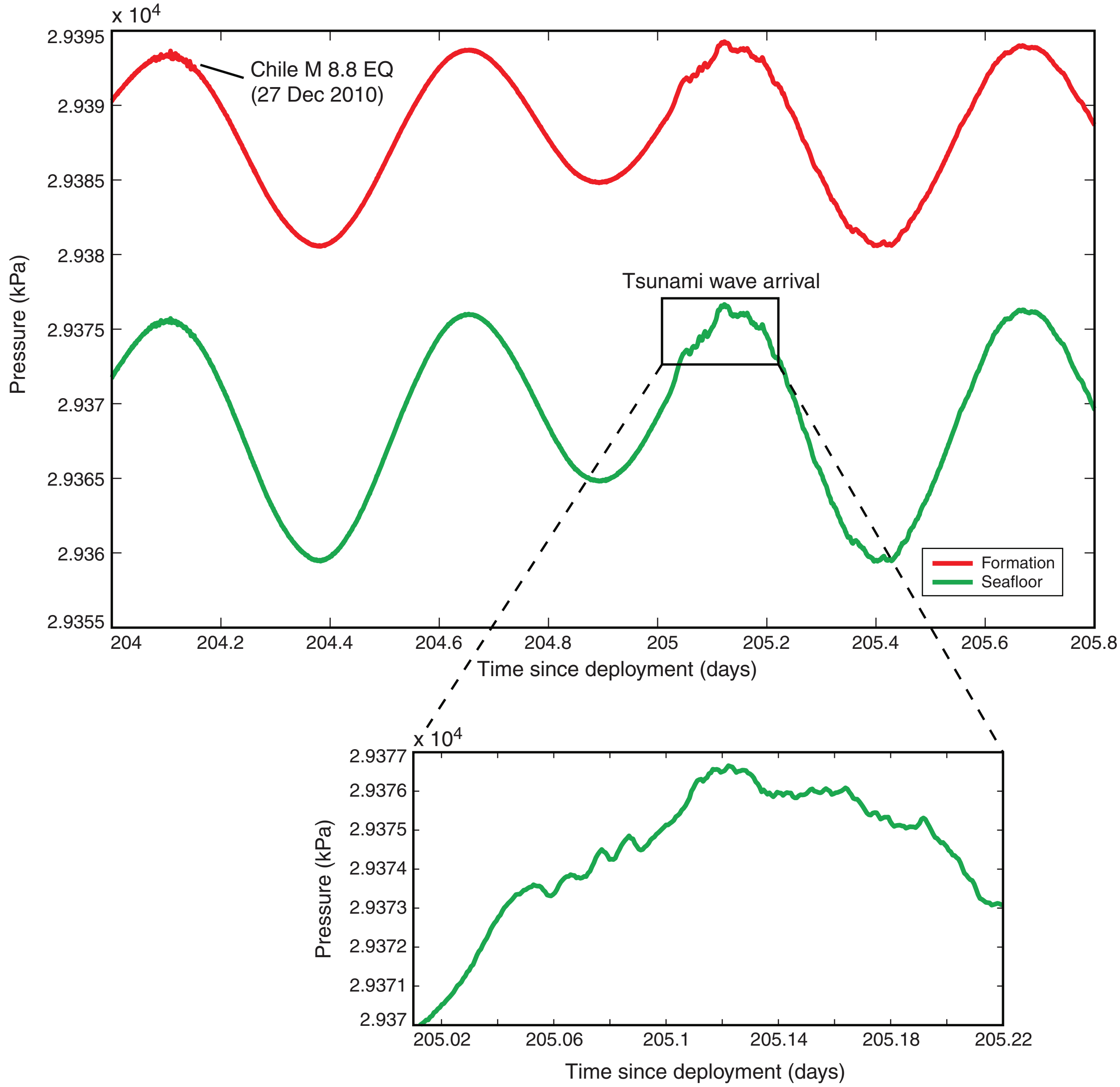

Figure F10. Pressure record during SmartPlug recovery, which demonstrates hydraulic isolation of the formation (downward-looking transducer) from the seafloor reference (upward-looking transducer), Site C0010.

