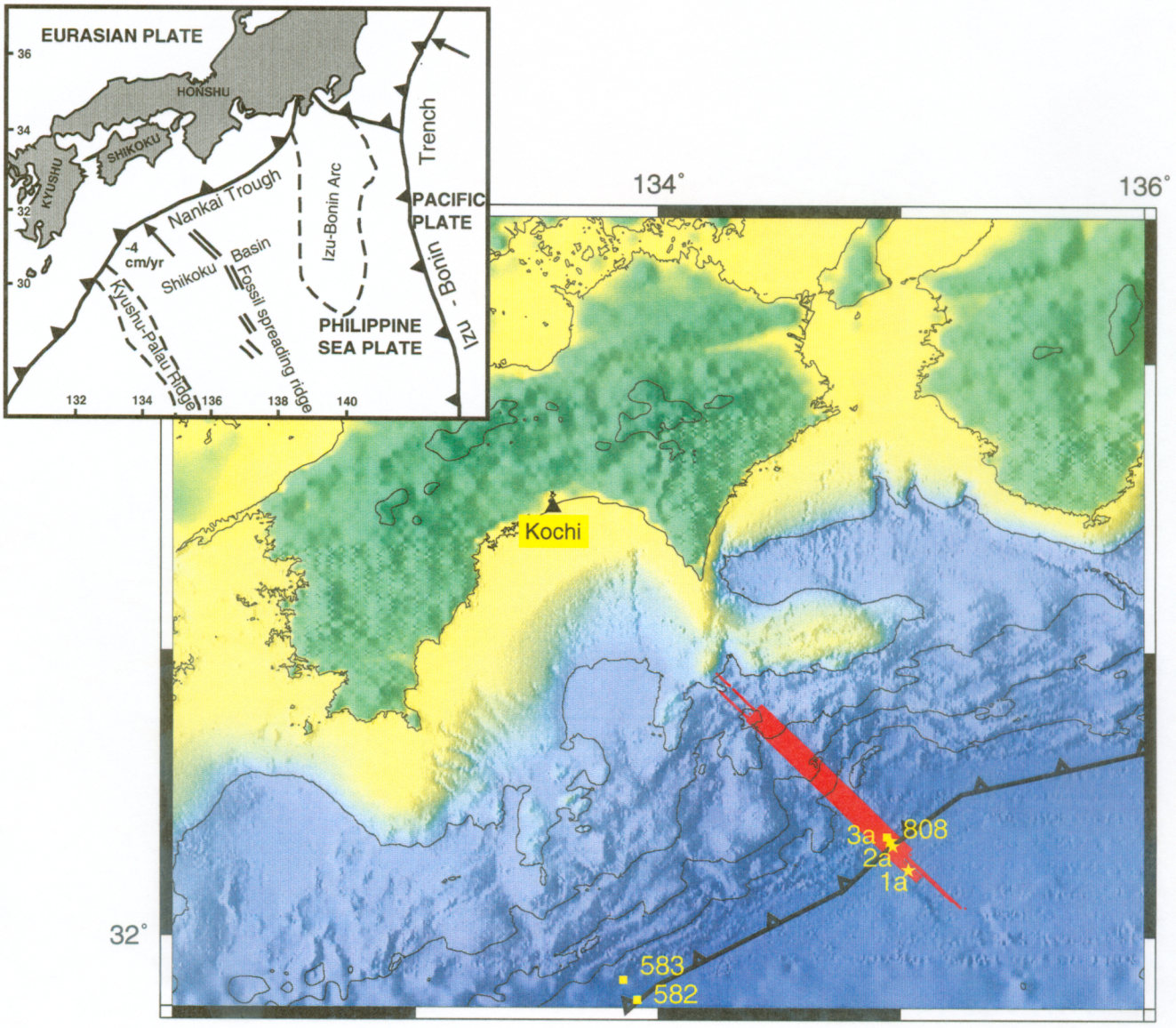
Nankai Trough 3-D Seismic Reflection Experiment



R/V Ewing Cruise EW9907 - 08
June 18, 1999 - August 18, 1999

EW9907 - 08 Cruise Report

Summary

Between June 18 and August 18, 1999, we spent 59 days at sea on the *R/V Maurice Ewing* conducting a 3-D seismic reflection and refraction experiment across the Nankai Trough 100 km south of Shikoku Island, Southwest Japan (Figure 1). The cruise was split into two legs, EW9907 and EW9908, with a two-day (July 19 - 21) port call in Kochi on Shikoku Island. During these two months, we recorded ~150,000 shots and imaged an 8 x 80 km area with 81, 80-km-long, high-quality, seismic reflection lines, all of which have nearly continuous coverage (Figure 2). During EW9908, we also deployed 8 OBS instruments and recorded 3-component reflection and refraction arrivals from *Ewing* shots.

Survey Objectives

The primary objective of our investigation was to image the plate boundary fault that forms at the toe of the accretionary wedge near the Nankai Trough and extends beneath Shikoku Island. The plate boundary thrust is a nucleus for generating great earthquakes and tsunamis, which have been recorded at ~ 100 year intervals for the past 1,200 years. Our goal was to image the thrust from where it slips aseismically near its initiation at the toe of the slope, 70 km into the seismogenic zone. The reflective image of the plate boundary contains information about the changes in physical conditions that transform a thrust from aseismic to seismic, and will help to unravel the mechanics of thrusting and the generation of Earth's largest earthquakes and tsunamis. In conjunction with this goal, 3-D seismic images are a rich source for revealing the deformational mechanism and history of the accretionary complex forming along this convergent margin.

Operations

The data acquisition proved to be a challenge on the *Ewing* in this area. Operationally we had numerous difficulties with weather, equipment, ship traffic, and strong currents. The ship traffic proved to be significant operational obstacle. We attempted, and usually succeeded, to contact 5 - 12 ships each day to request they alter course to avoid us. Ship traffic was particularly bad at the NE end of the survey. Despite considerable effort by the Ewing's officers and our chase boat, we had 12 emergency dives, and about as many ships cross the streamer, during the 2 months. We had one ship hit the streamer about 3/4 of the way between the ship and tailbuoy damaging the cable, and requiring us to stop acquisition and retrieve the guns and streamer. We had two oil tankers drift through our survey area because they had lost their propulsion. One of them caused us to break off our survey line.

The weather had a big effect on data quality and operations. Figure 3 shows the wind speed through out the two months. Data were noisy due to the rough seas when the winds were above 15 - 20 kts.

Figure 1. (Front Cover) Location map of the Nankai 3-D seismic survey area. The red box shows seismic lines of the 8 x 80 km survey area. Numbers indicate past DSDP and ODP drilling sites (Legs 87 and 131) and planned ODP leg 190 drill sites. Contour interval is 1000 m.

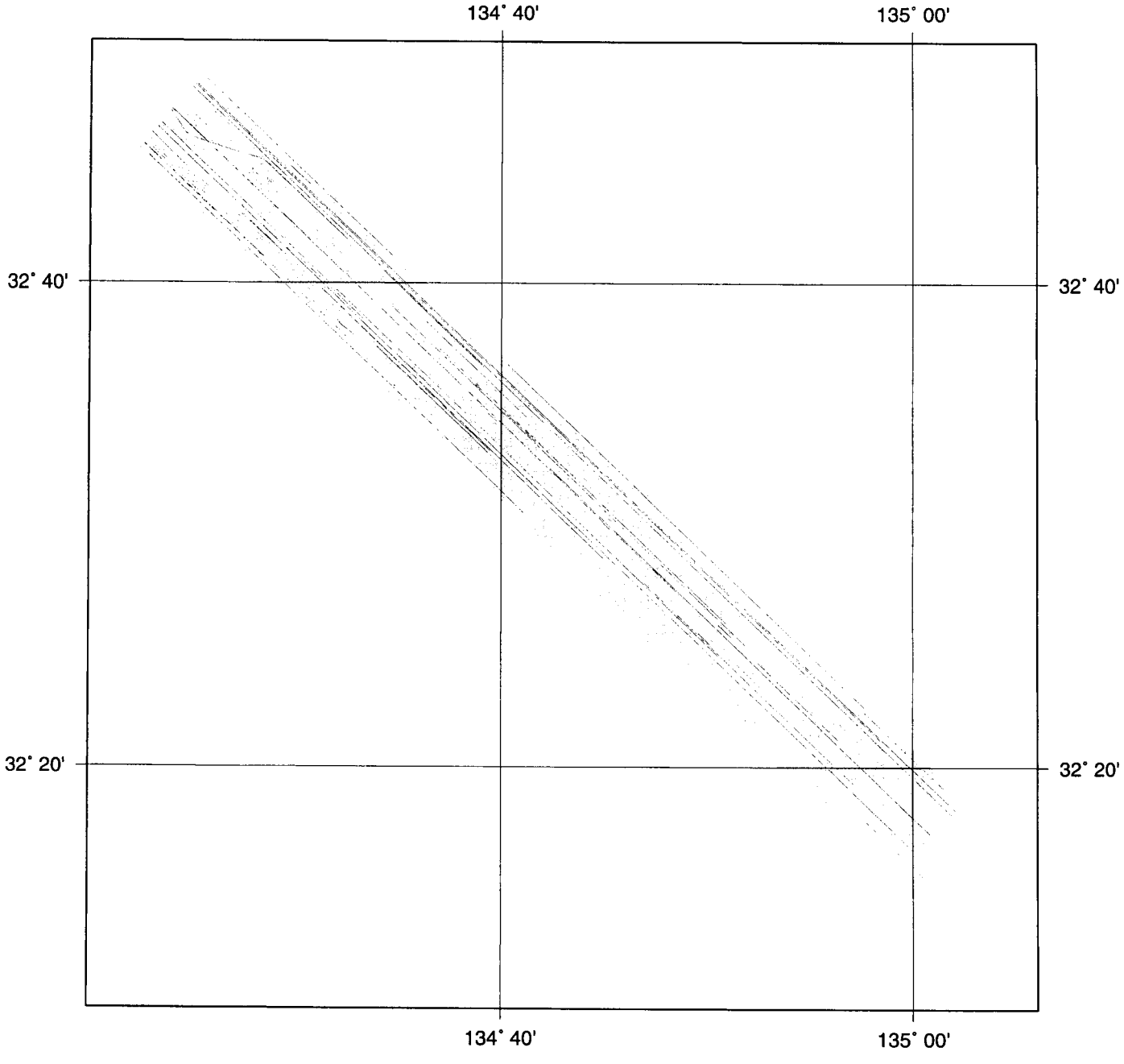


Figure 2. Map of all shot points that could be navigated with differential GPS, 150,065 total. Darker areas are reshot lines. The 8 x 80 km survey area is nearly completely covered with only few gaps in coverage. The largest gap is 900 m. Line spacing is 100 m.

Two tropical depressions and a typhoon affected operations by either requiring us to reshoot data because it was noisy, or when seas were bad enough, stop operations completely and retrieve the guns and streamer. There were 4 days of down time waiting for storms to pass, and about 8 additional days of reshooting noisy data.

A wide range of equipment problems interfered with operations, particularly during the beginning of the cruise. We wanted a working tailbuoy to constrain receiver positions with good accuracy. We retrieved the streamer 3 times to fix the tailbuoy at the beginning of the cruise, and each time it worked for less than a couple of days (Figure 3). The streamer behaved reasonably well in calm seas, but otherwise it was difficult to control. The ballasting also proved to be a challenge, with the streamer initially too light. We had some difficulty with recording the compass and bird data, particularly on compasses 2, 10, and 15. The problem was discovered during the last days of the cruise, and it turned out to be that the proper lead to the streamer reel was not being used. Instead the lead was a temporary line that periodically shorted to the hull of the ship. The tape drives were initially a problem until we replaced their cables early in the cruise. After that recording went fairly flawlessly. We lost ship's main engine power for about 5 minutes at the beginning of one line, and this caused a considerable interruption. After the power failure, we had no information on ship's speed through the water because the Furuno system died and could not be fixed.

The Kuroshio current affected us substantially at the northern end of our survey. Currents up to 4-5 kts flowed generally perpendicular to the shooting direction. The ship's course deviated up to 45° from the shooting line. Besides some interference with turns, which we quickly adjusted to, the biggest effect of currents on operations was their effect on our speed through the water, which ranged from 4.0 - 5.2 kts. The range in speed made it difficult to tow the guns at a consistent depth, which adversely affected the source signature.

Despite the tough working conditions, we acquired a large volume of high quality 3-D reflection and refraction data.

3-D Seismic Reflection Data

During the 2-month cruise, we acquired a volume of 3-D seismic reflection data over an area 8 x 80 km, and recorded data on 8 OBSs. A total of 81, 80-km-long seismic lines were shot across the trench and up the slope at 100 m spacing. This total is the final number of completed lines. Numerous reshoots were required to fill data gaps replace poor quality lines to complete the 81 lines. The result is nearly total coverage of the 8 x 80 km volume (Figure 2). Shots were fired on distance at 50 m spacing, with a nominal shot interval of 20 s. Twelve seconds of data were recorded in SEGD format at 2 msec sampling rate. A total of 151,061 shots that could be properly located with differential GPS were successfully recorded on tape. The total volume of data is ~ 500 Gbytes.

The data set is a unique volume of data across the accretionary prism. Numerous classic fold-and-thrust-belt structures are well-imaged in the preliminary 2-D processed versions of the seismic profiles. The plate-boundary thrust is also well-imaged across 40 km of the profile until it interferes with the seafloor multiple. Images of the thrust extend to greater than 5 km depth below seafloor, and well into the seismogenic zone. The top of the subducting crust is also well imaged across about half the profile. A strong BSR also appears across much of the profile. We expect these data will produce excellent quality imaged with full 3-D processing.

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John Byrne	Airgun Technician
John DiBernardo	Senior Airgun Technician
Carlos Gutierrez	Senior Airgun Technician

R/V Ewing Crew

James O'Loughlin	Master
Stanley Ziegler	First Mate
William Smith	Second Mate
David Wolford	Third Mate
Stephen Pica	Chief Engineer
Albert Karlyn	Chief Engineer

Narrative

The cruise was split into two legs (EW9907 and EW8809). The first leg began on June 18, 1999 from Yokohama, Japan and ended on July 19, 1999 in Kochi, Japan on the Island of Shikoku (Figure 3). After two days in port the second leg began on July 21, 1999 and ended in Yokohama, Japan on August 18, 1999. The total number of days at sea was 59. All times referenced below are local times.

June 17

Scientific party arrives at the ship and sets up computer equipment.

June 18

Depart Yokohama at 10:00 AM and head for survey area.

June 19

Arrive at the survey area 10:30 PM. Transit takes an extra 8-10 hours than expected because of Kuroshio current. Deploy guns and streamer. Streamer requires adding lead.

June 20

Finish streamer work 9:00 AM. Tailbuoy GPS system fails during last stages of streamer deployment. The rescue boat was launched to try to see the tailbuoy problem. The radio beacon was shut off to see if it was interfering with the signal, but no luck. The tailbuoy was plowing into the water and riding too low. Retrieving the streamer to fix the tailbuoy. We redeployed the streamer with some modifications to the tailbuoy. These include lowering the two floats attached to the side of the tailbuoy to raise it out of the water more and arrange modem so that it could better avoid overheating. A higher gain antenna was added to boost the signal strength. Redeployed tailbuoy and streamer.

June 21

Fire first test shots at 3:00 AM. Bird 15 not responding.
Started shooting line 141 from south. Continued with the northern extension of 141, line 42, until currents and ships traffic made continuing pointless. The currents were so strong that the crab angle was nearly 45°. After turning around we shot to line 100 in 3-D grid. After shooting just 20 km of line 100 the tailbuoy fails again. The chase boat thinks it has tipped over. Streamer and tailbuoy are recovered again and the floats are removed. The gun float lines are lengthened by 2 m to make them ride deeper at highest anticipated speeds, 5 kts. Tailbuoy GPS system fails again, soon after redeployment.

June 24

Midway down line 134, the streamer rises at the front 1/3. We decide more ballasting is required and that an SRD has possibly deployed. We bring in the streamer and determine that SRDs are fine. The tailbuoy is retrieved to repair GPS system once again. The tailbuoy is found to be flooded, which caused the equipment failure. The connection to the radio modem was melted because of the short circuit. The tailbuoy is redeployed without a working GPS system. As the streamer is redeployed, we drain about 1/2 gallon of oil from each of the farthest 1/3 of the sections, and 1- 3/4 of a gallon from the rest. Towing depth was increased from 8-10 m to 12 m to try to avoid the tendency for the streamer to pop up to the surface.

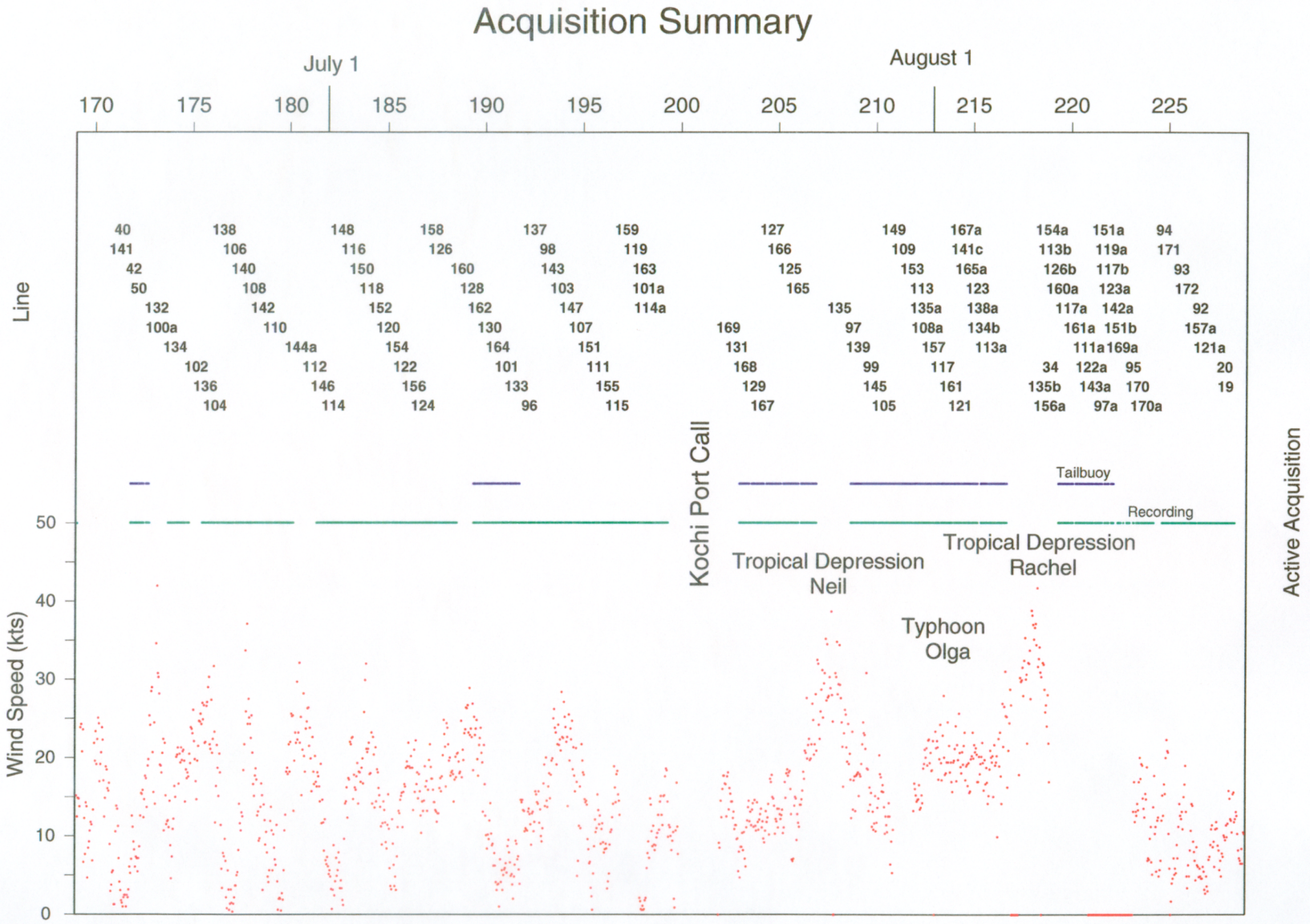


Figure 3. Acquisition summary for EW9907 - 08. Data acquisition was nearly continuous except for 3 days during a port call in Kochi, and 4 days of rough weather. The tailbuoy was working for approximately 1/3 of the data recording. Data quality was adversely affected during periods of rough seas, usually when winds exceeded 20 kts.

