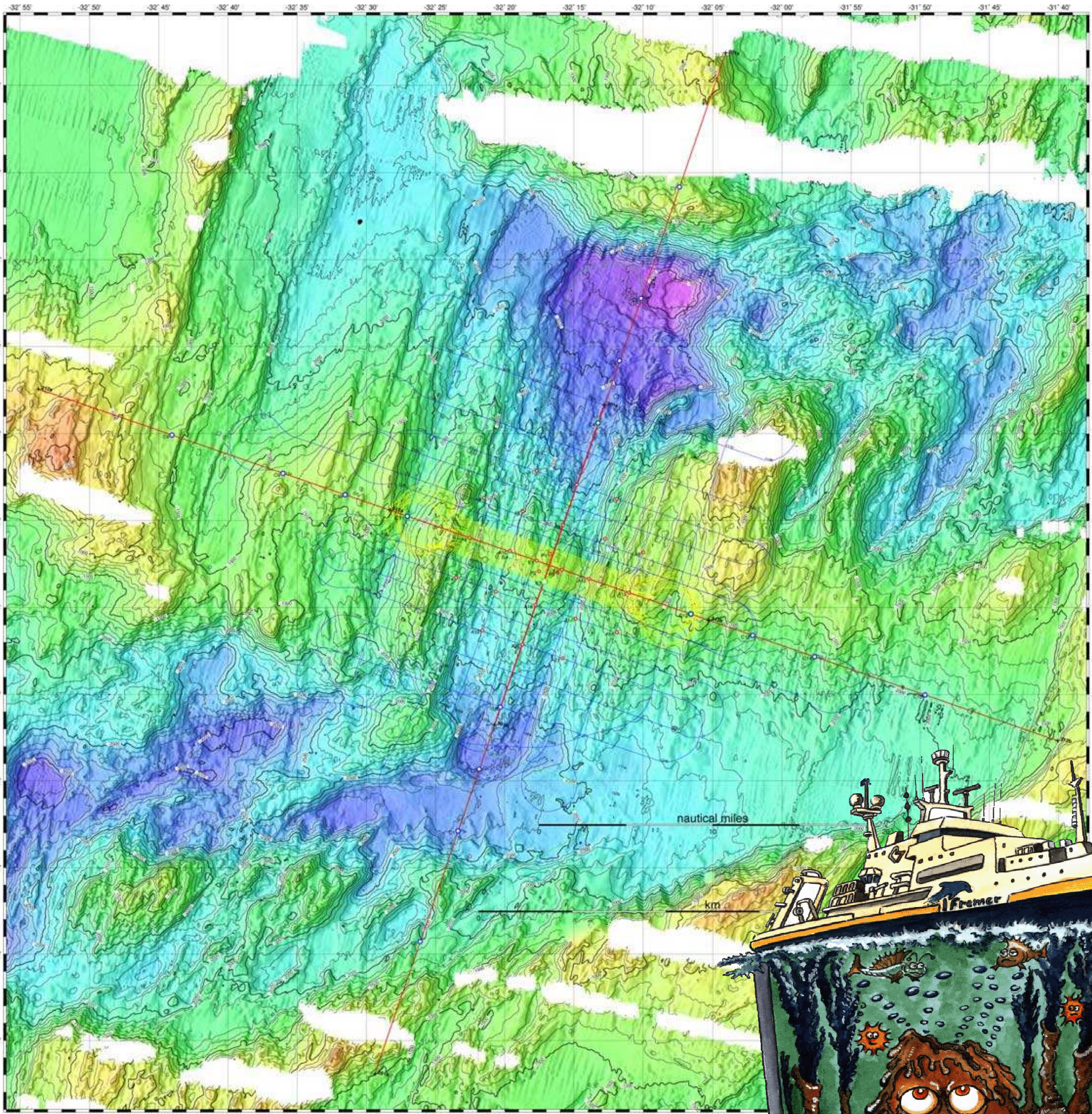
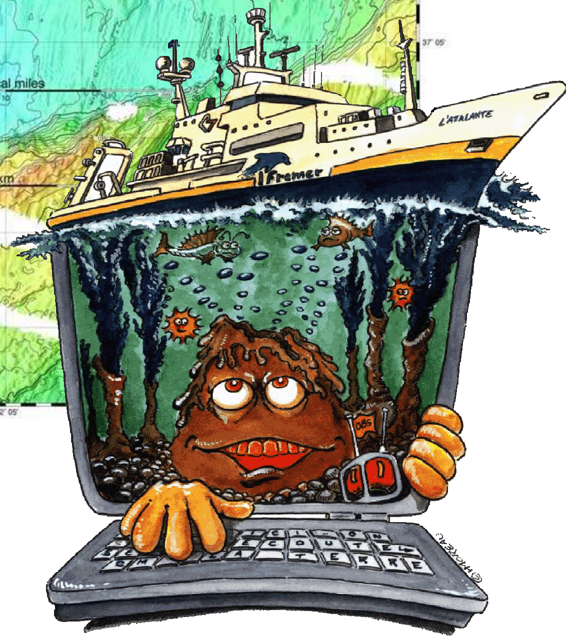
SISMOMAR

Cruise Report

31 May - 4 July 2005





Edited by Wayne Crawford

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1: Introduction

1.1 Introduction

Mathilde Cannat and Wayne Crawford

SISMOMAR is a seismic reflection and refraction study of crustal structure beneath the Lucky Strike segment of the Mid-Atlantic ridge. The experiment is composed of a 3D multichannel seismic reflection box (3.8 km along axis, 18 km across), a 3D seismic tomography box (20x20 km), and 2D seismic tomography and reflection lines along and across the rise axis. The seismic reflection data was recorded using a 4.5 km digital streamer. We also took advantage of the close line spacing to improve bathymetric, magnetic and gravimetric maps of the region. With 25 OBSs deployed at 42 sites and more than 53,000 airgun shots over 2500 km of shot lines, SISMOMAR is one of the largest seismic experiments on the Mid-Atlantic Ridge to date: only the "MARBE" experiment is comparable in terms of coverage and number of OBSs (Canales et al., 2000a; Hooft et al., 2000; Magde et al., 2000; Hosford et al., 2001).

SISMOMAR is part of the integrated "MOMAR" study program. The results will provide geophysical information for future experiments, which should include the installation of geophysical, geodetic and chemical sensors and or coring or drilling of hydrothermal systems.

1.1.1. Geological and geophysical framework of the Lucky Strike segment

The « Lucky Strike » segment (Figure 1) is about 70 km long and bounded at the north and south by moderate dextral discontinuities (Fig. 1). The axial valley remains 15-20 km wide over the segment length. A bulge more that 6 km in diameter and with a minimum depth of ~1600 m at the segment center is interpreted as a volcano. The south end of the volcano is fairly smooth, while the north end appears to be rifted and partially collapsed (Figure 2). The shallowest part of the volcano (~1600m) contains three peaks around a depression filled by lava flows (Fouquet et al., 1995; Humphris et al., 2002). Rock samples of the Lucky Strike segment have been limited to a few basalts taken at the "rise axis". The chemistry of some of these basalts indicates an enriched (hot spot) mantle source (Bourdon et al., 1996; Langmuir et al., 1997). Samples taken from near to the central depression include recent lava flows and volcanic ejecta, rarely seen at mid-ocean ridges, suggesting a sometimes explosive volcanism. (Ondreas et al., 1997).

The volcano summit hosts the Lucky Strike hydrothermal site, so named because it was discovered when a dredge brought hydrothermal deposits and vent animals to the surface (Langmuir et al., 1993). The Lucky Strike hydrothermal site has been the object of numerous geological, chemical and biological studies, thanks in particular to the European programs MAST 2 (MARFLUX experiment) and MAST 3 (AMORES experiment). These experiments showed the role of phase separation on fluid composition (Donval et al., 1994 ; Von Damm et al., 1998 ; Charlou et al., 2000), the temperature stability of the fluids over several months, the existence of a layer of basaltic breccia that block vertical fluid flow over a good portion of the site, and the importance of lower temperature diffuse fluid flow (Cooper et al., 2000).

Nepthalometer (light propagation) anomalies in the water column above the Lucky Strike site are relatively weak compared to other large hydrothermal sites in the Atlantic (Wilson et al., 1996), but they are detectable over the entire segment, indicating that there are probably other, deeper, hydrothermal sources that have not yet been discovered (Wilson et al., 1996). A low temperature hydrothermal site caused by the serpentinisation of peridotites has also been detected on top of the 10 by 20 km Menez Hom massif at the southwest end of the segment (Figure 1) (Gracia et al., 2000, Fouquet, personal communication).

Bathymetry, gravity and magnetic data have been collected at the rise axis (Needham et al, 1991) and out to about 10 Ma (SudAcores experiment, Cannat et al., 1999 ; Escartin et al., 2001). Higher resolution bathymetric and sidescan surveys were made using the scanning sonar TOBI (German et al., 1996) and a high-resolution DSL-120 survey of the central volcano (Scheirer et al., 2000). An electromagnetic survey that took place in 1999 is still being processed (MADRIGALS ; M. Sinha et al.).

Figure 1 shows that the seafloor is shallow and gravity is low at ages greater than anomaly 3 (~4Ma), linked to a magmatic surproduction from the Azores hotspot in the Miocene (Cannat et al., 1999). Younger regions have more "normal" magma production and bathymetric/gravity profiles (Escartin et al., 2001). The spreading rate is currently about 22 mm/yr (DeMets et al., 1994), and has varied little in the last 7 Ma (Sloan et Patriat, 1992; Freire Luis et al., l994). The distribution of magnetic anomalies shows a slight asymmetry on the segment scale, with faster rates in the East since anomaly 2A (~3 Ma). The western flank of the ridge is also deformed by the southward propagation of the Menez Gwen segment (Figure 1a).

For ages younger than anomaly 3, the segment's gravimetric structure of the segment is classic slow-spreading ridge, with a gravitational low suggesting thicker crust at the segment center and higher gravity values at the segment ends. Strangely, the gravity low is offset west of the central volcano (Figure 1b). Two gravity highs sit over inside corner highs, where the segment intersects the north and south discontinuities. A methane anomaly detected in the southwestern corner of the segment (Gracia et al., 2000) has since been confirmed to arise from a low-temperature hydrothermal site driven by the exothermic reaction of seawater with peridotites to create serpentinites at a structural dome that presumably overlies thin crust (Figure 1b).

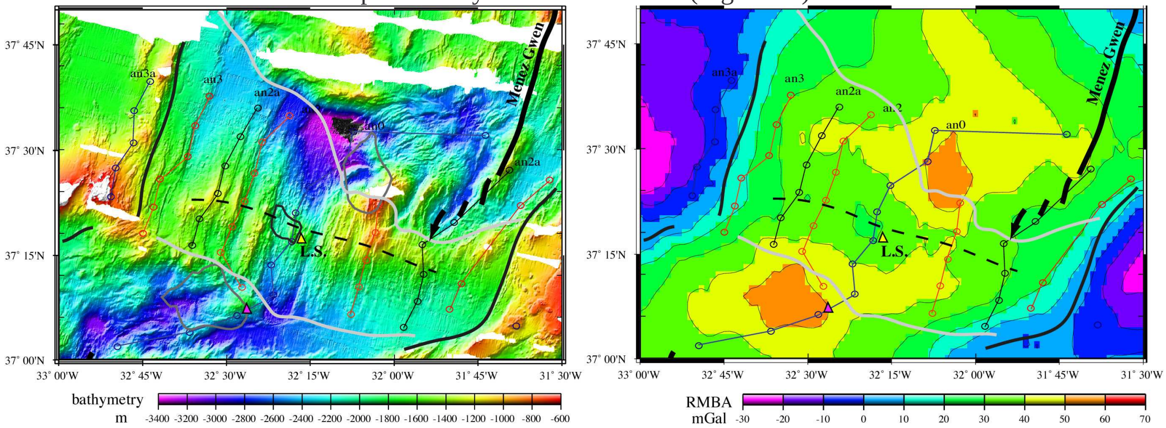

Figure 1. Bathymetry (left) and gravity anomalies (right: Residual mantle Bouguer anomalies corrected for lithospheric cooling with age) for the Lucky Strike segment of the Mid-Atlantic Ridge. The yellow triangle locates the Lucky Strike hydrothermal site. The shallow regions with a negative gravity anomaly outside of anomaly 3 correspond to the two rifted flanks of the Miocene volcanic plateau. The southward propagation of the Menez Gwen segment (black arrow) deforms the northeastern Lucky Strike crust. Light gray lines delimit a central zone of escarpments parallel to the rise axis. Thick black and gray contours on the bathymetric map correspond to the maximum and minimum gravity anomalies. The dashed black line is a minimum gravity axis. The purple triangle is the Menez Hom massif, host to a "low temperature" hydrothermal system.

A SOFAR channel hydrophone network installed since 1999 to survey seismic activity between 15° and 40°N recorded a seismic swarm on the Lucky Strike segment in 2000. The waveforms and distribution of the events suggest that they are linked to the propagation of a dike over ~10 km. (ref : web site http://www.pmel.noaa.gov/vents/acoustics/seismicity/mar/LuckyStrike2001.html). Observations indicate an increase in diffuse hydrothermal circulation following this event.

1.1.2. Objectives of the SISMOMAR cruise

The goal of the SISMOMAR cruise is to determine the three-dimensional structure of the entire crust beneath the center of the Lucky Strike segment, and to put this in the context of segment-scale tectonism and magmatism. We imaged the central region in 3D using seismic reflection (MCS) and refraction (25 OBSs) and used long 2D across and along-axis lines to quantify epochs and changes in tectonism and magmatism along the axis and with time. The 3D MCS study (2650 in3 source, 37.5 m shot spacing, 4.5 km streamer with 12.5 m element spacing) covers a 3.9 km by 13.5 km section spanning the central valley and covering 60% of the north-south extent of the central volcano. The 3D wide-angle study (8400 in3 source, 150 m shot spacing, 25 OBSs within an 18x18 km box) focuses on upper- to mid-crustal structure in an 18x18 km box over the central volcano. Finally, the 2D study (8400 in3 source, 425m and 150m shot spacing to 13 OBSs on each of two 115 km lines) looks at lower crustal structure and segment-scale variations.