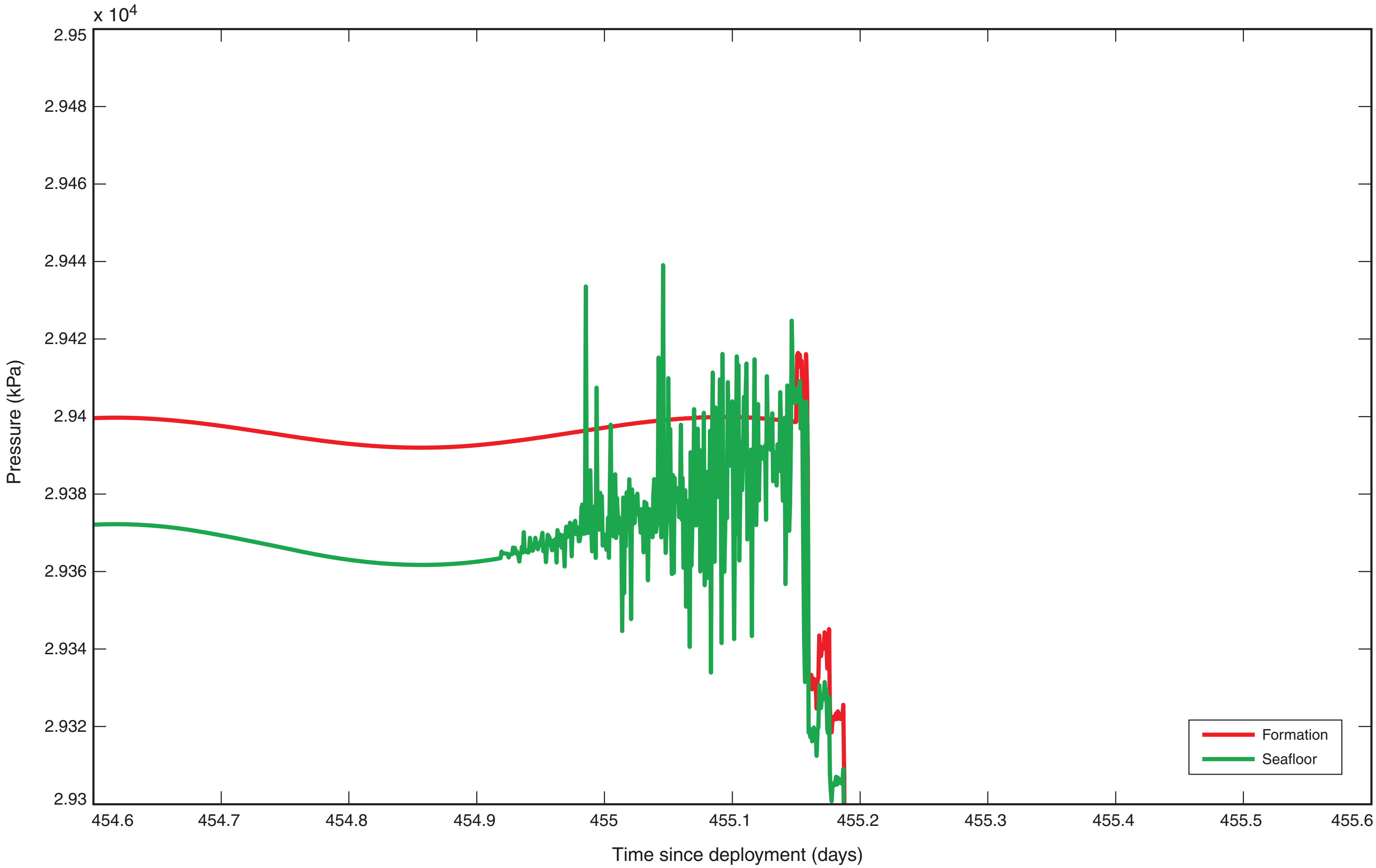

Figure F11. Overview of temperature record for 15 months, as recorded with the four different thermistors, Site C0010. See text. MTL = miniature temperature logger.