June 25

Several navigation problems arise. One is a problem occurring at 7:10 AM local time each morning in which no solution is possible because of the satellite configurations. A second problem is that shadow zones, which were supposed to be overcome with two mini-dome antennas on either side of the ship, appear to be interfering with our line-of-sight to the satellites. The starboard antenna is moved to the port side to fix this.

June 29

During a turn Chris tries to fix a problem with the bus to the tape drives. The tape drives were not showing up on the system. After an hour or so of delay, Chris replaced cables to the drives, and the problem was fixed. Still only drives 0 and 2 were operating. The weather deteriorates and the streamer stability problems reappear. The streamer rides to the surface and we can't keep it down. We add 3 heavy chains to the tow leader for weight. The Captain decides the weather is too rough to redeploy the guns. So we wait for calmer seas.

June 30

We begin diving the streamer to 15 m during turns to try to keep it from rising to the surface. The streamer has a tendency to pop up during turns because it is pulled sideways through the water and the birds are less effective. We settle on a lead in of 3 km is required at NW end, but 6 km is needed at the SE end.

July 4

From the examination of streamer locations in turns, we discover a problem with the compass data logging. The compass data are being buffered, which was not previously realized. The result is that compass data is not always in synchronization with the proper shot. The displacement between compass data and the shots also changes when compass data is interrupted such as when the birds are interrogated. The buffering is changed for lines 154 and higher to eliminate this problem. Corrections are calculated for lines up to 154.

July 5

On line 154, we deviate from the line to avoid collision with an oil tanker. The tanker lost power and was adrift through our survey area.

July 6

A second oil tanker loses power and drifts through the survey area. This time we are able to stay on our line.

July 7

A ferry crosses the streamer, but we are able to do an emergency dive in time. This is the 3rd ship to cross the streamer.

July 8

On line 126, near SP 500, a ship that we had acknowledged that it would sail behind the chase boat, changes its mind suddenly and crosses the streamer. With no time to dive the streamer, the ship hits it and there is no response from birds 1-5. We retrieve the streamer again and find extensive fishing tackle that probably contributed to some noisy channels, and we find a damaged cable between birds 5 and 6. All but the strength members are severed. We retrieve the entire streamer and tailbuoy. The GPS receiver and radio modem are replaced and the streamer is redeployed.

July 18

Retrieve streamer to head for Kochi at the end of EW9907, the first of the two legs. It takes 10 hours of transit to get to port.

July 19

Arrive in Kochi at 9:00 AM

July 21

Leave port at 11:00 AM to begin the second leg, EW9908. Transit back to survey area. Begin deploying OBSs at ~7:30 PM. Deploy 8 of the 9 OBSs. One OBS is released accidentally during deployment and falls onto the deck. The damaged does not allow it to be deployed.

July 22

Deploy streamer and guns.

July 26

From 9:30 AM to 2:00 PM we retrieve the guns and streamer due to tropical depression Neil and the rising sea state. Rough seas cause a computer monitor to crash on to the floor. A leak on the bridge gets a second monitor.

July 27

Neil passes and we redeploy the equipment at ~ 6:00 PM local time.

August 1

Tropical depression Olga is upgraded to a typhoon. Olga kicks up a big swell, but does not get very close. We are able to keep working.

August 2

We develop serious gun problems with the 640 cu. in. gun. Flange is worn and can't be kept from leaking. The 700 cu. in. is a temporary replacement for about two lines. Johnny DiBernardo is able to make a new 640 cu. in. chamber from other chambers.

August 5

Rough weather makes it hard to keep the streamer down. We break off line 113a. We slow down to 4.2 kts. and eventually the streamer settles down. As we are just beginning to reshoot line 126, the ship loses main engines and all power is lost. The ship is dead for 5 minutes. As we get the guns untangled, the weather worsens as tropical depression Rachel approaches. We begin to retrieve the guns and streamer around noon.

August 7

After about two days of waiting out the weather, the storm passes and we begin to redeploy the streamer and guns. The equipment is back and working by 7:00 PM. We are well south of the survey area, so we begin shooting a line leading up to the survey area. Unfortunately, Joe Stennet replaces a bad section with a bad section that was removed from the streamer during the previous leg. The result is 3-4 noisy channels, 96 - 99.

August 8

During the power failure, the Furuno system failed and could not be revived. Probably the problem is a bad circuit board. With the Furuno gone, we have no speed through the water, and no gyro. The ship's heading is needed to determine the gun positions along the survey line. Course is read from a separate gyro, and entered by hand. The gun setback is not entered for the lines 135b, 156a, 154a, and 113b. The gyro for these lines is reconstructed from streamer compass from bird 24.

August 10

The tailbuoy transmissions cease after we dive the streamer to avoid a ship. The standard practice had been to dive all but birds 1 and 2. This time all birds were set to 25 m and the tailbuoy submerged deep enough to flood.

August 12

The streamer develops an intermittent no-response problem from birds 1 - 10. We break off line 170 and retrieve the streamer to bird 10. Water was found in the section at bird 10 and obviously the cause of noisy traces 96-99. This section is replaced along with two others near the ship, including a stretch section.

August 17

Kimi and Toshi are transferred to the chase boat to begin OBS retrieval. We finish reshooting line 121a, and continue south shooting a 2-D line south of the survey area. We finish shooting at 7:00 PM and begin retrieving all gear.

August 18.

We arrive in Yokohama at 9:30 AM. EW9907-08 is finished.

Instrumentation

The Seismic Streamer

We recorded the seismic reflection data on *Ewing's* Syntrack 480-24 recording system. The streamer was configured to 240 channels, with 25 m groups, for a total of 6,000 m of active section. Twenty four Digicourse compass-birds were used for depth control and streamer navigation. The streamer configuration (Figure 4) was nearly the same in both legs of the cruise (EW9907-08), with only an addition of 50 m of stretch section at the tailbuoy. This section was added to increase the separation between the active sections and the tailbuoy to avoid submerging the tailbuoy during emergency dives.

An initial problem with the data recording was the problem of tape drives rejecting tapes as they first began writing. This problem was fixed by conducting the self-test on the recording drives during periods when the drives were not in use, e. g. during turns. After our port call in Kochi, we had a tape cleaner available to do the tape retensioning. In the end, this problem interfered only during the recording of a few of the first tapes.

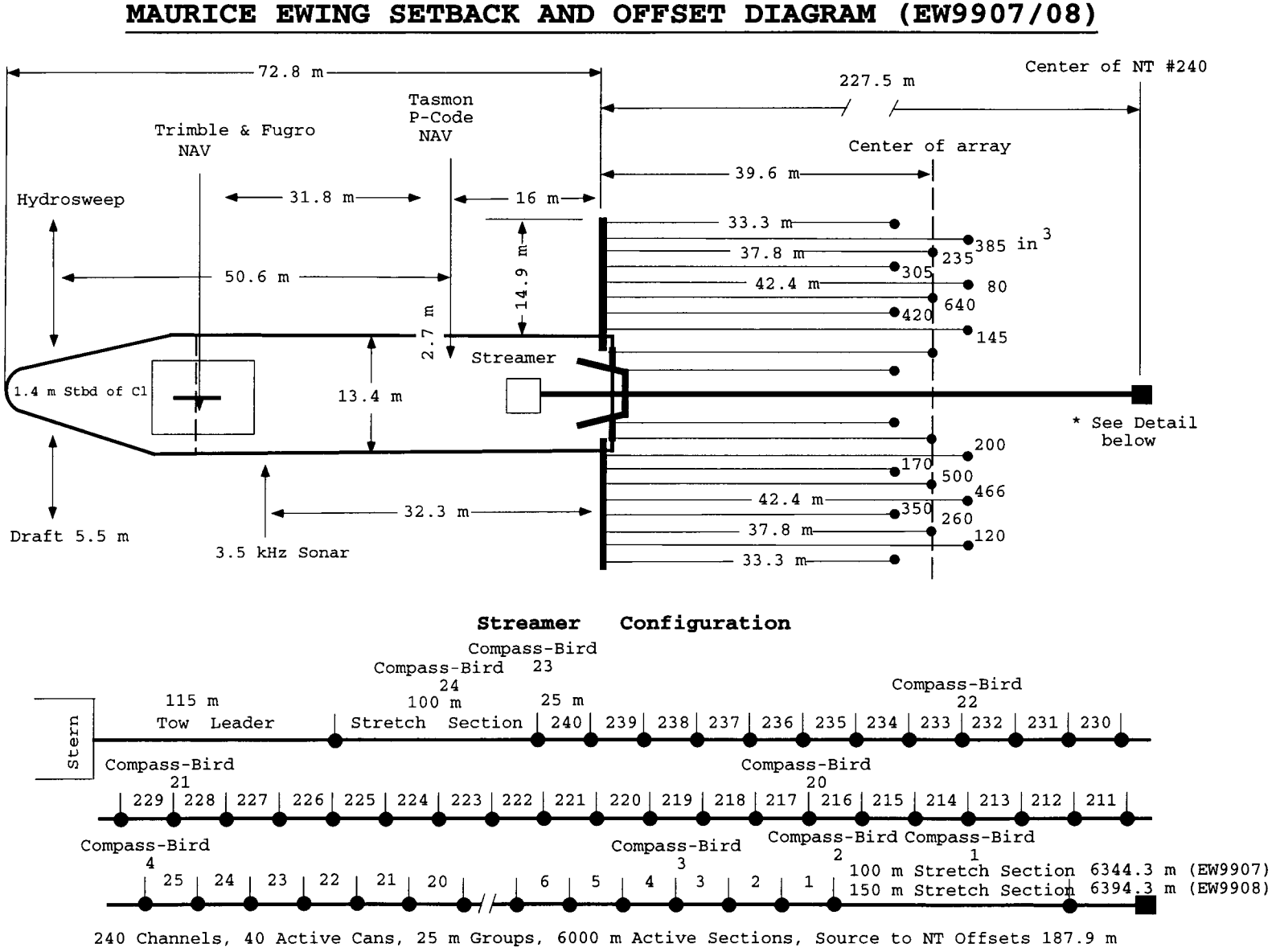


Figure 4. Airgun array and streamer configuration during EW9907-08. This configuration was unchanged for both legs except for the addition of 50 m of stretch section between the active section and the tailbuoy for the second lex.

Recording was occasionally interrupted during the first leg (EW9907) by tape drive failures. Drive 1 failed completely, rejecting tapes before the end, and could not be repaired at sea. Drives 0 and 2 had intermittent problems with the SCSI bus until they failed completely during the first leg (7/29). This problem was fixed by replacement of the SCSI cables and only minor tape drive problems were encountered after that.

The streamer balancing was difficult throughout much of the cruise. During the initial deployment, we added lead in anticipation of the warm salty water associated with the Kuroshio current. The ballasting proved to be quite difficult as the streamer was continually light and difficult to keep at a consistent depth. Initially we towed the streamer at 8 m, and soon quickly realized that this shallow depth was too difficult to maintain. The tendency of the streamer to be light and the rough seas required tow depths of at least 10 m, which we used for most of the rest of the cruise. Examination of the bird wing angles helped guide the streamer ballasting. Adding weight and draining oil was eventually successful in balancing the streamer in relatively calm seas. As the weather worsened (i.e. winds above 20 kts.) the front of the streamer popped up and brought the entire streamer to the surface. This problem was lessened by adding 3 sections of chain to the tow leader on 6/29. This improved the towing noticeably until sea states were much higher (i.e. winds of ~30 kts.). For the remainder of the cruise, the tendency of the streamer to rise to the surface during rough seas required slow speeds, as slow as 4 kts. Except during very calm seas, the streamer also tended to surface during turns because the birds became ineffective, as the streamer was pulled sideways through the water. We overcame this problem by diving the streamer to 15 m during turns.

The Seismic Source Array

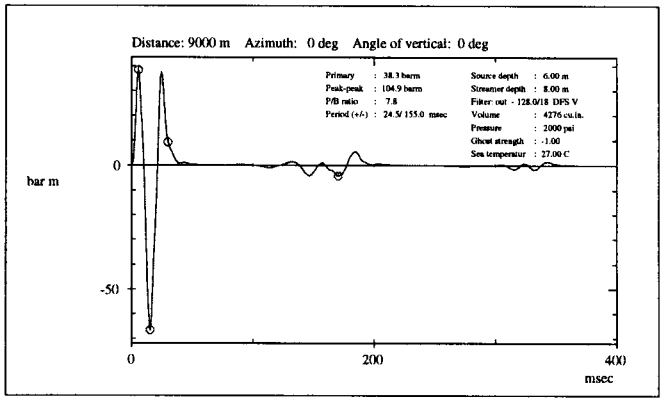
The seismic source turned out to be one of the biggest problems with the data acquisition. Although considerable effort went into the design of the array, we consistently had two problems that lead to a poor peak-to-bubble ratio in the source signature, which compromised the data. We had difficulty controlling the source depth because of its sensitivity to the ship's speed with the *Ewing's* towing design. We also consistently had ambiguities about the actual depth of the guns because of problems with obtaining accurate depths from the sensors. Both of these problems are described in more detail below.

We acquired the data during both legs of the cruise, EW9907-08, using a single configuration of the source seismic array. The array consisted of 14 Bolt 1900 air guns with a range of chamber sizes from 80 in^3 to 640 in^3. The individual guns were towed from Norwegian floats intended to maintain a consistent source depth. The towing arrangement and gun sizes are shown in Figure 4. The total volume of the source array was 4276 in^3.

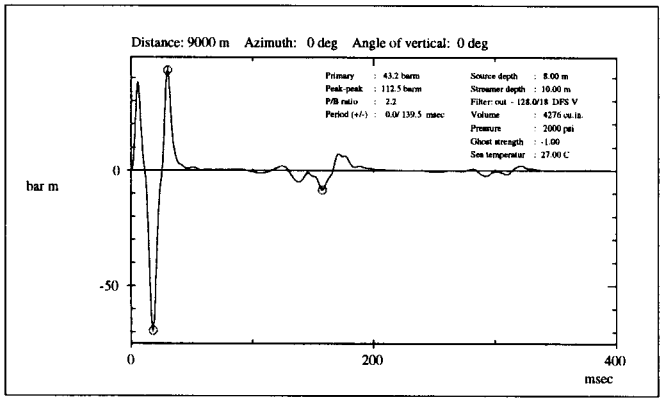
The airgun array was designed with a range of chamber sizes balancing the trade-off between increasing the source volume while still suppressing the bubble pulse. The array was designed using the Nucleus airgun modeling software to forward model source signals trying various chamber sizes. Modeling assumed a source depth of 6 m, and streamer towing depth of 8 m, and produces a source with peak-to-bubble ratio of about 10 (Figure 5).

Planned Seismic Source Signature

Far-field signature of array: Nankai14



Model of Actual Seismic Source



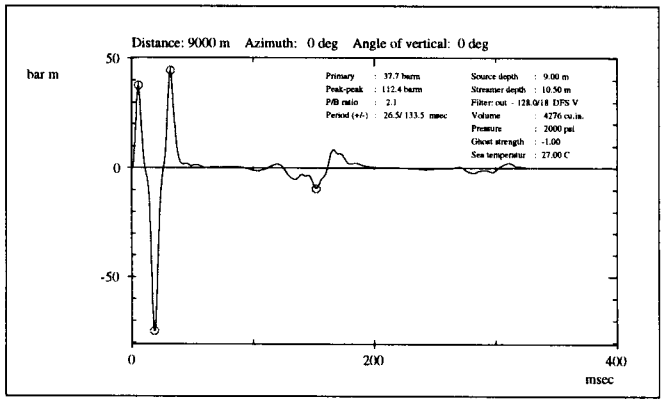


Figure 5. Models of planned and actual seismic source arrays. The airgun array consisted of 14 guns with a total of 4276 in^3. Due to difficulties in maintaining source depths, the bubble pulse was larger than anticipated.

In our initial attempts to use this source, we soon realized that some of these design parameters could not be implemented. First, even though floats were used, it was not possible to maintain a 6 m source depth. The floats were effective in maintaining the source depth at about 8 m or deeper, but were not very good at shallower depths. This was because the "kiting effect" from towing the guns through the water provided most of the support for the guns, which was controlled by the ship's speed. We were not able to work at speeds above 5 kts, which would be required to keep the source depth consistently above 8 m. Secondly, because a source depth above 8 m was affected so much by the ships speed, it was difficult to maintain it consistently at depths less than 8 m. Given our acquisition speeds (4.0 - 5.0 kts) and their variability with the strong currents, we settled with a source depth of 8 m. The result was a much larger bubble pulse as shown by modeling (Figure 5).

The problem of accurate depth measurement of the guns aggravated our attempts to maintain a consistent source depth. Depth sensors attached to the guns were consistently giving unreliable readings. This was evident because although the towing arrangements were not changed between deployments, depths for an individual gun varied by 3-4 m. The air gun technicians frequently discounted common anomalously deep readings of the depth sensors.

We experienced several difficulties with keeping the airguns operating throughout the cruise. The flange on the 640 in^3 gun wore down to the point where the chamber could not be sealed correctly. This required Johnny DiBernardo to rebuild a new chamber from two existing chambers, which he was successfully able to do at sea. While the chamber was repaired, we used a 700 in^3 chamber as a replacement. Numerous, typical problems occurred throughout the cruise that included airgun leaks, bad solenoids, broken hoses, etc. Each of these contributed to down time as noted in the lab log.

Navigation

Grid Design and Shooting the Grid

The 3-D survey grid was designed as 80-km-long lines spaced at 100 m using a universal Mercator projection along a NW-SE orientation. The UTM central meridian is 134.5 ° with a scale factor of 1. Lines were shot along azimuths of 314° and 134° (Figure 2). Shots were fired on distance at 50 m intervals as determined by "Shooter", a program written by M. Wiederspahn, with location input from the differential GPS (DGPS) navigation system. Shooter triggered shots using the external triggering mechanism on the Syntrack system. Nominal shot times were 20 s, but varied considerably with the strong currents and varying ship's speed.

A display of the ship's position was shown on computer terminals in the lab and on the bridge using the program "Nav99" written by M. Wiederspahn. This display showed the ship's position relative to the 3-D grid, and provided down line distance, off line distance, ship's speed, and a several other details. This was the primary display used by the bridge to steer the ship down lines within the grid. All lines were steered by a helmsman on the bridge by following the display provided by Nav99.

Half of the 3-D grid was shot in the NW direction (normal direction; i.e. increasing shot point numbers), and the other half in the SE (reversed direction) direction.

