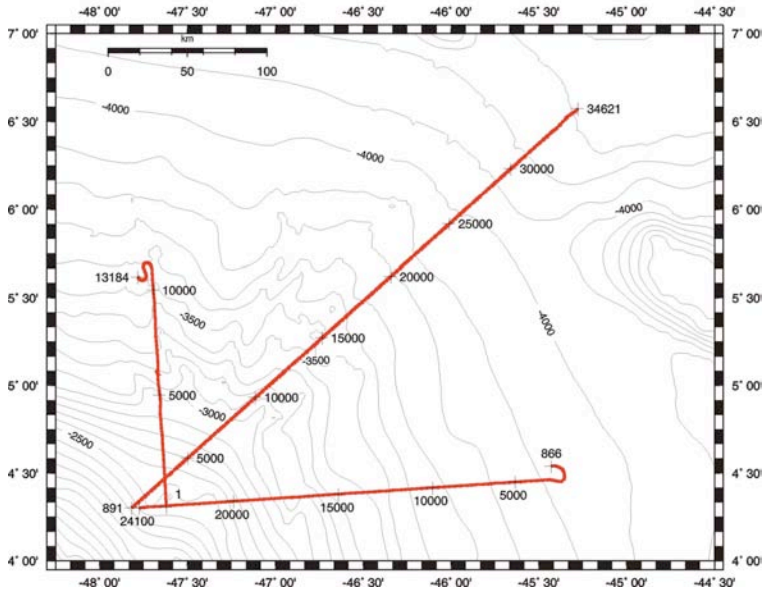

Figure 7 - Line ACE304E running south to north to the far left of the figure. CDP numbers are indicated.

Lines ACE323B (SW – NE) and ACE327F (E – W) are also shown.

Line ACE307A

Line ACE307A was shot off the coast of French Guiana, with 20 OBS/Hs deployed along its length at 10 km intervals. This line was shot in a north-east to south-west direction, i.e. towards the coast, (Fig. 8) and is approximately 330 km in length, and was shot in two distinct sections. The first, longer section was shot with the MCS streamer deployed. However, close to the coast where the water becomes shallower, the streamer was recovered and shooting was resumed into the OBS/H instruments only. Five land stations were deployed in-line with the on-land extension of this line. See section 2.4 for details. The shock-wave generated by the full volume array in the shallow shelf waters (<50 m) eventually resulted in line termination due to fears of damage to the vessel's propeller stern gland.

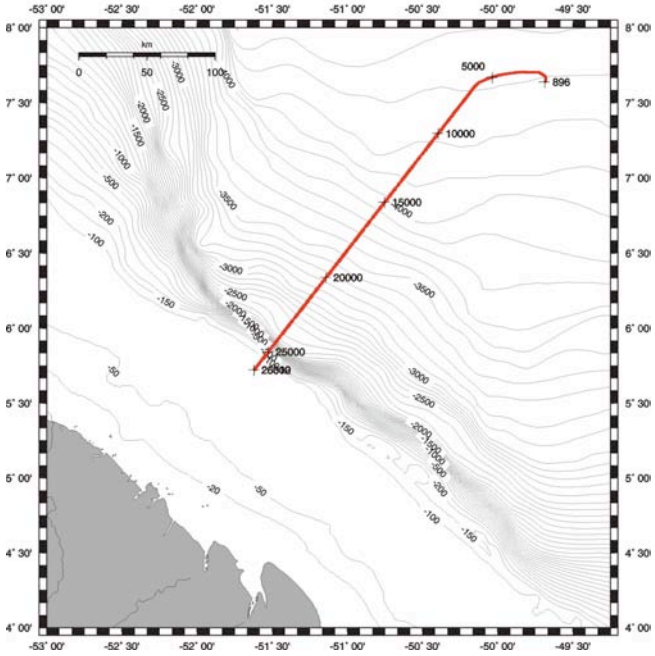

Figure 8 - Line ACE307A. CDP numbers are indicated.

