MGL2514 Cruise Report

8-G project: Oceanic Crust Hydrothermal circulation Offshore Guererro

December 2025

R/V Marcus G. Langseth (Lamont Doherty Earth Observatory)
December 2-26, 2025 (ports: Manzanillo, Colima, Mexico)
Chief Scientist: Glenn Spinelli (glenn.spinelli@nmt.edu)

NSF awards OCE-2234705 and OCE-2234706 "Collaborative Research: Quantifying the thermal effects of fluid circulation in oceanic crust on temperatures in the southern Mexico subduction zone" to Spinelli and Worthington.

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Note: this document is in local time except when listed (for GMT add 6 hours to the local (Central) time).

8-G project objectives

Accurate estimates of subduction zone temperatures are required to understand a variety of critical processes, including controls on seismogenic and aseismic behavior on subduction megathrusts. The region of flat-slab subduction in Mexico has been a focus of seismic and geodetic studies because it hosts an interesting range of behaviors on the plate interface (e.g., tremor, slow slip, presence of an ultra-slow layer postulated to be generated by fluid overpressure). Attempting to better understand physical conditions within the subduction zone, various studies predict temperatures and the distribution of slab alteration in this system. However, thermal models for the margin remain largely unconstrained due to insufficient heat flux observations on the incoming plate. Specifically, the potential presence and effects of fluid circulation in the basaltic basement aquifer of crust entering the southern Mexico subduction zone are unknown. The subduction zone in southern Mexico is among the warmest globally and the extent to which fluid circulation redistributes heat has profound implications for temperature distributions and subduction processes. The goal of this study is to assess the thermal regime of the Cocos plate entering the subduction zone offshore southern Mexico by collecting seismic reflection profiles and heat flux measurements. This will provide a process-based understanding of the thermal structure of the incoming Cocos plate. The central hypotheses are: 1) hydrothermal circulation advects substantial quantities of heat in oceanic crust near the deformation front offshore southern Mexico, and 2) bending-related normal faults play an important role in hydrothermal circulation and the thermal structure of the incoming plate in this system. Analyzing and interpreting the controls on the thermal state of the Cocos plate near the deformation front will allow for the development of improved predictive models of subduction zone temperatures.

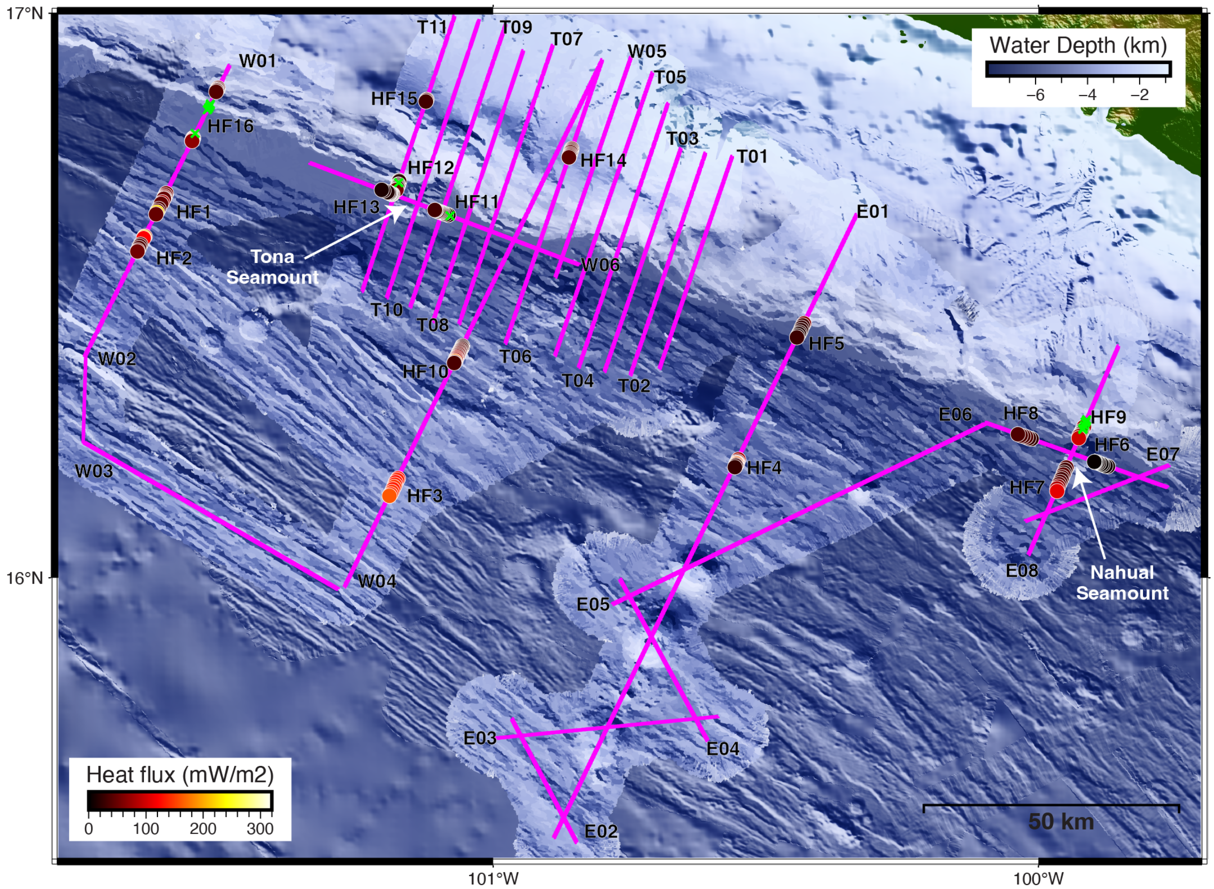

Figure 1: Map of the study area with key sites of the 8-G project labeled. Tracklines for seismic reflection profiles collected during the project (magenta lines) are named near the start of each line. Locations of heat flux penetrations made are colored circles.

Overview

There were many successes in the MGL2514 cruise. Overall, we collected ~1320 km of seismic reflection profiles and made 148 heat flux determinations. Major accomplishments include:

1) acquisition and preliminary processing of seismic reflection profiles along 25 lines ,

2) completion of 59 high-quality heat flux determinations across plate bending normal faults on the Cocos plate which appear to be indicative of lateral heat redistribution within the basaltic basement aquifer and potentially thermally-significant fluid flow along the normal faults,

3) completion of 65 high-quality heat flux determinations at the margins of two seamounts currently in the trench. Exceptionally low heat flux adjacent to Nahual Seamount which decreases towards the basement outcrop is likely indicative of fluid recharge into the seamount in that region. Moderate heat flux adjacent to Tona Seamount which increases towards the basement outcrop may be indicative of fluid discharge from the seamount in the region of those observations,

4) overall, heat flux substantially lower than the expected values for conductively cooled oceanic lithosphere are consistent with the extraction of heat from the crust by ventilated hydrothermal circulation. This affects the thermal state of the subducting crust, and ultimately the temperature distribution in the subduction zone.

We had ~23.5 days of operations from the time we left port until the time we returned. Of this, ~4.5 days were required for transits from/to Manzanillo harbor and between our research sites. Of the remaining time, we had 9.2 days of seismic data acquisition and 9.2 days of heat flow operations. We used ~0.5 days for troubleshooting issues with the winch.

Daily summaries (times in ship time, Central Standard)

Tuesday December 2, 2025

We left port at 18:30. We transited southeast towards a site to conduct a CASIUS calibration for the Sonardyne Ultrashort Baseline system.

Wednesday December 3, 2025

We continued transiting towards the site for the CASIUS calibration. We completed the CASIUS calibration and recovered the beacon. We transited east towards the start of the first seismic reflection profile. At 23:00, we began deploying the seismic streamer.

Thursday December 4, 2025

We deployed the seismic streamer. Then, we deployed the airguns. There was an issue with one of the airguns; it needed to be recovered and trouble-shot, then redeployed. At the beginning of the first seismic profile, there was an issue with the seismic data acquisition (continuous data was not properly being communicated and recorded). Seismic data acquisition resumed, and we continued seismic profile W01. First good shotpoint was SP1409. Turtle shutdown at SP 1269, ramp up again at SP 1301, full volume at SP 1325.

Friday December 5, 2025

We completed seismic profiles W01, W02, W03, and W04. On W03, streamer communication errors occurred from SP 7391 to SP 7406, 17 shots were missed. One W04, there was one MMO detection at SP 9857. Back to full volume at SP 9911. We started seismic profile W05.

Saturday December 6, 2025

We completed seismic profiles W05 and W06. We recovered the guns and streamer. Recovery was ~4.5 hours start to finish. Transit to heat flow station 1 (HF1) and deployed probe for waypoint 101 (HF1 - 101). Lost communication with heat probe, no data packets sent and no heat pulse. Problems with winch spooling, engineers and deck crew repaired (~2 hrs). Recovered probe for troubleshooting.

Sunday December 7, 2025

Re-deployed heat probe and completed 10 additional penetrations at HF1. Recovered probe and transited to heat flow station 2 (HF2).