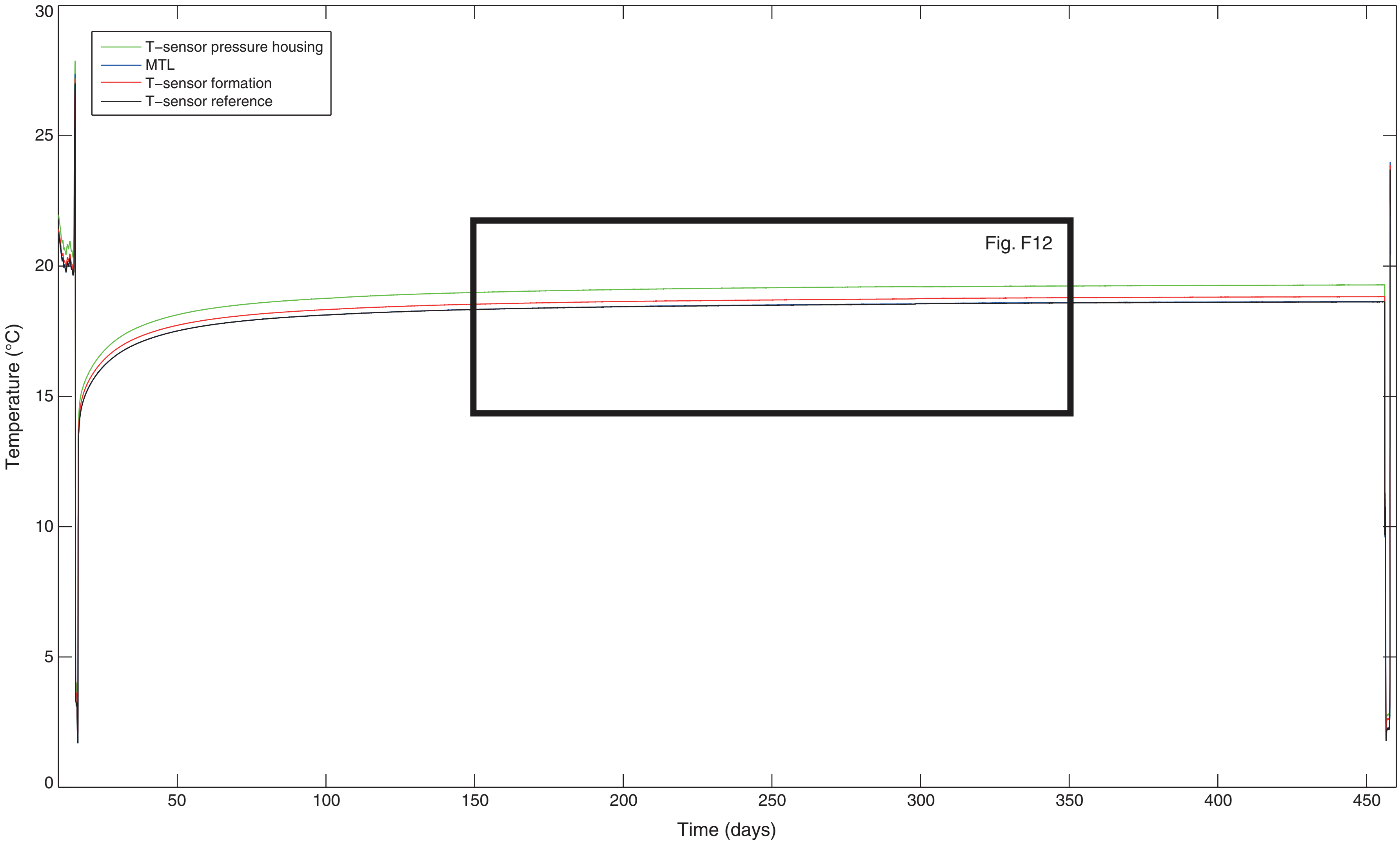

Figure F12. Example of temperature perturbations in late May 2010, Site C0010. It remains unresolved why three thermistors show a systematic increase by ~0.03°C, whereas one drops gently at the same time. MTL = miniature temperature logger.