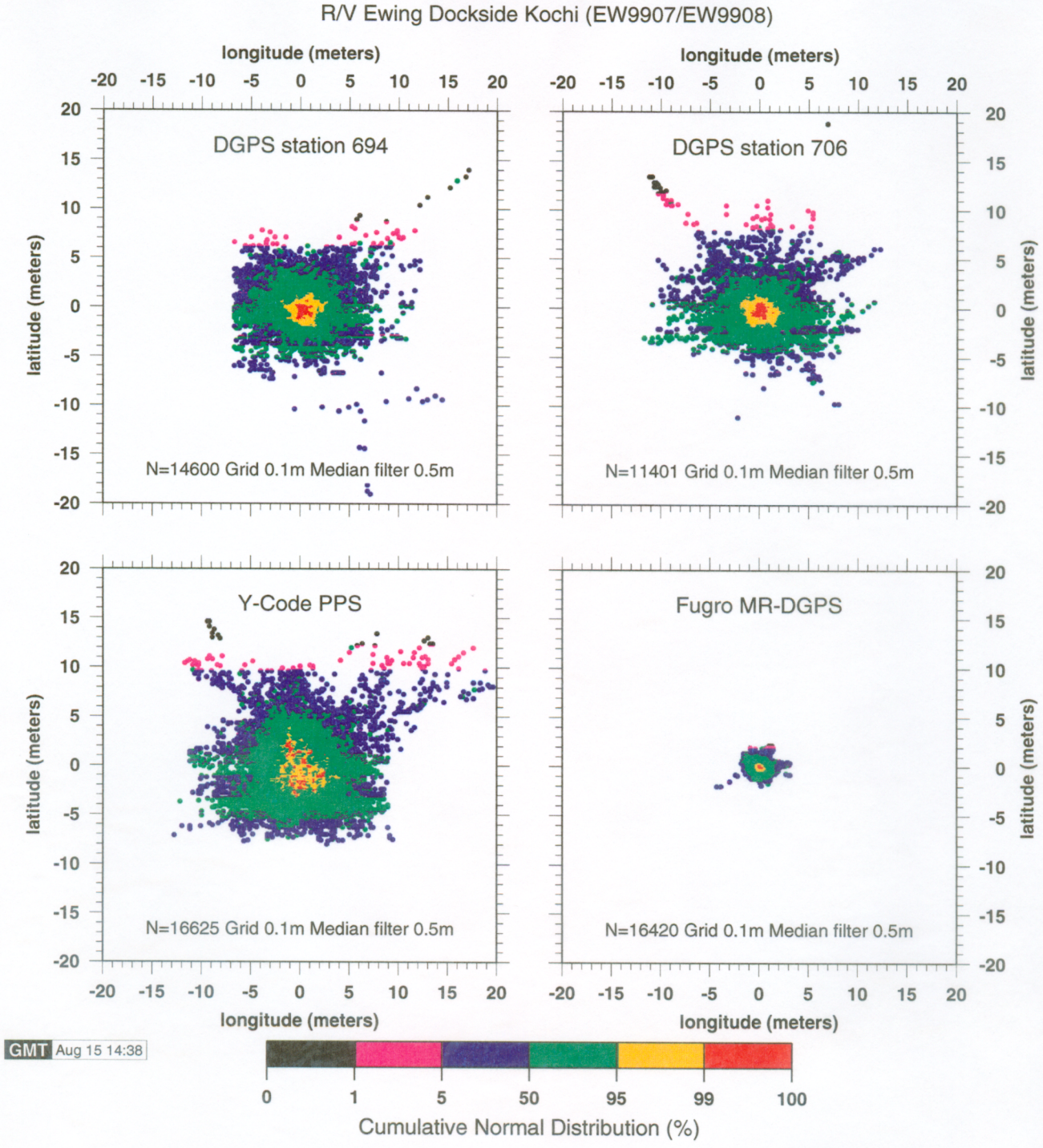


Figure 6. Distribution of receiver positions acquired during two days at the dock in Kochi. The upper plots were acquired with Trimble differential GPS. Differential corrections were provided from two stations that were roughly equidistant from Kochi. Y-Code receiver positions for the same period are shown in the lower left. All three of these positions have 95% of all values no less than ± 5 m. Fugro differential positions for the same period are shown in lower right and have 95% of all positions in a ± 2 m range. Nearly all shots were located with the Fugro DGPS.

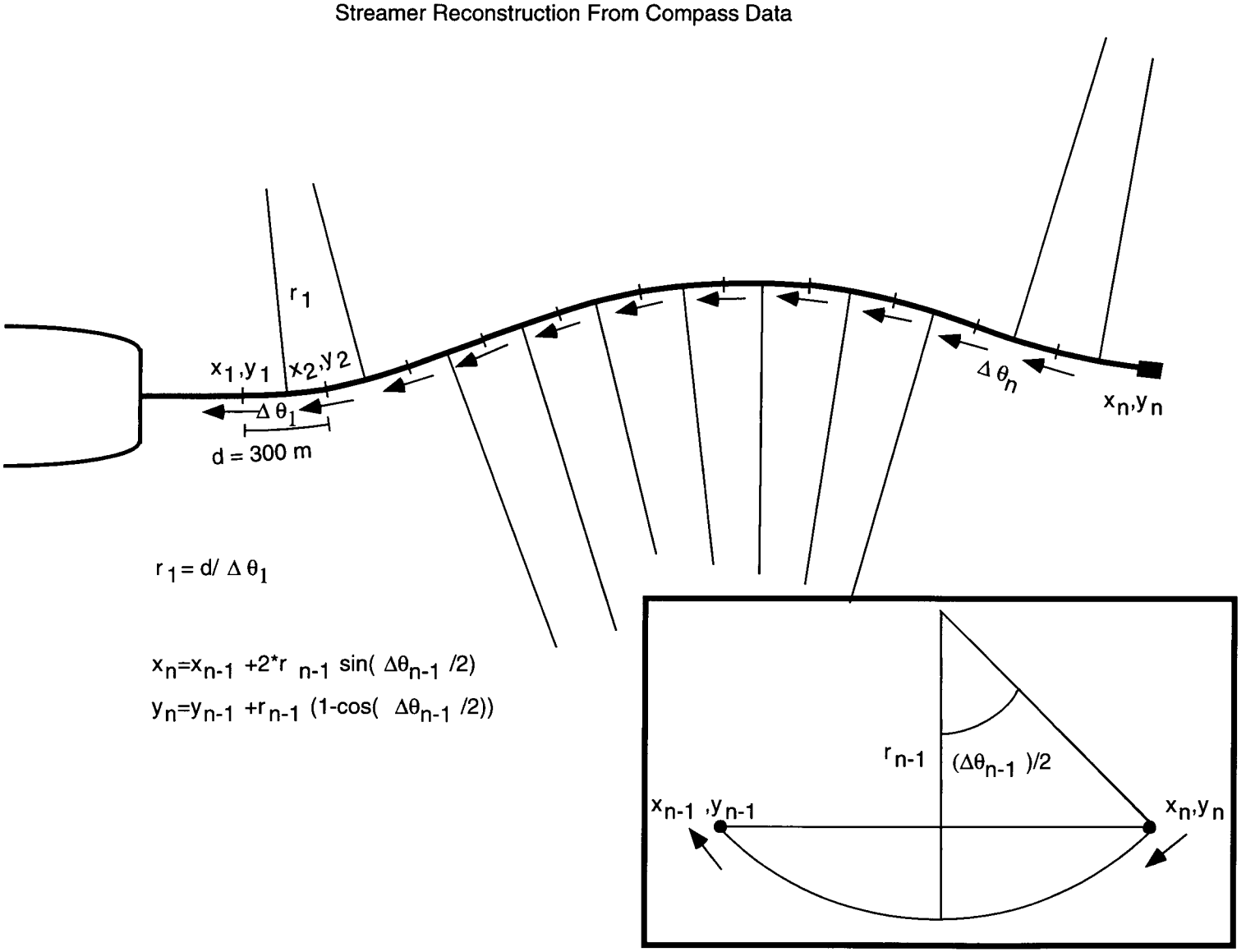


Figure 7. Scheme for streamer reconstruction from the compass data. Arrows are compass directions. Streamer geometry is reconstructed assuming circular arcs between compasses.

The division lies between line 133 and 134, with all lines numbered 134 and higher shot heading NW.

Ship's Navigation

Throughout both legs of the cruise, the ship's position was located at 1 sec intervals with a differential GPS navigation system supplied by Fugro Geodetic. Fugro leased us two microdome Inmarsat antenna, which also interfaced with the ship's Inmarsat A antenna, two Starfix 3000 LR12S DGPS receivers, and two PCs with QC software. Fugro provided access to three primary DGPS stations, Okinawa, Seoul, and Sapporo, although additional stations were also available at some times. The antennae were initially attached to the railing along the Bridge Deck on both sides of the ship (Figure 4). The location of the antennae did not eliminate shadow zones as intended, so the starboard side antenna was move to the Flying Bridge on the port side. During the first leg, the starboard side microdome antenna failed and was replaced by a backup sent to us in Kochi.

The ship's position was estimated by filtering the raw 1 Hz multi-station DGPS fixes using several kinds of filters to smooth the rolling, pitching and fore and aft surge of the ship. (The DGPS raw quality was good enough to easily see small rolls). The filter constant used depended on the weather, but was usually around 15 seconds for the velocity. The velocity was further smoothed by two other techniques: an exponential filter on the positions (~5 s), and a "stride" to find the average velocity over a longer time, typically 15 seconds also. The effect of all of these was to create a smooth velocity estimate, which remained sensitive to real environmental changes from shot to shot. The actual "filtered" position was further modified by the use of an antenna-to- gun setback, in the opposite direction of the ship's heading. Both the raw and filtered positions could be plotted in real time to assess the overall impact of these adjustments.

We recorded three independent GPS systems throughout the cruise. The main system was recorded at an interval of one second as described above. The two secondary systems were supplied by LDEO, and were generally recorded at 10 (sometimes 5) seconds. The "bridge Trimble NT200D" nearly always was in differential mode using its internal radiobeacon receiver listening to differential corrections from the Muroto Peninsula. The second system was a Trimble Tasman Y-code Precise Positioning Service receiver. These systems were plotted on the bridge or lab displays at the same time as the primary navigation source, as an overall sanity check, and a hedge against problems when the Fugro system did not update correctly. These outages were usually of short duration, but caused considerable difficulty both in steering and later in deriving the final shot locations. They were caused by satellite transmissions from the main Inmarsat A dome, by Inmarsat C, by an Iridium mobile satellite phone, and by short wave radio transmission.

The accuracy of the ship's position was established by recording our positions while tied to the dock during our Kochi port call. These data show 95% of all Fugro DGPS positions lie within a 2 m radius. Trimble DPGS is substantially worse with 95% of the positions within a 7-8 m radius, but it was still consistently better than Y-Code non-DGPS receiver positions (Figure 6).

Final shot positions were located with Fugro DGPS data or when unavailable, Trimble DGPS data. The 1-sec, Fugro and Trimble data were filtered to remove stale fixes, i.e. where fixes were more than 15 s old, and interpolated to fill in gaps of up to 2 min. All shots that were without Fugro differential were replaced with Trimble differential positions. This was a total of 375 shots out of 151,118 total shots. Very few

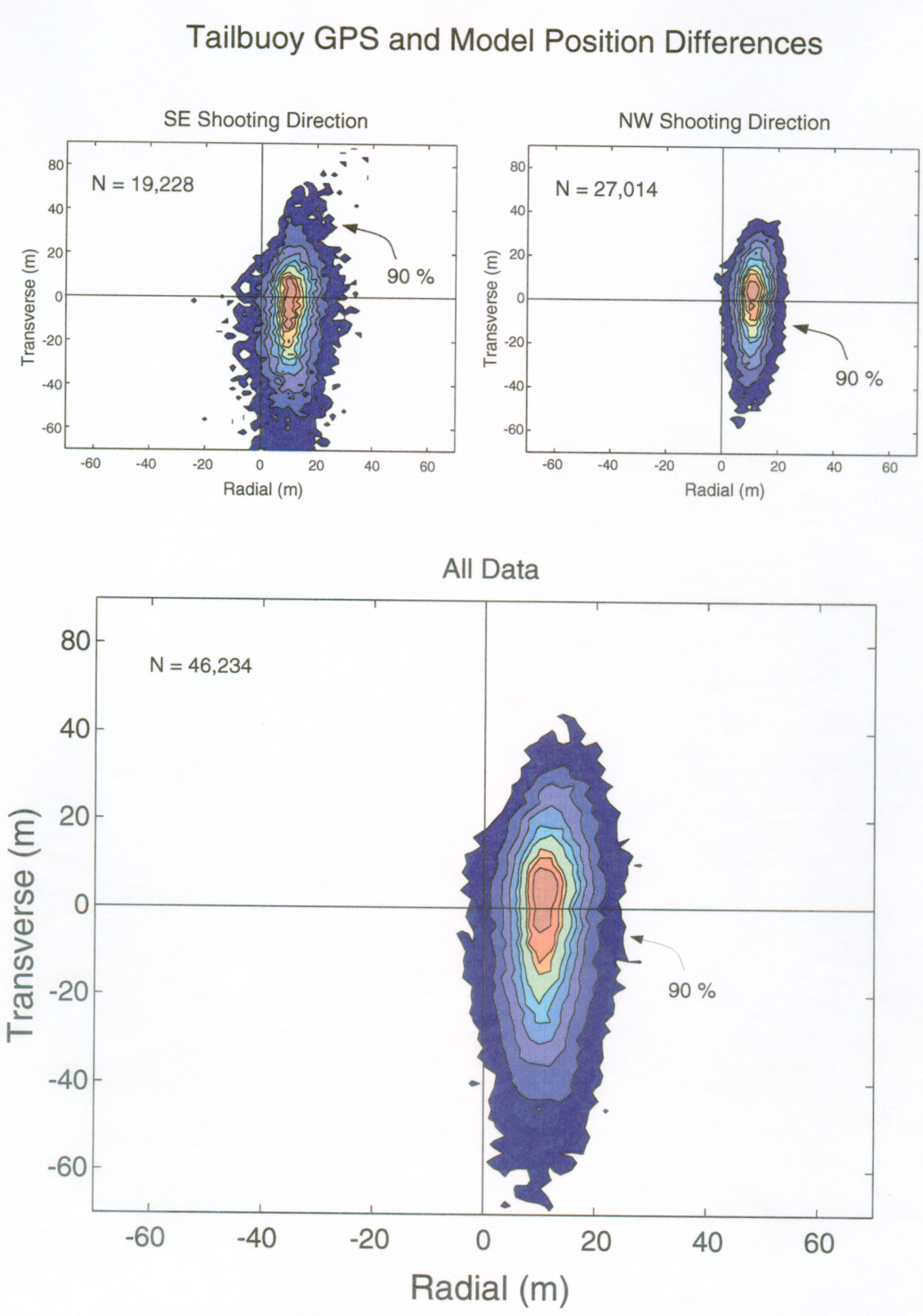


Figure 8. Distribution of differences between reconstructed tailbuoy positions and differential GPS positions. Upper plots show distribution for both shooting directions to determine that there is no directional bias. Radial direction is along the streamer, transverse direction is perpendicular to the streamer azimuth at the tailbuoy. Contours are every 10 %.

shots could not be located with either the primary or the secondary navigation. The total number of shots that could not be navigated was 57, and these shots were not used.

Streamer Navigation

The streamer was navigated with the 24 compasses in conjunction with DGPS tailbuoy positions, when available. The Digicourse compasses provided orientations at 300 m, and less, along the streamer (Figure 4). Compasses are believed to be accurate to ~0.1 °. The individual compass bias was determined to be negligible as discussed below. The compass orientations were estimated using a magnetic declination of –6 ° 14.5 ' (derived from the IGRF95 model by the National Geophysical Data Center). The compasses were interrogated at each shot and compass data were recorded in the SEGD headers.

Two problems developed during the cruise that required specific fixes to the compass data. Initial reconstructions of the streamer positions revealed the first 10 or so shots of each line had completely unrealistic orientations. The streamer reconstructions were correct for shots from the previous line, which suggested an offset between the compass data and the shot data. Further investigation revealed that the compass data were buffered and written out after the buffer was filled. The result was that the each shot logged compass data that belonged to a previous shot, usually the 10th previous. The displacement between compass data and shots, was not consistent, the position of the compass data in the buffer varied as the birds were interrogated or controlled. This problem was corrected for line 154 and subsequent lines. The compass data for lines up to 154 were corrected by shifting compass values to correlate with time stamps on both compass data and shots. This fix was successful everywhere except for the last 10 or so shots of each line, which had no recoverable compass data.

A second fix to the source receiver locations was used to deal with the 3.5 days without gyro. The Furuno Doppler speed log provided gyro information to all of the computers on the ship, and until a second gyro interface was arranged following the failure of the Furuno system, no gyro was available anywhere in digital form. Our reconstruction during this period assumes the near offset compass adequately represents the gyro.

Streamer positioning was calculated by reconstructions of the streamer assuming it formed a sequence of semi-circles that form a piece-wise continuous curve (Figure 7). The streamer position is constrained at the ship, and reconstructed from headings provided by the 24 compass-birds. Compasses constrain the orientation of semi-circles at their junctions, allowing reconstruction back to the tailbuoy as depicted in Figure 7.

The tailbuoy positions, when available, provided a means to confirm the accuracy of streamer reconstructions and give confidence in our ability to accurately locate receivers from reconstructions. The tailbuoy was navigated using the Fugro DGPS system. We equipped the tailbuoy with a GPS receiver and radio modem. The radio modem transmitted differential corrections calculated by the Fugro system to the tailbuoy GPS receiver. With the differential corrections the GPS receiver calculated a DGPS position at 1-second intervals that was transmitted back to the ship via the radio modem. Power to the GPS receiver and radio modem was supplied directly from the streamer.

The tailbuoy was prone to failure and provided useful data for 49,356 shots, or 33 % of the time (Figure 3). The tailbuoy DGPS system failed for two reasons: 1) because of the weak antenna that was initially used for the radio modem (this was replaced during the second leg), and 2) because the equipment was flooded in the tailbuoy compartment (see Narrative for more details). This compartment was prone to flooding during

emergency dives of the streamer. The tailbuoy compartment flooded once, but subsequent dives caused the gps antenna to fail, apparently due to water penetrating the cable or the gps antenna proper.

Comparison of DGPS and reconstructed tailbuoy positions show the limits in streamer positioning from streamer reconstructions. Differences in both the radial (along the streamer) and transverse (perpendicular to the tailbuoy heading) are up to several hundred meters. Most of the large differences are produced during turns, which were nearly always in the counter-clockwise direction. This pattern suggests a breakdown in the assumptions used for streamer reconstruction such as the assumption that the streamer is a series of circular arcs. Histograms (Figure 8) indicate a systematic bias of 10-12 m in the radial direction. DGPS positions are consistently closer to the ship than the compass reconstructions place the tailbuoy. The cause of the bias is unknown. Histograms show the distribution of 90 % of the streamer reconstructions are within ±12 m and ±50 m in the radial and transverse directions respectively. This pattern suggests that the streamer can be reconstructed to within the 100 m line and 50 m shot spacing of our survey. The results are better during data acquisition because these results include streamer reconstructions during turns where the streamer curvature causes breakdown of our assumptions. The results in Figure 8 also suggest no systematic bias associated with shooting direction, as the distributions are very similar except for differences due to different numbers of samples. We suspect there are no detectable individual compass biases or declination errors that would cause a systematic difference in the distributions with shooting direction. All streamer reconstructions were used to locate receiver positions.

Quality Control

EW9907-08 Gun Parameters Evaluation

A 3-D survey requires consistency in source and receiver characteristics for the duration of the program. Variations in weather, ship speed, streamer ballasting and gun floats influence overall system performance. Most of these parameters are logged and available in the extended SEGD shot headers.

At the end of each line the extended headers were extracted (hread) from the field tapes (headblock/line/line.n). Several ascii files were then created containing, gun, streamer and navigation information (line.gun, line.bird, line.compass,). These data files were used to locate exceptions to normal parameters and produce listings of abnormal conditions. These exceptions were used as guides to help decide if the shot should be included in later data processing.

The basic rules leading to exceptions are:

1. Mean streamer depth > 14 m. This rule was applied to determine the approximate location where the streamer was set to 25-m while avoiding ship traffic. Too shallow streamer depths were caught by the noisy-trace seismic editing.