Line ACE313D

Line ACE313D was shot to the north-west of line ACE307A, also offshore French Guiana. Similarly the line also had an accompanying deployment of 20 OBS/Hs each spaced 10 km apart, and was shot in the north-east to south-west direction, i.e. shoreward (Fig. 9). The line is approximately 451 km in length and its location was chosen, and the experimental programme designed, after sailing from Fortaleza when it became clear that diplomatic clearance might not be obtained in time to follow the original plan of shooting Line B directly after Line A. The land stations deployed for Line A were redeployed at the end of line D (see section 2.4).

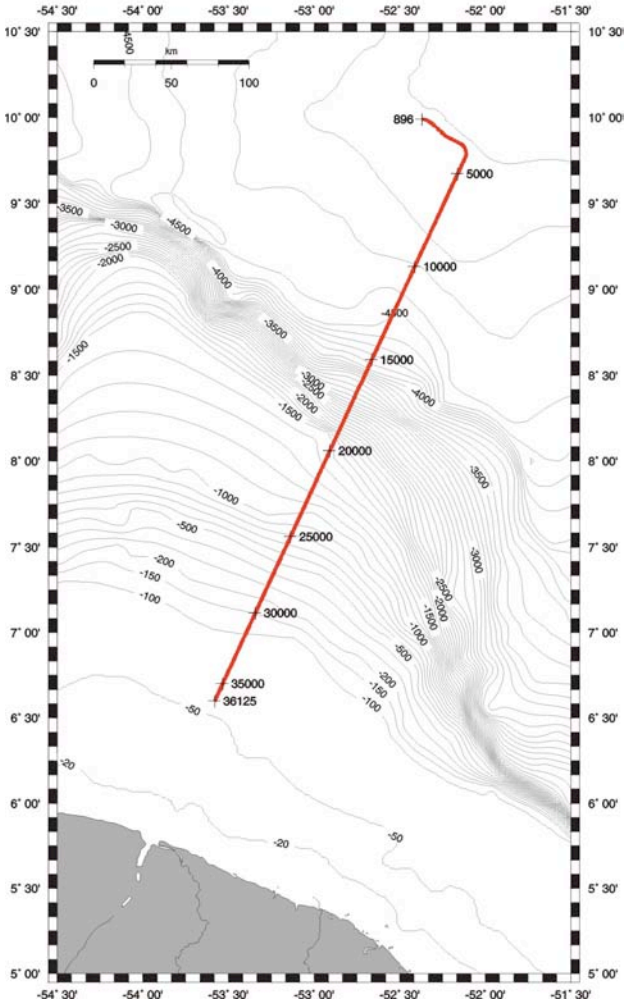

Figure 9 - Line ACE313D. CDP numbers are indicated.

Line ACE323B

Line ACE323B was shot perpendicular to the outflow of the Amazon River. Shooting began over the middle/lower Amazon Cone at a distance of approximately 200 nm from the Brazilian coast. The line was shot oceanward, from the south-west towards the north-east (Fig. 7). Note that this line crosses Line ACE304E near its beginning and is approximately 387 km in length, and was accompanied by the deployment of 19 OBS/H instruments spaced 12.5 km apart. Originally, this profile was planned to extend to within 20 nm of the coast and the shots fired to be recorded by land stations. In addition 39 OBS/H were to be deployed. However, two factors conspired to prevent either of these goals being achieved. Firstly the granting of permission to work within Brazilian waters was refused until personnel from their environmental agency ceased industrial action at some undeterminable date in the future. This ultimately confined us to international waters only and prevented the deployment of 7 OBS/Hs. Secondly, OBS/H deployment was terminated after only 19 instruments due to the necessity of an emergency boat transfer off Belem to disembark a crew member due to a family bereavement. The latter also resulted in the loss of several days of acquisition time.