We used 25 OBSs: 20 2-component instruments with a 2Hz vertical geophone from the French national research pool (INSU), 3 4-component instruments with 4.5 Hz geophones from the University of Lisbon, and 2 broad-band 4-component instruments from IPG Paris. The broadband instruments were designed to measure the seafloor compliance — the deformation of the seafloor under ocean waves — that is very sensitive to fluid-rich regions in the crust. The leveling system of these instruments was too loose, however, for optimal broadband/compliance measurements.

We had originally planned to make our large-scale study 3D as well, with most of the time dedicated to shooting from inside the 3D box to distant receivers in order to better constrain deep crustal structure beneath and around the volcano, but we changed our plans because of 1) an expansion of the 3D MCS experiment because of the exciting discoveries made during this phase, and 2) the rather poor long-distance azimuthal coverage that we could have obtained.

The OBS positions also provided a good configuration to measure local seismicity. To complement the good coverage on the 2-10 km scale provided by the "3D" OBS network for the refraction experiment, we deployed 3 OBSs in a triangle around the central peaks during the first two weeks of the mission to find small events beneath the hydrothermal site.

The INSU OBSs were first deployed in a "dense 3D" configuration. They stayed there for the entire 3D MCS and 3D OBS shooting schedule (Figures X and Y), Afterwards, all INSU OBSs not on the central across- and along-axis lines were recovered and redeployed on extensions of these lines to be used in the "long 2D" lines (Figure Z). The Portuguese OBSs were first deployed in a triangle around the central volcano summit, then they were moved to the 2D lines just before the 3D OBS shooting began. The compliance sensors were deployed at 4 sites near the volcano summit and one site on the along axis 2D line south of the volcano

The airgun shots were done in three phases: a "3D MCS" phase (Figures 2-3), a "dense 3D refraction" phase (Figures 3-4) and a "2D refraction" phase (Figures 5-6). The streamer was deployed during both the 3D MCS and dense 3D refraction phases. The streamer records during the 3D refraction phase gave us several 2D reflection lines across and along the axis to constrain the Moho depth, extent of the magma chamber and faults, and other reflectors. The 150-m shot spacing during this phase only gave us 15 folds, however, so we shot three lines at 75-m spacing; the central along-axis line (re-shot), an along-axis line in the valley center, and a line across the Menez Hom hydrothermal site. The "2D refraction" lines were 115 km long and shot at 425 m interval to minimize noise at the distant sites between shots. We also reshot the central 36 km of these lines at 150m spacing to try and have a denser ray coverage in the lower crust within the 3D box region while shooting to the most distant OBSs

1.1.3 References

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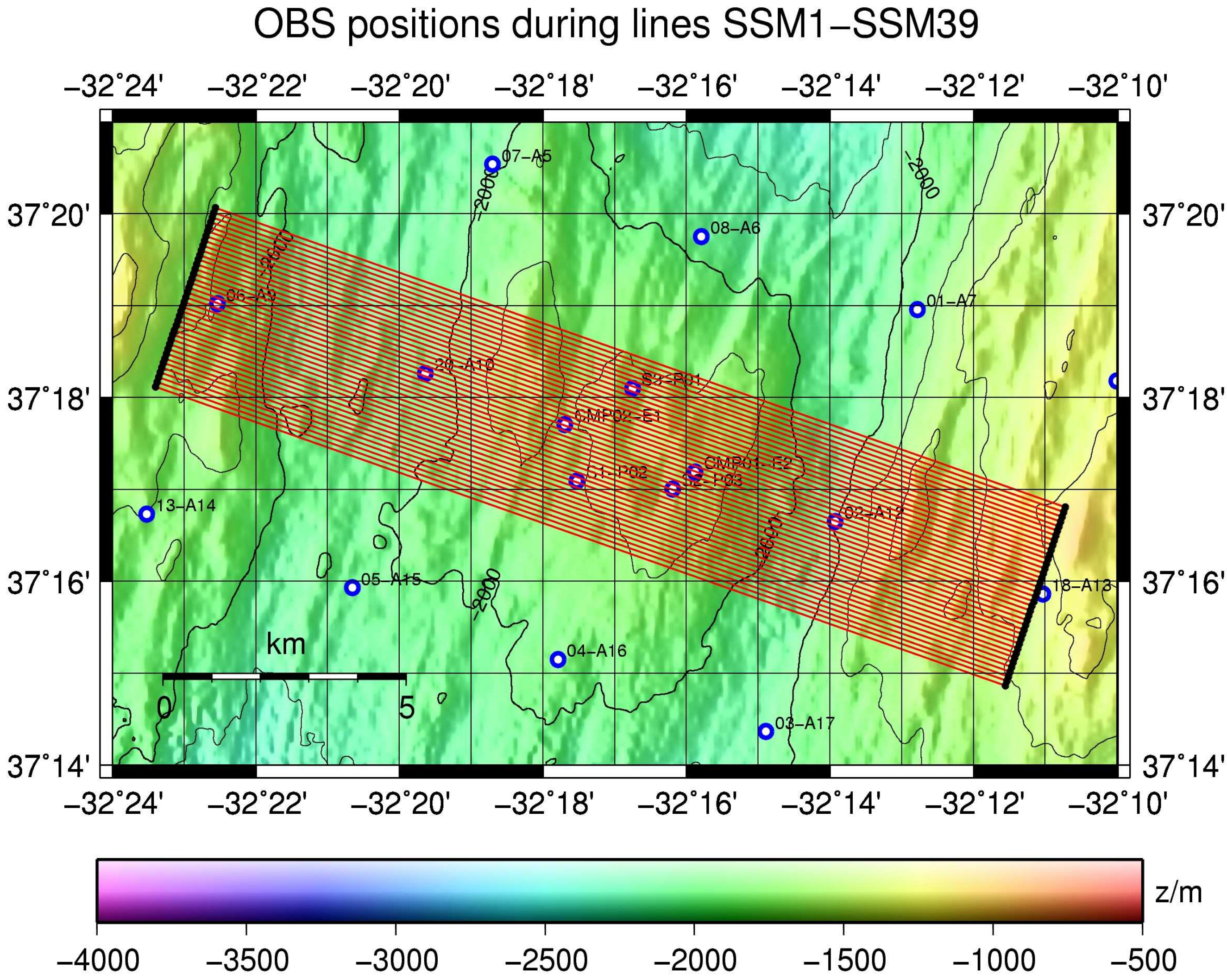
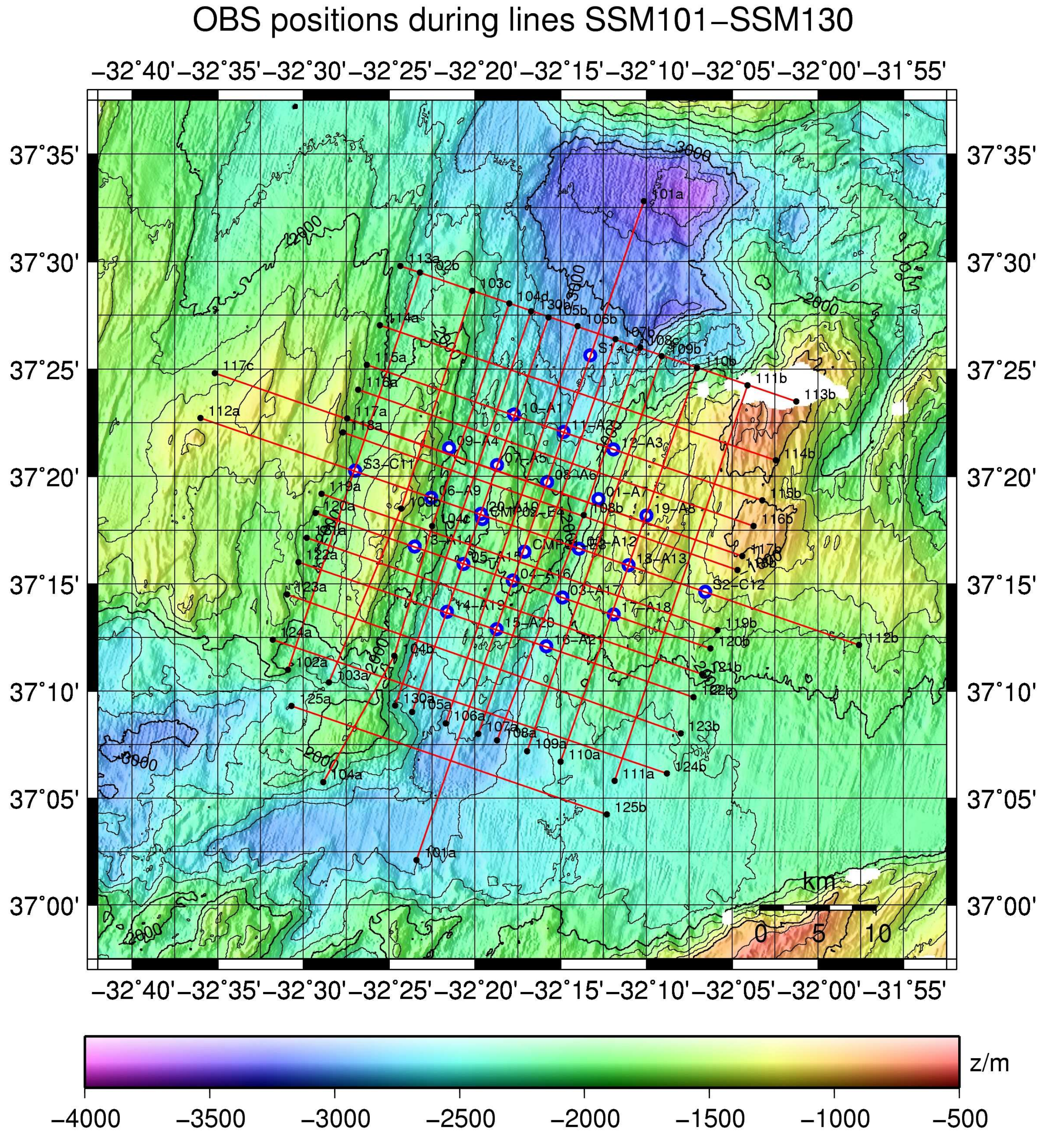
1.2 Site Maps