2. Gun sensor depth more than 2.5 m from mean of the good sensors. The original purpose was to detect loss of gun floats and therefore unusually deep guns. In reality these sensors were subject to a number of different failures independent of the gun depths. After initial runs with each new line, logic specific to each line was added to

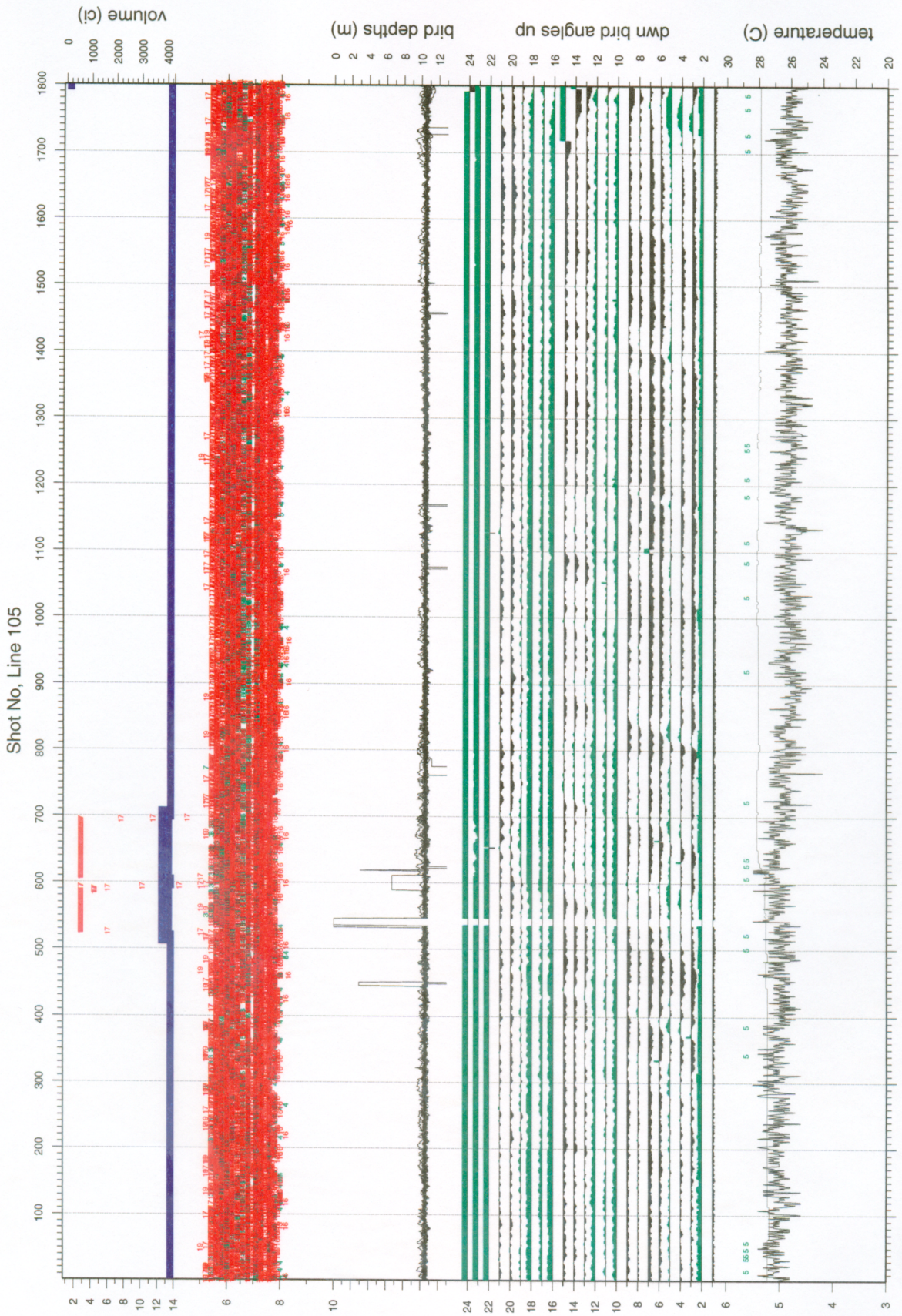


Figure 9. QC plots for line 105 showing gun problems and bird characteristics with respect to ship's speed and water temperature. Blue line shows gun volume indicating gun outages. Red numbers are gun number plotted at measured gun depth. Black fill indicates bird wings down and green indicates wings up. Thin black line is temperature.

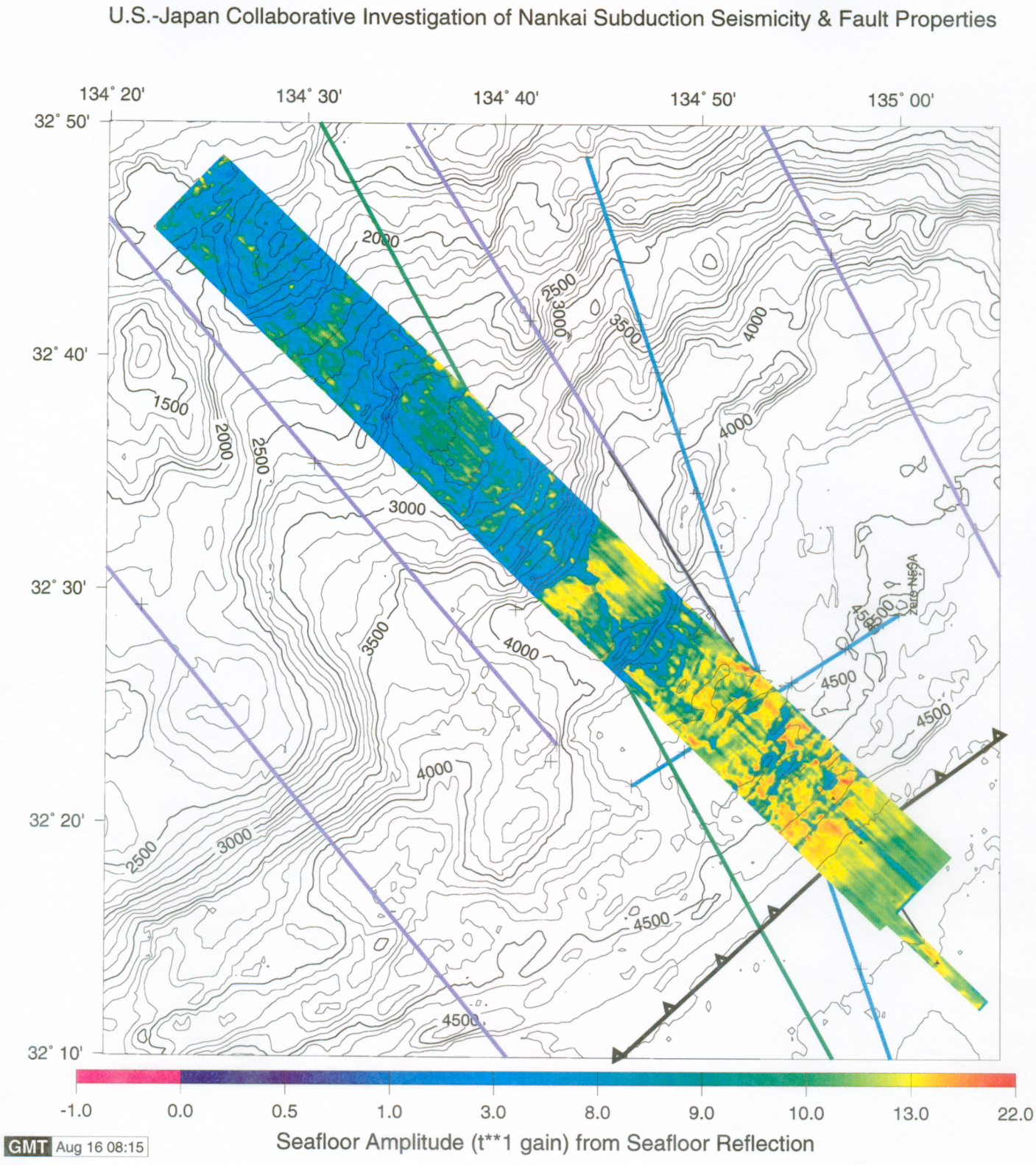


Figure 10. Seafloor reflection amplitude map across the 3-D survey grid. Amplitudes differences from line to line are used for quality control as they show where to look for potential timing and data quality problems.

account for bad sensor conditions. True gun depths are about 1-m deeper than the location of each sensor.

3. Any misfires (no detection of gun fire) of the 80 or 640 cubic inch guns. These two guns were considered critical to the basic waveform.

4. Any autofire (detection of gun fire outside of a 3 ms window centered about the aim point). An uncontrolled gun fire could lead to significant contamination of the source waveform. In all cases these shots were killed.

5. Total volume drop below 3556 cubic inches. Target was 4276 cubic inches.

A page size plot was prepared for each line. Produced with the script gmt.jwd the plots summarized numerous parameters as a function of shot point for the gun and streamer. The display included the steamer depth and bird angle for each of twenty-four birds along with water temperature and ship speed through the water. This group of parameters was useful for locating where the steamer was too shallow or too deep and bird angles and water temperature were useful in guiding ballasting. Individual information for each of the fourteen guns included misfires, autofires, total volume and gun depths. These were used in conjunction with the shot.error file to prepare the gun.kill files (Figure 9).

EW9907-08 Seafloor Reflection Quality Control

We discovered from the Barbados data set (EW9207) that monitoring the seafloor reflection is a useful gross method to examine potential navigation problems and line-to-line source and receiver variations. The migrated stacked section for each line was loaded in to Geoquest IESX and the seafloor reflection digitized. In map view this provided a means to evaluate line-to-line variations that might be associated with the acquisition system. We discovered a number of amplitude variations, which in most cases were tracked to differences in the stacking process, which were corrected. Cross lines were reviewed to check for tears in the seafloor reflection, which would indicate improperly, located lines. We discovered a combination of problems were responsible for errors associated with five lines, largely related to the evolution of the ukooa navigation generation and how this file was used in the 2-D sorting (Figure 10).

3D Binning for Quality Control

Onboard the R/V Maurice *Ewing* we used 3D binning with the FOCUS seismic processing system to aid in quality control of the cable reconstruction within the UKOOA format navigation data, to determine the amount and pattern of cable feathering, and to examine the midpoint coverage throughout the survey within different offset ranges. 3D binning was accomplished in the absence of the trace data by using UKOOA navigation data.

The UKOOA generation algorithm includes a cable reconstruction program that uses the compasses within the birds to determine the location of the cable relative to the ship. FOCUS was used to check the cable reconstruction for any erroneous compass readings. Visual examination of the reconstructed cable using FOCUS also showed clearly the affect of the currents, which were minimal in the southeastern portion of the survey. However, in the northwestern portion of the survey the strong northeastward flowing currents cause severe cable feathering.

3D binning is accomplished by determining the location of every midpoint, placed halfway between each source-receiver pair, and then gathering the midpoints into

rectangular bins. For the Nankai 3D experiment we chose bins that were 25m by 50m with the long axis oriented to the northeast. The grid of bins was oriented parallel to the survey at an azimuth of 315 degrees. Once the midpoints are gathered into bins, maps of the fold contained within each bin are produced to show how cable feathering and other acquisition related events affect the coverage of the data. These fold maps can contain midpoints with all source-receiver offsets (Figure 11a) or be displayed in ranges of offsets (Figures 12a-14a). These fold maps can then be studied for gaps in coverage that should be filled in by reshoots. Especially important is the near offset coverage so that any region with no or little fold in the near offsets is a prime candidate for reshooting.

In addition to simple binning (Figure 11a-14a), intelligent or extended binning can be used to smooth out in equalities in fold coverage. Obviously this technique can be used improperly and remove or smear real variations in the seismic data. For Nankai 3D we tested an extended binning routine where in the event a bin had fold less than the theoretical maximum fold of 120 the routine would search one half a bin, or 25 m, out in the crossline direction but not search in the inline direction. Relative to each bin the search routine copies any traces encountered in the adjacent half-bins in order to raise the fold in each bin. Figure 11b shows the results of the extended binning routine for all offsets and Figure 12b-14b show the results for the near, middle, and far offsets. Any gaps in coverage or particularly low-fold regions not corrected in the extended binning fold maps are especially important to reshoots.

Onboard Processing

During the cruise all of the data were processed as 2-D seismic lines including velocity analysis and through migration. Below outlines the basic processing sequence for entire cruise. Examples of the data are presented in the following "Preliminary Results" section.

1. Read SEG-D tapes on 3490E drive
2. Antialias filter and resample from 2 ms to 4 ms
3. Write SEG-Y format on DLT tapes
4. Filter 4-6-80-90 Hz
5. Calculate trace statistics (trace ave. amplitude, peak frequency, deviation from peak frequency, amplitude decay)
6. Automatic trace kill based on trace statistics
7. Manual trace kill

7a. Write out file with all trace kills

8. Geometry
9. Velocity analysis
10. Apply NMO
11. Top and inside mutes
12. Stack
13. F-K Time migration
14. Output SEG-Y files with 0.5 sec agc and t**2 gain

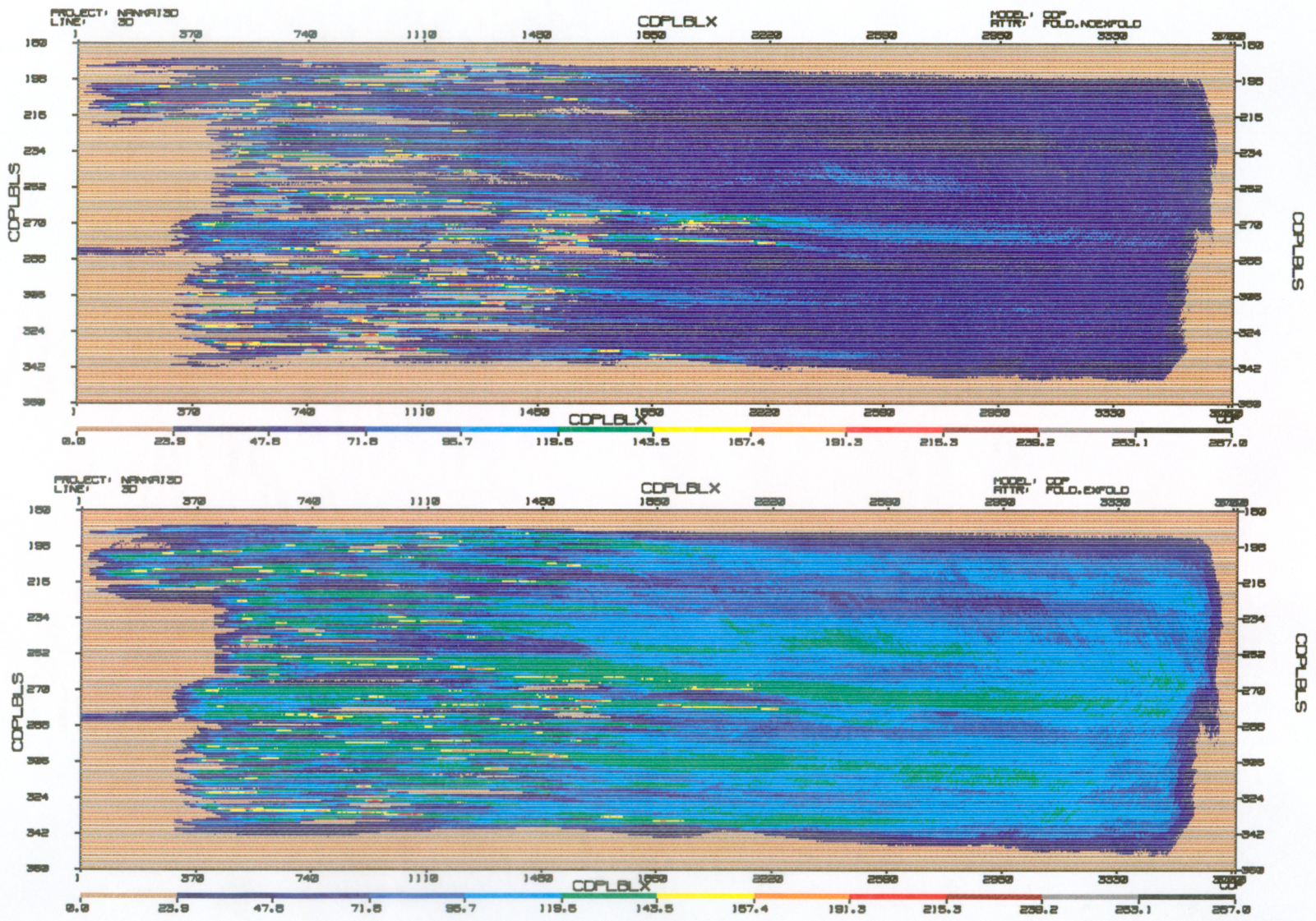


Figure 11. Fold maps of midpoints within the Nankai 3D survey area. X-axis is in CDPLBLS units which are twice the sail line number and the Y-axis is in CDPLBLX units which are twice the shotpoint number. The color is the fold value respective to each 25 by 50 m bin. A) Fold map generated by simple binning at 25 by 50 m. B) Fold map generated by extended binning an additional 25 m in both cross line directions.

A.

B.

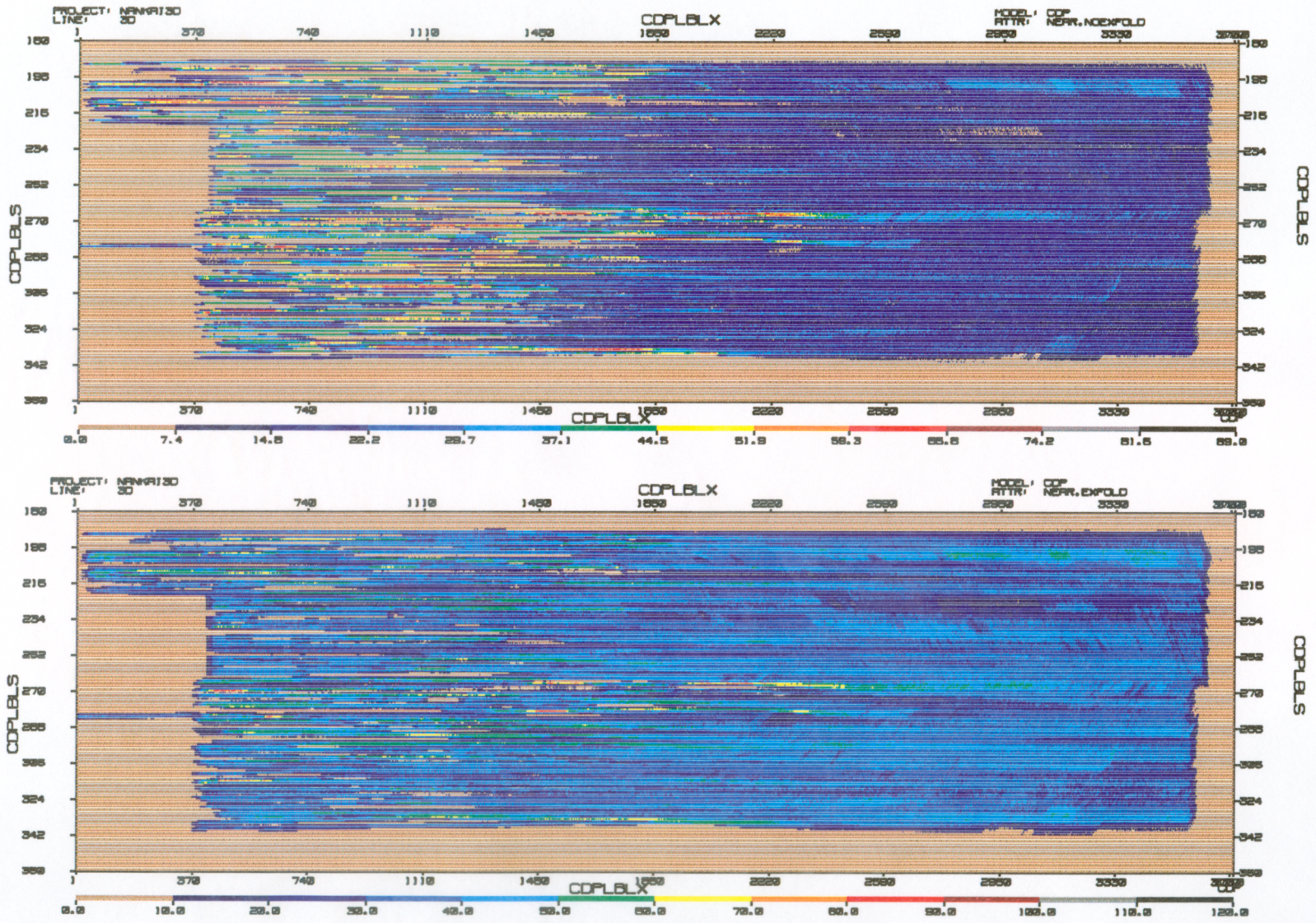


Figure 12. Fold maps of midpoints with near offsets within the Nankai 3D survey area. X and Y axes are the same as Figure 11. A) Simple binning at 25 by 50 m. B) Extended binning an additional 25 m in the cross-line direction.