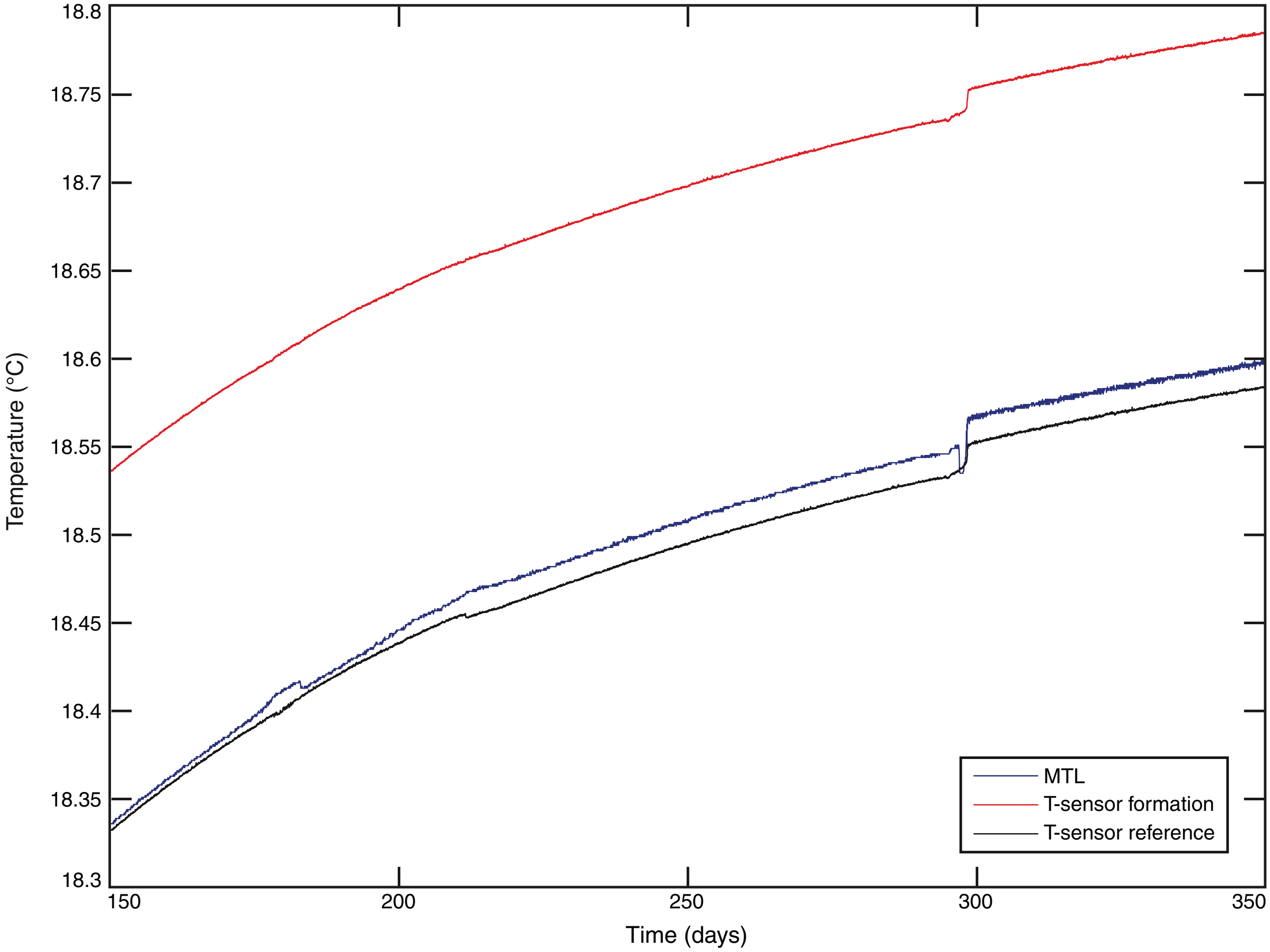

Figure F13. Acceleration data collected during SmartPlug retrieval operations, Accelerometer 1 at 461 m DRF, Site C0010. Yellow shading = data during drifting. POOH = pull out of hole. See text.