Tim Seher

1.2.1 OBS Positions and thoretical lines




OBS positions during lines SSM101−SSM130
−32˚40' −32˚35' −32˚30' −32˚25' −32˚20' −32˚15' −32˚10' −32˚05' −32˚00' −31˚55'
37˚35'
37˚30'
37˚25'
37˚20'
37˚15'
37˚10'
37˚05'
37˚00'
km
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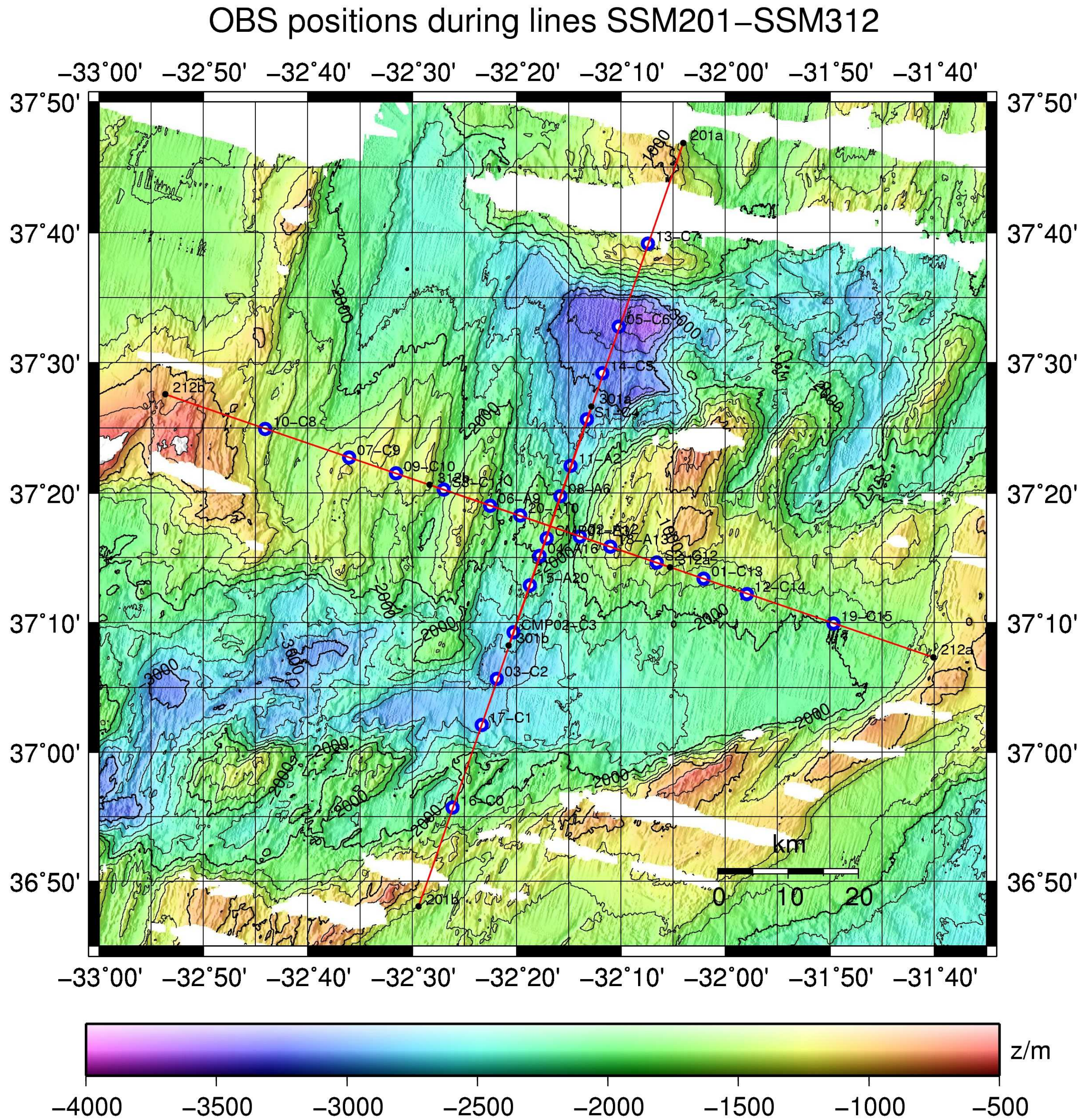
OBS positions during lines SSM201–SSM312
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–32˚50'
–32˚40'
–32˚30'
–32˚20'
–32˚10'
–32˚00'
–31˚50'
–31˚40'
37˚50'
37˚40'
37˚30'
37˚20'
37˚10'
37˚00'
36˚50'
201a
13–C7
05–C6
14–C5
301a
212b
10–C8
07–C9
09–C10
11–A2
08–A6
06–A9
15–A20
CMP02–C3
301b
03–C2
17–C1
16–C0
201b
01–C13
12–C14
19–C15
212a
km
0
10
20
z/m
–4000
–3500
–3000
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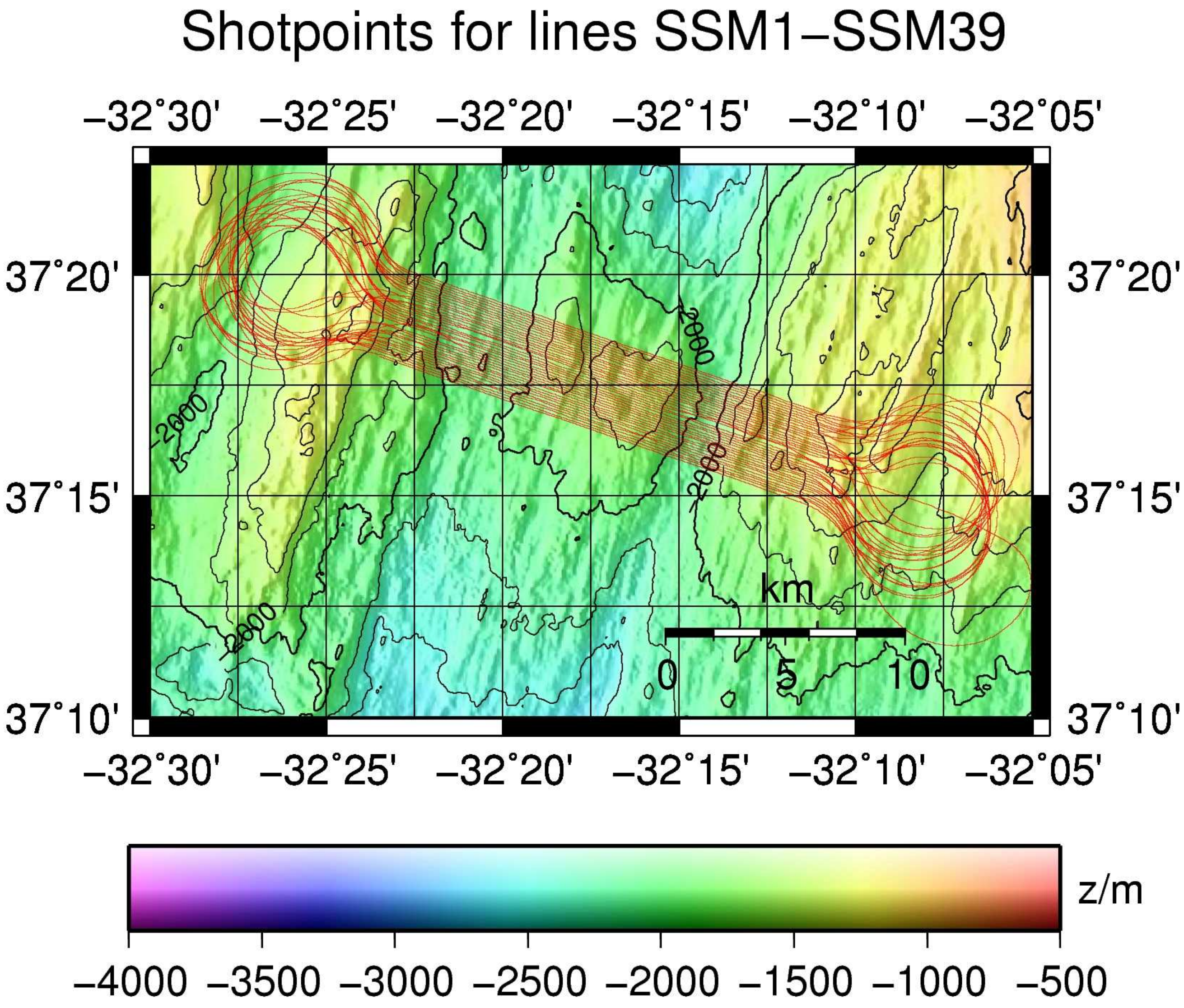
–1500
–1000
–500

1.2.2: Actual Shot Points



2: Preliminary Processing

2.1 Multichannel Seismic Reflection Data: Onboard Preliminary Processing

Juan-Pablo Canales

During the cruise we did some preliminary processing of all of the seismic reflection profiles for QC and experiment planning purposes. Recording of the multichannel seismic data was done in SEG-D format on DLT tapes (one copy for the scientific party and a second copy for *Genavir*). Each 35-Gbyte tape held ~2 days of recording. At the beginning of the two MCS experiments, only one seismic profile was recorded in one tape so we could have access to the data in a timely fashion to test the processing procedures. Data were transferred from the tapes to a *Linux* PC with a DLT drive, and were stored in its internal hard drive.

Focus 5.2 software by *Paradigm* was used to read the tapes and for subsequent processing and visualization. The two MCS experiments had different shooting configurations, so data from each experiment were archived and processed in two different *Focus Projects* called SISMO1 and SISMO2, for the 3D and 2D MCS experiments, respectively. All of the SISMO1 profiles were processed under one single *Focus Line* (LINE2) - except tapes 1 and 3 and line SSM1 that were processed in *Focus* Line LINE1-, and the profiles for SISMO2 were processed under two different *Focus Lines*: 2DLINES and 2D_75M (because of a change in shooting spacing for the last 3 profiles of the 2D experiment). The following table summarizes the record length, shooting parameters, and data storages for both *Focus Projects*:

	Record Length	Sampling Rate	Shot Spacing	Data Paths
Project: **SISMO1** Line: **LINE1, LINE2**	12 s	2 ms	37.5 m	/DATA1/sismomar
Project: **SISMO2** Line: **2DLINES**	30 s	4 ms	150 m	/DATA1/sismomar /DATA2/sismomar2
Project: **SISMO2** Line: **2D_75m**	25 s	4 ms	75 m	/DATA1/sismomar /DATA2/sismomar2

In the next section we describe each step, the parameters used, and provide examples of the *Focus* jobs. The **general processing flow** was as follows:

1- Create geometry.

2- Read the DLT tape (in SEG-D format) and save shot gathers in the *Focus* database with geometry (CDP) included in the headers.

3- Extract and cut the shot gathers corresponding to each line recorded in the tape.

4- Constant-velocity stacks of CDP gathers.

5- Detailed velocity analysis and picking every 200 CDPs.

6- Stack of CDP gathers after normal moveout and stretch muting.

7- F-K migration with water velocity.

8- Save stack and migrated images in SEG-Y format.

The ***Focus* jobs** were stored on disk in the following directories:

`/DATA1/sismomar/JOB_FILES/tape*/` contains the geometry job (only in those tapes corresponding to the beginning of the experiments), the tape reading jobs, and the cut line jobs.

`/DATA1/sismomar/JOB_FILES/tape*/SSM*/` contains all the other jobs (velocity analysis, stack, and migration).

The **data files** were stored both in the *Focus* database and in disk (*Focus* VDS format):

A. *Focus* database
   i. Data read from the tapes: `shots_tape*`
   ii. Shot gathers cut for each profile: `shots_SSM*`
   iii. Constant-velocity stacks for each profile: `cvs_SSM*`

B. *Focus* VDS format (`/DATA1/sismomar/DSK/`)
   i. Stacks: `stack_SSM*.dsk`
   ii. Migrated sections: `mig1500_stackSSM*.dsk`

2.1.1- Geometry

The geometry was defined only once at the beginning of each experiment, since the shooting and streamer configuration did not change during each experiment (except the last three profiles of the 2D experiment, which were then defined with a different geometry).

3D Experiment: Project **SISMO1** Line **LINE2**

Module DUMIN just simulates a seismic trace input (2 ms sampling rate, 12 s long) for the module MARINE.

Module MARINE is defined with 6000 shots (enough for each line), 360 channels (channel# 1 closets to shot), 200 m near-trace offset, 12.5 m group interval, and 37.5 m shot interval. All shots were renumbered, starting at shot# 1.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape4/geometry.dat`

```
*JOB    SISMO1  LINE2
*CALL   DUMIN   2       12000
*CALL   MARINE  6000    360     1       200     12.5    37.5
1
*END
```

2D Experiment: Project **SISMO2** Line **2DLINES**

Module DUMIN just simulates a seismic trace input (4 ms sampling rate, 30 s long) for the module MARINE.

Module MARINE has the same parameters as in the previous case, but now the shot interval is 150 m.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape20/geometry.dat`

```
*JOB    SISMO2  2DLINES
*CALL   DUMIN   4       30000
*CALL   MARINE  6000    360     1       200     12.5    150
1
*END
```

2D Experiment: Project **SISMO2** Line **2D_75m**

The last 3 profiles of the 2D experiment were shot at a different interval.

Module DUMIN is as before, but with 25-s-long records.

Module MARINE has the same parameters as in the previous case, but now the shot interval is 75 m.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape27/geometry.dat`

```
*JOB    SISMO2  2D_75M
*CALL   DUMIN   4       25000
*CALL   MARINE  6000    360     1       200     12.5    75
1
*END
```

2.1.2- Tape dumping

Each SEG-D tape was copied to a hard drive, storing the shot gathers in the *Focus* database. Two Focus jobs were used: `segd_part1.dat` was run to store a file in the Focus database with information on the acquisition parameters, and `segd_part2.dat` was run reading the output of the previous job. `segd_part1.dat` only needed to be run for a few minutes to extract the information from the tape, and then it could be stopped.

When starting a *Focus* job that required input from a tape, the Tape Facility tool had to be opened (from the main *Focus* window, under Options Menu) and the request submitted to the appropriate server.

segd_part1.dat:

Module SEGD reads a SEG-D tape, with 8058 as demultiplexed data format. The WRITE option outputs the file `reading_line2` to the database with the recording parameters.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape4/segd_part1.dat`

```
*JOB    SISMO1  LINE2
*CALL   SEGD                            8058
WRITE   reading_line2
RECORD  tape4

*END
```

segd_part2.dat:

Module SEGD reads a SEG-D tape, with 8058 as demultiplexed data format. The READ option reads the file `reading_line2` from the database with the recording parameters. In this example from the 3D experiment, trace length is set to 12 s, sampling rate to 2 ms, maximum number of traces is 360. The tape drive is identified as dltl.

For the 2D experiment we set the trace length to 10 s (out of the 25-30 s recorded on tape; for the preliminary processing there was no need of such long records) and the sampling rate to 4 ms.

Module RESAMP resamples the data to 4 ms (this was not needed in the 2D experiment).

Module PROFILE adds the geometry information (offset and CDP number) to the trace headers. (**NOTE**: In the 2D experiment the PROFILE module was not used in this step; it was used in the next step when cutting the shot gathers for each line.)

Module DSOUT writes the shot gathers to the *Focus* database.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape4/segd_part2.dat`

```
*JOB    SISMO1  LINE2
*CALL   SEGD    11000   2       360     8058
READ    reading_line2   LINE2
RECORD  tape4

TAPEOPT  /unit=dltl
*CALL   RESAMP  4       6000
*CALL   PROFILE         1
*CALL   DSOUT   OVERWRT
LABEL   shots_tape4
*END
```

2.1.3- Cut shot gathers for each line

Each of the Focus files with all the shots from one tape were then cut into smaller files containing the shots of each line.

Module DSIN reads the shot gathers of one single tape from the *Focus* database (in this example for line SSM17, shot numbers from 300 to 877). The first shot number corresponds to the beginning of the line, and the last shot number is the end of the line plus 60 shots (15 shots for the 2D MCS experiment) after the beginning of the turn to have complete fold for the CDP at the end of line.

Module DSOUT writes the shot gathers to the *Focus* database.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape4/cut_lineSSM17.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSIN
LABEL   shots_tape4
RANGE   300     877     1       1
*CALL   DSOUT   OVERWRT
LABEL   shots_SSM17
*END
```

2.1.4- Constant velocity stacks

Before doing the velocity analysis, we constructed constant velocity stacks (CVS) in order to have an idea of which velocities were more appropriate for the different events we found (layer 2A, AMC, faults, Moho). The

CVS were then visually inspected, and for each event we wrote down the best stacking velocity and range of CDPs where the event was observed. Examples of CVS are shown in Figure 1.

Module DSIN reads the data from the database, sorted in CDP order.

Module CVA performs the constant velocity normal moveout of the CDP and stacks them. The velocity analysis was done for several velocities. In this example: Seafloor: 1400-1500 m/s every 50 m/s; Layer 2A: 1600-1800 m/s every 100 m/s, 1900-2300 m/s every 200 m/s; AMC and faults: 2900-3700 m/s, every 200 m/s; and Moho: 4500-5100 m/s, every 200 m/s.

Module FILTER applies a Butterworth filter between 5-50 Hz to the stacks.

Module DSOUT writes the constant velocity stacks to the database. They can be visualized with the View Data option in *Focus* (each ensemble corresponds to one velocity).

Focus job name: `/DATA1/sismomar/JOB_FILES/tape13/SSM16/cvs.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSIN
LABEL   shots_SSM16
ORDER   CDP     SEQNO
*CALL   CVA                             STACK   CDP
VELC
1400    50      3
1600    100     3
1900    200     3
2900    200     6
4500    200     4
*CALL   FILTER  CDP
BUTTER
        6000    5               50
*CALL   DSOUT   OVERWRT
LABEL   cvs_SSM16
*END
```

2.1.5- Velocity analysis

The constant velocity stacks described above were used as a guide for an interactive velocity analysis performed every 200 CMP. An example of the velocity model for one supergather is shown in Figure 2.

Module DSIN reads the data from the database, sorted in CDP order. In this example CDP are read in groups of 6, every 200 (e.g., CDP 2800-2805, 3000-3005, etc.). The reason for this is that in the VELDEF module each group of 6 CDP will be used to form a supergather. For the 3D experiment, a 360-fold supergather is formed with 6 consecutive 60-fold CDP. For the 2D experiment, a 360-fold supergather is formed with 24 consecutive 15-fold CDP.