Line ACE327F

Line ACE327F was shot in an east to west direction, heading landward towards the start of Lines ACE304E and ACE323B. Fig. 7 shows a close up of the line shot, which is approximately 284 km in length and was accompanied by the deployment of 8 OBS/H instruments. This profile was designed to provide input into a 3-D model of the toe of the Amazon Cone.

Line ACE331G

Line ACE331G was shot over the Ceara Rise, to the east of other MCS lines. The Ceara Rise is an aseismic ridge of unknown origin and has been drilled by the ODP and DSDP. Fig. 10 shows a track chart of this line together with its arrow-head shape. Shooting began from the most southerly point and proceeded in a north-east direction, before making a turn and altering course to an east to west direction heading along the same bearing as Line ACE327F. This line is approximately 442 km long, and was accompanied by the deployment of 12 OBS/H instruments; six on each leg of the line. Line ACE331G_a corresponds to the most southerly portion of the line (marked CDP 866 to 18220) and is approximately 230 km in length and Line ACE331G_b to the section running east to west (CDP 2594 to 22267), 212 km in length.

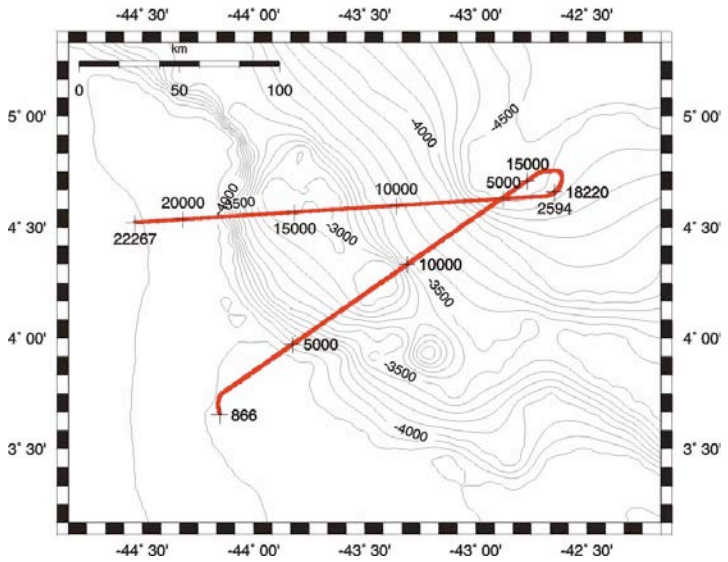

Figure 10 - Line ACE331G. CDP numbers are indicated.

2.2 Ocean-bottom seismograph deployments

A large volume of OBS/H data were collected in conjunction with the MCS data. For each seismic line (with the exception of Line ACE304E which was used primarily as a seismic equipment test) a number of OBS/Hs were deployed prior to seismic shooting and recovered after shooting ceased. The number of instruments deployed along each profile varied between 8 and 20, at separations of 10 to 25 km, and a mixture of OBSs and OBHs were used in combination to optimise the type and amount of data recorded relative to the available equipment. The OBS/H instrumentation was supplied and operated by Geomar under a hire contract.

A total of 79 deployments were made throughout the cruise and all instruments were recovered successfully. In some cases certain instruments failed to record on one, or more, channels although the reason for this was never resolved as the same instruments recorded on these failed channels on subsequent deployments. A summary of OBS/H deployment locations, relative to seabed depth, for each line is shown in Fig. 11, and example data from the hydrophone channel of Line ACE313D OBH 4 is shown in Figs. 12 and 13.

Figs. 14-17 show deployment locations and instrument numbers for each profile and exact deployment positions can be found in tables 3-8, with a summary of instrument numbers and types deployed along each line contained in table 2. As can be seen from Fig. 12, arrivals are observable for in excess of 200 km from an instrument location, while Fig. 13 shows the clarity and range of arrivals observable within ± 50 km of an instrument.