Monday December 8, 2025

Completed the transit to heat flow station 2. Deployed the heat flow probe and completed 8 penetrations at HF2. Recovered the heat flow probe. Transited to heat flow station 3. Deployed the heat flow probe and started heat flow penetrations at HF3. Heat flow station 3 is the first instance when the heat pulse fired during penetrations.

Tuesday December 9, 2025

We completed heat flow station 3. Then, we recovered the heat flow probe, ending the first suite of heat flow operations. We transited to the beginning of the seismic profiles in the eastern portion of the study area. We deployed the seismic streamer and guns. We began acquisition along seismic profile E01.

Happy Birthday to Isabela!

Wednesday December 10, 2025

We completed seismic acquisition along profiles E01, E02, E03. We started seismic acquisition along profile E04. Smooth acquisitions and no protected species shutdowns. We adjusted line E04 start to drive straight across middle of Cratoria seamount crater.

Thursday December 11, 2025

We completed seismic acquisition along profiles E04, E05, E06, E07, and E08. Anomalous noise on E05 around SP25496 coming in consistently at ~2500 ms for 2-3 shots. Likely a sideswipe from something port or starboard. Increased record length to 9.0 seconds for E06-E08 to image trench sediments and structure in the deepest part of the study area. Glassy seas today, stronger top of water reflection in data. Science party began decking the halls and trimming the tree.

Friday December 12, 2025

Completed acquisition of E08, recovered guns and streamer. E08 acquisition experienced strong currents and slower than typical speed along the line. Transited to heat flow station HF4. Deployed heat probe and began heat flow acquisition.

Saturday December 13, 2025

We completed heat flow station HF4 at ~01:00. We transited to heat flow station HF5, in the trench along seismic profile E01. We completed station HF5. We transited to heat flow station HF6, on the east side of a seamount in the trench in the eastern edge of the study area. We started heat flow station HF6. Busy day with heat flow. The heat flow probe is collecting good data, and heat pulses are routinely firing in the sediment (and not firing in the water column – all good). The only issue with the heat flow probe has been intermittent communication from the probe to the transducer on the ship. This is likely due to the deep water (~4100 m at HF 4; >5600 m at HF5). We are receiving position data for the probe more commonly than temperature and tilt data, but in the deepest water even the position data is intermittent.

Sunday December 14, 2025

We completed heat flow station HF6 on the east side of Nahual Seamount. We transited to heat flow station HF7 on the south side of Nahual Seamount. We deployed the probe and started heat flow station HF7.

Monday December 15, 2025

We completed heat flow station HF7. We transited to heat flow station HF8, west of Nahual Seamount. We deployed the probe and completed station HF8. We transited to heat flow station HF9, on the margin wedge north of Nahual Seamount. We deployed the probe and started data collection at HF9. Penetrations seemed difficult (based on low/no pull-out tension) in the upper portion of the heat flow station. For several of the penetrations on the lower portions of the slope the data stream from the probe worked and we could observe that the probe was penetrating the seafloor (at least partially).

Tuesday December 16, 2025

We completed the penetrations at heat flow station HF9 at ~05:30 and began recovering the probe to the deck. There were problems with the winch that required securing the wire to the probe and unspooling ~400 m of wire on deck, then re-wrapping the wire on the drum. Recovery of the probe continued until the probe was at ~2500 m water depth at which point the winch stopped working. The chief engineer and crew worked to troubleshoot the winch and get it operational again. Once the winch was operational (~8.5 hours after problems began), we finished recovering the heat flow probe. Then, we transited towards the beginning of seismic profile T01. We deployed the seismic streamer and sources. We continued transiting towards the beginning of seismic profile T01.

Wednesday December 17, 2025

We finished transiting to the beginning of seismic profile T01. Seismic acquisition began with ramp-up to full volume and the start of T01 at SP41471. Due to a magnetometer fault, the Maggie was recovered, then later redeployed once conditions allowed. Line T01 was completed successfully. Following completion of the line, sources were disabled and ramped up for Line T02, SOL at SP45417. Sources were again disabled between line acquisitions and during the turns. Later in the day, sources were again ramped up and Line T03 was started at SP48515.

We acquired as much data as possible on the northern extensions of the profiles, before hitting 1000 m depth. Our permitting does not allow shooting in water depth <1000 m.

TLDR: We acquired seismic data along profiles T01, T02, and T03.

Thursday December 18, 2025

Seismic operations continued with the completion of line T03 in the early morning hours, after which all sources were secured. Following a standard ramp-up, acquisition began on T04 (SP51341) and proceeded steadily through the morning. The line was completed around midday and sources were again silenced.

Early afternoon operations included ramp-up and the start of T05 (SP54343). During acquisition, a shutdown was required following a PSO detection (shutdown from SP55537-SP55556). After clearance, operations returned to full volume. Later in the line, a second shutdown was implemented due to a turtle sighting, with a precautionary 15-minute silence period as the animal was not observed leaving the area (shutdown from SP56163-SP56251).

Line T05 was completed in the evening and all sources were secured. Late-night operations included ramp-up and the start of T06 (SOL-SP59656).

TLDR: We completed seismic data acquisition along profile T03. We acquired seismic data along profiles T04, T05 and T06. Two protected species shutdowns.

Friday December 19, 2025

Seismic acquisition continued overnight with the completion of T06 in the early morning hours, after which all sources were secured. Following a standard ramp-up, operations resumed with the start of T07 (SP60392), and acquisition proceeded through the morning.

Line T07 was completed in the early afternoon and the guns were secured. After a subsequent ramp-up, acquisition began on T08 (SP63322), which continued through the afternoon and evening hours. The line was completed later that night, and all sources were again secured.

Late-night operations included another ramp-up and the start of T09 (SP66341).

Happy Birthday to Jose Angel!

TLDR: We completed T06, T07, T08, and began T09.

Saturday December 20, 2025

Seismic acquisition continued overnight with the completion of T09 in the early morning hours. We started T10 (SP69394) and completed this sequence in the mid-morning. Acquisition proceeded on to T11 (SP72421). Seismic operations completed around 1700 local time.

Happy Solstice! Lunch BBQ on the muster deck today, great weather, great food, great folks!

We transited to heat flow station HF10 and deployed the heat flow probe.

Sunday December 21, 2025

We completed heat flow station HF10. We transited to heat flow station HF11. We started heat flow station HF11.

Monday December 22, 2025

We completed heat flow station HF11. We transited to heat flow station HF12. We completed heat flow station HF12. We transited to heat flow station HF13. We started heat flow station HF13.

Tuesday December 23, 2025

We completed heat flow station HF13. We transited to heat flow station HF14. We started heat flow station HF14. While lowering the heat flow probe at station HF14, there were some bad wraps on the winch that required troubleshooting (~3 hours). We completed 3 penetrations at station HF14, then began recovering the probe.

Wednesday December 24, 2025

We recovered the heat flow probe, completing station HF14. We transited to heat flow station HF15. We completed station HF15. We transited to heat flow station HF16. We deployed the probe and started station HF16 on the margin wedge north of the trench along seismic profile W01. Heat flow station HF16 extended from the deformation front, across the trench, to a portion of the incoming Cocos plate with some prominent normal faulting.

Thursday December 25, 2025

Akin to a plot point in The Polar Express, we completed “the first heat flow penetration of Christmas”. We completed heat flow station HF16. We recovered the heat flow probe, secured it to deck, and began transiting to the port of Manzanillo.

Friday December 26, 2025

We arrived in the port of Manzanillo (including a phenomenal show by two breaching humpback whales only a few hundred meters outside of the harbor). End of cruise.

Seismic reflection report

Seismic data acquisition and processing was led by Lindsay Worthington (University of New Mexico) with assistance from the rest of the Science Party. High resolution seismic reflection data were acquired using the Langseth high-resolution system. The seismic source consisted of two 45/105 in^3 GI guns (total volume of 90 in^3) towed at a depth of 3 m. The receiver array was 4010 m streamer with 648 channels, towed at a depth of 4 m. Shot spacing was 25 m, channel spacing was 6.25 m. This configuration resulted in a nominal common depth point spacing of 3.125 m and data fold of 81 traces.