A.

B.

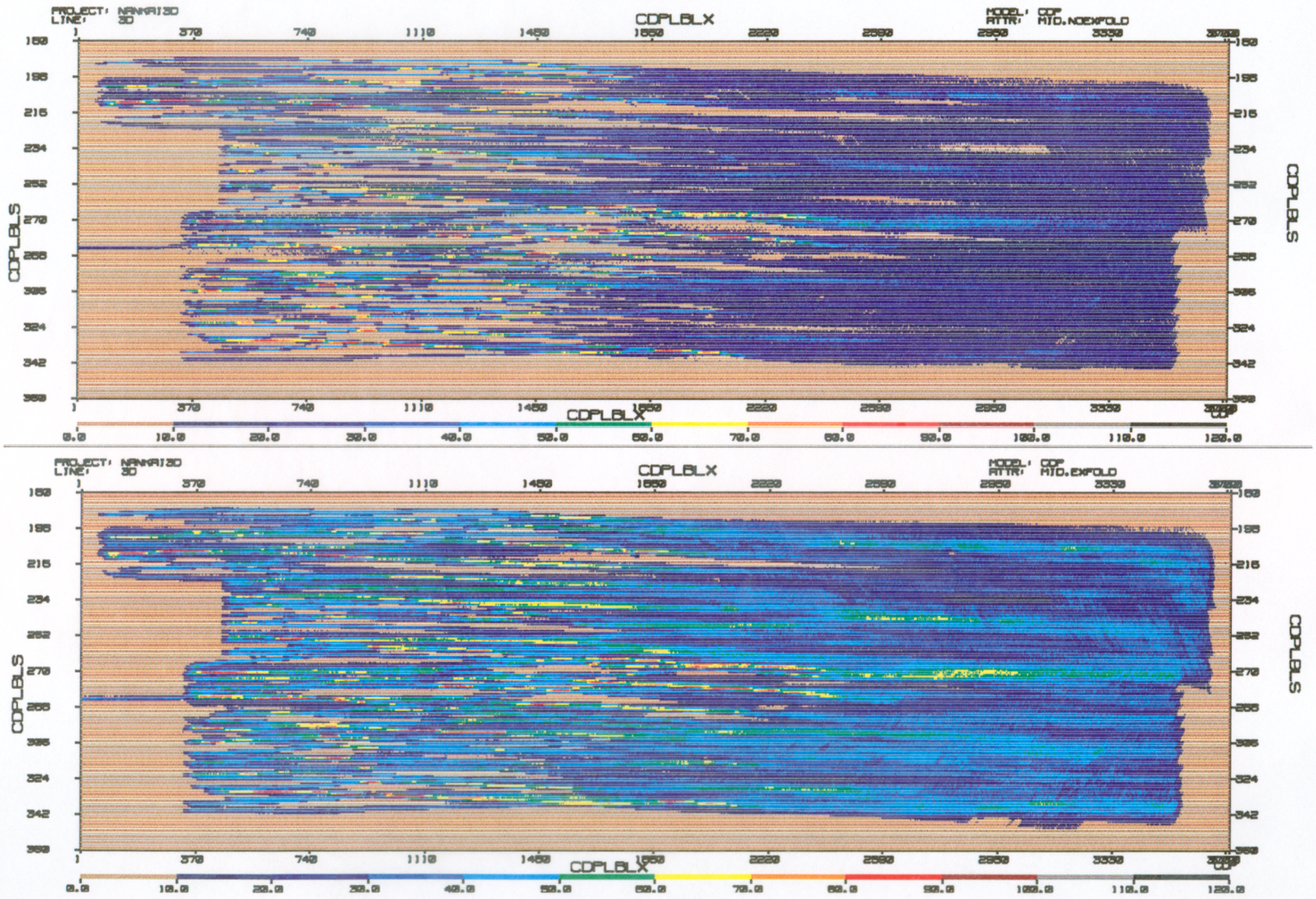
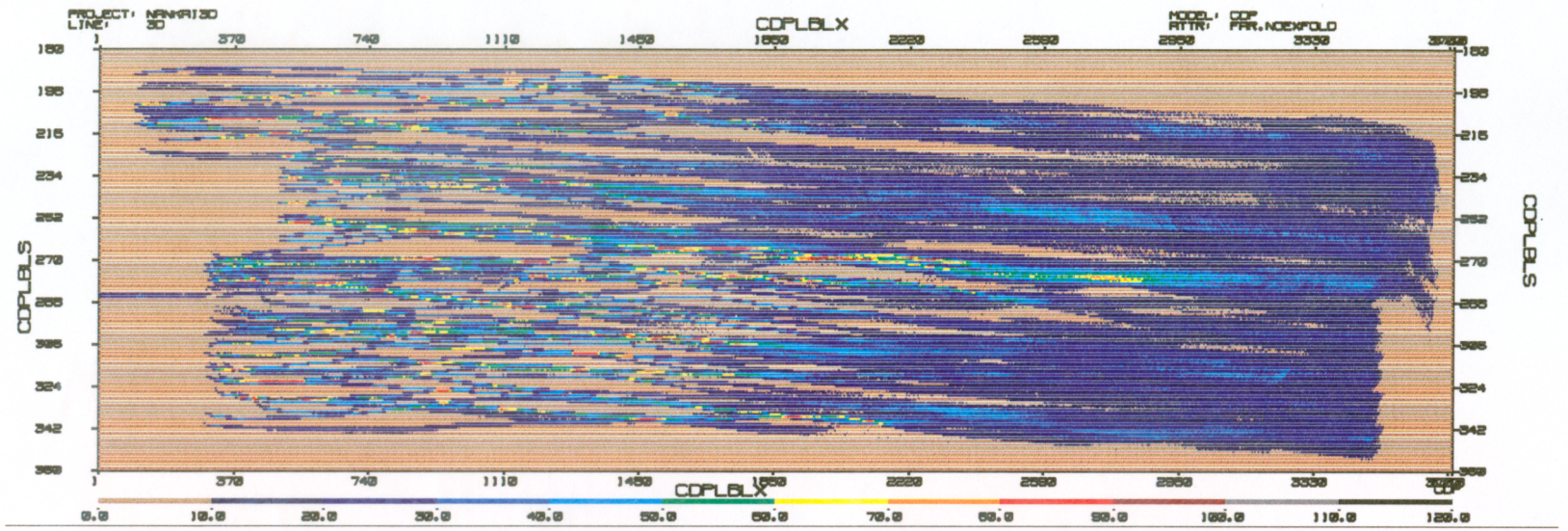


Figure 13. Fold maps of midpoints with middle offsets within the Nankai 3D survey area. X and Y axes are the same as Figure 11. A) Simple binning at 25 by 50 m. B) Extended binning an additional 25 m in the cross-line direction.

A.



B.

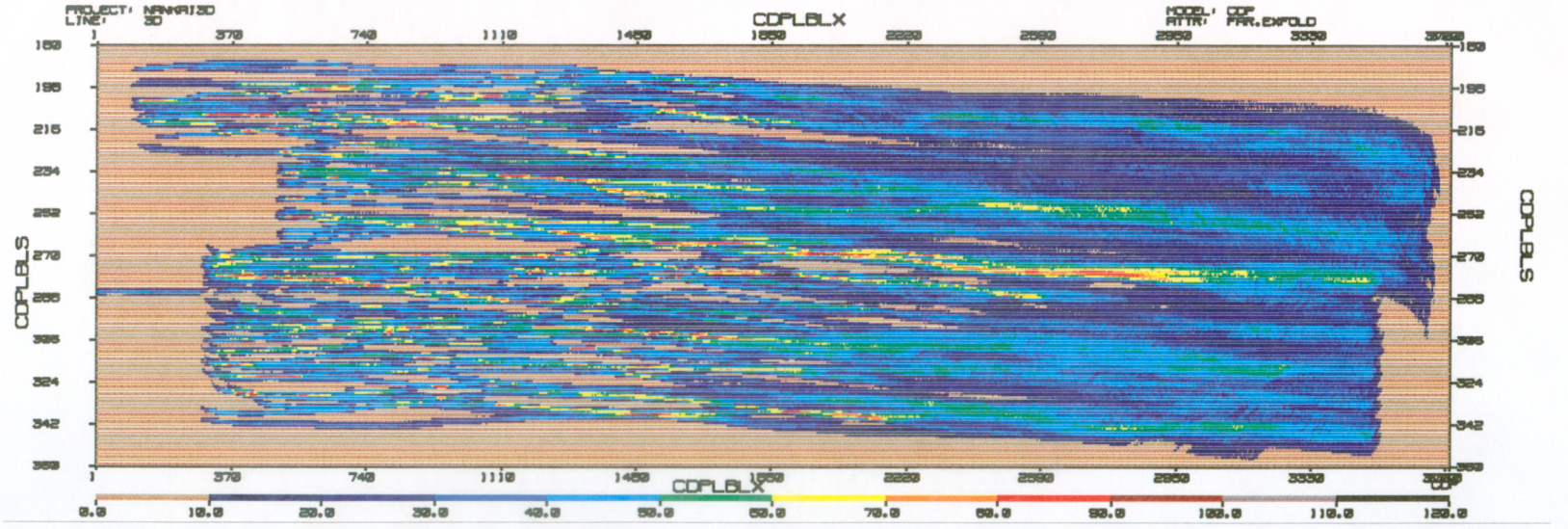


Figure 14. Fold maps of midpoints with far offsets within the Nankai 3D survey area. X and Y axes are the same as Figure 11. A) Simple binning at 25 by 50 m. B) Extended binning an additional 25 m in the cross-line direction.

The OBS Experiment

EW9908 included an OBS experiment conducted by Kimi Mochizuki. Eight OBS instruments were deployed after our transit from Kochi to the 3-D survey area. The eight OBSs were deployed in the center of the survey area where shots during the second leg of the cruise would be optimally recorded on the instruments (Figure 15). All 8 instruments were recovered by the chase boat at the end of the cruise.

EW9908 OBS Locations

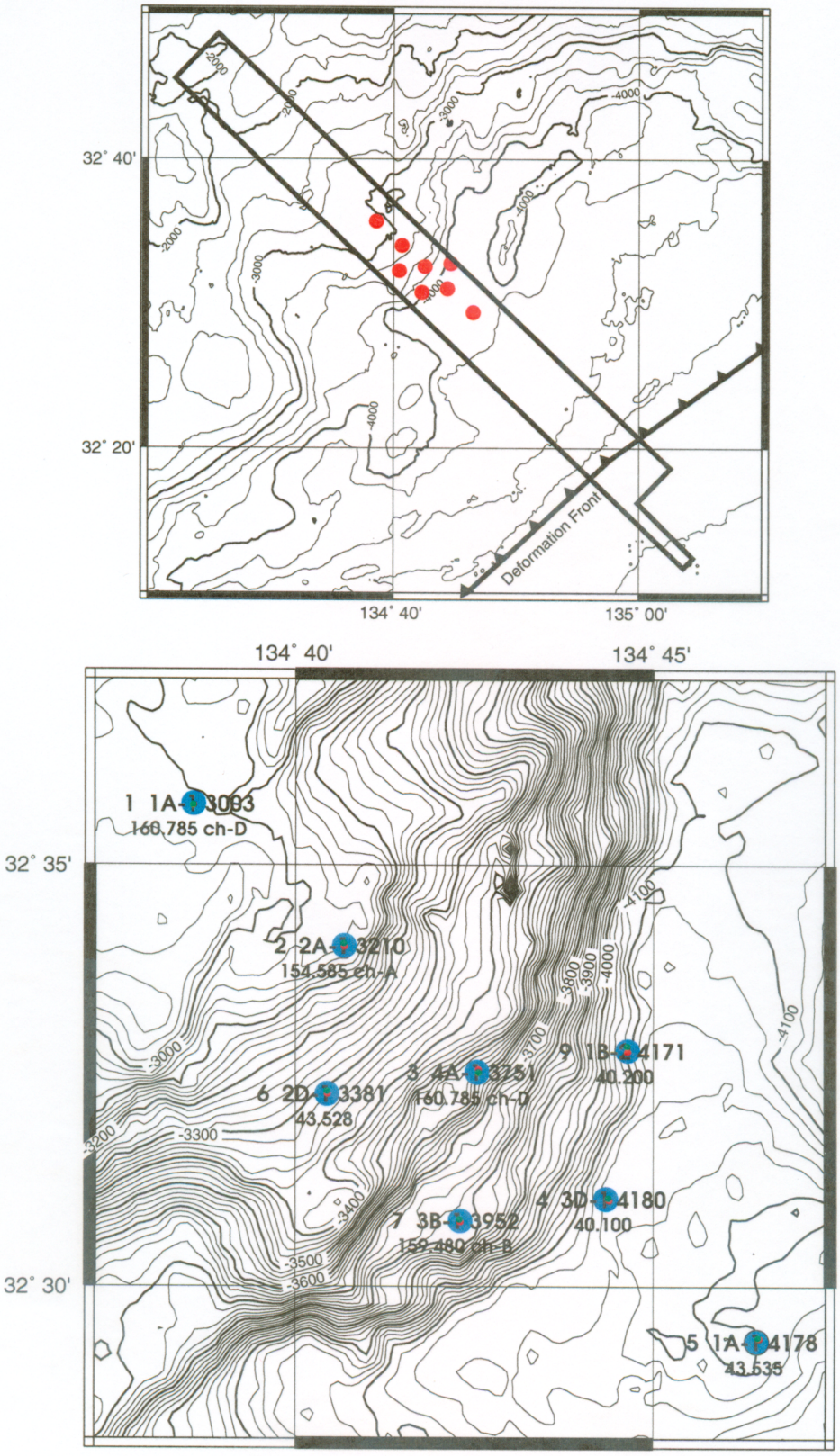


Figure 15. Location map for the 8 OBSs deployed during the second leg (EW9908) of the Nankai 3-D seismic experiment.

Line Summaries

Line Order

	Line	Date	Shot	FFID	Shot Position		Tailbuoy Position	
Start	20	228:07:07:10.363	2	1600	N 32 16.5833	E 135 00.3723	N 00 00.0000	E 000 00.0000
End	20	228:08:25:26.955	248	1846	N 32 11.9722	E 135 06.0250	N 00 00.0000	E 000 00.0000
Start	34	219:09:32:20.136	4	2	N 32 06.1355	E 135 15.9088	N 32 05.3415	E 135 19.8897
End	34	219:12:49:21.834	201	593	N 32 16.8823	E 135 01.3070	N 32 14.3171	E 135 04.0762
Start	40	171:19:47:30.406	6	2	N 32 06.2468	E 135 14.7672	N 32 03.9123	E 135 17.7518
End	40	171:23:12:22.309	600	590	N 32 17.4363	E 135 01.1828	N 32 15.2443	E 135 04.3230
Start	42	172:09:07:51.338	1	2156	N 32 47.4314	E 134 24.3162	N 32 46.7920	E 134 28.3304
End	42	172:12:36:26.307	419	135	N 32 55.2560	E 134 14.5944	N 32 55.1305	E 134 18.6852
Start	50	172:15:08:06.609	313	1	N 32 51.6042	E 134 15.3262	N 32 55.0476	E 134 15.4221
End	50	172:19:47:22.823	1370	719	N 32 37.7185	E 134 32.5340	N 32 40.7915	E 134 31.0958
Start	92	227:01:54:47.827	1801	1	N 32 45.4546	E 134 22.1930	N 00 00.0000	E 000 00.0000
End	92	227:10:28:35.639	137	1665	N 32 14.2702	E 135 00.5343	N 00 00.0000	E 000 00.0000
Start	93	226:02:33:06.874	1801	1	N 32 45.4957	E 134 22.2401	N 00 00.0000	E 000 00.0000
End	93	226:11:24:20.718	138	1664	N 32 14.3260	E 135 00.5519	N 00 00.0000	E 000 00.0000
Start	94	225:04:43:35.846	1801	1	N 32 45.5360	E 134 22.2832	N 00 00.0000	E 000 00.0000
End	94	225:14:04:46.967	137	1665	N 32 14.3458	E 135 00.6189	N 00 00.0000	E 000 00.0000
Start	95	223:15:39:28.266	1801	1	N 32 45.5703	E 134 22.3188	N 00 00.0000	E 000 00.0000
End	95	224:00:07:17.690	134	1655	N 32 14.3308	E 135 00.7357	N 00 00.0000	E 000 00.0000
Start	96	192:16:09:56.329	1801	1	N 32 45.6092	E 134 22.3664	N 00 00.0000	E 000 00.0000
End	96	193:01:30:57.965	1	1801	N 32 11.8771	E 135 03.8352	N 00 00.0000	E 000 00.0000
Start	97	209:06:53:39.026	1801	2	N 32 45.7397	E 134 22.2817	N 32 48.7489	E 134 23.3426
End	97	209:16:22:26.591	131	1674	N 32 14.3742	E 135 00.9178	N 32 16.9287	E 134 58.1292
Start	97a	222:10:26:46.250	1785	17	N 32 45.3476	E 134 22.7779	N 00 00.0000	E 000 00.0000
End	97a	222:14:29:47.065	994	808	N 32 30.5489	E 134 41.0577	N 00 00.0000	E 000 00.0000
Start	98	193:14:16:17.303	1801	1	N 32 45.6868	E 134 22.4470	N 00 00.0000	E 000 00.0000
End	98	193:23:58:48.646	74	1728	N 32 13.3324	E 135 02.2565	N 00 00.0000	E 000 00.0000
Start	99	210:04:43:07.509	1801	1	N 32 45.7241	E 134 22.4951	N 32 48.9250	E 134 22.9597
End	99	210:13:32:20.087	140	1662	N 32 14.5991	E 135 00.7753	N 32 17.1962	E 134 58.0000
Start	100a	174:05:29:13.078	1801	1	N 32 45.7772	E 134 22.5624	N 00 00.0000	E 000 00.0000
End	100a	174:15:24:32.024	1	1763	N 32 12.0307	E 135 04.0101	N 00 00.0000	E 000 00.0000
Start	101	191:17:52:01.839	1801	1	N 32 45.8030	E 134 22.5819	N 32 48.8692	E 134 23.2947
End	101	192:03:10:35.880	1	1791	N 32 12.0690	E 135 04.0532	N 32 15.3310	E 134 56.9560
Start	101a	199:04:56:16.703	1783	1	N 32 45.4575	E 134 22.9925	N 00 00.0000	E 000 00.0000
End	101a	199:06:08:20.480	1549	0235	N 32 41.0952	E 134 28.4249	N 00 00.0000	E 000 00.0000
Start	102	175:19:03:33.169	1801	1	N 32 45.8571	E 134 22.6523	N 00 00.0000	E 000 00.0000
End	102	176:04:37:22.943	1	1791	N 32 12.1130	E 135 04.1038	N 00 00.0000	E 000 00.0000
Start	103	194:13:21:58.360	1801	1	N 32 45.8796	E 134 22.6644	N 00 00.0000	E 000 00.0000
End	103	194:22:43:17.146	1	1801	N 32 12.1532	E 135 04.1486	N 00 00.0000	E 000 00.0000
Start	104	176:18:22:54.802	1801	1	N 32 45.9325	E 134 22.7376	N 00 00.0000	E 000 00.0000
End	104	177:03:46:23.545	1	1791	N 32 12.1845	E 135 04.1854	N 00 00.0000	E 000 00.0000
Start	105	211:01:40:27.265	1801	1	N 32 46.3549	E 134 22.2707	N 32 48.6753	E 134 24.0775
End	105	211:11:13:01.535	1	1802	N 32 12.2210	E 135 04.2255	N 32 14.7259	E 135 01.3799
Start	106	177:18:01:44.977	1801	1	N 32 46.0135	E 134 22.8285	N 00 00.0000	E 000 00.0000
End	106	178:03:19:13.696	1	1791	N 32 12.2665	E 135 04.2782	N 00 00.0000	E 000 00.0000
Start	107	195:12:00:12.104	1801	1	N 32 46.0359	E 134 22.8458	N 00 00.0000	E 000 00.0000
End	107	195:21:23:34.360	1	1801	N 32 12.3042	E 135 04.3203	N 00 00.0000	E 000 00.0000
Start	108	178:18:22:14.217	1801	1	N 32 46.0888	E 134 22.9141	N 00 00.0000	E 000 00.0000
End	108	179:03:56:57.183	1	1739	N 32 12.3348	E 135 04.3563	N 00 00.0000	E 000 00.0000
Start	108a	213:11:57:51.930	300	1	N 32 17.9597	E 134 57.5105	N 32 20.6122	E 134 55.1774
End	108a	213:13:01:06.381	110	191	N 32 14.3889	E 135 01.8644	N 32 16.9284	E 134 59.0637
Start	109	212:00:41:43.752	1801	1	N 32 46.1229	E 134 22.9432	N 32 49.4102	E 134 21.7122
End	109	212:10:15:18.450	1	2	N 32 12.3735	E 135 04.3992	N 32 14.8876	E 135 01.5664
Start	110	179:20:11:59.011	1801	1	N 32 46.1385	E 134 22.9697	N 00 00.0000	E 000 00.0000
End	110	180:05:34:00.561	1	1799	N 32 12.4159	E 135 04.4479	N 00 00.0000	E 000 00.0000