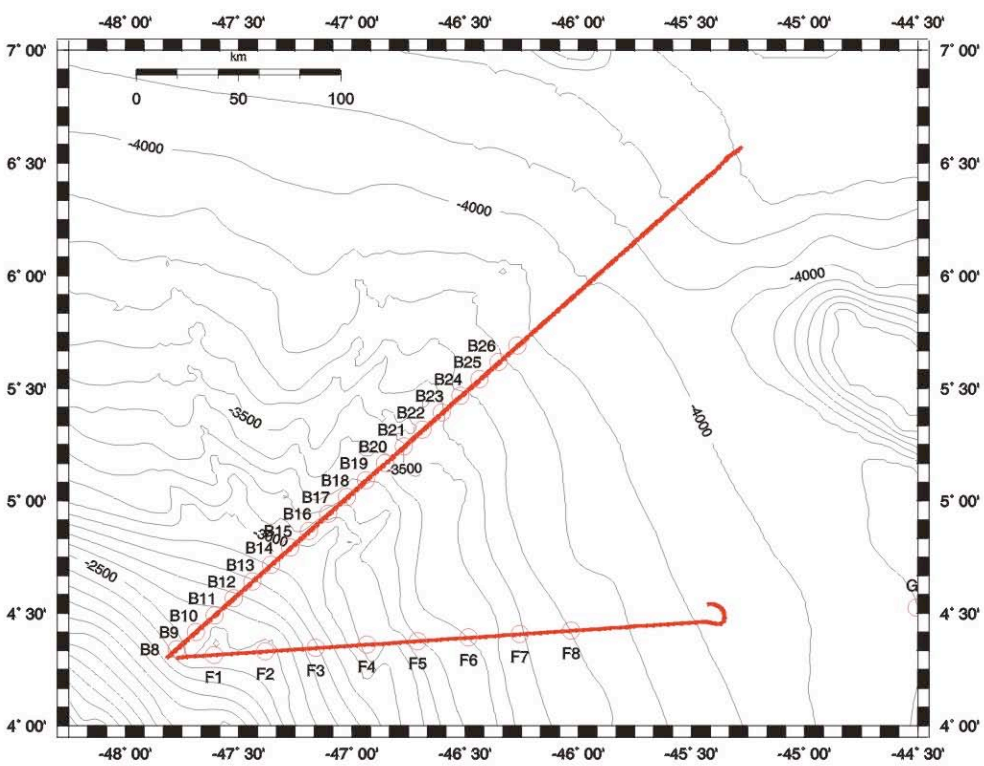

Figure 16 - OBS/Hdeployment locations for Lines ACE323B and ACE327F.

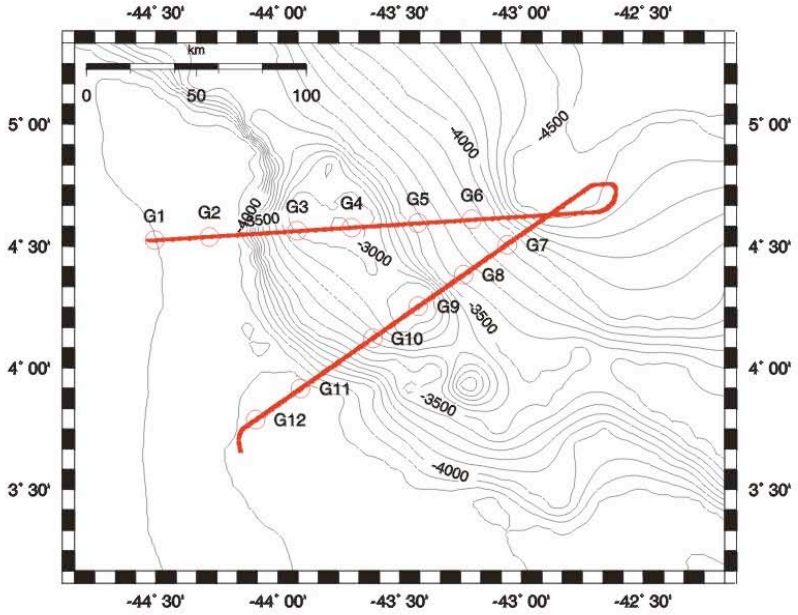

Figure 17 - OBS/H deployment locations for Line ACE331G.