Module FILTER applies a Butterworth filter between 5-50 Hz to the CDP gathers.

Module VELDEF is the interactive velocity definition module. The velocity model is stored in the database with the name `SSM16Vel`. To perform the velocity analysis in the supergathers, one must enable the "Form Supergather" option under the Functions Menu in the interactive window. Also, in the "Global Parameters" window (under the Parameters Menu), one must select the number of ensembles to form the supergather (6 for the 3D experiment, 24 for the 2D experiment). Velocities were picked at the seafloor, in a ~500 ms window centered near the 2A/2B reflections/refraction for the appropriate normal moveout, and if the AMC and faults were present, also ~500 ms windows centered in those events. Finally velocities appropriate for the Moho were picked at ~2 s below the seafloor. One must note that the velocity analysis is user dependent. Thus several velocity models for the same profile were constructed by different people, resulting in somewhat different stack and migrated images.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape13/SSM16/velbuild_ss.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSIN
LABEL   shots_SSM16
ORDER   CDP     SEQNO
RANGE   2800    6234    6       200
*CALL   FILTER  CDP
BUTTER
        6000    5               50
*CALL   VELDEF  CDP                     SSM16Vel
```

```
*END
```

2.1.6- Normal moveout (NMO), muting, and stack

The velocity models were then used to apply the NMO correction to the CDP gathers, which were then subsequently muted and stacked.

Module DSIN reads the shot gathers, sorting them to CDP gathers.

Module NMO applies the NMO correction using the velocity model `SSM32Vel`. The option NOMUTE was use so no crossover mute was applied. This allowed more of the energy of the 2A/2B boundary near the intersection with the seafloor reflection to be included in the stack. Also, a stretch mute (50%) was applied to the NMO-corrected gathers.

Module FILTER applies a Butterworth filter between 5-50 Hz to the CDP gathers.

Module DSKWRT writes the stack to a disk file in *Focus* VDS format.

Focus job name: `/DATA1/sismomar/JOB_FILES/tape14/SSM32/stack.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSIN
LABEL   shots_SSM32
ORDER   CDP     OFFSET
RANGE   13867   17586   1       1
*CALL   NMO     SSM32Vel        NOMUTE
STRETCH 50
*CALL   STACK   60
*CALL   FILTER  CDP
BUTTER
        6000    5               50
*CALL   DSKWRT  /DATA1/sismomar/DSK/stack_SSM32_strmute.dsk
*END
```

2.1.7- Migration

The rough topography of unsedimented, slow-spreading ocean crust results in considerable scattering that is apparent in the stacks as hyperbolic events. This noise can be partially eliminated by migrating the stack in the F-K domain using a constant water velocity (1500 m/s). The resulting migrated images are in most cases cleaner than the stacks, and the events are sharper. Better results could be obtained if the primary multiple were to be muted from the stack prior to migration. Several examples of the migrated images with the most relevant features are shown in Figures 3 through 8.

Module DSKRD reads the stack from the disk file.

Module MIGDMO performs the migration in the F-K domain (FKMIG option) with water velocity (1500 m/s) defined everywhere in the section. The correct number of CDP to be migrated (3720 in this example) and the CDP spacing (6.25 m) must be supplied.

Module DSKWRT writes the migrated image to a disk file in *Focus* VDS format.

Module RUNMIX performs a spatial running-window averaging of consecutive traces to enhance the image and coherent events. In this example 9 traces were averaged, with weighting decreasing away from the central trace. Note that in some lines, the RUNMIX module was done prior to DSKWRT, while in other line it was done after saving the migrated image (this example).

Focus job name: `/DATA1/sismomar/JOB_FILES/tape14/SSM32/migdmo1.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSKRD   /DATA1/sismomar/DSK/stack_SSM32_strmute.dsk
*CALL   MIGDMO  3720    3720    6.25
USERVEL
0       1500    500     1500    1000    1500    1500    1500
2000    1500    2500    1500
FKMIG
*CALL   DSKWRT  /DATA1/sismomar/DSK/mig1500_stackSSM32_stmut.dsk
*CALL   RUNMIX  9       ACROSS
WEIGHTS
1       3       5       7       9       7       5       3
1
```

```
*END
```

2.1.8- Save SEG-Y stack and migrated images

The stacks and migrated images were saved on disk in SEG-Y format after muting above the seafloor.

Module DSKRD reads the stack or migrated images from the disk file.

Module MUTE applies a mute above 1.4 s.

Module GOUT save a SEG-Y file on disk (the DENSITY parameter needs to be set, even if there is not tape involved).

Focus job name: `/DATA1/sismomar/JOB_FILES/tape14/SSM32/write_segy.dat`