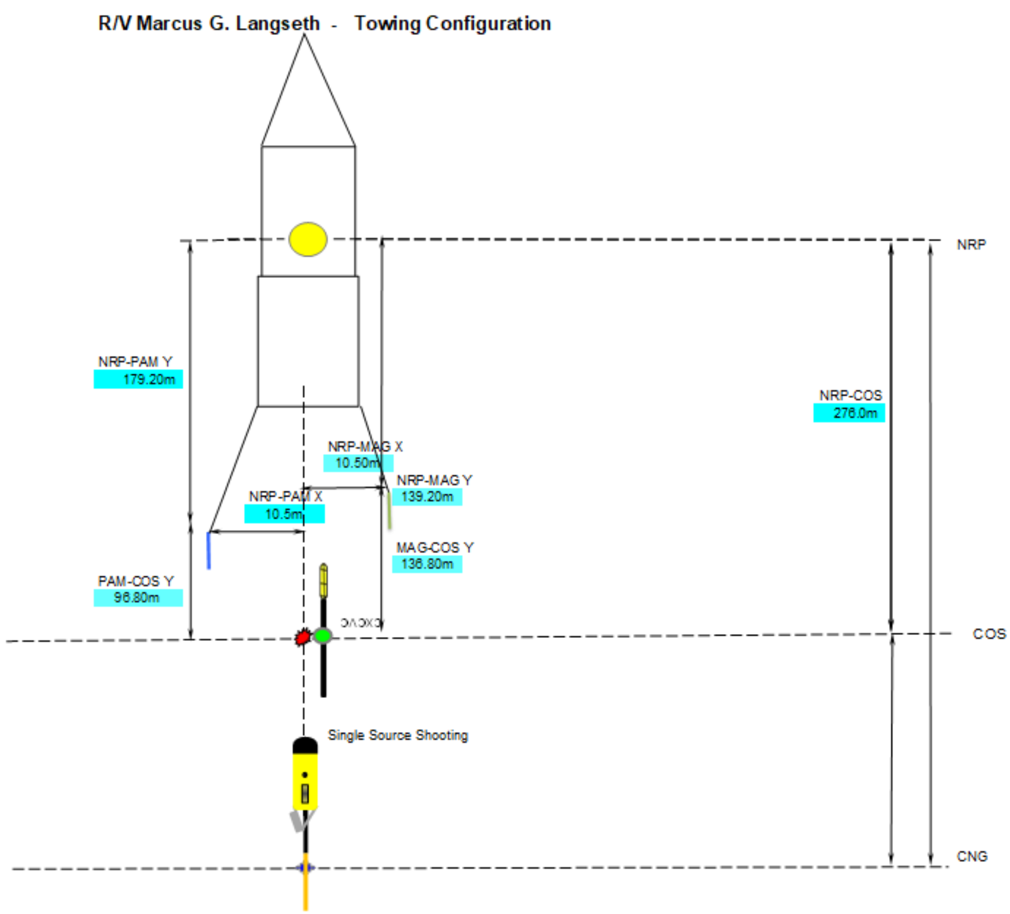

Figure 2: Towing configuration.

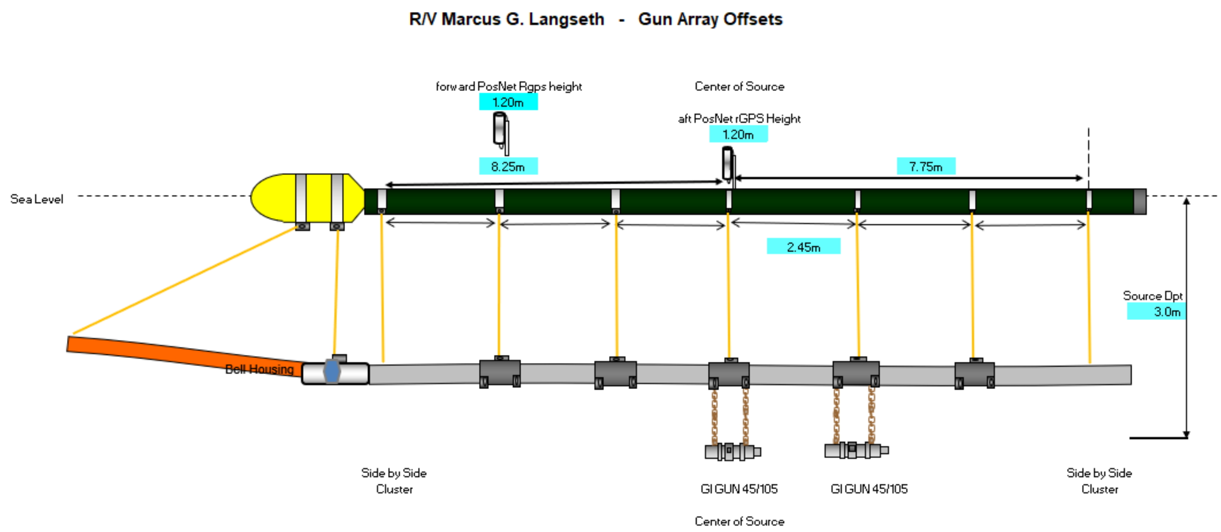

Figure 3: Seismic source array configuration.

Table 1: General Geometry of MGL2514 Seismic Acquisition

Shot spacing (m)	25
Channel spacing (m)	6.25
Number of channels	648
CMP spacing (m)	3.125
Maximum traces per CMP	81

Seismic Parameters

Seismic Recording Systems

Recording type	Sercel SEAL 428
Sample rate	0.5 ms
Recording length	8-9 sec
Low Cut Filter	3.0 Hz Digital Filter / 12 dB/OCT
High Cut Filter	200 Hz Digital Filter /276 dB/OCT w/ linear phase
Data format	SEG-D 8058 Rev1 demultiplexed with External Header.
Media	Data recorded directly to disk

Seismic Streamer

Streamer type	Sercel Sentinel SSAS
No of streamers	1
Streamer length	4050m
No of groups	648
Group Interval	6.25 m
Group length	6.25 m
Streamer depth	4 m
Near offset	140m/110m
Spacing of birds	~300 meters with extra redundancy at head and tail of streamer

Seismic Source

Source type	BOLT Air-Sound Source
Source System	Gun Link 2000
Shot interval	25 m
Number Sources	1
Source depth	3 m
Volume	90 in3
Air pressure	1900 +/- 100 psi
Source separation	NA
Sub Array separation	NA
Max timing error	+/- 2 ms

Processing Summary

The science party completed preliminary processing of multi-channel seismic data up to migrated velocity stacks. We used Reveal processing software installed on the onboard servers and licensed through LDEO. All science party members participated in seismic processing. Initial background and training for processing was done during a 2-day, pre-cruise workshop in October 2025 that included lectures on cruise objectives and seismic processing and hands on interpretation practice using Kingdom Seismic Suite licensed through University of New Mexico. Additional processing procedures were discussed throughout the cruise via one-on-one student meetings and were summarized via student presentations on deconvolution and velocity analysis towards the end of the cruise.

The co-chief scientists developed a standard workflow for baseline data products (up to post-stack migrated sections) and created logsheets to help organize the processing steps. Beyond the basic workflow, students were encouraged to explore different parameters and processing steps to follow their interests, including velocity analysis.

The basic workflow was as follows:
• Raw SEG-D files were read into Reveal
• A 2.5-D geometry was established using the processed P190 navigation files and stacking bins created every 3.125 m
• Filtering and other data cleaning steps were applied, which included trace editing, bandpass filtering and noise suppression
• Spherical divergence corrections
• Brutestack using 1490 m/s and time migration
• Velocity analysis every 200-500 CDP
• Stacking and post-stack time migration using stacking velocities

We also exported SEGY files of the unprocessed shots with geometry updated in the headers and the post-stack time migrated sections. Shot data, raw SEG-D, P190, and processed SEG-Y files will be archived with the Academic Seismic Portal maintained at the LDEO.

Preliminary Outcomes

The primary objective of the seismic imaging was to identify heat flow probe locations and provide structural context for the heat flow measurements. Heat flow locations were chosen given adequate sediment depth above basement to avoid direct contact with bedrock that would damage the probe. We also chose locations that sampled different oceanic plate ages, distances from the trench and different structural features such as seamount flanks, plate-bending oceanic normal faults and thrust fault sections on the accretional wedge.

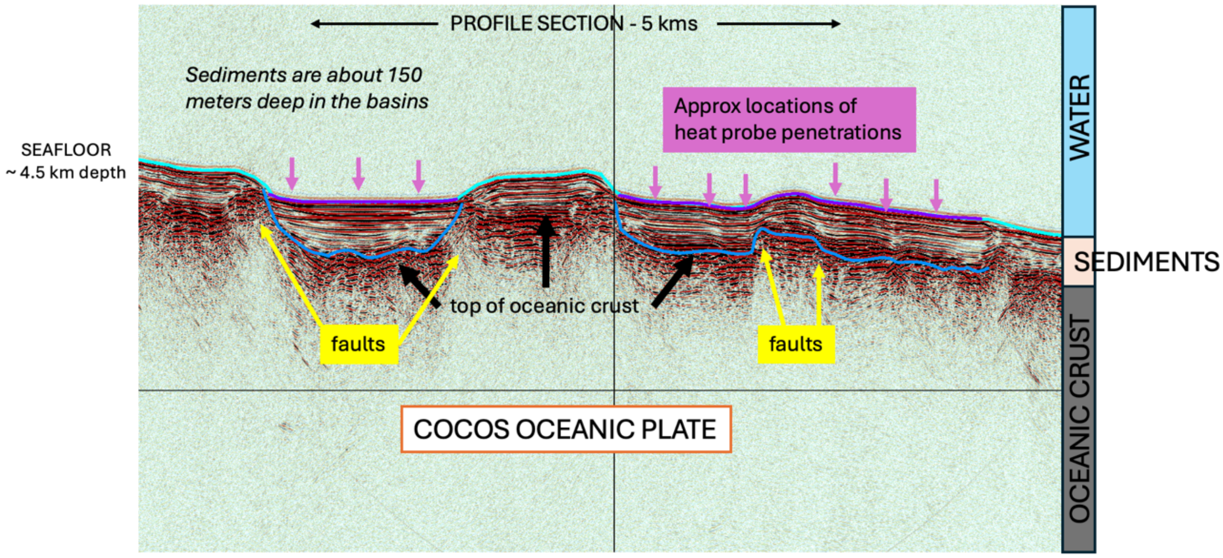

Figure 4: Preliminary interpretation and data example from profile W01, outboard of the subduction trench, showing heat flow probe sites in areas with adequate sediment coverage and near faults and basement outcrops.