2.3 Sound velocity profiling

Sound velocity profiling through the water column was attempted on four occasions during the cruise to collect information on the water column to inform ray-trace modelling of the wide-angle refraction data and by which to calibrate the more rapidly and more flexibly deployable expendable bathymetric thermographs.

The probe used, hired in especially for this cruise since the UKORS probe required repair, is designed to take measurements of sound velocity, pressure and temperature to a depth in excess of 2000 m. Fig. 18 shows the locations of sound velocity dips completed throughout the cruise, whose locations are given in table 10.

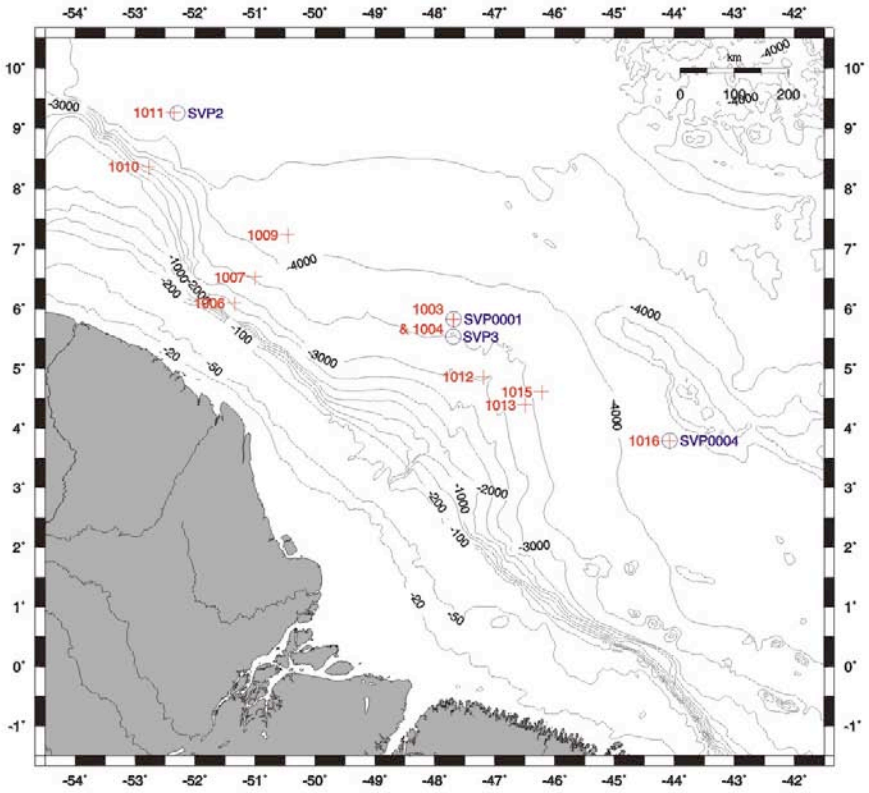

Figure 18 - XBT (light grey) and SVP (mid-grey) deployment locations.

2.4 Land recording

Simultaneous with the shooting of the offshore profiles a number of land stations were installed. The purpose of the land stations were to extend the velocity model landwards to ensure that a good estimate of crustal thickness and structure away from the extended continental margin could be obtained. Two groups were involved in the land acquisition: University of Durham (Richard Hobbs) using SEIS-UK equipment; University of Sao Paulo, (Prof Berrocal and team) using their own equipment. The work was scheduled in three parts to coordinate with the planned offshore activity. Hobbs was to run a profile on-land in French Guyana to compliment Line ACE307A using SEIS-UK equipment, then he was to move to Brazil and link up with Berrocal and record Line ACE323B using both Sao Paulo and SEIS-UK equipment, then finally to record Line C using SEIS-UK kit. In the event, due to changes in ship schedules, detailed elsewhere, the land recording plan was seriously modified.