Start	111	196:10:59:52.457	1801	1	N 32 46.1935	E 134 23.0160	N 00 00.0000	E 000 00.0000
End	111	196:19:36:26.171	201	1601	N 32 16.2226	E 134 59.9189	N 00 00.0000	E 000 00.0000
Start	111a	221:18:40:05.303	1330	1	N 32 37.3932	E 134 33.9362	N 32 40.3655	E 134 31.7951
End	111a	221:19:55:51.117	1089	238	N 32 32.8856	E 134 39.5038	N 32 35.6309	E 134 36.9664
Start	112	181:21:29:07.516	1801	1	N 32 46.2336	E 134 23.0680	N 00 00.0000	E 000 00.0000
End	112	182:06:11:46.408	201	1600	N 32 16.2572	E 134 59.9593	N 00 00.0000	E 000 00.0000
Start	113	212:23:20:18.957	1801	1	N 32 46.2743	E 134 23.1171	N 32 49.5355	E 134 22.3855
End	113	213:07:54:59.478	201	1600	N 32 16.2959	E 135 00.0012	N 32 18.7155	E 134 57.0637
Start	113a	216:18:09:28.958	1620	2	N 32 42.8928	E 134 27.3145	N 32 46.1914	E 134 26.0219
End	113a	216:18:44:14.578	1535	87	N 32 41.3043	E 134 29.2818	N 32 44.5525	E 134 27.8007
Start	113b	220:00:31:33.133	1600	1	N 32 42.5637	E 134 27.7528	N 32 45.6315	E 134 25.8354
End	113b	220:03:20:07.681	1093	508	N 32 33.0697	E 134 39.4586	N 32 36.1212	E 134 37.4857
Start	114	182:20:28:28.231	1801	1	N 32 46.3107	E 134 23.1514	N 00 00.0000	E 000 00.0000
End	114	183:05:14:17.520	201	1601	N 32 16.3325	E 135 00.0425	N 00 00.0000	E 000 00.0000
Start	114a	199:06:40:13.897	1451	1	N 32 39.7666	E 134 31.2608	N 00 00.0000	E 000 00.0000
End	114a	199:09:44:23.307	856	0596	N 32 28.6320	E 134 45.0025	N 00 00.0000	E 000 00.0000
Start	115	197:09:40:29.979	1801	1	N 32 46.3462	E 134 23.1939	N 00 00.0000	E 000 00.0000
End	115	197:18:18:48.674	201	1601	N 32 16.3751	E 135 00.0930	N 00 00.0000	E 000 00.0000
Start	116	183:20:25:52.571	1801	1	N 32 46.3890	E 134 23.2314	N 00 00.0000	E 000 00.0000
End	116	184:04:43:10.949	216	1586	N 32 16.6889	E 134 59.7845	N 00 00.0000	E 000 00.0000
Start	117	214:01:28:51.249	1801	1	N 32 46.4297	E 134 23.2926	N 32 49.1799	E 134 24.2367
End	117	214:10:23:21.655	201	1591	N 32 16.4516	E 135 00.1785	N 32 18.8404	E 134 57.2031
Start	117a	220:20:15:39.854	1801	1	N 32 46.4328	E 134 23.2993	N 32 48.8553	E 134 24.6963
End	117a	221:04:51:33.576	201	1601	N 32 16.4626	E 135 00.1893	N 32 18.4839	E 134 56.8611
Start	117b	222:23:33:31.797	1099	1	N 32 33.3015	E 134 39.5294	N 00 00.0000	E 000 00.0000
End	117b	223:00:31:55.438	918	0182	N 32 29.9069	E 134 43.6957	N 00 00.0000	E 000 00.0000
Start	118	184:18:28:06.417	1801	1	N 32 46.9230	E 134 22.7620	N 00 00.0000	E 000 00.0000
End	118	185:03:08:43.413	203	1602	N 32 16.4913	E 135 00.2247	N 00 00.0000	E 000 00.0000
Start	119	198:07:03:06.596	1801	1	N 32 46.5097	E 134 23.3801	N 00 00.0000	E 000 00.0000
End	119	198:16:13:23.822	201	1601	N 32 16.5303	E 135 00.2690	N 00 00.0000	E 000 00.0000
Start	119a	222:21:23:10.132	1508	1	N 32 41.0349	E 134 30.1706	N 00 00.0000	E 000 00.0000
End	119a	222:22:05:13.925	1376	133	N 32 38.5618	E 134 33.2209	N 00 00.0000	E 000 00.0000
Start	120	185:15:27:56.183	1801	1	N 32 46.5464	E 134 23.4180	N 00 00.0000	E 000 00.0000
End	120	186:00:23:39.176	201	1601	N 32 16.5789	E 135 00.3239	N 00 00.0000	E 000 00.0000
Start	121	214:23:37:35.262	1801	1	N 32 46.5854	E 134 23.4688	N 32 49.4179	E 134 24.4668
End	121	215:06:10:53.453	630	1172	N 32 24.6685	E 134 50.5138	N 32 27.1876	E 134 47.6886
Start	121a	227:22:42:37.790	1801	1	N 32 46.5921	E 134 23.4798	N 00 00.0000	E 000 00.0000
End	121a	228:07:06:52.063	201	1599	N 32 16.6018	E 135 00.3494	N 00 00.0000	E 000 00.0000
Start	122	186:12:45:06.360	1801	1	N 32 46.6271	E 134 23.5149	N 00 00.0000	E 000 00.0000
End	122	186:21:17:50.364	201	1601	N 32 16.6447	E 135 00.3990	N 00 00.0000	E 000 00.0000
Start	122a	21:23:43:18.690	344	442	N 32 19.3369	E 134 57.1256	N 32 21.9117	E 134 54.3728
End	122a	221:21:27:44.878	785	1	N 32 27.6079	E 134 46.9831	N 32 30.2565	E 134 44.3326
Start	123	215:20:56:26.546	1801	1	N 32 46.6642	E 134 23.5562	N 32 50.0862	E 134 23.0336
End	123	216:05:50:38.239	201	1509	N 32 16.6885	E 135 00.4492	N 32 19.1509	E 134 57.5535
Start	123a	223:01:27:36.045	746	1	N 32 26.9133	E 134 47.9204	N 00 00.0000	E 000 00.0000
End	123a	223:01:58:38.378	649	98	N 32 25.0888	E 134 50.1452	N 00 00.0000	E 000 00.0000
Start	124	187:10:06:43.707	1801	1	N 32 46.6987	E 134 23.5926	N 00 00.0000	E 000 00.0000
End	124	187:18:34:30.592	201	1601	N 32 16.7329	E 135 00.4999	N 00 00.0000	E 000 00.0000
Start	125	206:05:20:26.851	1801	1	N 32 46.7339	E 134 23.6345	N 32 50.0635	E 134 24.1508
End	125	206:14:03:32.115	201	1601	N 32 16.7613	E 135 00.5318	N 32 19.3656	E 134 57.8136
Start	126	188:07:45:14.543	1801	1	N 32 46.7831	E 134 23.6870	N 00 00.0000	E 000 00.0000
End	126	188:14:37:50.654	546	1256	N 32 23.2846	E 134 52.6638	N 00 00.0000	E 000 00.0000
Start	126b	220:06:01:56.402	600	1	N 32 24.2958	E 134 51.4201	N 32 26.8242	E 134 48.6015
End	126b	220:08:11:55.168	201	400	N 32 16.8085	E 135 00.5851	N 32 18.9132	E 134 57.3229
Start	127	205:07:16:15.066	1801	1	N 32 46.8226	E 134 23.7352	N 32 49.3144	E 134 25.0863
End	127	205:15:23:27.052	201	1601	N 32 16.8409	E 135 00.6226	N 32 19.2829	E 134 57.7022
Start	128	189:22:01:32.605	1801	1	N 32 46.8592	E 134 23.7798	N 32 49.6919	E 134 24.9015
End	128	190:06:56:20.802	201	1601	N 32 16.8829	E 135 00.6696	N 32 19.0668	E 134 57.5190
Start	129	204:09:58:18.046	1801	1	N 32 46.8994	E 134 23.8223	N 32 51.8730	E 134 24.3686
End	129	204:18:50:42.327	201	1601	N 32 16.9177	E 135 00.7092	N 32 19.1608	E 134 57.5885
Start	130	190:20:08:37.646	1801	1	N 32 46.9360	E 134 23.8630	N 32 49.7056	E 134 24.8781
End	130	191:04:28:49.454	201	1601	N 32 16.9608	E 135 00.7587	N 32 19.3579	E 134 57.8313
Start	131	203:12:19:07.566	1801	1	N 32 46.9795	E 134 23.9098	N 32 50.0016	E 134 24.9076
End	131	203:20:21:23.243	201	1601	N 32 16.9939	E 135 00.7958	N 32 19.4608	E 134 57.9004
Start	132	173:18:25:32.770	201	1	N 32 17.1057	E 135 00.7626	N 00 00.0000	E 000 00.0000

End	132	174:04:01:54.082	1801	1580	N 32 47.1000	E 134 23.8966	N 00 00.0000	E 000 00.0000
Start	133	192:05:01:54.241	201	1	N 32 17.1488	E 135 00.8127	N 32 08.6032	E 135 03.9441
End	133	192:14:37:10.409	1801	1600	N 32 47.1223	E 134 23.9284	N 31 33.8317	E 135 40.0612
Start	134	174:17:12:14.096	201	1	N 32 17.1840	E 135 00.8506	N 00 00.0000	E 000 00.0000
End	134	175:17:38:12.320	1801	1802	N 32 47.1755	E 134 23.9830	N 00 00.0000	E 000 00.0000
Start	134b	216:09:43:46.102	720	1	N 32 26.9350	E 134 48.9404	N 32 24.4157	E 134 51.7650
End	134b	216:16:08:03.948	1801	1082	N 32 47.1662	E 134 23.9726	N 32 45.6024	E 134 27.6455
Start	135	208:18:18:20.745	226	26	N 32 17.6907	E 135 00.3223	N 32 15.4545	E 135 03.4730
End	135	209:04:56:46.296	1801	1601	N 32 47.1783	E 134 24.0015	N 32 46.7726	E 134 28.0866
Start	135a	213:09:43:58.819	201	1	N 32 17.2225	E 135 00.8954	N 32 14.5603	E 135 03.3728
End	135a	213:10:10:09.938	283	83	N 32 18.7650	E 134 59.0168	N 32 16.4302	E 135 02.0587
Start	135b	219:12:54:47.022	201	1	N 32 17.1924	E 135 00.9386	N 32 14.6053	E 135 03.6782
End	135b	219:17:43:08.260	1010	810	N 32 32.3953	E 134 42.3649	N 32 30.0798	E 134 45.4299
Start	136	176:06:32:06.730	201	1	N 32 16.8014	E 135 01.4977	N 00 00.0000	E 000 00.0000
End	136	176:16:55:06.437	1801	1603	N 32 47.2561	E 134 24.0732	N 00 00.0000	E 000 00.0000
Start	137	193:03:15:09.261	201	1	N 32 17.3078	E 135 00.9941	N 00 00.0000	E 000 00.0000
End	137	193:12:32:57.480	1801	1601	N 32 47.2764	E 134 24.1040	N 00 00.0000	E 000 00.0000
Start	138	177:05:43:26.796	201	1	N 32 17.3401	E 135 01.0293	N 00 00.0000	E 000 00.0000
End	138	177:16:11:47.351	1801	1582	N 32 47.3349	E 134 24.1631	N 00 00.0000	E 000 00.0000
Start	138a	216:07:50:17.425	402	1	N 32 21.1198	E 134 56.4228	N 32 19.2156	E 134 59.8323
End	138a	216:09:15:42.443	656	255	N 32 25.8919	E 134 50.5901	N 32 23.3097	E 134 53.3337
Start	139	209:17:22:56.177	201	1	N 32 17.3756	E 135 01.0699	N 32 14.8162	E 135 01.8182
End	139	210:02:58:25.633	1801	1600	N 32 47.3616	E 134 24.1951	N 32 46.1497	E 134 28.0618
Start	140	178:05:38:43.344	210	10	N 32 17.5917	E 135 00.9186	N 00 00.0000	E 000 00.0000
End	140	178:16:47:00.138	1801	1599	N 32 47.4139	E 134 24.2516	N 00 00.0000	E 000 00.0000
Start	141	171:23:15:45.502	10	592	N 32 17.6252	E 135 00.9550	N 32 15.4340	E 135 04.0956
End	141	172:09:06:52.168	1598	2154	N 32 47.3937	E 134 24.3622	N 32 46.7471	E 134 28.3741
Start	141c	215:12:07:41.502	602	1	N 32 24.9960	E 134 51.9658	N 32 22.7743	E 134 55.0696
End	141c	215:16:12:51.063	1352	751	N 32 39.0461	E 134 34.6750	N 32 37.1445	E 134 38.1270
Start	142	179:05:52:48.488	201	1	N 32 16.9345	E 135 01.8837	N 00 00.0000	E 000 00.0000
End	142	179:18:22:07.435	1801	1561	N 32 47.4903	E 134 24.3387	N 00 00.0000	E 000 00.0000
Start	142a	223:05:33:46.428	1051	1	N 32 33.4438	E 134 41.6610	N 00 00.0000	E 000 00.0000
End	142a	223:06:19:37.601	1180	130	N 32 35.8582	E 134 38.6844	N 00 00.0000	E 000 00.0000
Start	143	194:01:26:54.121	201	1	N 32 17.5419	E 135 01.2618	N 00 00.0000	E 000 00.0000
End	143	194:11:39:50.857	1801	1601	N 32 47.5102	E 134 24.3696	N 00 00.0000	E 000 00.0000
Start	143a	222:02:13:13.429	650	1	N 32 25.9696	E 134 50.9454	N 32 23.7092	E 134 54.0569
End	143a	222:05:30:19.693	1254	605	N 32 37.2852	E 134 37.0235	N 32 35.2014	E 134 40.3196
Start	144a	181:09:19:36.317	201	1	N 32 17.5734	E 135 01.2948	N 00 00.0000	E 000 00.0000
End	144a	181:19:58:13.838	1801	1601	N 32 47.5557	E 134 24.4181	N 00 00.0000	E 000 00.0000
Start	145	210:14:34:45.765	201	1	N 32 17.6079	E 135 01.3344	N 32 15.0694	E 135 02.2885
End	145	211:00:06:04.994	1801	1601	N 32 47.5923	E 134 24.4587	N 32 46.1927	E 134 28.0
Start	146	182:07:27:03.706	201	1	N 32 17.4799	E 135 01.5811	N 00 00.0000	E 000 00.0000
End	146	182:18:37:06.241	1801	1603	N 32 47.6248	E 134 24.5028	N 00 00.0000	E 000 00.0000
Start	147	195:00:45:11.418	201	1	N 32 17.6978	E 135 01.4415	N 00 00.0000	E 000 00.0000
End	147	195:10:23:50.794	1801	1601	N 32 47.6671	E 134 24.5456	N 00 00.0000	E 000 00.0000
Start	148	183:06:58:16.645	201	1	N 32 17.7233	E 135 01.4654	N 00 00.0000	E 000 00.0000
End	148	183:18:41:20.787	1801	1601	N 32 47.6899	E 134 24.5847	N 00 00.0000	E 000 00.0000
Start	149	211:12:57:28.274	201	1	N 32 17.7669	E 135 01.5147	N 32 15.5334	E 135 04.6570
End	149	211:22:29:21.896	1801	1601	N 32 47.7489	E 134 24.6358	N 32 46.5540	E 134 28.5060
Start	150	184:06:45:02.423	201	1	N 32 17.8040	E 135 01.5569	N 00 00.0000	E 000 00.0000
End	150	184:16:50:13.766	1801	1601	N 32 47.7846	E 134 24.6819	N 00 00.0000	E 000 00.0000
Start	151	195:23:02:25.512	201	1	N 32 17.8468	E 135 01.6062	N 00 00.0000	E 000 00.0000
End	151	196:09:11:35.568	1801	1601	N 32 47.8212	E 134 24.7240	N 00 00.0000	E 000 00.0000
Start	151a	222:17:25:54.853	1243	1	N 32 37.3849	E 134 37.6253	N 00 00.0000	E 000 00.0000
End	151a	222:17:49:58.123	1303	61	N 32 38.5108	E 134 36.2423	N 00 00.0000	E 000 00.0000
Start	151b	223:09:04:40.224	1088	1	N 32 34.4884	E 134 41.2060	N 00 00.0000	E 000 00.0000
End	151b	223:10:06:16.505	1258	171	N 32 37.6768	E 134 37.2874	N 00 00.0000	E 000 00.0000
Start	152	185:05:12:04.967	202	1	N 32 17.9055	E 135 01.6285	N 00 00.0000	E 000 00.0000
End	152	185:13:46:23.401	1801	1600	N 32 47.8629	E 134 24.7672	N 00 00.0000	E 000 00.0000
Start	153	212:11:54:30.410	203	1	N 32 17.9612	E 135 01.6469	N 32 15.5726	E 135 04.6263
End	153	212:21:08:41.687	1801	1592	N 32 47.9069	E 134 24.8140	N 32 46.6148	E 134 28.6404
Start	154	186:02:24:36.997	205	1	N 32 18.0427	E 135 01.6545	N 00 00.0000	E 000 00.0000
End	154	186:11:20:19.756	1801	0120	N 32 47.1198	E 134 23.9193	N 00 00.0000	E 000 00.0000
Start	154a	219:20:35:32.926	1474	1	N 32 41.8120	E 134 32.4778	N 32 40.3579	E 134 36.2138
End	154a	219:22:44:45.065	1801	328	N 32 47.9261	E 134 24.9077	N 32 46.5341	E 134 28.6734