Data quality was high throughout the survey, with consistent depth penetration of up to 3-4 seconds two-way travel time below the seafloor. We interpreted the seafloor, shallow stratigraphic features, fault structures and the sediment-basement contact throughout the survey. At the trench, the full trench fill sediment package was imaged and many trench-crossing profiles showed the shallow plate interface up to 9s total two-way travel time. We were also able to resolve features within the basaltic oceanic basement that may be related to layering of successive lava flows while the plate was built at the mid-ocean ridge or other volcanism after the plate was formed.

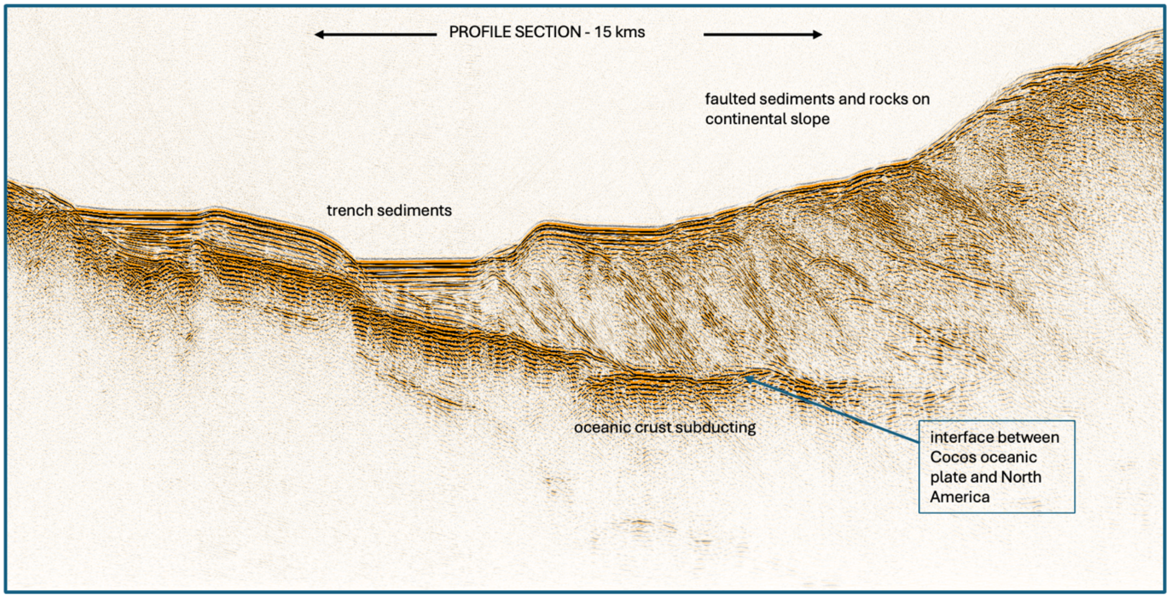

Figure 5: Data example from post-stack migrated seismic section, T01. We identify faulted oceanic basement, sediment layering above the oceanic basement, the trench sediment fill, subduction oceanic crust, internal layering within the oceanic crust, and faulted sediments on the continental slope.

Heat flow report

The heat flow team was led by G. Spinelli (New Mexico Tech) and Mandy Kiger (Oregon State), with assistance from the rest of the Science Party. The primary goal of the heat flow program was to collect data to characterize the thermal state of the Cocos plate entering the subduction zone and to test for the presence of hydrothermal circulation, helping constrain the nature and extent of thermally significant fluid circulation within the basaltic basement aquifer of the oceanic crust just seaward of the deformation front. This objective involved measuring heat flow along transects over plate bending normal faults and adjacent to the edges of basement outcrops (e.g., seamounts), collocated with seismic data from which sediment thickness data could be determined, followed by analytical and numerical modeling to determine patterns of fluid flow necessary to generate observed thermal conditions.

The primary tool used for collection of new heat flow data was a multipenetration heat flow probe (MHFP) consisting of a 3.5-m, 17-thermistor, violin-bow heat flow system. Temperature time series used for both the determination of the thermal gradient and thermal conductivity are logged into solid-state memory in a data logger located in the probe weight stand. Temperatures were recorded every second. Other parameters logged by the system include time, bottom water temperature, a stable reference resistance, and acceleration that is used to derive tilt and arm/trigger the heat pulse for thermal conductivity measurements. Acoustic telemetry and probe position data were acquired using the Sonardyne Ranger 2 system. Probe position data is relayed to the ship every second and a subset of probe data is transmitted to the ship every 10 seconds. This subset of data is enough to ensure the probe is operating correctly and gives a quantitative indication of the thermal gradient during each penetration.

Most heat flow stations consisted of 8-14 measurements separated by approximately 200-500 m. MHFP operations were run from the starboard side using the A-frame, trawl wire and traction winch. Crew members ran the winch at the direction of the science party. Deployments and recoveries of the probe were safe, efficient, and quick. A pinger was attached to the trawl wire 75 m above the MHFP weight stand. After arriving at each way point, the probe was allowed to settle until it got to within 200 m of the ship position. MHFP measurements were made by lowering the heat flow probe into the seafloor at a rate of 60 m/min. Tool penetration was typically followed by 7 minutes during which the thermistor tube approaches thermal equilibrium with the surrounding sediments. A calibrated heat pulse was automatically fired when the acceleration sensor sensed stability during the 7 minute equilibration period, and the thermal response of the thermistor tube was monitored to determine in-situ thermal conductivity. An accelerometer was used to monitor stability. In most cases, heat pulses were not generated in the water column and were generated during a penetration. Final parameters for the heat pulse are stored in the data files. After a measurement was completed, the probe was raised approximately 100 m above the seafloor while the ship transited at ~1 kt to the next site.

Multipenetration heat flow data were parsed into individual penetration files and processed using SlugHeat**,** a Matlab program based on the hfred/hflow set of processing programs (Dickerson *et al.*, 2024). Additional analysis will be required to finalize the heat flow values listed in this report (Table A-2), but values are unlikely to change by more than a few percent as a result of reanalysis. At this stage, no corrections have been applied for sedimentation, or local topography.

A listing of heat flow measurement locations and other information is presented in Table A-3, and plots showing locations and preliminary values are shown in Figures 6-8. A total of 148 successful heat flow measurements were made. In-situ thermal conductivity was determined during most tool penetrations, and data were generally of high quality. Final processing of MGL2514 data will require a careful assessment of data quality.

Although this cruise report is publicly available soon after completion of the cruise, access to Table A-2 (*i.e.,* with the heat flux determinations) is restricted until 2 years after the end of the cruise (December 26, 2025). For more information, please contact Chief Scientist Glenn Spinelli directly.