Line ACE307A

Five SEIS-UK 6TD seismometers were deployed on an onshore extension to Line ACE307A extending from Cayenne to Cacao in French Guiana, profile length 46.8 km. Station locations were chosen in places were the Proterozoic bedrock was close to, or at, the surface and accessible by vehicle. Each station was installed by digging/augering a pit back-filling with wet sand to form a base, the 6TD was wrapped in a plastic bag and set in the pit, orientated to north, levelled and backfilled with wet sand. An external battery box was either buried nearby or left in shade of bushes, GPS antenna was located within 1 m of seismometer with a clear view of the sky. Station locations are given in table 12.

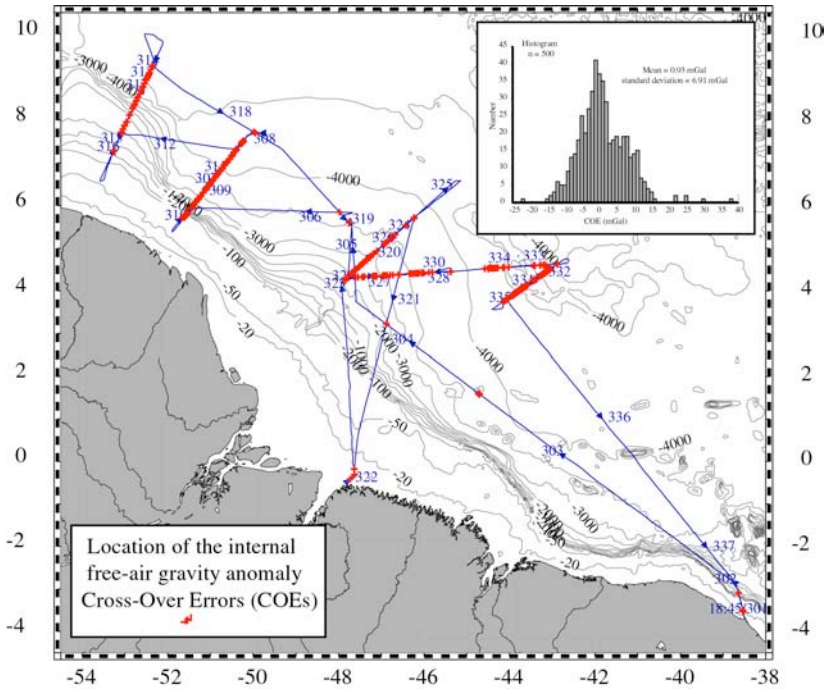

Figure 21 - Location of intersecting ship tracks of D275-ACE.

Note the large number of intersections along seismic Lines A, D, B, F and G. The inset shows a histogram of 500 intersections.

An example of the free-air gravity anomaly data acquired during and immediately following the shooting of seismic Line ACE313D is shown in Fig. 22. Note that noise levels in the gravity data are relatively low during the shooting of Line ACE313D, but relatively high following shooting when the OBS/Hs were being recovered. The mean free-air gravity over the deep sea is ~ -40 mGal. This low is present in maps of the long-wavelength (wavelength > 2000 km) free-air gravity anomaly field and forms part of a low that extends from the Brazilian shield, to east of the Caribbean, and into central Canada. At the Demerera Plateau margin, there is a distinct free-air "edge effect" high and low of about +/- 30 mGal, that is superimposed on the regional low. We attribute the edge effect anomaly to the transition between thick (continental ?) crust beneath the Demerara Plateau and the thin (oceanic ?) crust that underlies the adjacent ocean floor.

2.7 Magnetics

Magnetic data were acquired using a Varian proton precession magnetometer towed 200 m behind ship.