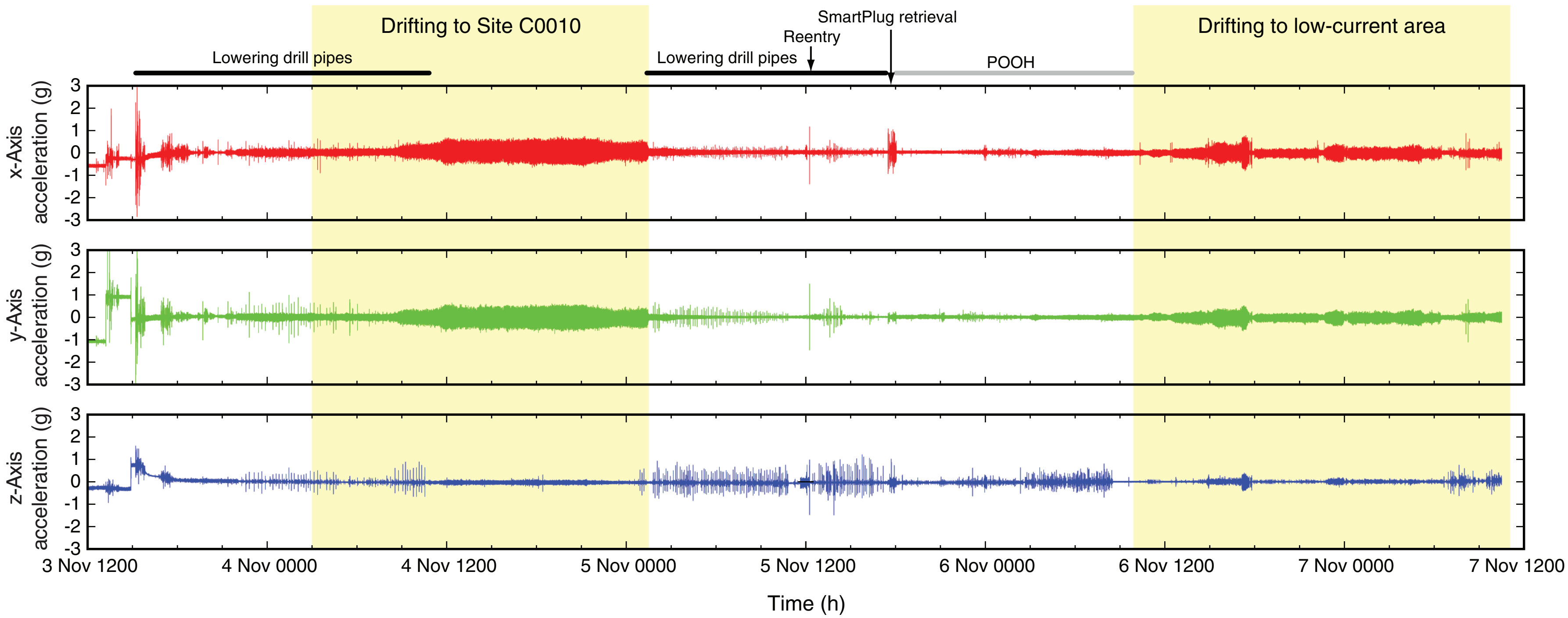

Figure F14. Accelerometer record from start of dummy run deployment during drifting toward Site C0010, Expedition 319 (Expedition 319 Scientists, 2010). Note high ship speed approaching 4 kt as well as high-amplitude power spectral density toward end of time series shown. See text for discussion. Please also refer to Figure **F13** as well as Figure **F20** in the "Site C0002" chapter (Expedition 332 Scientists, 2011b) for comparison of this data set to Expedition 332 data sets with the accelerometer instruments.