Start	155	196:21:27:29.716	201	1	N 32 18.0074	E 135 01.7884	N 00 00.0000	E 000 00.0000
End	155	197:07:48:36.083	1801	1601	N 32 47.9785	E 134 24.8992	N 00 00.0000	E 000 00.0000
Start	156	186:23:18:53.714	201	1	N 32 17.5234	E 135 02.4619	N 00 00.0000	E 000 00.0000
End	156	187:08:33:59.141	1801	1602	N 32 48.0188	E 134 24.9428	N 00 00.0000	E 000 00.0000
Start	156a	219:18:48:39.715	1189	1	N 32 36.5533	E 134 39.1481	N 32 34.2109	E 134 42.1418
End	156a	219:20:06:46.463	1401	213	N 32 40.5213	E 134 34.2509	N 32 38.8150	E 134 37.8383
Start	157	213:14:14:22.571	201	1	N 32 18.0773	E 135 01.8684	N 32 15.3961	E 135 03.8562
End	157	213:23:52:54.584	1801	1587	N 32 48.0580	E 134 24.9887	N 32 46.8479	E 134 28.8482
Start	157a	227:11:58:39.697	201	1	N 32 18.0725	E 135 01.8639	N 00 00.0000	E 000 00.0000
End	157a	227:21:20:55.372	1801	1601	N 32 48.0672	E 134 24.9922	N 00 00.0000	E 000 00.0000
Start	158	187:20:29:50.921	201	1	N 32 18.1220	E 135 01.9200	N 00 00.0000	E 000 00.0000
End	158	188:05:53:59.357	1801	1601	N 32 48.0943	E 134 25.0369	N 00 00.0000	E 000 00.0000
Start	159	197:20:09:36.929	201	1	N 32 18.1582	E 135 01.9615	N 00 00.0000	E 000 00.0000
End	159	198:05:25:13.515	1801	1601	N 32 48.1380	E 134 25.0761	N 00 00.0000	E 000 00.0000
Start	160	189:10:27:06.697	206	6	N 32 18.2958	E 135 01.8978	N 32 15.6220	E 135 04.4210
End	160	189:20:20:27.933	1801	1601	N 32 48.1753	E 134 25.1209	N 32 47.4655	E 134 29.1267
Start	160a	220:09:35:39.443	350	1	N 32 21.0033	E 134 58.5946	N 32 18.2898	E 135 01.1639
End	160a	220:18:31:34.561	1801	1452	N 32 48.1842	E 134 25.1276	N 32 46.7336	E 134 28.8714
Start	161	214:12:11:51.021	201	1	N 32 18.2360	E 135 02.0487	N 32 15.4906	E 135 04.1247
End	161	214:21:54:10.674	1801	1601	N 32 48.2134	E 134 25.1637	N 32 46.9746	E 134 29.0145
Start	161a	221:06:31:11.954	201	1	N 32 18.2445	E 135 02.0632	N 32 15.1012	E 135 02.7390
End	161a	221:15:25:50.309	1801	1592	N 32 48.2280	E 134 25.1761	N 32 46.7857	E 134 28.9281
Start	162	190:08:51:46.062	201	1	N 32 18.2776	E 135 02.0970	N 32 15.6603	E 135 04.7202
End	162	190:18:31:22.177	1801	1601	N 32 48.2518	E 134 25.2082	N 32 47.3990	E 134 29.1703
Start	163	198:18:01:33.226	201	1	N 32 18.3139	E 135 02.1372	N 00 00.0000	E 000 00.0000
End	163	199:03:31:37.048	1801	1587	N 32 48.2886	E 134 25.2513	N 00 00.0000	E 000 00.0000
Start	164	191:06:05:42.436	201	1	N 32 18.3477	E 135 02.1759	N 32 15.7691	E 135 04.2716
End	164	191:15:37:36.808	1801	1601	N 32 48.3305	E 134 25.2972	N 32 47.6162	E 134 29.3004
Start	165	206:15:22:56.514	201	1	N 32 18.3899	E 135 02.2247	N 32 15.8521	E 135 02.9044
End	165	207:00:20:12.740	1612	1412	N 32 44.8322	E 134 29.7141	N 32 43.7045	E 134 33.5971
Start	165a	215:17:31:51.507	1567	1	N 32 44.0054	E 134 30.7656	N 32 42.2417	E 134 34.3004
End	165a	215:18:57:17.345	1801	235	N 32 48.3721	E 134 25.3416	N 32 47.0269	E 134 29.1339
Start	166	205:16:44:44.067	201	1	N 32 18.4286	E 135 02.2678	N 32 15.7878	E 135 03.3585
End	166	206:02:59:50.617	1801	1601	N 32 48.4114	E 134 25.3862	N 32 47.3191	E 134 29.3046
Start	167	204:20:11:27.114	201	1	N 32 18.4718	E 135 02.3173	N 32 15.7104	E 135 03.2213
End	167	205:05:58:26.385	1801	1601	N 32 48.4509	E 134 25.4311	N 32 46.9677	E 134 29.1592
Start	167a	215:10:05:17.988	232	1	N 32 19.0523	E 135 01.6030	N 32 16.3186	E 135 02.9056
End	167a	215:11:00:45.653	403	172	N 32 22.2668	E 134 57.6830	N 32 19.9373	E 135 00.7227
Start	168	203:22:21:01.402	201	1	N 32 18.5049	E 135 02.3546	N 32 16.0491	E 135 05.2380
End	168	204:08:23:43.636	1801	1601	N 32 48.4892	E 134 25.4749	N 32 47.2899	E 134 29.2697
Start	169	203:01:11:13.659	201	1	N 32 18.5441	E 135 02.3989	N 32 16.2044	E 135 05.4222
End	169	203:10:48:25.979	1801	1601	N 32 48.5325	E 134 25.5240	N 32 47.1631	E 134 29.3223
Start	169a	223:11:01:37.153	1401	1	N 32 41.0569	E 134 34.7822	N 00 00.0000	E 000 00.0000
End	169a	223:13:36:29.736	1801	401	N 32 48.5334	E 134 25.5229	N 00 00.0000	E 000 00.0000
Start	170	224:01:41:16.727	201	1	N 32 18.5787	E 135 02.4394	N 00 00.0000	E 000 00.0000
End	170	224:07:16:29.522	1167	967	N 32 36.6881	E 134 40.2090	N 00 00.0000	E 000 00.0000
Start	170a	224:17:35:48.640	409	2	N 32 22.4831	E 134 57.6632	N 00 00.0000	E 000 00.0000
End	170a	225:02:46:50.915	1801	1394	N 32 48.5678	E 134 25.5623	N 00 00.0000	E 000 00.0000
Start	171	225:15:33:24.624	201	1	N 32 18.6203	E 135 02.4881	N 00 00.0000	E 000 00.0000
End	171	226:00:53:53.116	1801	1594	N 32 48.6184	E 134 25.6152	N 00 00.0000	E 000 00.0000
Start	172	226:13:06:25.489	201	1	N 32 18.6559	E 135 02.5284	N 00 00.0000	E 000 00.0000
End	172	227:00:01:28.534	1801	1601	N 32 48.6498	E 134 25.6535	N 00 00.0000	E 000 00.0000

Cronological Order

	Date	Line	Shot	FFID	Shot Position		Tailbuoy Position	
Start	171:19:47:30.406	40	6	2	N 32 06.2468	E 135 14.7672	N 32 03.9123	E 135 17.7518
End	171:23:12:22.309	40	600	590	N 32 17.4363	E 135 01.1828	N 32 15.2443	E 135 04.3230
Start	171:23:15:45.502	141	10	592	N 32 17.6252	E 135 00.9550	N 32 15.4340	E 135 04.0956

End	172:09:06:52.168	141	1598	2154	N 32 47.3937	E 134 24.3622	N 32 46.7471	E 134 28.3741
Start	172:09:07:51.338	42	1	2156	N 32 47.4314	E 134 24.3162	N 32 46.7920	E 134 28.3304
End	172:12:36:26.307	42	419	135	N 32 55.2560	E 134 14.5944	N 32 55.1305	E 134 18.6852
Start	172:15:08:06.609	50	313	1	N 32 51.6042	E 134 15.3262	N 32 55.0476	E 134 15.4221
End	172:19:47:22.823	50	1370	719	N 32 37.7185	E 134 32.5340	N 32 40.7915	E 134 31.0958
Start	173:18:25:32.770	132	201	1	N 32 17.1057	E 135 00.7626	N 00 00.0000	E 000 00.0000
End	174:04:01:54.082	132	1801	1580	N 32 47.1000	E 134 23.8966	N 00 00.0000	E 000 00.0000
Start	174:05:29:13.078	100a	1801	1	N 32 45.7772	E 134 22.5624	N 00 00.0000	E 000 00.0000
End	174:15:24:32.024	100a	1	1763	N 32 12.0307	E 135 04.0101	N 00 00.0000	E 000 00.0000
Start	174:17:12:14.096	134	201	1	N 32 17.1840	E 135 00.8506	N 00 00.0000	E 000 00.0000
End	175:17:38:12.320	134	1801	1802	N 32 47.1755	E 134 23.9830	N 00 00.0000	E 000 00.0000
Start	175:19:03:33.169	102	1801	1	N 32 45.8571	E 134 22.6523	N 00 00.0000	E 000 00.0000
End	176:04:37:22.943	102	1	1791	N 32 12.1130	E 135 04.1038	N 00 00.0000	E 000 00.0000
Start	176:06:32:06.730	136	201	1	N 32 16.8014	E 135 01.4977	N 00 00.0000	E 000 00.0000
End	176:16:55:06.437	136	1801	1603	N 32 47.2561	E 134 24.0732	N 00 00.0000	E 000 00.0000
Start	176:18:22:54.802	104	1801	1	N 32 45.9325	E 134 22.7376	N 00 00.0000	E 000 00.0000
End	177:03:46:23.545	104	1	1791	N 32 12.1845	E 135 04.1854	N 00 00.0000	E 000 00.0000
Start	177:05:43:26.796	138	201	1	N 32 17.3401	E 135 01.0293	N 00 00.0000	E 000 00.0000
End	177:16:11:47.351	138	1801	1582	N 32 47.3349	E 134 24.1631	N 00 00.0000	E 000 00.0000
Start	177:18:01:44.977	106	1801	1	N 32 46.0135	E 134 22.8285	N 00 00.0000	E 000 00.0000
End	178:03:19:13.696	106	1	1791	N 32 12.2665	E 135 04.2782	N 00 00.0000	E 000 00.0000
Start	178:05:38:43.344	140	210	10	N 32 17.5917	E 135 00.9186	N 00 00.0000	E 000 00.0000
End	178:16:47:00.138	140	1801	1599	N 32 47.4139	E 134 24.2516	N 00 00.0000	E 000 00.0000
Start	178:18:22:14.217	108	1801	1	N 32 46.0888	E 134 22.9141	N 00 00.0000	E 000 00.0000
End	179:03:56:57.183	108	1	1739	N 32 12.3348	E 135 04.3563	N 00 00.0000	E 000 00.0000
Start	179:05:52:48.488	142	201	1	N 32 16.9345	E 135 01.8837	N 00 00.0000	E 000 00.0000
End	179:18:22:07.435	142	1801	1561	N 32 47.4903	E 134 24.3387	N 00 00.0000	E 000 00.0000
Start	179:20:11:59.011	110	1801	1	N 32 46.1385	E 134 22.9697	N 00 00.0000	E 000 00.0000
End	180:05:34:00.561	110	1	1799	N 32 12.4159	E 135 04.4479	N 00 00.0000	E 000 00.0000
Start	181:09:19:36.317	144a	201	1	N 32 17.5734	E 135 01.2948	N 00 00.0000	E 000 00.0000
End	181:19:58:13.838	144a	1801	1601	N 32 47.5557	E 134 24.4181	N 00 00.0000	E 000 00.0000
Start	181:21:29:07.516	112	1801	1	N 32 46.2336	E 134 23.0680	N 00 00.0000	E 000 00.0000
End	182:06:11:46.408	112	201	1600	N 32 16.2572	E 134 59.9593	N 00 00.0000	E 000 00.0000
Start	182:07:27:03.706	146	201	1	N 32 17.4799	E 135 01.5811	N 00 00.0000	E 000 00.0000
End	182:18:37:06.241	146	1801	1603	N 32 47.6248	E 134 24.5028	N 00 00.0000	E 000 00.0000
Start	182:20:28:28.231	114	1801	1	N 32 46.3107	E 134 23.1514	N 00 00.0000	E 000 00.0000
End	183:05:14:17.520	114	201	1601	N 32 16.3325	E 135 00.0425	N 00 00.0000	E 000 00.0000
Start	183:06:58:16.645	148	201	1	N 32 17.7233	E 135 01.4654	N 00 00.0000	E 000 00.0000
End	183:18:41:20.787	148	1801	1601	N 32 47.6899	E 134 24.5847	N 00 00.0000	E 000 00.0000
Start	183:20:25:52.571	116	1801	1	N 32 46.3890	E 134 23.2314	N 00 00.0000	E 000 00.0000
End	184:04:43:10.949	116	216	1586	N 32 16.6889	E 134 59.7845	N 00 00.0000	E 000 00.0000
Start	184:06:45:02.423	150	0201	1	N 32 17.8040	E 135 01.5569	N 00 00.0000	E 000 00.0000
End	184:16:50:13.766	150	1801	1601	N 32 47.7846	E 134 24.6819	N 00 00.0000	E 000 00.0000
Start	184:18:28:06.417	118	1801	1	N 32 46.9230	E 134 22.7620	N 00 00.0000	E 000 00.0000
End	185:03:08:43.413	118	203	1602	N 32 16.4913	E 135 00.2247	N 00 00.0000	E 000 00.0000
Start	185:05:12:04.967	152	202	1	N 32 17.9055	E 135 01.6285	N 00 00.0000	E 000 00.0000
End	185:13:46:23.401	152	1801	1600	N 32 47.8629	E 134 24.7672	N 00 00.0000	E 000 00.0000
Start	185:15:27:56.183	120	1801	1	N 32 46.5464	E 134 23.4180	N 00 00.0000	E 000 00.0000
End	186:00:23:39.176	120	201	1601	N 32 16.5789	E 135 00.3239	N 00 00.0000	E 000 00.0000
Start	186:02:24:36.997	154	205	1	N 32 18.0427	E 135 01.6545	N 00 00.0000	E 000 00.0000
End	186:11:20:19.756	154	1801	0120	N 32 47.1198	E 134 23.9193	N 00 00.0000	E 000 00.0000
Start	186:12:45:06.360	122	1801	1	N 32 46.6271	E 134 23.5149	N 00 00.0000	E 000 00.0000
End	186:21:17:50.364	122	201	1601	N 32 16.6447	E 135 00.3990	N 00 00.0000	E 000 00.0000
Start	186:23:18:53.714	156	201	1	N 32 17.5234	E 135 02.4619	N 00 00.0000	E 000 00.0000
End	187:08:33:59.141	156	1801	1602	N 32 48.0188	E 134 24.9428	N 00 00.0000	E 000 00.0000
Start	187:10:06:43.707	124	1801	1	N 32 46.6987	E 134 23.5926	N 00 00.0000	E 000 00.0000
End	187:18:34:30.592	124	201	1601	N 32 16.7329	E 135 00.4999	N 00 00.0000	E 000 00.0000
Start	187:20:29:50.921	158	201	1	N 32 18.1220	E 135 01.9200	N 00 00.0000	E 000 00.0000
End	188:05:53:59.357	158	1801	1601	N 32 48.0943	E 134 25.0369	N 00 00.0000	E 000 00.0000
Start	188:07:45:14.543	126	1801	1	N 32 46.7831	E 134 23.6870	N 00 00.0000	E 000 00.0000
End	188:14:37:50.654	126	546	1256	N 32 23.2846	E 134 52.6638	N 00 00.0000	E 000 00.0000
Start	189:10:27:06.697	160	206	6	N 32 18.2958	E 135 01.8978	N 32 15.6220	E 135 04.4210
End	189:20:20:27.933	160	1801	1601	N 32 48.1753	E 134 25.1209	N 32 47.4655	E 134 29.1267
Start	189:22:01:32.605	128	1801	1	N 32 46.8592	E 134 23.7798	N 32 49.6919	E 134 24.9015
End	190:06:56:20.802	128	201	1601	N 32 16.8829	E 135 00.6696	N 32 19.0668	E 134 57.5190