Fig 22 shows an example of the magnetic anomaly data acquired while shooting Line ACE313D. The line shows several prominent anomalies with amplitudes of ± 100 nT and wavelengths of 100-200 km. Similar amplitude and wavelength anomalies have been described by *Cochran* (1973) on north-south crossings of the St Paul's and Romanche Fracture Zones where they have been interpreted in terms of lateral changes in magnetization due to intrusion of ultra-basic rocks.

Other prominent magnetic anomalies were identified on the Demerera Plateau and over the deep seafloor to the west of the Ceara Rise. We attribute a large-amplitude magnetic anomaly low of ~ 600 nT along seismic Line ACE323B to basaltic rocks associated one edge of the buried western extension of the Ceara Rise.

2.8 Bathymetry – 10 kHz

Initially, 10 kHz bathymetry data were acquired using a towed fish and SIMRAD EA 500 hydrographic echo sounder. Almost from the moment of first deployment the fairing on the tow cable became damaged and had to be repaired at every available opportunity whilst other equipment was being deployed. Inevitably, the hull-mounted transducers had to be used instead as the fish tow cable fairing damage became irreparable due to the lack of spares, despite efforts to build completely new fairing from a fire hose. It appears the newly refurbished fairing supplied for the cruise had been constructed of a material that became very soft in the saline, warm waters of the work area, such that the fittings simply pulled straight through when under tow.

		15:00 09:26 14:00	 XBT test. Recovered 10 kHz and 3.5 kHz fish. End of trials.
289	Thursday 16th October	09:00	Boat transfer off Santa Cruz de Tenerife.

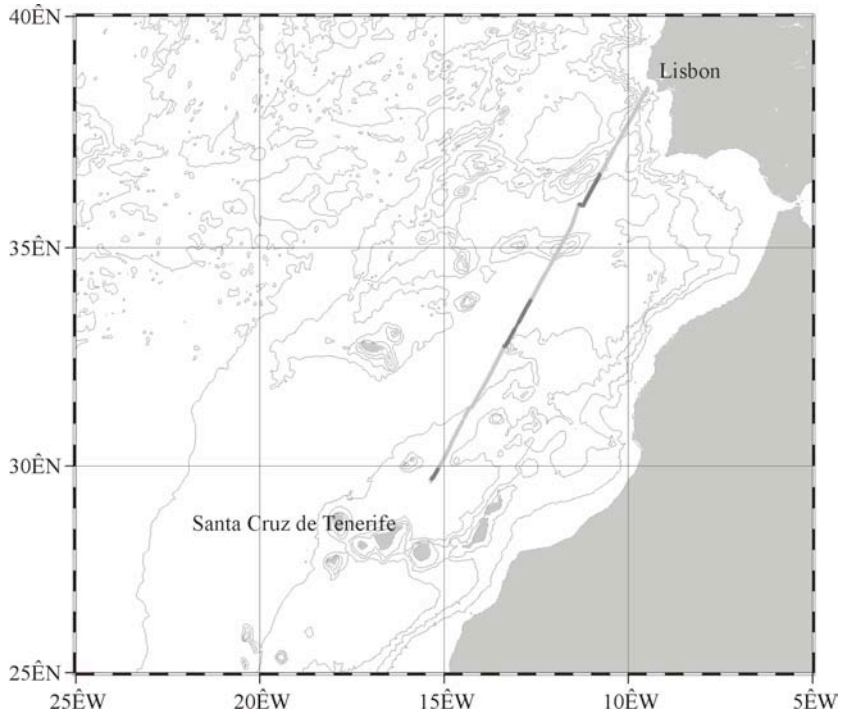

Figure 25 - Trials cruise track chart.

Dark grey lines show locations where equipment was deployed during daylight hours.

3.2 Cruise narrative

The duration of the cruise was 35 days and 16 hours. Of this, 4 days were spent on passage to and from Fortaleza to the work area, leaving a total of 29 days and 6 hours in the work area. Of the latter ~8 days were spent shooting, ~9 days on OBS/H deployment and recovery, ~ 8 days on MCS equipment deployment, recovery and repairs to the streamer and ~3 days on the boat transfer off Belem.