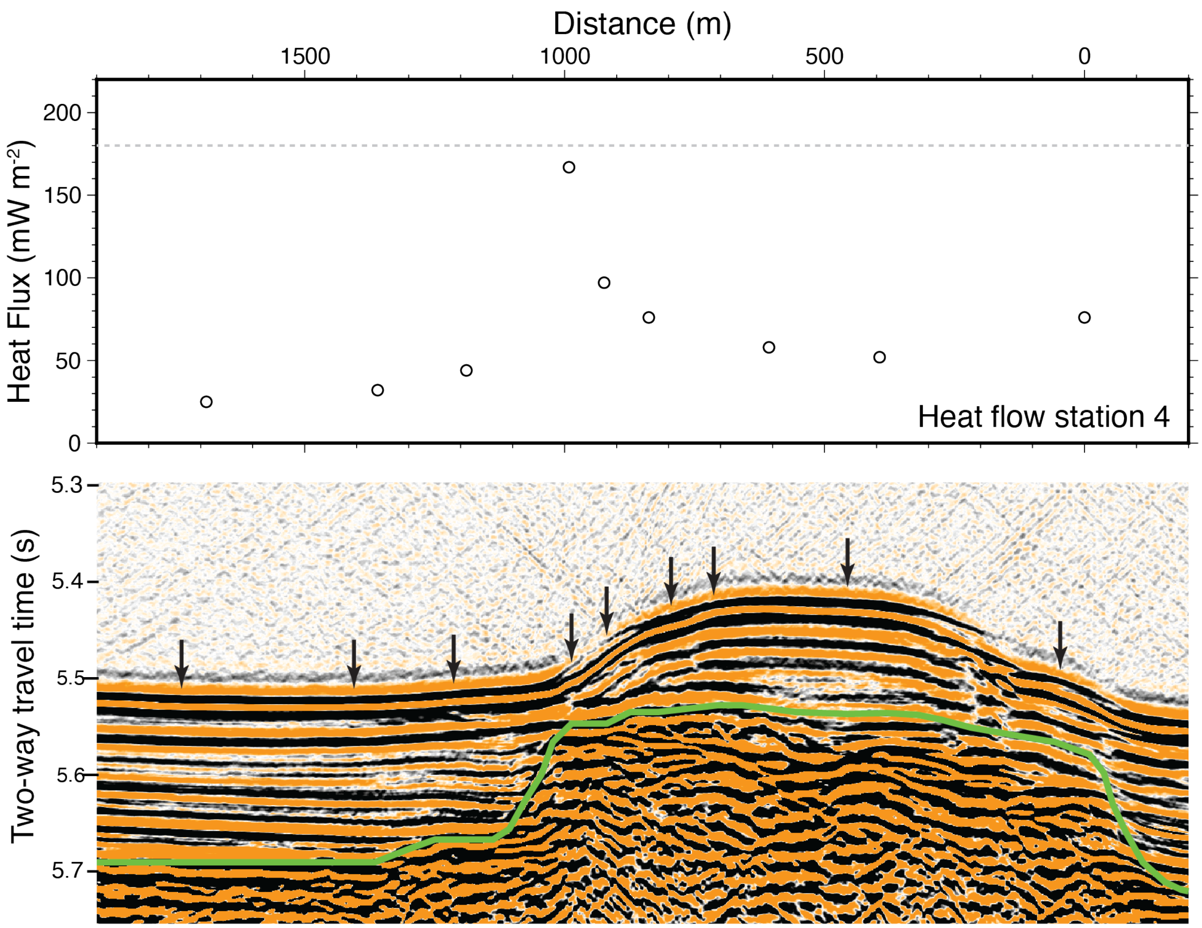

Figure 6: Summary of heat flux determinations at station HF4, along seismic profile E01, crossing bending-related normal faults on the Cocos plate. The heat flux determinations (upper panel) are aligned with the portion of the seismic reflection profile shown in the lower panel. Locations of the heat flux penetrations along the seismic profile are shown with arrows at the seafloor. The green line is the sediment-basement interface. The dashed line in the upper panel is the surface heat flux that is predicted for conductively cooled oceanic crust ~7.7 million years old.

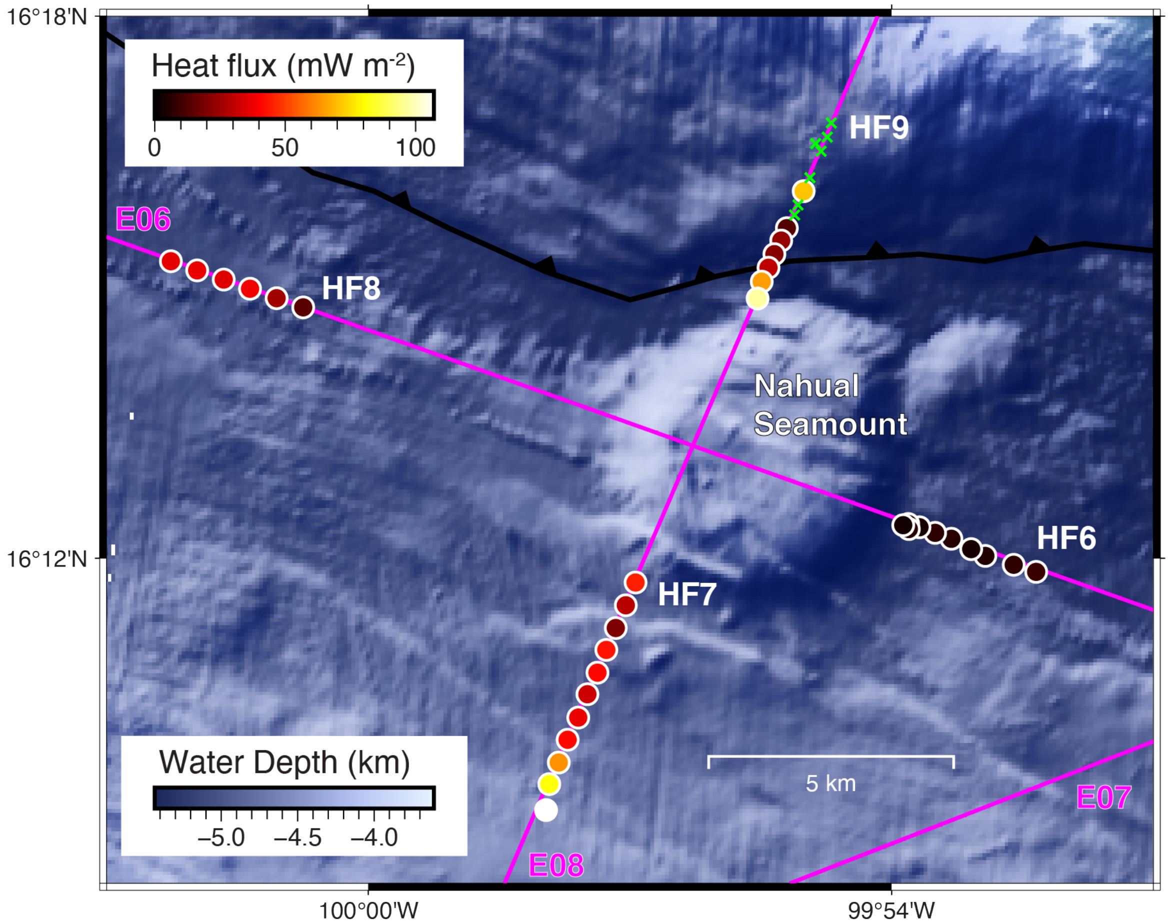

Figure 7: Map summarizing heat flux determinations around Nahual Seamount, along seismic profiles E06 and E08. Nahual Seamount is in the trench (deformation front indicated with black line with hatches) near the eastern end of the study area. Heat flux east of Nahaul Seamount (station HF6) is exceptionally low. Penetrations with the heat flow probe on the toe of the margin wedge at station HF9 were difficult; green x's show locations of failed penetration attempts.

Auxiliary Data Sets

In addition to the primary seismic reflection and heat flux data, auxiliary data sets were recorded. These data are archived through the Rolling Deck to Repository website, which also includes a copy of this cruise report.

XBTs

Expendable Bathythermographs (XBTs) were generally taken once per day to provide sound velocity profiles through the water column for processing the multibeam data. A summary of the XBT casts is provided in Table A-4.

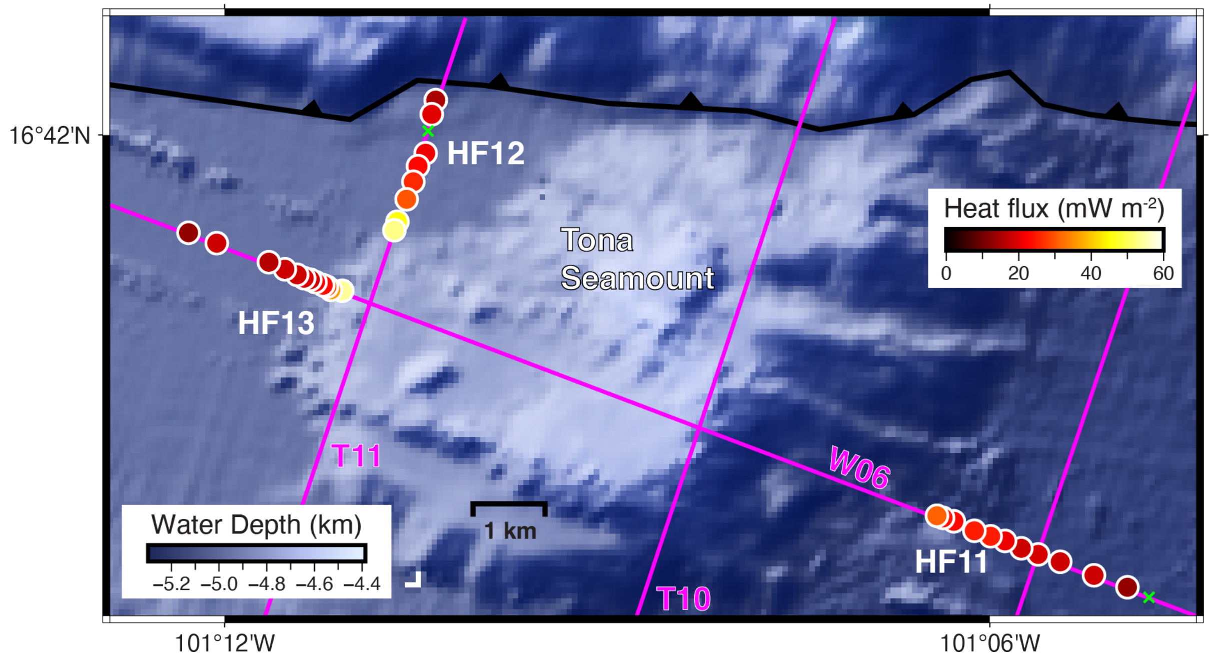

Figure 8: Map summarizing heat flux determinations around Tona Seamount, along seismic profiles W06 and T11. Tona Seamount is in the trench (deformation front indicated with black line with hatches) in the central portion of the study area. For all 3 heat flow stations around Tona Seamount, heat flux increases modestly approaching the basement outcrop.