Start	190:08:51:46.062	162	201	1	N 32 18.2776	E 135 02.0970	N 32 15.6603	E 135 04.7202
End	190:18:31:22.177	162	1801	1601	N 32 48.2518	E 134 25.2082	N 32 47.3990	E 134 29.1703
Start	190:20:08:37.646	130	1801	1	N 32 46.9360	E 134 23.8630	N 32 49.7056	E 134 24.8781
End	191:04:28:49.454	130	201	1601	N 32 16.9608	E 135 00.7587	N 32 19.3579	E 134 57.8313
Start	191:06:05:42.436	164	201	1	N 32 18.3477	E 135 02.1759	N 32 15.7691	E 135 04.2716
End	191:15:37:36.808	164	1801	1601	N 32 48.3305	E 134 25.2972	N 32 47.6162	E 134 29.3004
Start	191:17:52:01.839	101	1801	1	N 32 45.8030	E 134 22.5819	N 32 48.8692	E 134 23.2947
End	192:03:10:35.880	101	1	1791	N 32 12.0690	E 135 04.0532	N 32 15.3310	E 134 56.9560
Start	192:05:01:54.241	133	201	1	N 32 17.1488	E 135 00.8127	N 32 08.6032	E 135 03.9441
End	192:14:37:10.409	133	1801	1600	N 32 47.1223	E 134 23.9284	N 31 33.8317	E 135 40.0612
Start	192:16:09:56.329	96	1801	1	N 32 45.6092	E 134 22.3664	N 00 00.0000	E 000 00.0000
End	193:01:30:57.965	96	1	1801	N 32 11.8771	E 135 03.8352	N 00 00.0000	E 000 00.0000
Start	193:03:15:09.261	137	201	1	N 32 17.3078	E 135 00.9941	N 00 00.0000	E 000 00.0000
End	193:12:32:57.480	137	1801	1601	N 32 47.2764	E 134 24.1040	N 00 00.0000	E 000 00.0000
Start	193:14:16:17.303	98	1801	1	N 32 45.6868	E 134 22.4470	N 00 00.0000	E 000 00.0000
End	193:23:58:48.646	98	74	1728	N 32 13.3324	E 135 02.2565	N 00 00.0000	E 000 00.0000
Start	194:01:26:54.121	143	201	1	N 32 17.5419	E 135 01.2618	N 00 00.0000	E 000 00.0000
End	194:11:39:50.857	143	1801	1601	N 32 47.5102	E 134 24.3696	N 00 00.0000	E 000 00.0000
Start	194:13:21:58.360	103	1801	1	N 32 45.8796	E 134 22.6644	N 00 00.0000	E 000 00.0000
End	194:22:43:17.146	103	1	1801	N 32 12.1532	E 135 04.1486	N 00 00.0000	E 000 00.0000
Start	195:00:45:11.418	147	201	1	N 32 17.6978	E 135 01.4415	N 00 00.0000	E 000 00.0000
End	195:10:23:50.794	147	1801	1601	N 32 47.6671	E 134 24.5456	N 00 00.0000	E 000 00.0000
Start	195:12:00:12.104	107	1801	1	N 32 46.0359	E 134 22.8458	N 00 00.0000	E 000 00.0000
End	195:21:23:34.360	107	1	1801	N 32 12.3042	E 135 04.3203	N 00 00.0000	E 000 00.0000
Start	195:23:02:25.512	151	201	1	N 32 17.8468	E 135 01.6062	N 00 00.0000	E 000 00.0000
End	196:09:11:35.568	151	1801	1601	N 32 47.8212	E 134 24.7240	N 00 00.0000	E 000 00.0000
Start	196:10:59:52.457	111	1801	1	N 32 46.1935	E 134 23.0160	N 00 00.0000	E 000 00.0000
End	196:19:36:26.171	111	201	1601	N 32 16.2226	E 134 59.9189	N 00 00.0000	E 000 00.0000
Start	196:21:27:29.716	155	201	1	N 32 18.0074	E 135 01.7884	N 00 00.0000	E 000 00.0000
End	197:07:48:36.083	155	1801	1601	N 32 47.9785	E 134 24.8992	N 00 00.0000	E 000 00.0000
Start	197:09:40:29.979	115	1801	1	N 32 46.3462	E 134 23.1939	N 00 00.0000	E 000 00.0000
End	197:18:18:48.674	115	201	1601	N 32 16.3751	E 135 00.0930	N 00 00.0000	E 000 00.0000
Start	197:20:09:36.929	159	201	1	N 32 18.1582	E 135 01.9615	N 00 00.0000	E 000 00.0000
End	198:05:25:13.515	159	1801	1601	N 32 48.1380	E 134 25.0761	N 00 00.0000	E 000 00.0000
Start	198:07:03:06.596	119	1801	1	N 32 46.5097	E 134 23.3801	N 00 00.0000	E 000 00.0000
End	198:16:13:23.822	119	201	1601	N 32 16.5303	E 135 00.2690	N 00 00.0000	E 000 00.0000
Start	198:18:01:33.226	163	201	1	N 32 18.3139	E 135 02.1372	N 00 00.0000	E 000 00.0000
End	199:03:31:37.048	163	1801	1587	N 32 48.2886	E 134 25.2513	N 00 00.0000	E 000 00.0000
Start	199:04:56:16.703	101a	1783	1	N 32 45.4575	E 134 22.9925	N 00 00.0000	E 000 00.0000
End	199:06:08:20.480	101a	1549	0235	N 32 41.0952	E 134 28.4249	N 00 00.0000	E 000 00.0000
Start	199:06:40:13.897	114a	1451	1	N 32 39.7666	E 134 31.2608	N 00 00.0000	E 000 00.0000
End	199:09:44:23.307	114a	856	0596	N 32 28.6320	E 134 45.0025	N 00 00.0000	E 000 00.0000
Start	203:01:11:13.659	169	201	1	N 32 18.5441	E 135 02.3989	N 32 16.2044	E 135 05.4222
End	203:10:48:25.979	169	1801	1601	N 32 48.5325	E 134 25.5240	N 32 47.1631	E 134 29.3223
Start	203:12:19:07.566	131	1801	1	N 32 46.9795	E 134 23.9098	N 32 50.0016	E 134 24.9076
End	203:20:21:23.243	131	201	1601	N 32 16.9939	E 135 00.7958	N 32 19.4608	E 134 57.9004
Start	203:22:21:01.402	168	201	1	N 32 18.5049	E 135 02.3546	N 32 16.0491	E 135 05.2380
End	204:08:23:43.636	168	1801	1601	N 32 48.4892	E 134 25.4749	N 32 47.2899	E 134 29.2697
Start	204:09:58:18.046	129	1801	1	N 32 46.8994	E 134 23.8223	N 32 51.8730	E 134 24.3686
End	204:18:50:42.327	129	201	1601	N 32 16.9177	E 135 00.7092	N 32 19.1608	E 134 57.5885
Start	204:20:11:27.114	167	201	1	N 32 18.4718	E 135 02.3173	N 32 15.7104	E 135 03.2213
End	205:05:58:26.385	167	1801	1601	N 32 48.4509	E 134 25.4311	N 32 46.9677	E 134 29.1592
Start	205:07:16:15.066	127	1801	1	N 32 46.8226	E 134 23.7352	N 32 49.3144	E 134 25.0863
End	205:15:23:27.052	127	201	1601	N 32 16.8409	E 135 00.6226	N 32 19.2829	E 134 57.7022
Start	205:16:44:44.067	166	201	1	N 32 18.4286	E 135 02.2678	N 32 15.7878	E 135 03.3585
End	206:02:59:50.617	166	1801	1601	N 32 48.4114	E 134 25.3862	N 32 47.3191	E 134 29.3046
Start	206:05:20:26.851	125	1801	1	N 32 46.7339	E 134 23.6345	N 32 50.0635	E 134 24.1508
End	206:14:03:32.115	125	201	1601	N 32 16.7613	E 135 00.5318	N 32 19.3656	E 134 57.8136
Start	206:15:22:56.514	165	201	1	N 32 18.3899	E 135 02.2247	N 32 15.8521	E 135 02.9044
End	207:00:20:12.740	165	1612	1412	N 32 44.8322	E 134 29.7141	N 32 43.7045	E 134 33.5971
Start	208:18:18:20.745	135	226	26	N 32 17.6907	E 135 00.3223	N 32 15.4545	E 135 03.4730
End	209:04:56:46.296	135	1801	1601	N 32 47.1783	E 134 24.0015	N 32 46.7726	E 134 28.0866
Start	209:06:53:39.026	97	1801	2	N 32 45.7397	E 134 22.2817	N 32 48.7489	E 134 23.3426
End	209:16:22:26.591	97	131	1674	N 32 14.3742	E 135 00.9178	N 32 16.9287	E 134 58.1292
Start	209:17:22:56.177	139	201	1	N 32 17.3756	E 135 01.0699	N 32 14.8162	E 135 01.8182

End	210:02:58:25.633	139	1801	1600	N 32 47.3616	E 134 24.1951	N 32 46.1497	E 134 28.0618
Start	210:04:43:07.509	99	1801	1	N 32 45.7241	E 134 22.4951	N 32 48.9250	E 134 22.9597
End	210:13:32:20.087	99	140	1662	N 32 14.5991	E 135 00.7753	N 32 17.1962	E 134 58.0454
Start	210:14:34:45.765	145	201	1	N 32 17.6079	E 135 01.3344	N 32 15.0694	E 135 02.2885
End	211:00:06:04.994	145	1801	1601	N 32 47.5923	E 134 24.4587	N 32 46.1927	E 134 28.2306
Start	211:01:40:27.265	105	1801	1	N 32 46.3549	E 134 22.2707	N 32 48.6753	E 134 24.0775
End	211:11:13:01.535	105	1	1802	N 32 12.2210	E 135 04.2255	N 32 14.7259	E 135 01.3799
Start	211:12:57:28.274	149	201	1	N 32 17.7669	E 135 01.5147	N 32 15.5334	E 135 04.6570
End	211:22:29:21.896	149	1801	1601	N 32 47.7489	E 134 24.6358	N 32 46.5540	E 134 28.5060
Start	212:00:41:43.752	109	1801	1	N 32 46.1229	E 134 22.9432	N 32 49.4102	E 134 21.7122
End	212:10:15:18.450	109	1	2	N 32 12.3735	E 135 04.3992	N 32 14.8876	E 135 01.5664
Start	212:11:54:30.410	153	0203	1	N 32 17.9612	E 135 01.6469	N 32 15.5726	E 135 04.6263
End	212:21:08:41.687	153	1801	1592	N 32 47.9069	E 134 24.8140	N 32 46.6148	E 134 28.6404
Start	212:23:20:18.957	113	1801	1	N 32 46.2743	E 134 23.1171	N 32 49.5355	E 134 22.3855
End	213:07:54:59.478	113	201	1600	N 32 16.2959	E 135 00.0012	N 32 18.7155	E 134 57.0637
Start	213:09:43:58.819	135a	201	1	N 32 17.2225	E 135 00.8954	N 32 14.5603	E 135 03.3728
End	213:10:10:09.938	135a	283	83	N 32 18.7650	E 134 59.0168	N 32 16.4302	E 135 02.0587
Start	213:11:57:51.930	108a	300	1	N 32 17.9597	E 134 57.5105	N 32 20.6122	E 134 55.1774
End	213:13:01:06.381	108a	110	191	N 32 14.3889	E 135 01.8644	N 32 16.9284	E 134 59.0637
Start	213:14:14:22.571	157	201	1	N 32 18.0773	E 135 01.8684	N 32 15.3961	E 135 03.8562
End	213:23:52:54.584	157	1801	1587	N 32 48.0580	E 134 24.9887	N 32 46.8479	E 134 28.8482
Start	214:01:28:51.249	117	1801	1	N 32 46.4297	E 134 23.2926	N 32 49.1799	E 134 24.2367
End	214:10:23:21.655	117	201	1591	N 32 16.4516	E 135 00.1785	N 32 18.8404	E 134 57.2031
Start	214:12:11:51.021	161	201	1	N 32 18.2360	E 135 02.0487	N 32 15.4906	E 135 04.1247
End	214:21:54:10.674	161	1801	1601	N 32 48.2134	E 134 25.1637	N 32 46.9746	E 134 29.0145
Start	214:23:37:35.262	121	1801	1	N 32 46.5854	E 134 23.4688	N 32 49.4179	E 134 24.4668
End	215:06:10:53.453	121	630	1172	N 32 24.6685	E 134 50.5138	N 32 27.1876	E 134 47.6886
Start	215:10:05:17.988	167a	232	1	N 32 19.0523	E 135 01.6030	N 32 16.3186	E 135 02.9056
End	215:11:00:45.653	167a	403	172	N 32 22.2668	E 134 57.6830	N 32 19.9373	E 135 00.7227
Start	215:12:07:41.502	141c	602	1	N 32 24.9960	E 134 51.9658	N 32 22.7743	E 134 55.0696
End	215:16:12:51.063	141c	1352	751	N 32 39.0461	E 134 34.6750	N 32 37.1445	E 134 38.1270
Start	215:17:31:51.507	165a	1567	1	N 32 44.0054	E 134 30.7656	N 32 42.2417	E 134 34.3004
End	215:18:57:17.345	165a	1801	235	N 32 48.3721	E 134 25.3416	N 32 47.0269	E 134 29.1339
Start	215:20:56:26.546	123	1801	1	N 32 46.6642	E 134 23.5562	N 32 50.0862	E 134 23.0336
End	216:05:50:38.239	123	201	1509	N 32 16.6885	E 135 00.4492	N 32 19.1509	E 134 57.5535
Start	216:07:50:17.425	138a	402	1	N 32 21.1198	E 134 56.4228	N 32 19.2156	E 134 59.8323
End	216:09:15:42.443	138a	656	255	N 32 25.8919	E 134 50.5901	N 32 23.3097	E 134 53.3337
Start	216:09:43:46.102	134b	720	1	N 32 26.9350	E 134 48.9404	N 32 24.4157	E 134 51.7650
End	216:16:08:03.948	134b	1801	1082	N 32 47.1662	E 134 23.9726	N 32 45.6024	E 134 27.6455
Start	216:18:09:28.958	113a	1620	2	N 32 42.8928	E 134 27.3145	N 32 46.1914	E 134 26.0219
End	216:18:44:14.578	113a	1535	87	N 32 41.3043	E 134 29.2818	N 32 44.5525	E 134 27.8007
Start	219:09:32:20.136	34	4	2	N 32 06.1355	E 135 15.9088	N 32 05.3415	E 135 19.8897
End	219:12:49:21.834	34	201	593	N 32 16.8823	E 135 01.3070	N 32 14.3171	E 135 04.0762
Start	219:12:54:47.022	135b	201	1	N 32 17.1924	E 135 00.9386	N 32 14.6053	E 135 03.6782
End	219:17:43:08.260	135b	1010	810	N 32 32.3953	E 134 42.3649	N 32 30.0798	E 134 45.4299
Start	219:18:48:39.715	156a	1189	1	N 32 36.5533	E 134 39.1481	N 32 34.2109	E 134 42.1418
End	219:20:06:46.463	156a	1401	213	N 32 40.5213	E 134 34.2509	N 32 38.8150	E 134 37.8383
Start	219:20:35:32.926	154a	1474	1	N 32 41.8120	E 134 32.4778	N 32 40.3579	E 134 36.2138
End	219:22:44:45.065	154a	1801	328	N 32 47.9261	E 134 24.9077	N 32 46.5341	E 134 28.6734
Start	220:00:31:33.133	113b	1600	1	N 32 42.5637	E 134 27.7528	N 32 45.6315	E 134 25.8354
End	220:03:20:07.681	113b	1093	508	N 32 33.0697	E 134 39.4586	N 32 36.1212	E 134 37.4857
Start	220:06:01:56.402	126b	600	1	N 32 24.2958	E 134 51.4201	N 32 26.8242	E 134 48.6015
End	220:08:11:55.168	126b	201	400	N 32 16.8085	E 135 00.5851	N 32 18.9132	E 134 57.3229
Start	220:09:35:39.443	160a	350	1	N 32 21.0033	E 134 58.5946	N 32 18.2898	E 135 01.1639
End	220:18:31:34.561	160a	1801	1452	N 32 48.1842	E 134 25.1276	N 32 46.7336	E 134 28.8714
Start	220:20:15:39.854	117a	1801	1	N 32 46.4328	E 134 23.2993	N 32 48.8553	E 134 24.6963
End	221:04:51:33.576	117a	201	1601	N 32 16.4626	E 135 00.1893	N 32 18.4839	E 134 56.8611
Start	221:06:31:11.954	161a	201	1	N 32 18.2445	E 135 02.0632	N 32 15.1012	E 135 02.7390
End	221:15:25:50.309	161a	1801	1592	N 32 48.2280	E 134 25.1761	N 32 46.7857	E 134 28.9281
Start	221:18:40:05.303	111a	1330	1	N 32 37.3932	E 134 33.9362	N 32 40.3655	E 134 31.7951
End	221:19:55:51.117	111a	1089	238	N 32 32.8856	E 134 39.5038	N 32 35.6309	E 134 36.9664
Start	221:21:27:44.878	122a	785	1	N 32 27.6079	E 134 46.9831	N 32 30.2565	E 134 44.3326
End	221:23:43:18.690	122a	344	442	N 32 19.3369	E 134 57.1256	N 32 21.9117	E 134 54.3728
Start	222:02:13:13.429	143a	650	1	N 32 25.9696	E 134 50.9454	N 32 23.7092	E 134 54.0569
End	222:05:30:19.693	143a	1254	605	N 32 37.2852	E 134 37.0235	N 32 35.2014	E 134 40.3196

Start	222:10:26:46.250	97a	1785	17	N 32 45.3476	E 134 22.7779	N 00 00.0000	E 000 00.0000
End	222:14:29:47.065	97a	994	808	N 32 30.5489	E 134 41.0577	N 00 00.0000	E 000 00.0000
Start	222:17:25:54.853	151a	1243	1	N 32 37.3849	E 134 37.6253	N 00 00.0000	E 000 00.0000
End	222:17:49:58.123	151a	1303	61	N 32 38.5108	E 134 36.2423	N 00 00.0000	E 000 00.0000
Start	222:21:23:10.132	119a	1508	1	N 32 41.0349	E 134 30.1706	N 00 00.0000	E 000 00.0000
End	222:22:05:13.925	119a	1376	133	N 32 38.5618	E 134 33.2209	N 00 00.0000	E 000 00.0000
Start	222:23:33:31.797	117b	1099	1	N 32 33.3015	E 134 39.5294	N 00 00.0000	E 000 00.0000
End	223:00:31:55.438	117b	918	0182	N 32 29.9069	E 134 43.6957	N 00 00.0000	E 000 00.0000
Start	223:01:27:36.045	123a	746	1	N 32 26.9133	E 134 47.9204	N 00 00.0000	E 000 00.0000
End	223:01:58:38.378	123a	649	98	N 32 25.0888	E 134 50.1452	N 00 00.0000	E 000 00.0000
Start	223:05:33:46.428	142a	1051	1	N 32 33.4438	E 134 41.6610	N 00 00.0000	E 000 00.0000
End	223:06:19:37.601	142a	1180	130	N 32 35.8582	E 134 38.6844	N 00 00.0000	E 000 00.0000
Start	223:09:04:40.224	151b	1088	1	N 32 34.4884	E 134 41.2060	N 00 00.0000	E 000 00.0000
End	223:10:06:16.505	151b	1258	171	N 32 37.6768	E 134 37.2874	N 00 00.0000	E 000 00.0000
Start	223:11:01:37.153	169a	1401	1	N 32 41.0569	E 134 34.7822	N 00 00.0000	E 000 00.0000
End	223:13:36:29.736	169a	1801	401	N 32 48.5334	E 134 25.5229	N 00 00.0000	E 000 00.0000
Start	223:15:39:28.266	95	1801	1	N 32 45.5703	E 134 22.3188	N 00 00.0000	E 000 00.0000
End	224:00:07:17.690	95	134	1655	N 32 14.3308	E 135 00.7357	N 00 00.0000	E 000 00.0000
Start	224:01:41:16.727	170	201	1	N 32 18.5787	E 135 02.4394	N 00 00.0000	E 000 00.0000
End	224:07:16:29.522	170	1167	967	N 32 36.6881	E 134 40.2090	N 00 00.0000	E 000 00.0000
Start	224:17:35:48.640	170a	409	2	N 32 22.4831	E 134 57.6632	N 00 00.0000	E 000 00.0000
End	225:02:46:50.915	170a	1801	1394	N 32 48.5678	E 134 25.5623	N 00 00.0000	E 000 00.0000
Start	225:04:43:35.846	94	1801	1	N 32 45.5360	E 134 22.2832	N 00 00.0000	E 000 00.0000
End	225:14:04:46.967	94	137	1665	N 32 14.3458	E 135 00.6189	N 00 00.0000	E 000 00.0000
Start	225:15:33:24.624	171	201	1	N 32 18.6203	E 135 02.4881	N 00 00.0000	E 000 00.0000
End	226:00:53:53.116	171	1801	1594	N 32 48.6184	E 134 25.6152	N 00 00.0000	E 000 00.0000
Start	226:02:33:06.874	93	1801	1	N 32 45.4957	E 134 22.2401	N 00 00.0000	E 000 00.0000
End	226:11:24:20.718	93	138	1664	N 32 14.3260	E 135 00.5519	N 00 00.0000	E 000 00.0000
Start	226:13:06:25.489	172	201	1	N 32 18.6559	E 135 02.5284	N 00 00.0000	E 000 00.0000
End	227:00:01:28.534	172	1801	1601	N 32 48.6498	E 134 25.6535	N 00 00.0000	E 000 00.0000
Start	227:01:54:47.827	92	1801	1	N 32 45.4546	E 134 22.1930	N 00 00.0000	E 000 00.0000
End	227:10:28:35.639	92	137	1665	N 32 14.2702	E 135 00.5343	N 00 00.0000	E 000 00.0000
Start	227:11:58:39.697	157a	201	1	N 32 18.0725	E 135 01.8639	N 00 00.0000	E 000 00.0000
End	227:21:20:55.372	157a	1801	1601	N 32 48.0672	E 134 24.9922	N 00 00.0000	E 000 00.0000
Start	227:22:42:37.790	121a	1801	1	N 32 46.5921	E 134 23.4798	N 00 00.0000	E 000 00.0000
End	228:07:06:52.063	121a	201	1599	N 32 16.6018	E 135 00.3494	N 00 00.0000	E 000 00.0000
Start	228:07:07:10.363	20	2	1600	N 32 16.5833	E 135 00.3723	N 00 00.0000	E 000 00.0000
End	228:08:25:26.955	20	248	1846	N 32 11.9722	E 135 06.0250	N 00 00.0000	E 000 00.0000