```
*JOB    SISMO1  LINE2
*CALL   DSKRD   /DATA1/sismomar/DSK/mig1500_stackSSM32_stmut.dsk
ENSMBLE CDP
14226   17225
*CALL   MUTE    CDP     CDP     20
ON      14225
14225   1400
*CALL   GOUT    SEGY            POSTSTK
DENSITY 6250
TAPEOPT /tapefile="/DATA1/sismomar/SEGY/mig1500_stackSSM32.segy"
*END
```

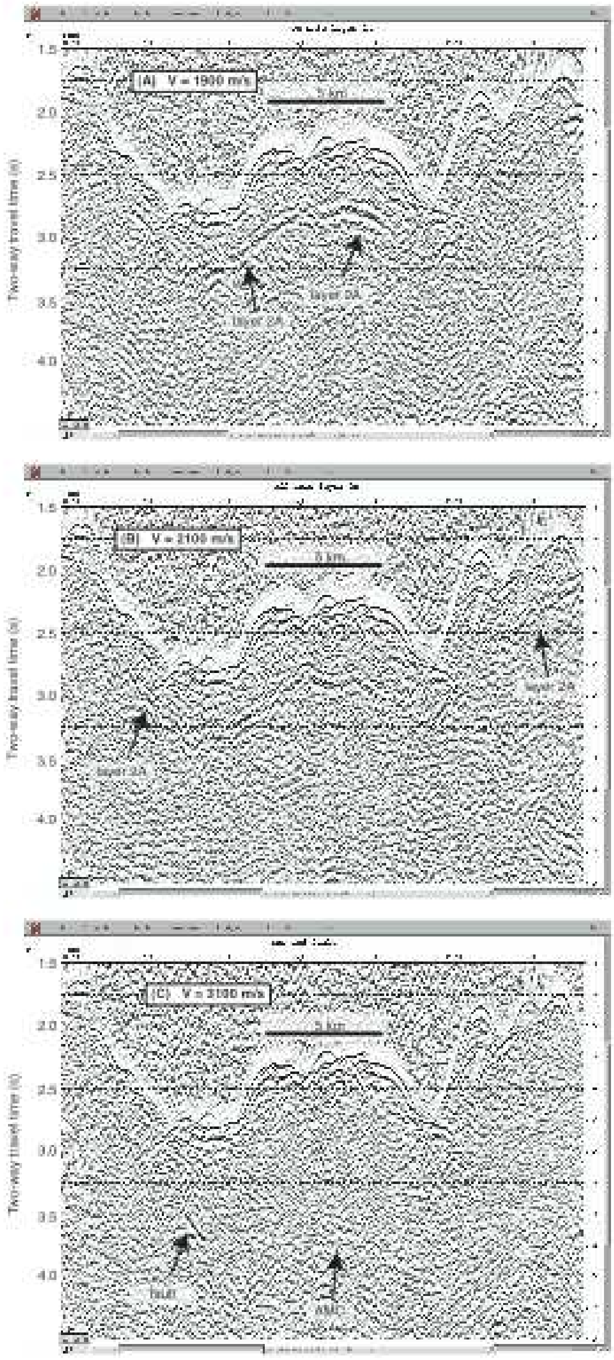


Figure 1. Examples of constant velocity stacks for SSM21. (A) For V=1900 m/s, on-axis layer 2A is well imaged. (B) Off-axis layer 2A is best imaged for V=2100 m/s, evidencing the off-axis increase in upper crustal velocity. (C) Higher stacking velocity (V=3100 m/s) are appropriate for the deeper events: AMc and rift valley faults.

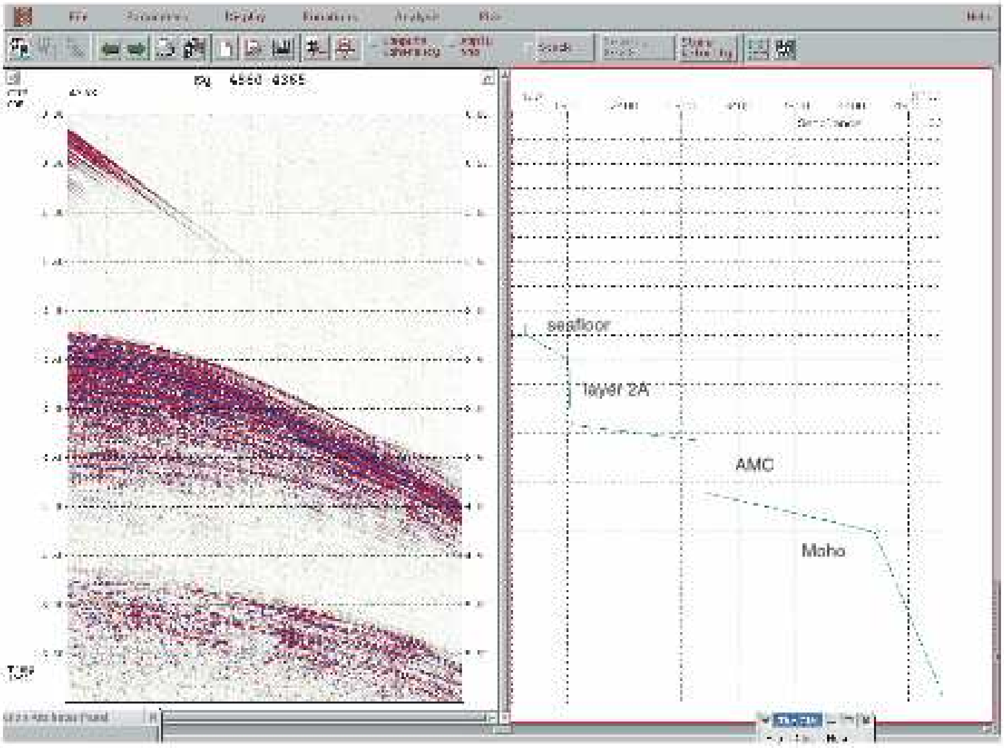


Figure 2. Examples of velocity analysis showing the velocity picks for each of the main events.

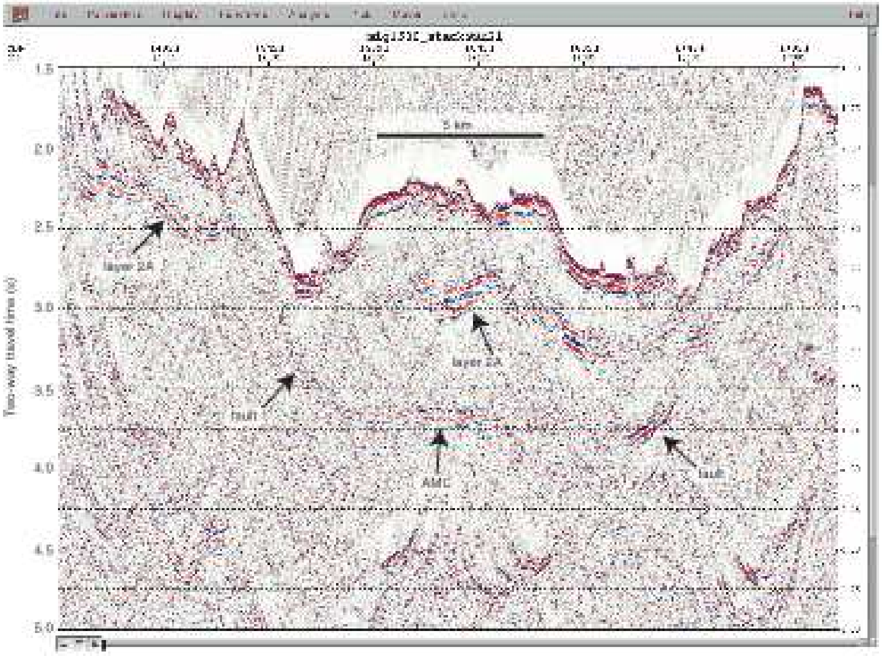


Figure 3. Line SSM21 (migrated) across Lucky Strike Volcano. The main events are the base of layer 2A and the AMC beneath the summit of the volcano, as well as faulting along the rift valley walls.

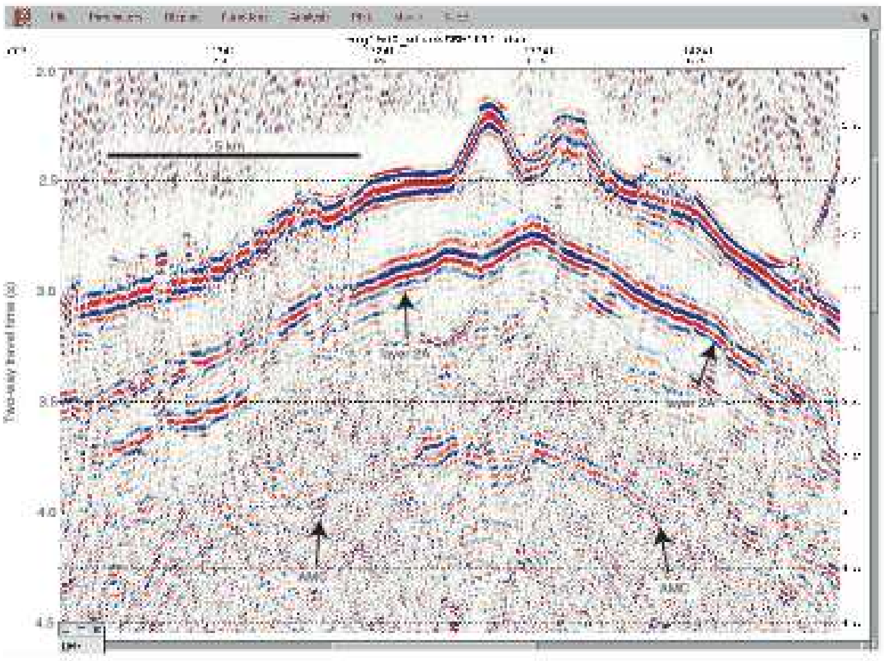


Figure 4. Portion of Line SSM1011 (migrated) along Lucky Strike Volcano. The main events are the base of layer 2A and the AMC beneath the summit of the volcano. Note that the AMC extens from north to south along ~7 km.