Multibeam

The EM-122 swath bathymetry system was operated during transits. The system recorded water depth, seafloor reflectivity, and water column data. The sound velocity profile was updated approximately daily using data from XBTs. The EM-122 data are available through the Rolling Deck to Repository website.

3.5 kHz subbottom profiler

The 3.5 kHz subbottom profiler operated during most of the cruise, except during heat flux operations when the 12 kHz transducer was used to "listen" to the 12 kHz bottom-finding pinger attached to the wire 50 m above the heat flow probe. Data were recorded in native Knudsen "keb" format and can be played back using Knudsen's software package PostSurvey.

Gravity

Gravity data were collected throughout the cruise using a Bell BGM-3 gravimeter. These data are available from the Rolling Deck 2 Repository website.

ADCP
ADCP data were acquired throughout the cruise and are available through the Rolling Deck 2 Repository website.

Meteorological data
Meteorological data were collected with a Viasala WXT-520 weather station. Standard meteorological data from the cruise are available through the Rolling Deck 2 Repository website.

Acknowledgments
We thank the officers and crew of the *R/V Marcus G. Langseth* cruise MGL2514 for their assistance. This work was supported by the NSF OCE-2234705 (GAS), and OCE-2234706 (LLW).

Table A-1: Line log for seismic data.

		Start of Line					End of Line					
Seq. #	Line #	Time (UTC)	Latitude	Longitude	File #	Shot #	Time (UTC)	Latitude	Longitude	File #	Shot #	Length (km)
1	W01	2025-12-04T23:08:34	16.3923	-101.7496	1	1491	2025-12-05T06:38:54	16.9079	-101.4837	2513	4003	63.9
2	W02	2025-12-05T06:40:50	16.2390	-101.7522	2514	5015	2025-12-05T08:35:04	16.3973	-101.7474	3179	5680	17.6
3	W03	2025-12-05T08:37:23	15.9798	-101.2847	3180	6025	2025-12-05T15:23:37	16.2399	-101.7499	5434	8295	57.5
4	W04	2025-12-05T15:32:48	16.9167	-100.8005	5435	9058	2025-12-06T04:13:53	15.9839	-101.2729	9994	13634	115.2
5	W05	2025-12-06T05:06:27	16.5334	-100.8860	9995	13971	2025-12-06T10:22:22	16.9221	-100.7474	11799	15775	45.6
6	W06	2025-12-06T12:07:28	16.7356	-101.3365	11800	16392	2025-12-06T19:24:53	16.5553	-100.8425	14019	18611	56.2
7	E01	2025-12-09T23:36:47	15.5379	-100.8888	14046	19870	2025-12-10T15:06:24	16.6441	-100.3333	19446	25276	136.5
8	E02	2025-12-10T16:47:52	15.7494	-100.9660	19447	25838	2025-12-10T19:47:09	15.5294	-100.8469	20509	26900	27.6
9	E03	2025-12-10T21:18:00	15.7151	-100.9934	20510	26843	2025-12-11T02:19:56	15.7534	-100.5875	22228	28561	43.6
10	E04	2025-12-11T03:37:45	15.9974	-100.7673	22229	29342	2025-12-11T07:35:30	15.7108	-100.6070	23645	30759	36.2
11	E05	2025-12-11T09:30:58	16.2730	-100.0981	23646	31383	2025-12-11T18:54:59	15.9529	-100.7810	26869	34606	81.1
12	E06	2025-12-11T19:00:32	16.1603	-99.7626	26870	35520	2025-12-11T23:42:17	16.2758	-100.0981	28367	37017	38.0
13	E07	2025-12-12T00:58:29	16.1007	-100.0236	28368	37273	2025-12-12T04:55:03	16.2000	-99.7603	29546	38451	30.2
14	E08	2025-12-12T06:34:58	16.4114	-99.8530	29547	39192	2025-12-12T12:40:59	16.0412	-100.0179	31295	40940	44.7
15	T01	2025-12-17T07:46:31	16.3711	-100.6951	31296	41471	2025-12-17T13:09:15	16.7474	-100.5616	33021	43196	44.2
16	T02	2025-12-17T14:49:13	16.7537	-100.6105	33022	45417	2025-12-17T20:27:53	16.3591	-100.7486	34828	47223	46.2
17	T03	2025-12-17T22:51:53	16.3657	-100.7959	34829	48515	2025-12-18T04:45:57	16.7613	-100.6558	36642	50328	46.4
18	T04	2025-12-18T05:43:20	16.8411	-100.6795	36643	51341	2025-12-18T12:31:38	16.3731	-100.8433	38802	53500	54.8
19	T05	2025-12-18T13:59:59	16.3939	-100.8870	38803	54343	2025-12-18T21:07:47	16.8950	-100.7080	41119	56659	58.9
20	T06	2025-12-18T22:43:03	16.9179	-100.8001	41120	59656	2025-12-19T05:50:21	16.4159	-100.9778	43435	57341	58.9
21	T07	2025-12-19T07:37:08	16.4508	-101.0625	43436	60392	2025-12-19T14:38:34	16.9436	-100.8907	45702	62658	57.7
22	T08	2025-12-19T15:35:20	16.9340	-100.9449	45703	63322	2025-12-19T22:47:48	16.4543	-101.1106	48039	65658	56.1
23	T09	2025-12-19T23:47:58	16.4801	-101.1523	48040	66341	2025-12-20T06:56:22	16.9811	-100.9768	50357	68658	58.7
24	T10	2025-12-20T08:04:14	16.9896	-101.0255	50358	69394	2025-12-20T15:04:51	16.4964	-101.1954	52622	71658	57.7
25	T11	2025-12-20T16:16:32	16.5078	-101.2406	52623	72421	2025-12-20T23:11:43	16.9949	-101.0710	54860	74658	57.0

Table A-2. Summary of heat flux measurements (will be made available 1 year after completion of the cruise).

Table A-3. Summary of heat flux measurement locations, number of sensors with usable data

Heat flow station	Penetration #	Latitude	Longitude	# of sensors [a]	Notes
HF1	1	16.6814	-101.5999	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	2	16.6780	-101.6014	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	3	16.6755	-101.6029	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	4	16.6734	-101.6035	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	5	16.6720	-101.6043	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	6	16.6657	-101.6075	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	7	16.6629	-101.6090	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	8	16.6542	-101.6139	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	9	16.6510	-101.6156	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	10	16.6482	-101.6171	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF1	11	16.6445	-101.6188	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	1	16.6055	-101.6394	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	2	16.6041	-101.6403	17	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values

HF2	3	16.6021	-101.6412	14	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	4	16.5915	-101.6470	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	5	16.5886	-101.6484	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	6	16.5853	-101.6501	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	7	16.5812	-101.6520	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF2	8	16.5789	-101.6530	16	Assumed K trend (no heat pulse); k vs z trend from HF3-->HF8 values
HF3	1	16.1767	-101.1750	17	
HF3	2	16.1737	-101.1765	16	
HF3	3	16.1693	-101.1787	17	
HF3	4	16.1652	-101.1806	17	
HF3	5	16.1614	-101.1822	16	
HF3	6	16.1571	-101.1842	17	
HF3	7	16.1526	-101.1861	17	
HF3	8	16.1486	-101.1884	17	
HF3	9	16.1454	-101.1904	16	
HF4	1	16.2100	-100.5502	17	
HF4	2	16.2066	-100.5514	17	
HF4	3	16.2046	-100.5528	17	
HF4	4	16.2038	-100.5529	17	
HF4	5	16.2029	-100.5535	17	
HF4	6	16.2023	-100.5538	17	
HF4	7	16.2005	-100.5543	16	
HF4	8	16.1991	-100.5554	16	
HF4	9	16.1964	-100.5567	16	
HF5	1	16.4512	-100.4299	17	
HF5	2	16.4477	-100.4321	16	
HF5	3	16.4437	-100.4341	14	
HF5	4	16.4397	-100.4361	13	
HF5	5	16.4356	-100.4382	14	
HF5	6	16.4326	-100.4397	14	
HF5	7	16.4296	-100.4412	14	
HF5	8	16.4266	-100.4427	17	
HF6	1	16.1975	-99.8725	16	
HF6	2	16.1988	-99.8767	15	
HF6	3	16.2004	-99.8821	15	
HF6	4	16.2017	-99.8848	14	
HF6	5	16.2036	-99.8886	15	
HF6	6	16.2047	-99.8917	15	
HF6	7	16.2057	-99.8947	16	
HF6	8	16.2063	-99.8968	16	
HF6	9	16.2054	-99.8967	16	
HF6	10	16.2061	-99.8978	16	
HF7	1	16.1955	-99.9489	15	