A summary of the events that took place appears below. All times are in GMT and all way points (WPxxx – where xxx is the way point number) are listed in table 15 and a cruise track chart in Fig. 26.

Julian Day	Date	Time (GMT)	Activity
301	Tuesday 28th October	18:45	Sailed from Fortaleza.
302	Wednesday 29th October	All day	Transit to WP002.
303	Thursday 30th October	11:08 13:01 14:35	Deployed 10 kHz and 3.5 kHz fish. Calibration of ship's Cherikof log using measured mile. Recommenced transit to WP002.
304	Friday 31st October	08:03 08:21 13:30	Arrival at WP002. Commenced deployment of MCS equipment and magnetometer whilst heading towards WP003. Deployment complete.

333	Saturday 29th November	18:05 18:16 18:20 21:20 21:22 23:01	EOL ACE331G_b. Commencing MCS equipment recovery. 3.5 kHz and 10 kHz fish recovered. Completed MCS equipment recovery. Heading for WP369 for OBS/H 1G recovery. WP369 - OBS/H 1G recovered.
334	Sunday 30th November	01:25 03:52 05:45 07:52 09:50 11:47 14:13 16:27 18:43 22:20	WP370 - OBS/H 2G recovered. WP371 - OBS/H 3G recovered. WP372 - OBS/H 4G recovered. WP373 - OBS/H 5G recovered. WP374 - OBS/H 6G recovered. WP375 - OBS/H 7G recovered. WP376 - OBS/H 8G recovered. WP377 - OBS/H 9G recovered. WP378 - OBS/H 10G recovered. WP379 - OBS/H 11G recovered.
335	Monday 1st December	00:41 01:02 01:03 02:20 02:30	WP380 - OBS/H 12G recovered. WP380 – deployment of XBT11. Sound velocity dip - SV04 - deployed. Sound velocity dip SV04 complete. End of data acquisition. Heading for Fortaleza.
336	Tuesday 2nd December	All day	Passage to Fortaleza.
337	Wednesday 3rd December	10:00	Arrival in Fortaleza. End of cruise.

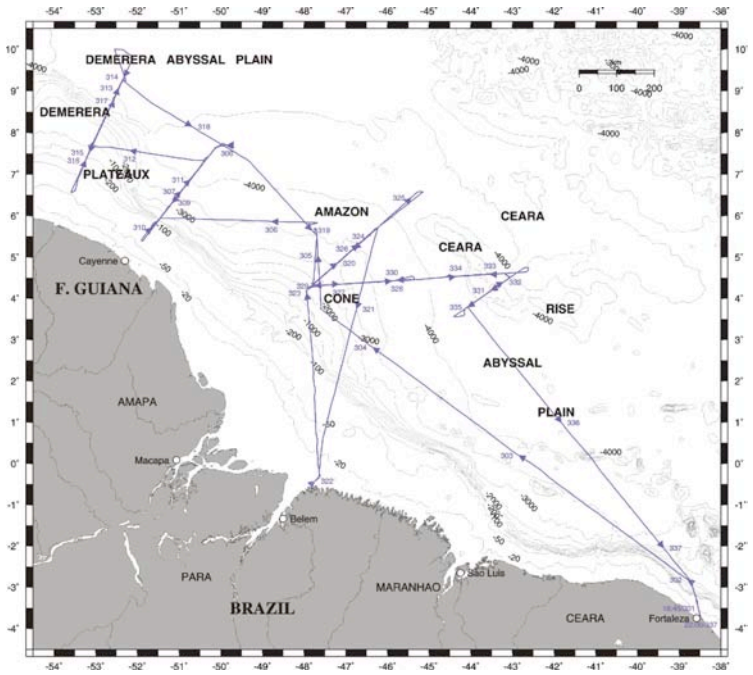

Figure 26 - D275-ACE track chart.

4. Equipment performance

4.1 Trials cruise