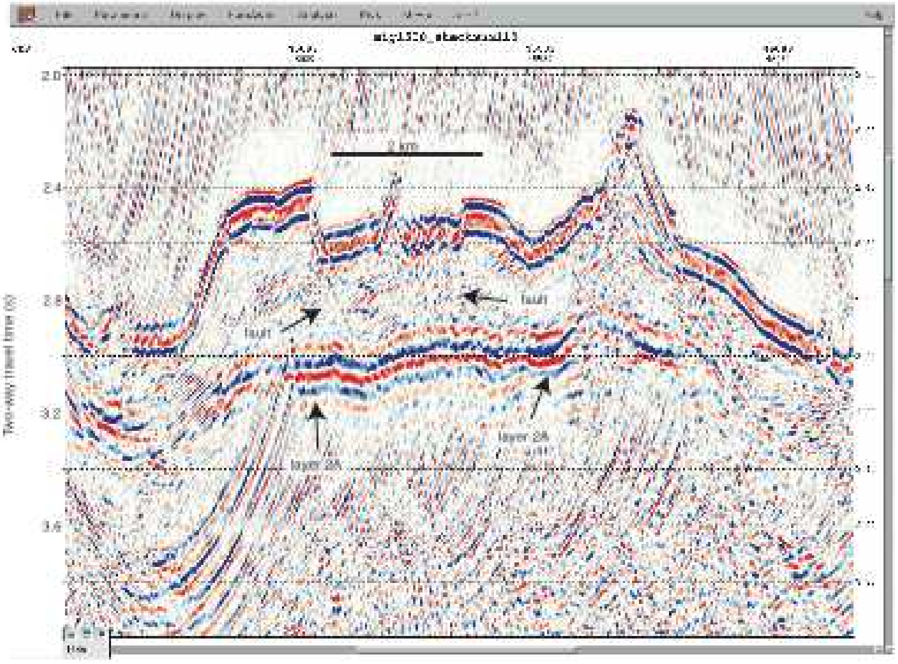


Figure 5. Line SSM118 (migrated) across the northern end of Lucky Strike Volcano. The main events are the base of layer 2A and the shallow, small-scale faulting.

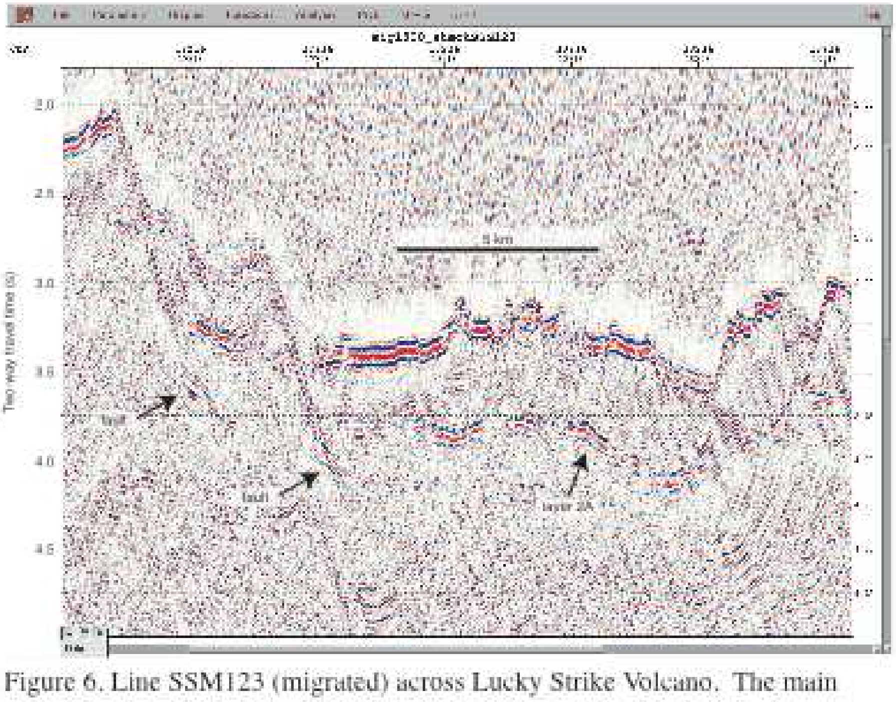


Figure 6. Line SSM123 (migrated) across Lucky Strike Volcano. The main events are the base of layer 2A and the large-scale faulting along the rift valley

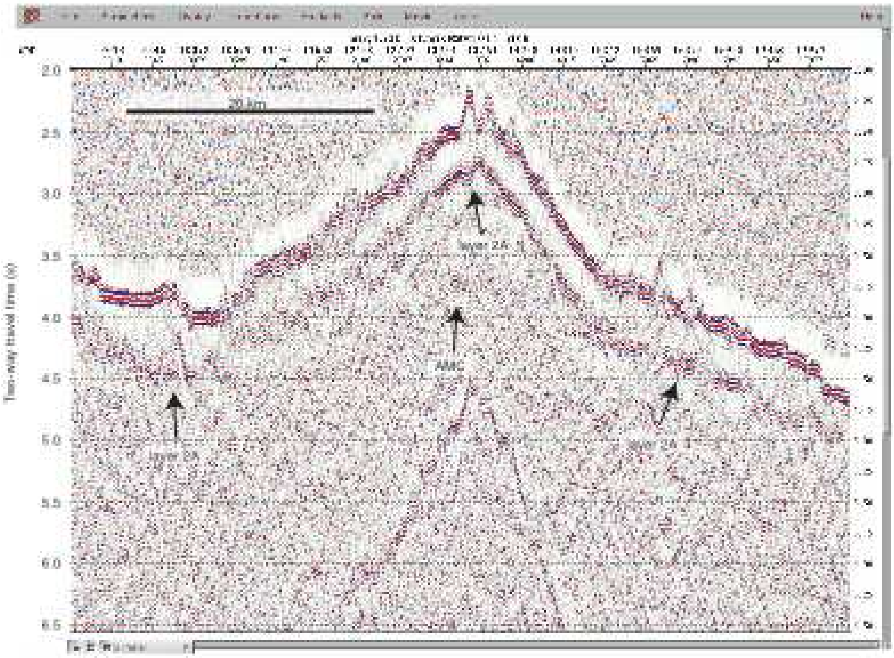


Figure 7. Line SSM1011 (migrated) along Lucky Strike segment. The main events are the base of layer 2A and the AMC beneath the summit of the volcano.

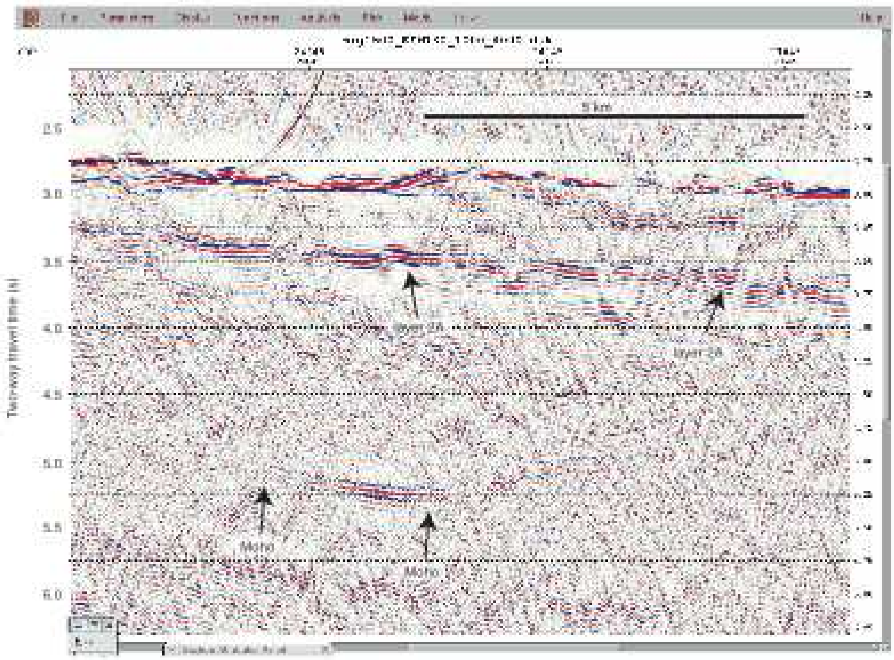


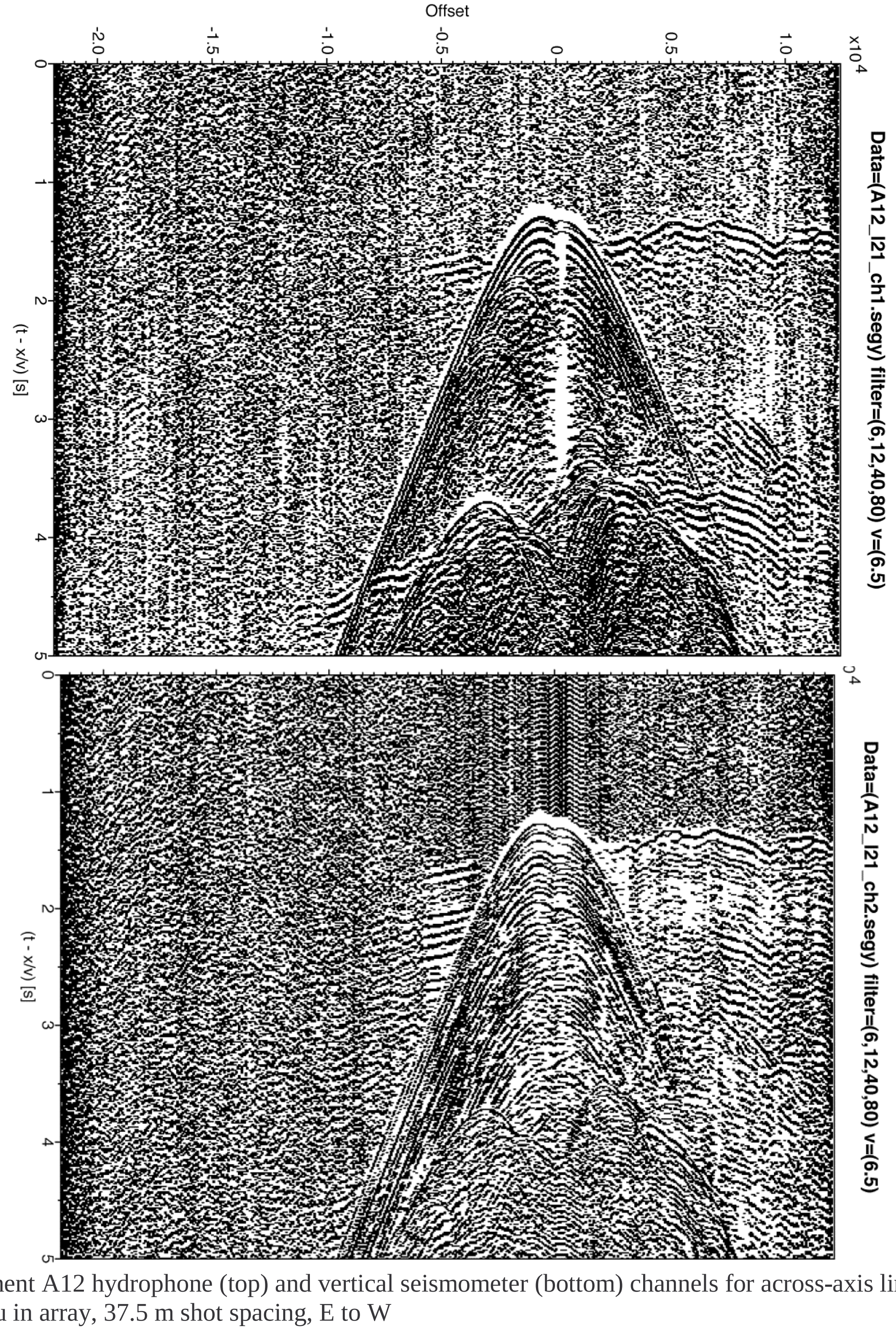
Figure 8. Example of Moho reflection from profile SSM130 along the western side of the rift valley floor.

2.2 Seismic Record Sections

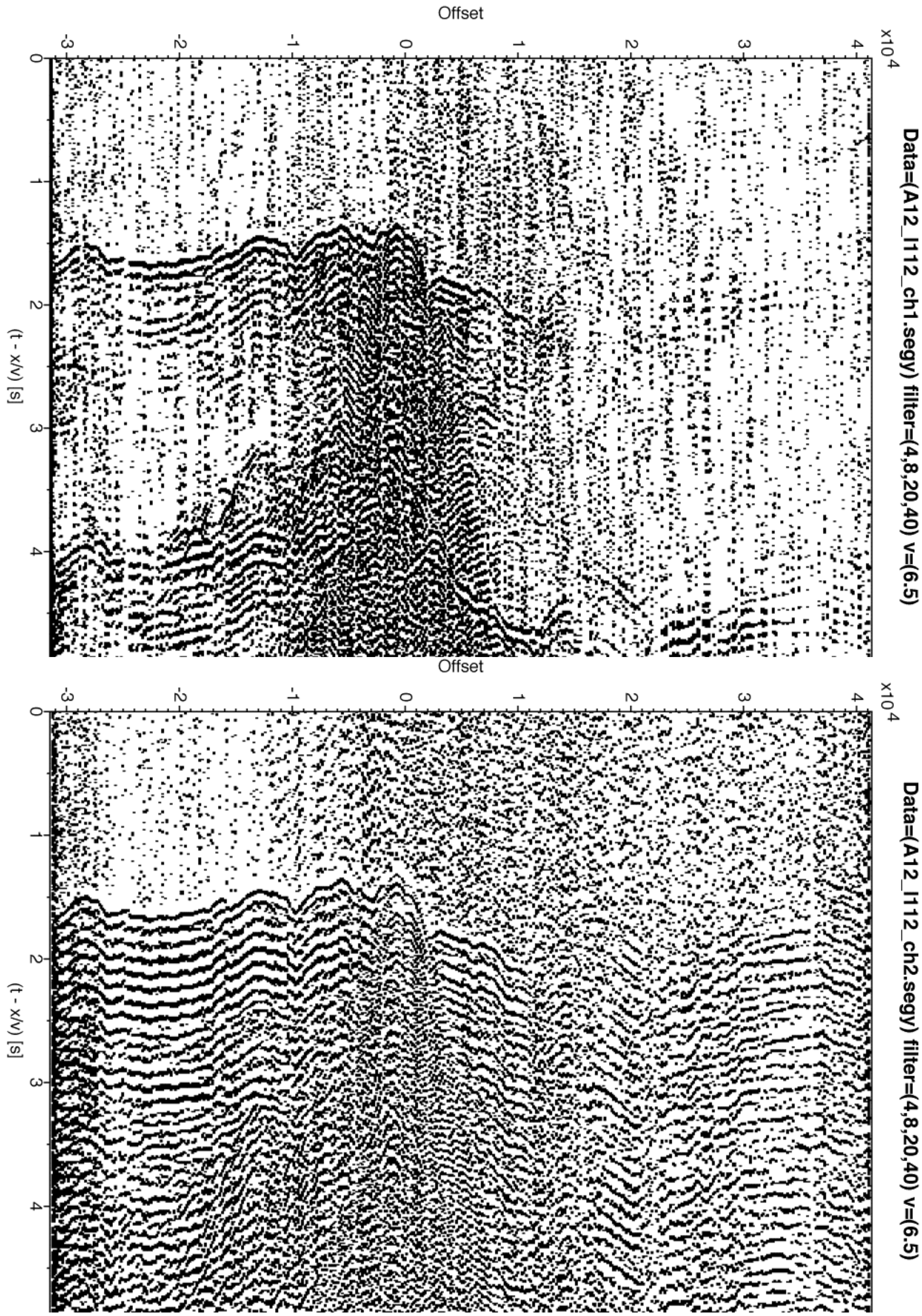
Tim Seher

To check the quality and timing of the OBS recordings, we first plotted up record sections for each airgun and shot-spacing configuration. To generate the sections shown here, we balanced the traces by subtracting the mean, applied a band-pass filter and converted to reduced time.

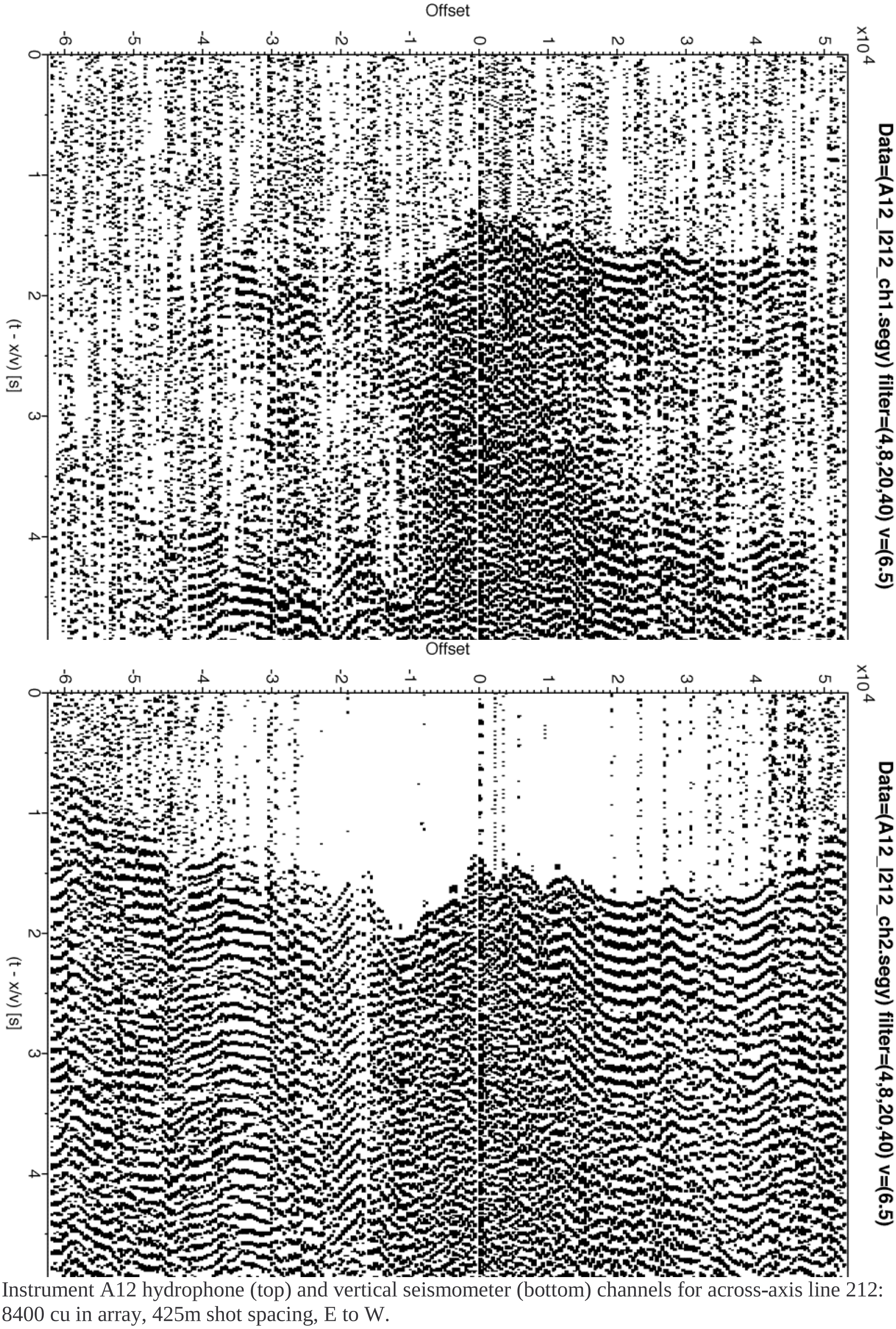
2.2.1 Across-axis lines