HF7	2	16.1913	-99.9508	17	
HF7	3	16.1871	-99.9527	17	
HF7	4	16.1831	-99.9545	17	
HF7	5	16.1789	-99.9562	17	
HF7	6	16.1749	-99.9581	17	
HF7	7	16.1706	-99.9599	17	
HF7	8	16.1665	-99.9619	16	
HF7	9	16.1623	-99.9636	17	
HF7	10	16.1583	-99.9654	17	
HF7	11	16.1535	-99.9660	17	
HF8	1	16.2463	-100.0124	17	
HF8	2	16.2480	-100.0175	16	
HF8	3	16.2497	-100.0226	16	
HF8	4	16.2514	-100.0276	17	
HF8	5	16.2531	-100.0327	17	
HF8	6	16.2548	-100.0377	17	
HF9	1	16.2803	-99.9115		tipped over
HF9	2	16.2777	-99.9123	2	very high tilt
HF9	3	16.2751	-99.9135		tipped over
HF9	4	16.2765	-99.9145		tipped over
HF9	5	16.2702	-99.9156	8	probe tipped over more during measurement; probably unreliable
HF9	6	16.2677	-99.9168	5	
HF9	7	16.2652	-99.9179		tipped over
HF9	8	16.2633	-99.9185		tipped over
HF9	9	16.2608	-99.9200	14	
HF9	10	16.2586	-99.9211	8	
HF9	11	16.2560	-99.9224	12	
HF9	12	16.2535	-99.9235	17	
HF9	13	16.2510	-99.9248	17	
HF9	14	16.2479	-99.9256	17	
HF10	1	16.4111	-101.0568	16	
HF10	2	16.4094	-101.0574	16	
HF10	3	16.4075	-101.0583	16	
HF10	4	16.4053	-101.0595	17	
HF10	5	16.4031	-101.0607	17	
HF10	6	16.4011	-101.0619	17	
HF10	7	16.3993	-101.0628	17	
HF10	8	16.3971	-101.0640	17	
HF10	9	16.3950	-101.0650	17	
HF10	10	16.3931	-101.0661	17	
HF10	11	16.3907	-101.0674	17	
HF10	12	16.3889	-101.0681	17	
HF10	13	16.3870	-101.0689	17	
HF10	14	16.3847	-101.0699	17	
HF10	15	16.3826	-101.0708	17	
HF10	16	16.3809	-101.0715	17	
HF11	1	16.6418	-101.0792		did not penetrate; probe tipped over
HF11	2	16.6431	-101.0820	12	
HF11	3	16.6446	-101.0864	15	

HF11	4	16.6463	-101.0908	12	
HF11	5	16.6472	-101.0937	12	
HF11	6	16.6480	-101.0959	14	
HF11	7	16.6489	-101.0980	12	
HF11	8	16.6495	-101.0999	17	
HF11	9	16.6502	-101.1020	15	
HF11	10	16.6514	-101.1047	15	
HF11	11	16.6518	-101.1061	9	
HF11	12	16.6521	-101.1069	11	
HF12	1	16.7044	-101.1724	8	
HF12	2	16.7026	-101.1729	7	
HF12	3	16.7005	-101.1734	16	high tilt
HF12	4	16.6977	-101.1737	11	
HF12	5	16.6961	-101.1747	12	
HF12	6	16.6941	-101.1753	9	
HF12	7	16.6919	-101.1762	9	
HF12	8	16.6891	-101.1774	9	
HF12	9	16.6880	-101.1778	8	
HF13	1	16.6804	-101.1846	11	
HF13	2	16.6805	-101.1861	12	
HF13	3	16.6809	-101.1866	12	
HF13	4	16.6811	-101.1871	11	
HF13	5	16.6815	-101.1881	11	
HF13	6	16.6818	-101.1888	9	
HF13	7	16.6820	-101.1896	9	
HF13	8	16.6824	-101.1905	9	
HF13	9	16.6831	-101.1921	17	
HF13	10	16.6840	-101.1942	16	
HF13	11	16.6864	-101.2010	7	
HF13	12	16.6877	-101.2047	9	
HF14	1	16.7602	-100.8561	17	
HF14	2	16.7582	-100.8569	17	
HF14	3	16.7561	-100.8577	16	
HF14	4	16.7540	-100.8583	16	
HF14	5	16.7518	-100.8590	17	
HF14	6	16.7496	-100.8595	17	
HF14	7	16.7476	-100.8602	17	
HF14	8	16.7455	-100.8609	13	
HF15	1	16.8474	-101.1224	15	
HF15	2	16.8461	-101.1229	17	
HF15	3	16.8441	-101.1236	14	
HF16	1	16.8677	-101.5050	17	
HF16	2	16.8663	-101.5057	17	
HF16	3	16.8648	-101.5066	17	
HF16	4	16.8634	-101.5078	17	
HF16	5	16.8614	-101.5084	17	
HF16	6	16.8397	-101.5191		tipped over
HF16	7	16.8376	-101.5193		tipped over

HF16	8	16.8343	-101.5212	6	pulled before heat pulse
HF16	9	16.8314	-101.5229		tipped over
HF16	10	16.8295	-101.5244		
HF16	11	16.7877	-101.5469	15	high tilt; pulled or slipped during heat pulse
HF16	12	16.7798	-101.5506	17	
HF16	13	16.7780708	-101.5513	17	
HF16	14	16.7770	-101.5517	17	
HF16	15	16.7759	-101.5517	17	
HF16	16	16.7754	-101.5522	13	
HF16	17	16.7743649	-101.5525	16	

a – Number of sensors that penetrated the seafloor and appear to have provided useful data.

Table A-4. Summary of XBT casts.

Event	Date	Time	Latitude	Longitude	Notes
Drop 01	12/3/25	09:50	17.752600 N	102.509497 W	Max depth 577 m
Drop 02	12/4/25	18:55	16.786853 N	101.548266 W	Max depth 373 m; failed
Drop 03	12/4/25	18:59	16.781772 N	101.550841 W	Max depth 2146 m
Drop 04	12/5/25	19:00	16.685386 N	100.919658 W	Failed
Drop 05	12/5/25	19:05	16.691414 N	100.916644 W	Failed
Drop 06	12/5/25	20:15	16.775555 N	100.874455 W	Max depth 2160 m
Drop 07	12/7/25	23:03	16.661072 N	100.611585 W	Max depth 2150 m
Drop 08	12/9/25	02:43	16.172415 N	101.178205 W	Max depth 2186 m
Drop 09	12/10/25	02:14	16.466575 N	100.425981 W	Max depth 2043 m
Drop 10	12/11/25	00:20	15.915796 N	100.720315 W	Max depth 2068 m
Drop 11	12/12/25	00:36	16.049348 N	100.002270 W	Failed
Drop 12	12/12/25	04:23	16.280705 N	99.913431 W	Failed
Drop 13	12/14/25	22:12	16.162003 N	99.964064 W	Max depth 2181 m
Drop 14	12/16/25	16:17	16.307761 N	99.992852 W	Failed
Drop 17	12/17/25	18:33	16.644096 N	100.704534 W	Max depth 2105 m
Drop 18	12/19/25	22:34	16.640094 N	101.097449 W	Max depth 2133 m
Drop 19	12/21/25	02:15	16.404951 N	101.060089 W	Max depth 2284 m

Table A-3. Ship Crew

#	Name	Position
1	Breck Crum	Master
2	Dave Abbott	Chief Mate
3	Samuel Jacobs	2nd Mate
4	Katherine Dabrow	3rd Mate
5	Ricardo Redito	Bosun
6	Jennifer Dillon	AB
7	Gary Curry	AB
8	Maurquise Brown	OS
9	Jay Butler	Chief Engineer
10	Fernando Biwer-Paz	1 A/Engineer
11	Kyle Chernoff	2nd A/Engineer
12	Trevor Hodges	3rd A/Engineer
13	Robert Headd	Oiler
14	Jessie Lewis	Oiler
15	Terrex Houston	Oiler
16	James Davis	Steward

17	Gabriel Cook	Cook
18	Ryan Dreis	Jr Engr
19	Marcellus Clay	Utility

Table A-4. Shipboard Technical Staff

#	Name	Position
1	Cody Bahlau	Chief science officer
2	Brian Agee	Research Technician
3	Gilles Guerin	Research Technician
4	Aaron Martin	Research Technician
5	Ray Hatton	Research Technician
6	Jose Ramirez Najera	Research Technician

Table A-5. Science Party

#	Name	Location	Email	Position
1	Glenn Spinelli	NMT	glenn.spinelli@nmt.edu	Chief scientist
2	Lindsay Worthington	UNM	lworthington@unm.edu	Co-chief scientist
3	Isabela Macias Iñiguez	UABC	macias.isabela@uabc.edu.mx	Graduate student
4	Adriana Piña	Caltech	lpinapae@caltech.edu	Graduate student
5	Luis Vega	UABC	luisvega@uabc.edu.mx	Graduate student
6	Mandy Kiger	Oregon State	kiger.mandy@gmail.com	Heat flow tech
7	Manet Peña	UABC	manet.pena@uabc.edu.mx	Scientist
8	Kain Lager-Lowe	UNM	kainlagerlowe@unm.edu	Graduate student
9	Madelyn (Maddie) Hurd	UNM	maddhurd@unm.edu	Graduate student
10	Joel Aguilar Tomasini	CICESE	tomasin@cicese.edu.mx	Graduate student
11	Lujendra Ojha	Rutgers University	luju.ojha@rutgers.edu	Scientist
12	Jeffrey Poort	Sorbonne Universite	jeffrey.poort@sorbonne-universite.fr	Scientist
13	Elizabeth Houghton	UNM	ehoughton@unm.edu	Graduate student
14	Harol Segura	CICESE	hbuitrago@cicese.edu.mx	Graduate student