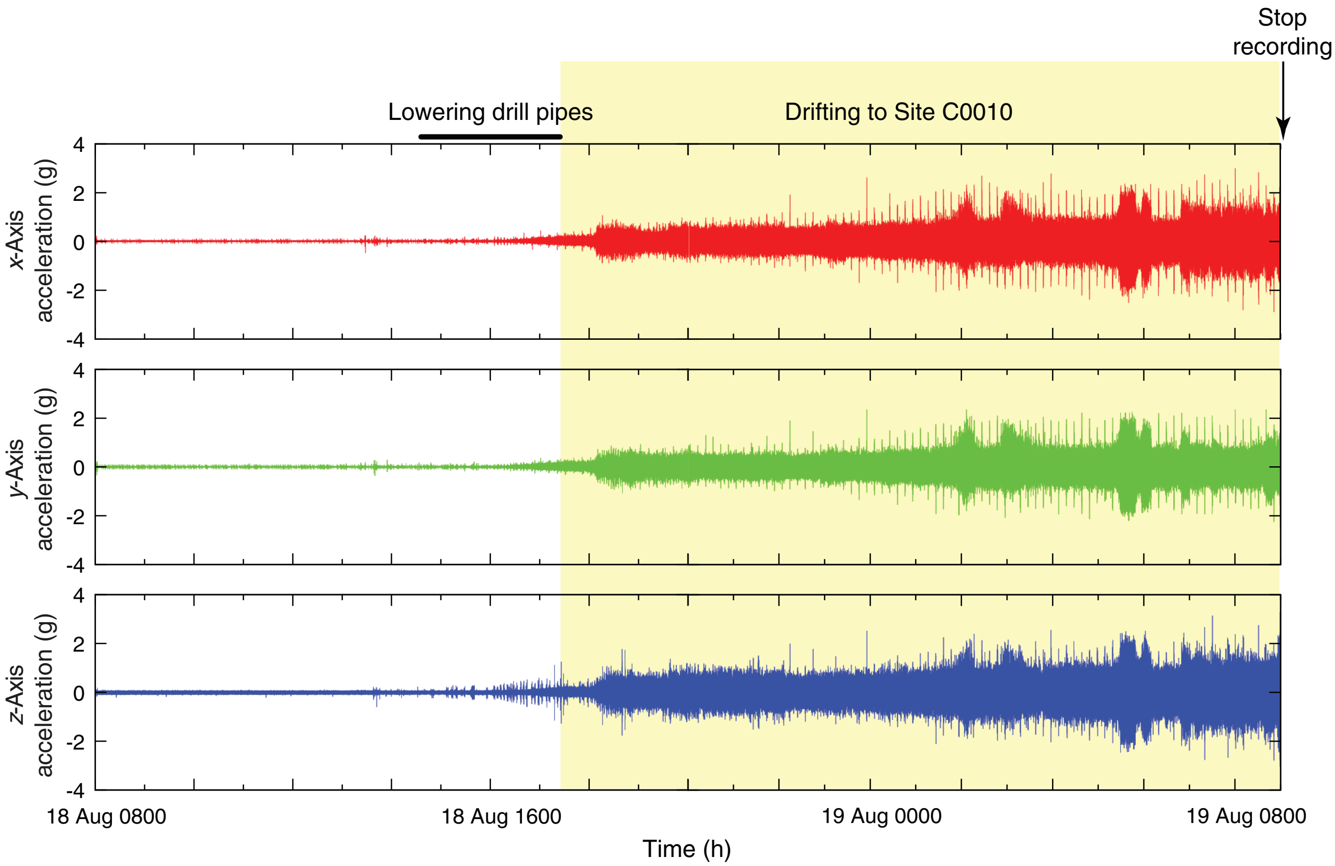

Table T1. Operations summary, Site C0010.

Hole C0010A
Latitude: 33°12.5981′N
Longitude: 136°41.1924′E
Water depth (m): 2523.7
Seafloor (m): 2552 DRF (2523.7 mbsl)
20 conductor pipe shoe (m): 2593 DRF (41 mbsf)
9-5/8 casing screen interval (m): 2939–2961 DRF (387–409 mbsf)
9-5/8 casing shoe (m): 3096 DRF (518 mbsf)
TD (m): 3107 DRF (555 mbsf)