Instrument A12 hydrophone (top) and vertical seismometer (bottom) channels for across-axis line 21: 2600 cu in array, 37.5 m shot spacing, E to W

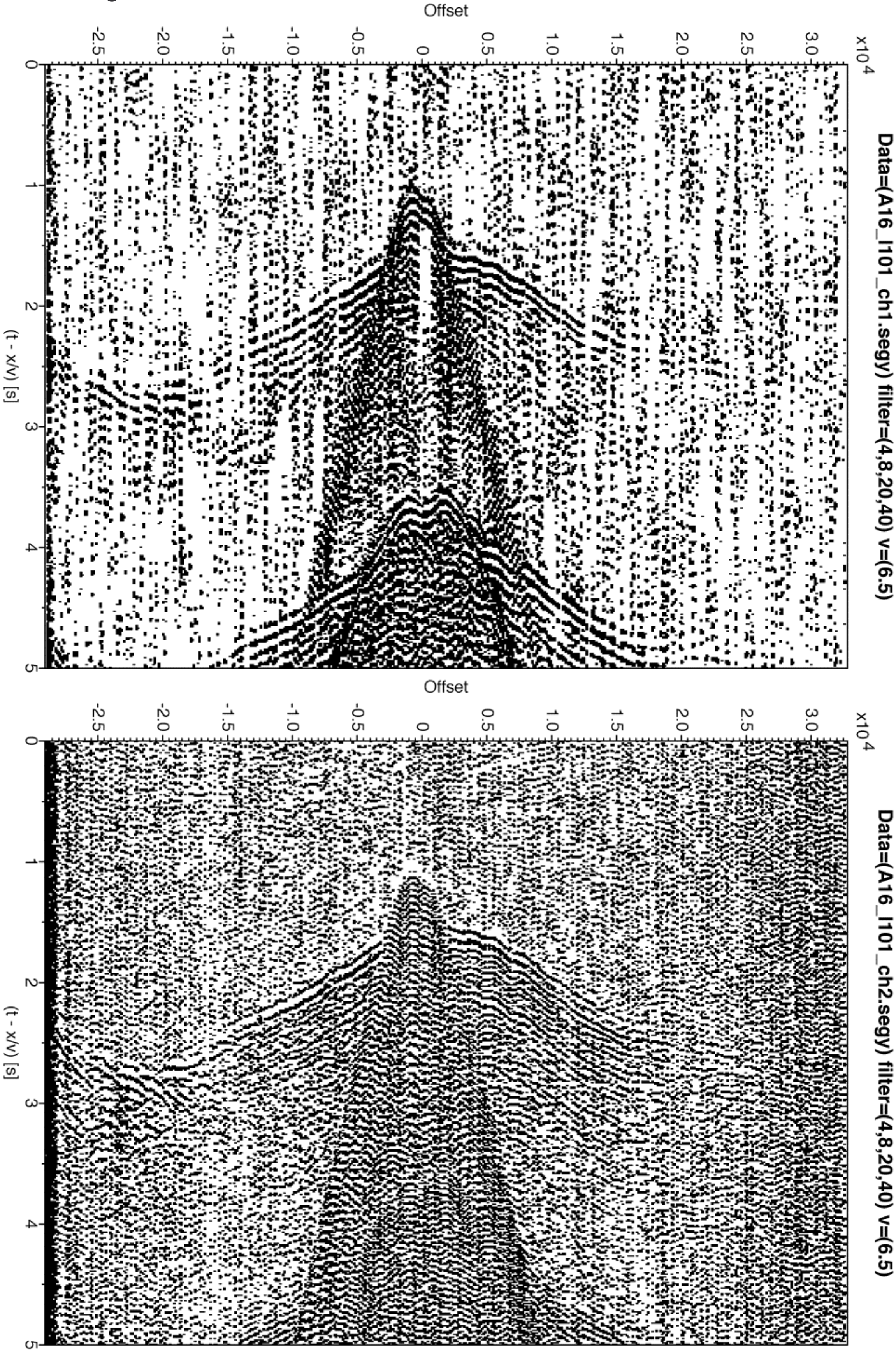


Instrument A12 hydrophone (top) and vertical seismometer (bottom) channels for across-axis line 112: 8400 cu in array, 150m shot spacing, W to E.

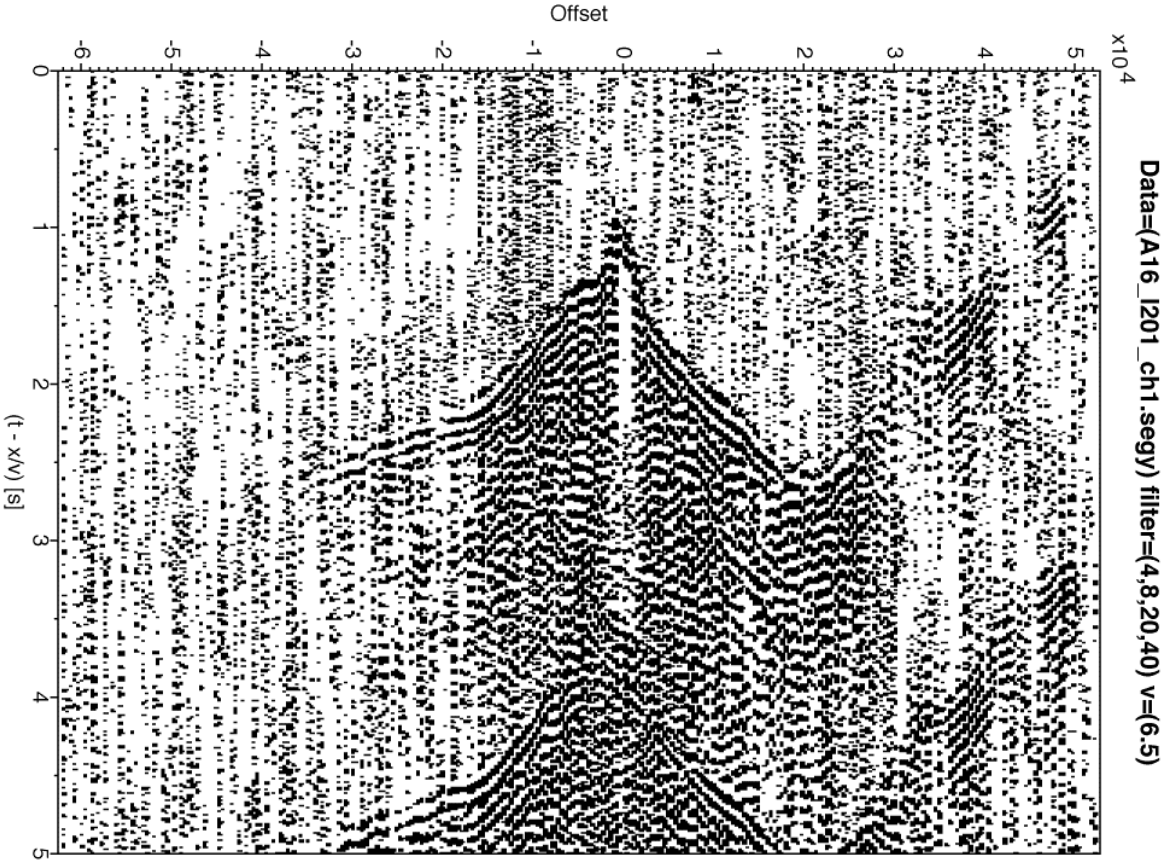


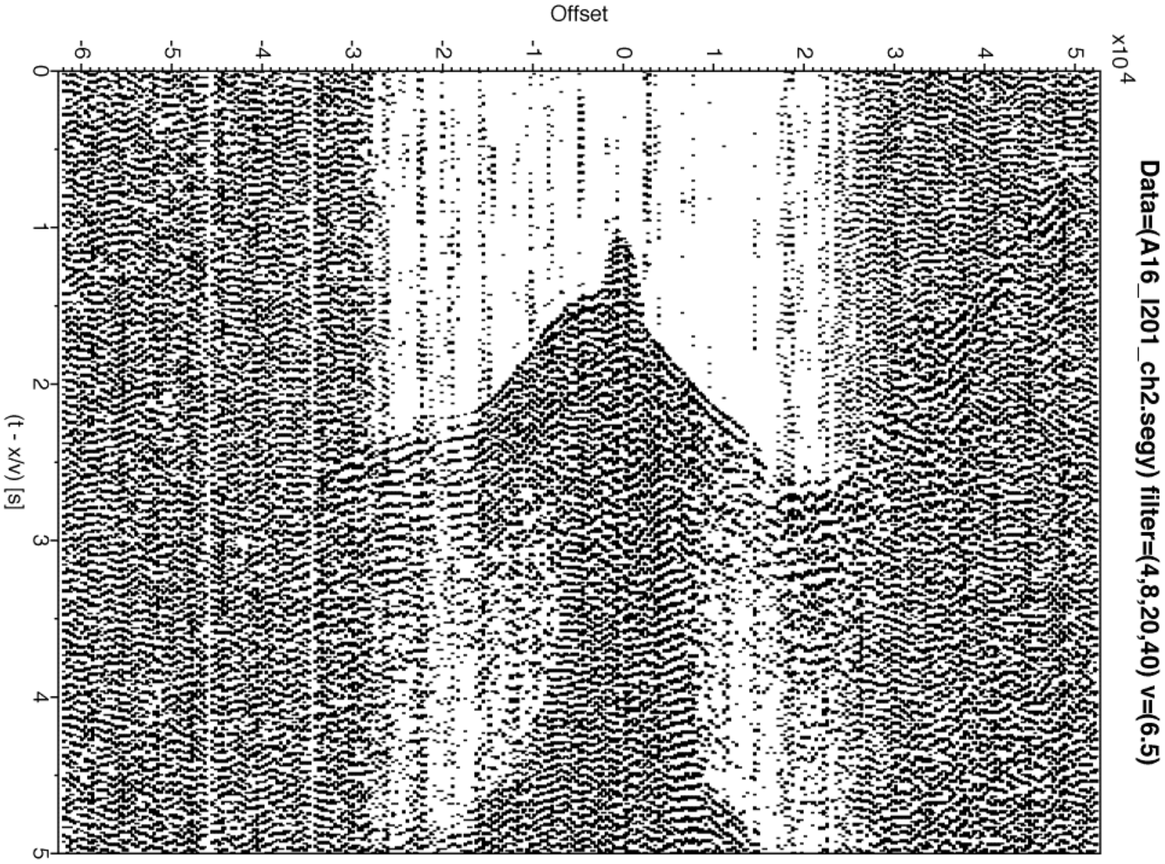
Instrument A12 hydrophone (top) and vertical seismometer (bottom) channels for across-axis line 212: 8400 cu in array, 425m shot spacing, E to W.

2.2.2 Along-axis lines

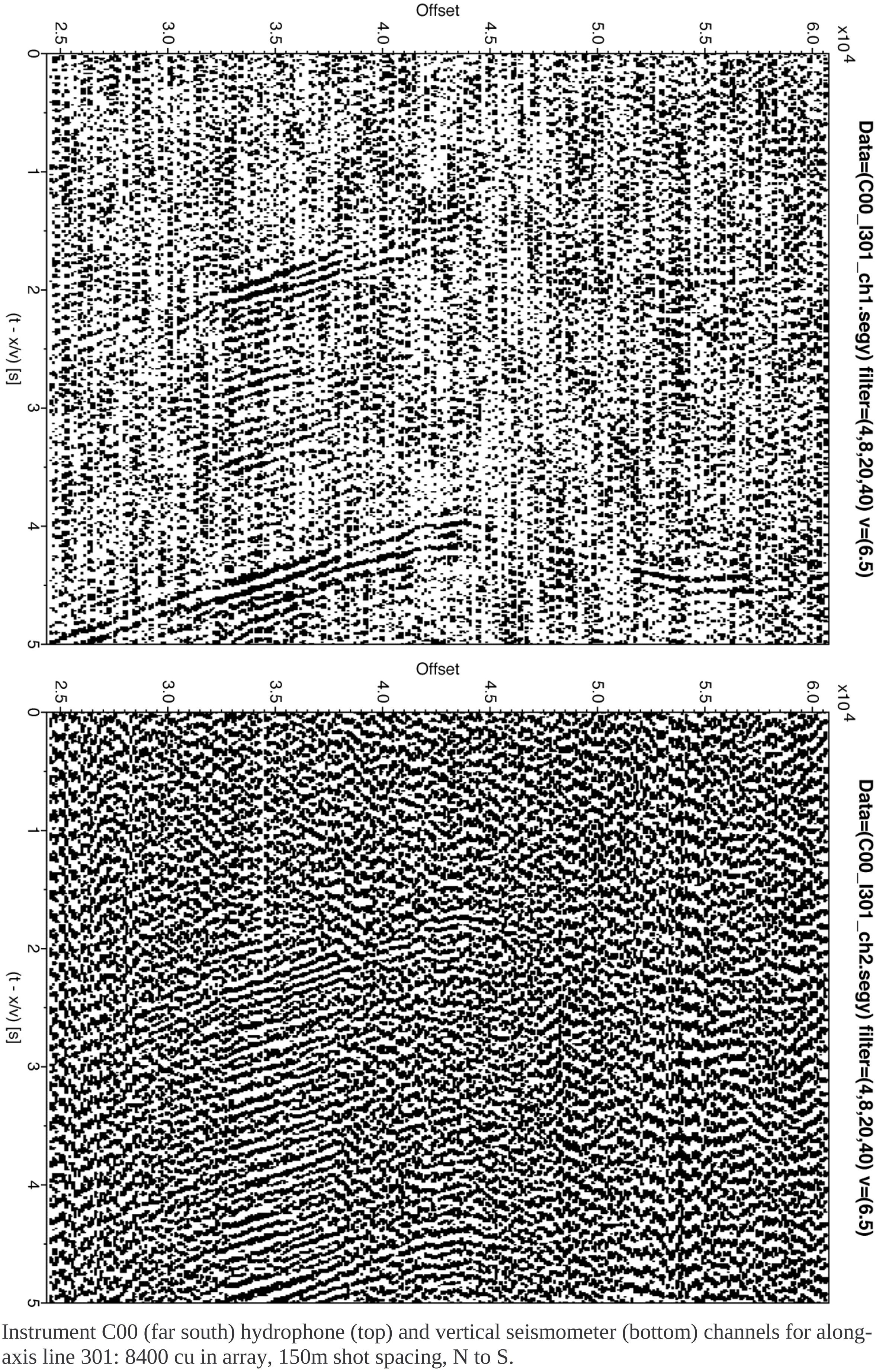


Instrument A16 hydrophone (top) and vertical seismometer (bottom) channels for along-axis line 101: 8400 cu in array, 150m shot spacing, N to S





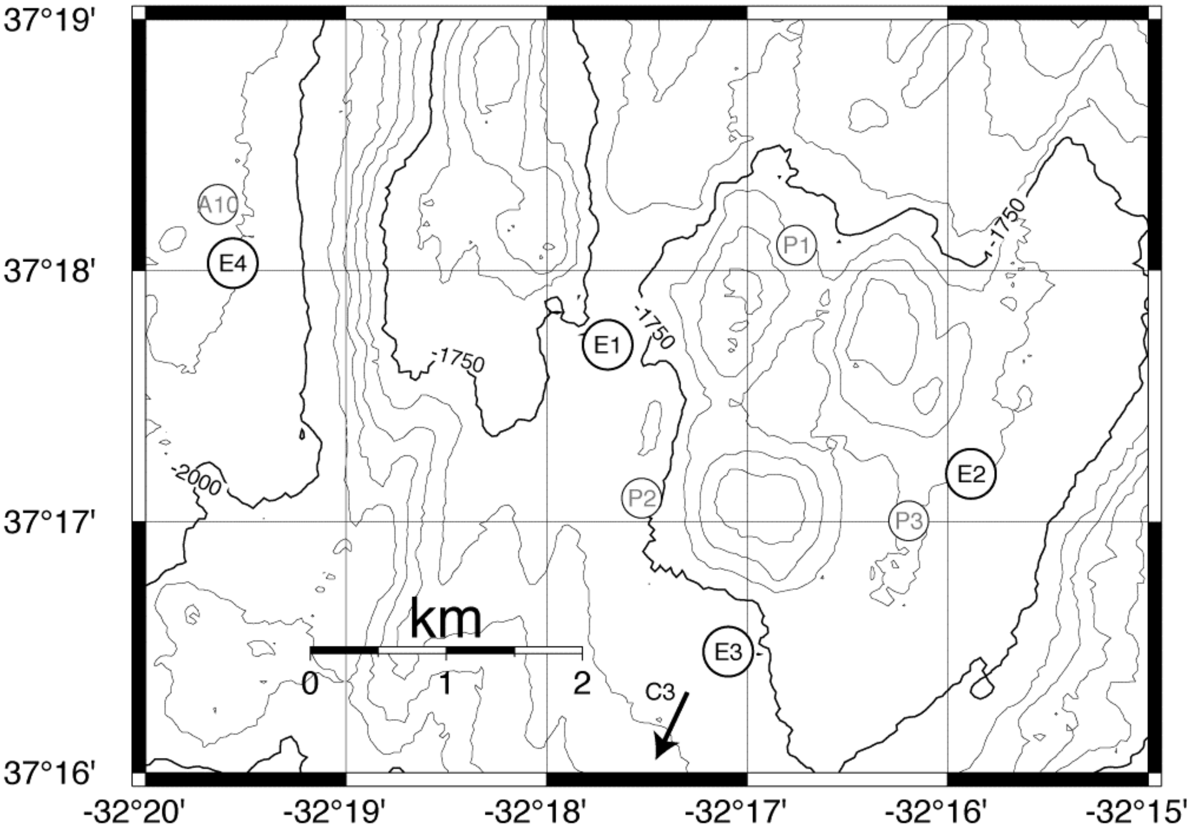
Instrument A16 hydrophone (top) and vertical seismometer (bottom) channels for along-axis line 201: 8400 cu in array, 425m shot spacing, S to N



Instrument C00 (far south) hydrophone (top) and vertical seismometer (bottom) channels for along-axis line 301: 8400 cu in array, 150m shot spacing, N to S.

2.3 Seafloor Compliance

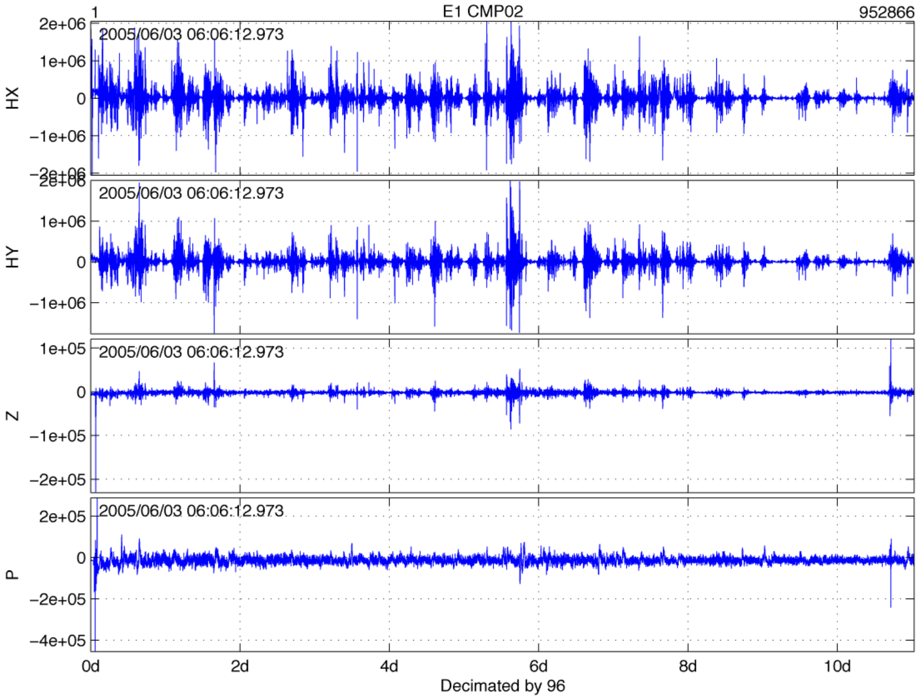
Wayne Crawford

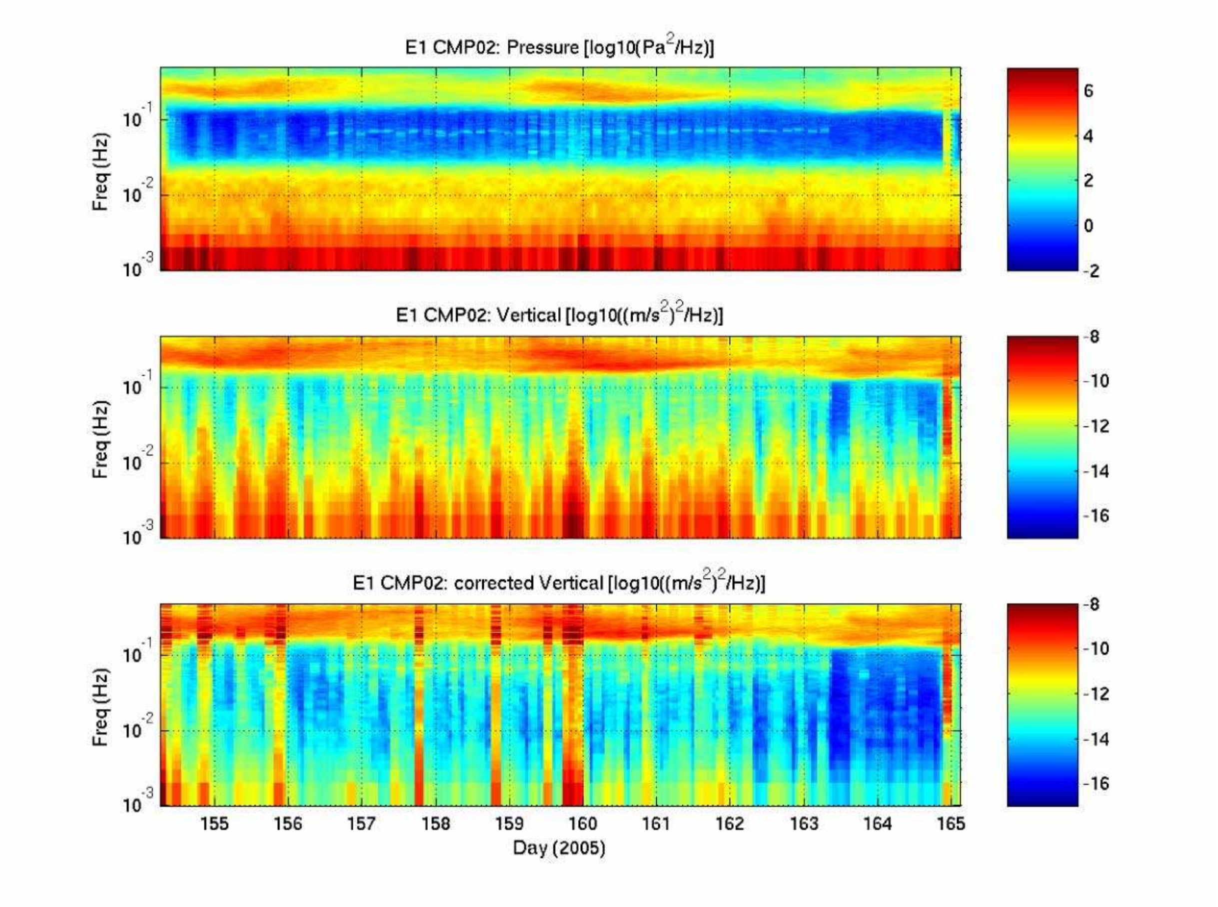