Table A-6. Protected Species Observers

#	Name
1	Maritza Martinez
2	Ana Salomon
3	Yessica Vicencio
4	Veronica Balderas
5	Lilia Perez

Table A-8. Cruise log (local time)

Event	Duration (hrs)	Duration (days)	Start, date & approx. time	End, date & approx. time
Leave Manzanillo	0	0.00	12/02/25 18:30	12/02/25 18:30
Transit to CASIUS calibration site	15	0.63	12/02/25 18:30	12/03/25 09:30
CASIUS calibration	9	0.38	12/03/25 09:30	12/03/25 18:30
Transit towards site for seismic deployment	5.5	0.23	12/03/25 18:30	12/03/25 23:00
Deploy seismic streamer	8	0.33	12/03/25 23:00	12/04/25 07:00
Deploy seismic array	3	0.13	12/04/25 07:00	12/04/25 10:00
Ramping up and troubleshooting airguns	5	0.21	12/04/25 10:00	12/04/25 15:00
Start of seismic profile W01	-	-	12/04/25 15:18	
Troubleshooting problem with continuous recording	1.5	0.06	12/04/25 15:46	12/04/25 17:08
Seismic recording resumed	-	-	12/04/25 17:08	
Recording along seismic profile W01	7	0.29	12/04/25 17:08	12/05/25 00:38
Seismic profile W02	2	0.08	12/05/25 00:40	12/05/25 02:35
Seismic profile W03	7	0.29	12/05/25 02:37	12/05/25 09:23
Seismic profile W04	13	0.54	12/05/25 09:25	12/05/25 22:14
Seismic profile W05	5	0.21	12/05/25 23:27	12/06/25 04:22
Seismic profile W06	7	0.29	12/06/25 06:07	12/06/25 13:24
Recover seismic gear	4	0.17	12/06/25 13:24	12/06/25 17:25
Transit to heat flow station HF1	1.5	0.06	12/06/25 17:25	12/06/25 19:00
Heat flow station HF1	29	1.17	12/06/25 19:00	12/08/25 00:10
Transit to heat flow station HF2	2	0.08	12/08/25 00:10	12/08/25 02:20
Heat flow station HF2	10.5	0.44	12/08/25 02:20	12/08/25 12:45
Transit to heat flow station HF3	5.5	0.23	12/08/25 12:45	12/08/25 18:10
Heat flow station HF3	11.5	0.48	12/08/25 18:10	12/09/25 05:41
Transit to eastern seismic profiles	5.5	0.23	12/09/25 05:41	12/09/25 11:15
Deploy seismic streamer and sources	3.25	0.14	12/09/25 11:15	12/09/25 14:32
Seismic profile E01	15.5	0.73	12/09/25 17:36	12/10/25 09:06
Seismic profile E02	3	0.13	12/10/25 10:47	12/10/25 13:47
Seismic profile E03	5	0.21	12/10/25 15:18	12/10/25 20:19
Seismic profile E04	4	0.17	12/10/25 21:37	12/11/25 01:34
Seismic profile E05	9.5	0.4	12/11/25 03:30	12/11/25 12:55
Seismic profile E06	4.5	0.19	12/11/25 13:00	12/11/25 17:42
Seismic profile E07	4	0.17	12/11/25 18:58	12/11/25 22:55
Seismic profile E08	6	0.25	12/12/25 00:34	12/12/25 06:40
Recover seismic gear	3.5	0.15	12/12/25 07:21	12/12/25 10:49
Transit to heat flow station HF4	3	0.13	12/12/25 10:49	12/12/25 13:47
Heat flow station HF4	11.5	0.48	12/12/25 13:47	12/13/25 01:11
Transit to heat flow station HF5	3	0.13	12/13/25 01:11	12/13/25 04:11
Heat flow station HF5	12.25	0.51	12/13/25 04:11	12/13/25 16:25
Transit to heat flow station HF6	4.5	0.19	12/13/25 16:25	12/13/25 21:00
Heat flow station HF6	12	0.5	12/13/25 21:00	12/14/25 09:01
Transit to heat flow station HF7	4	0.17	12/14/25 09:01	12/14/25 12:56
Heat flow station HF7	13.5	0.56	12/14/25 12:56	12/15/25 02:22
Transit to heat flow station HF8	1.5	0.06	12/15/25 02:22	12/15/25 03:50
Heat flow station HF8	9.5	0.4	12/15/25 03:50	12/15/25 13:20
Transit to heat flow station HF9	2	0.08	12/15/25 13:20	12/15/25 15:10
Heat flow station HF9	14.5	0.6	12/15/25 15:10	12/16/25 05:40
Troubleshoot problems with winch	8.5	0.35	12/16/25 05:40	12/16/25 14:21
Finish recovering heat flow probe	1	0.04	12/16/25 14:21	12/16/25 15:31

Transit towards start of seismic profile T01	3.25	0.14	12/16/25 15:31	12/16/25 18:45
Deploy seismic gear / continue transit	4	0.17	12/16/25 18:45	12/16/25 22:50
Transit to start of seismic profile T01	3	0.13	12/16/25 22:50	12/17/25 01:46
Seismic profile T01	5.5	0.23	12/17/25 01:46	12/17/25 07:09
Turn	1.5	0.06	12/17/25 07:09	12/17/25 08:49
Seismic profile T02	5.5	0.23	12/17/25 08:49	12/17/25 14:27
Turn	2.5	0.1	12/17/25 14:27	12/17/25 16:51
Seismic profile T03	6	0.25	12/17/25 16:51	12/17/25 22:45
Turn	1	0.04	12/17/25 22:45	12/17/25 23:45
Seismic profile T04	6.8	0.28	12/17/25 23:45	12/18/25 06:31
Turn	1.5	0.06	12/18/25 06:31	12/18/25 07:59
Seismic profile T05	7.1	0.30	12/18/25 07:59	12/18/25 15:07
Turn	1.6	0.07	12/18/25 15:07	12/18/25 16:43
Seismic profile T06	7.1	0.30	12/18/25 16:43	12/18/25 23:50
Turn	1.8	0.08	12/18/25 23:50	12/19/25 01:38
Seismic profile T07	7.0	0.29	12/19/25 01:38	12/19/25 08:38
Turn	0.9	0.04	12/19/25 08:38	12/19/25 09:35
Seismic profile T08	7.2	0.30	12/19/25 09:35	12/19/25 16:47
Turn	1.0	0.04	12/19/25 16:47	12/19/25 17:47
Seismic profile T09	7.2	0.30	12/19/25 17:47	12/20/25 00:56
Turn	1.1	0.05	12/20/25 00:56	12/20/25 02:04
Seismic profile T10	7.0	0.29	12/20/25 02:04	12/20/25 09:04
Turn	1.2	0.05	12/20/25 09:04	12/20/25 10:16
Seismic profile T11	6.9	0.29	12/20/25 10:16	12/20/25 17:11
Recover seismic gear	3.0	0.12	12/20/25 17:11	12/20/25 20:09
Transit to heat flow station HF10	2.0	0.08	12/20/25 20:09	12/20/25 22:08
Heat flow station HF10	15.9	0.66	12/20/25 22:08	12/21/25 14:05
Transit to heat flow station HF11	4.4	0.18	12/21/25 14:05	12/21/25 18:30
Heat flow station HF11	12.3	0.51	12/21/25 18:30	12/22/25 06:49
Transit to heat flow station HF12	1.1	0.05	12/22/25 06:49	12/22/25 07:56
Heat flow station HF12	9.0	0.37	12/22/25 07:56	12/22/25 16:54
Transit to heat flow station HF13	1.1	0.05	12/22/25 16:54	12/22/25 18:03
Heat flow station HF13	10.2	0.43	12/22/25 18:03	12/23/25 04:16
Transit to heat flow station HF14	3.0	0.13	12/23/25 04:16	12/23/25 07:19
Heat flow station HF14	7.8	0.32	12/23/25 07:19	12/23/25 15:05
Transit to heat flow station HF15	2.7	0.11	12/23/25 15:05	12/23/25 17:45
Heat flow station HF15	7.7	0.32	12/23/25 17:45	12/24/25 01:30
Transit to heat flow station HF16	2.6	0.11	12/24/25 01:30	12/24/25 04:05
Heat flow station HF16	24.9	1.04	12/24/25 04:05	12/25/25 05:00
Transit to Manzanillo	27.0	1.13	12/25/25 05:00	12/26/25 08:00
End of cruise			12/26/25 08:00	