Operation	Start Date (2010)	Start Local time (h)	Depth DSF (m) Top	Depth DSF (m) Bottom	Comments
Hole C0010A			0	560	
Prep tool, rig up, and RIH	1 Nov	2215			Make up 5.5 inch DP and 5 inch DP stands
Run ROV survey	2 Nov	0145			Prepare and launch ROV for diving and transponder setting
Recover ROV	2 Nov	0545			ROV camera fault, recovered to troubleshoot and repair
Relaunch ROV	2 Nov	1400			Relaunch ROV with 3 transponders, deploy transponders
Remove corrosion cap from well	2 Nov	1945			Remove corrosion cap and place on seabed
Recover ROV	2 Nov	2045			Recover ROV from seafloor
Calibrate DP	2 Nov	2300			Set and calibrate DP
Move to LCA	3 Nov	0300			Move *Chikyu* to LCA
Set DP mode	3 Nov	1130			
RIH casing packer retrieving assembly	3 Nov	1230			1445 h attach accelerometer to DP
Begin attaching anti-VIV ropes	3 Nov	1730			Continue to RIH packer running tool from 1200 to 1400 m DRF
Continue to RIH	4 Nov	0445			Attached Accelerometer 2 to DP at 1600 m DRF
Drift to Site C0010	4 Nov	1045			Observing drill pipe for VIV while drifting
Resume running packer running tool	5 Nov	0030			Running DP while attaching anti-VIV ropes
Launch ROV	5 Nov	0215			ROV launched 2 nmi from site
Reenter wellhead	5 Nov	1215			Running tool run into well
Lower string to casing packer	5 Nov	1730			Tag and touch down on casing packer
POOH from 2890 to 2734 m DRF	5 Nov	2000			Pull up and retrieve packer assembly
POOH running tool and SmartPlug	6 Nov	0230			Packer and SmartPlug visually confirmed by ROV camera
Drift while recovering	6 Nov	0235			Drifting with current as packer assembly is recovered
Recover ROV	6 Nov	1030			ROV brought back on deck
Recover Accelerometer 1	7 Nov	0820			
Recover Accelerometer 2	7 Nov	1250			
Recover and lay out packer and SmartPlug	7 Nov	1415			Casing packer and SmartPlug recovered and laid out on deck
Prepare casing scraper assembly	7 Nov	1430			Casing scraper assembly readied and racked
RIH casing scraper assembly	7 Nov	2300			Casing scraper run to 480 m DRF
Pull out to 1000 m DRF	8 Nov	0215			High current dictated POOH and LCA movement
Resume casing scraper run	8 Nov	0700			Resume RIH to 2283 m DRF with drifting
Launch ROV	8 Nov	1030			
Continue to RIH scraping assembly	8 Nov	1130			Continue to RIH casing scraper to 2543 m DRF
Recover ROV	8 Nov	1215			Camera cable loose, needing troubleshooting
Stop *Chikyu* drifting and dive ROV	8 Nov	2200			
RIH casing scraper assembly	8 Nov	2330			RIH to 2400 m DRF
RIH casing scraper assembly into wellhead	9 Nov	0115			RIH to 2933 m DRF, 2 scraper runs
Circulate bottoms up	9 Nov	0115			
POOH wellhead	9 Nov	0145			Clear wellhead and begin drifting
Recover ROV	9 Nov	0400			Leave corrosion cap on seafloor
Move to LCA	9 Nov	1030			Pick up and rack stands
Start drifting	9 Nov	1745			
Pick up casing packer and GeniusPlug	9 Nov	1915			2 joints of tubing bent while lying down, bent back
RIH casing packer assembly	9 Nov	2015			RIH to 1550 m DRF
Dive ROV	11 Nov	0800			Dive ROV and check BHA
Resume running packer running tool	11 Nov	0815			Running casing packer from 2400 to 2536 m DRF
Shift *Chikyu* to reenter Hole C0010A	11 Nov	1030			
Reenter wellhead with GeniusPlug	11 Nov	1100			RIH casing packer and GeniusPlug past wellhead
Run casing packer to setting depth	11 Nov	1545			Casing packer run to 2938 m DRF
Set A3 packer at 2950 m DRF	11 Nov	1710			Casing packer set at 373 mbsf, bottom of GeniusPlug at 395 mbsf
Displace hole with suspension fluid	11 Nov	1715			Place 20 kL of suspension fluid
POOH to 2550 m DRF	11 Nov	2400			Confirm L10 running tool on BHA
Use ROV to pick up corrosion cap	12 Nov	0015			ROV on deck at 0200 h with corrosion cap
Resume POOH to surface with drifting	12 Nov	1045			
Dive ROV to set corrosion cap	12 Nov	1500			Corrosion cap set at 1600 h
Use ROV to recover transponders	12 Nov	2330			All 4 transponders recovered

Table T1 (continued).

Operation	Start		Depth DSF (m)		Comments
	Date (2010)	Local time (h)	Top	Bottom	
Retrieve ROV on deck	12 Nov	2330			
Begin transit to Site C0002	12 Nov	2330			Arrived at Site C0002 at 2400 h

DRF = drilling depth below rig floor, mbsl = meters below sea level, mbsf = meters below seafloor, DSF = drilling depth below seafloor. TD = total depth. DP = dynamic positioning. RIH = run in hole, POOH = pull out of hole. ROV = remotely operated vehicle. LCA = low-current area, VIV = vortex-induced vibration. BHA = bottom-hole assembly.