The two seafloor compliance sensors were deployed at 5 different sites, 4 on the Lucky Strike central volcano (E1-E4) and one on-axis further to the south (C3). Data were generally noisy with a tidal periodicity, indicating that currents were rocking the instruments. The current leveling system is known to be too flexible, which may be one of the problems, but the Atlantic Ocean also has relatively low infragravity waves and may have high bottom currents (S Webb, personal communication). Site C3 (well south of the volcano) had the lowest noise (good enough to see a decent compliance coherence, while site E3 (on the south side of the volcano) was the worst (X channel completely off scale, and Y channel often clipped). Site E3 is in a rifted area, perhaps the sphere was poorly coupled to the seafloor?

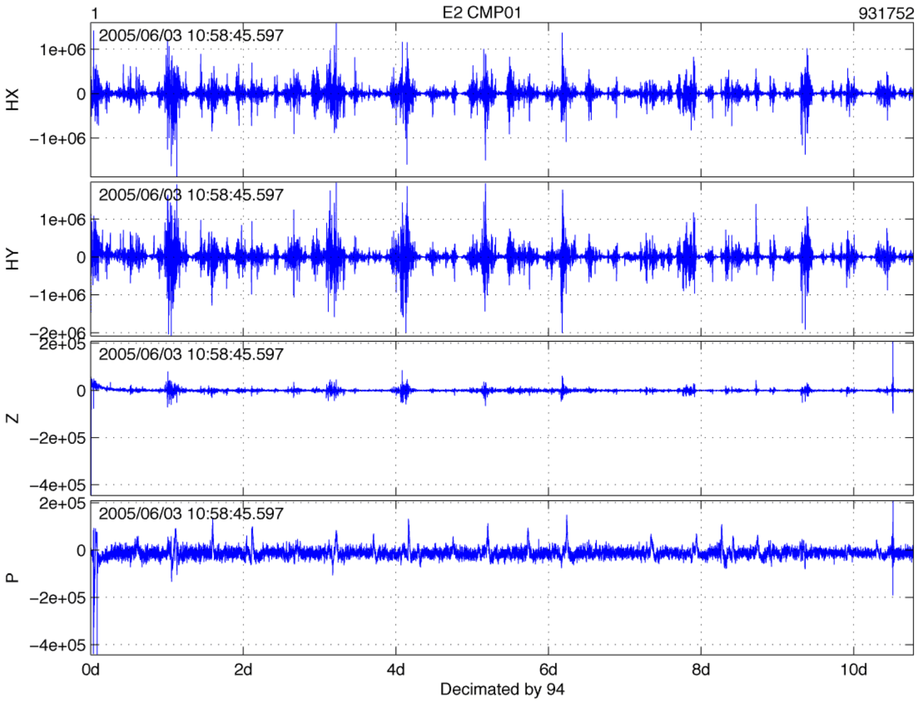
2.3.1 Time series and spectragrams

Site E1

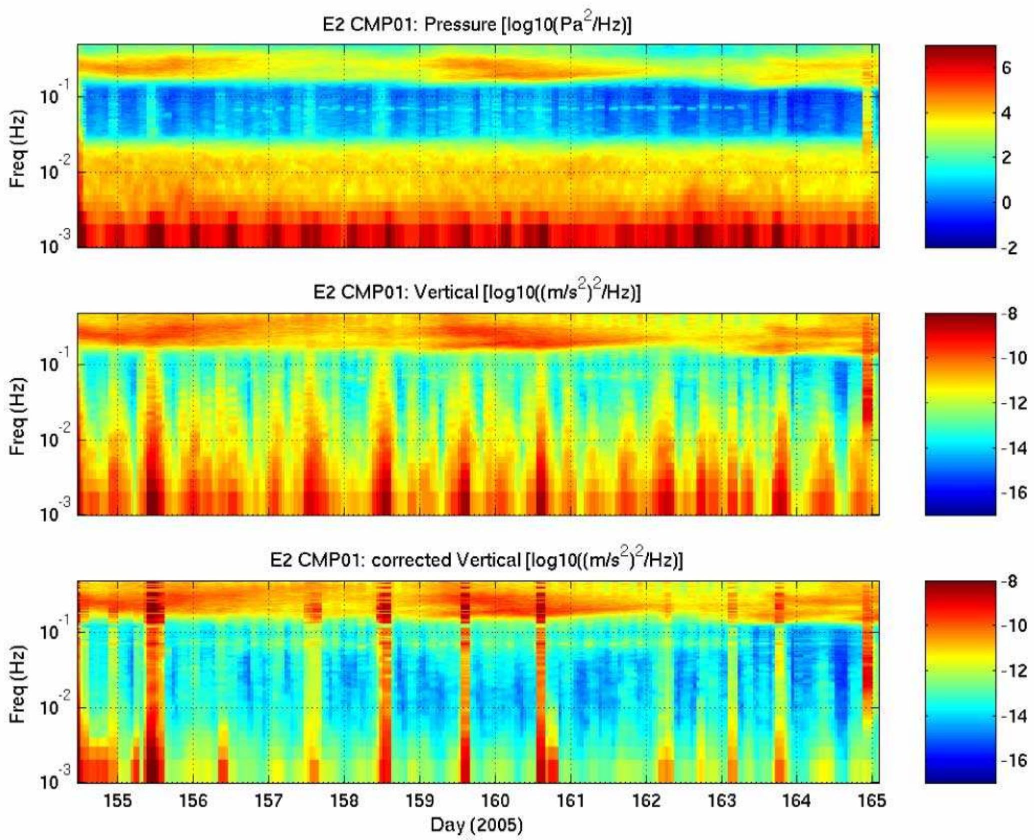




Site E2

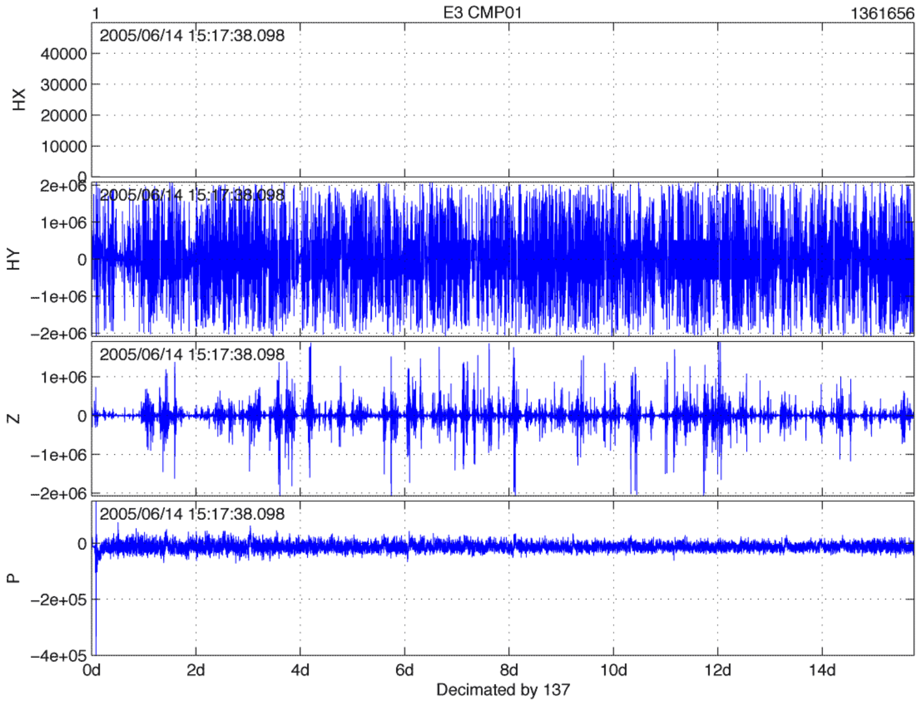


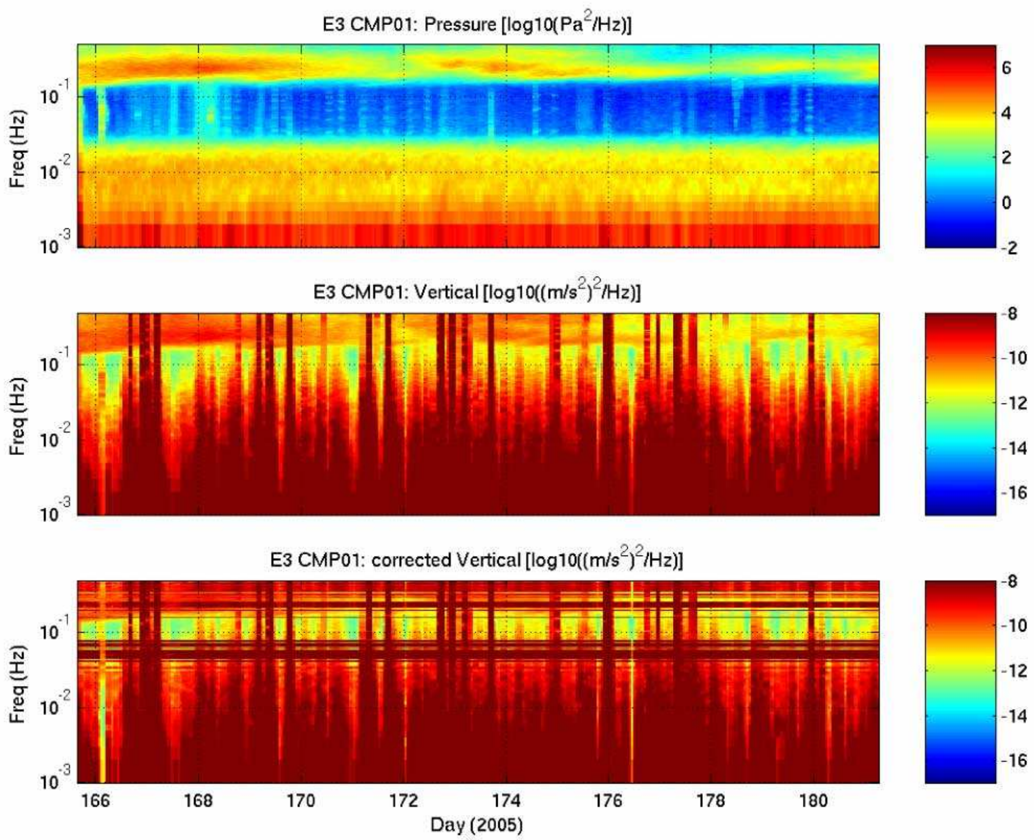
1
E2 CMP01
931752
2005/06/03 10:58:45.597
HX
HY
Z
P
1e+06
0
−1e+06
−2e+06
2e+05
−2e+05
−4e+05
0d
2d
4d
6d
8d
10d
Decimated by 94



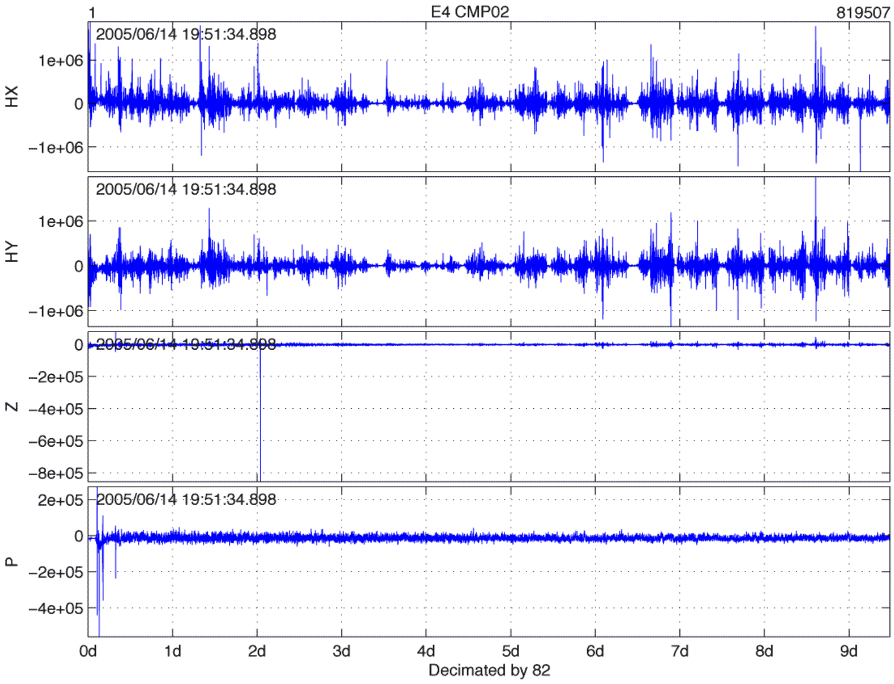
E2 CMP01: Pressure [log10(Pa^2/Hz)]
E2 CMP01: Vertical [log10((m/s^2)^2/Hz)]
E2 CMP01: corrected Vertical [log10((m/s^2)^2/Hz)]
Freq (Hz)
Day (2005)
155
156
157
158
159
160
161
162
163
164
165

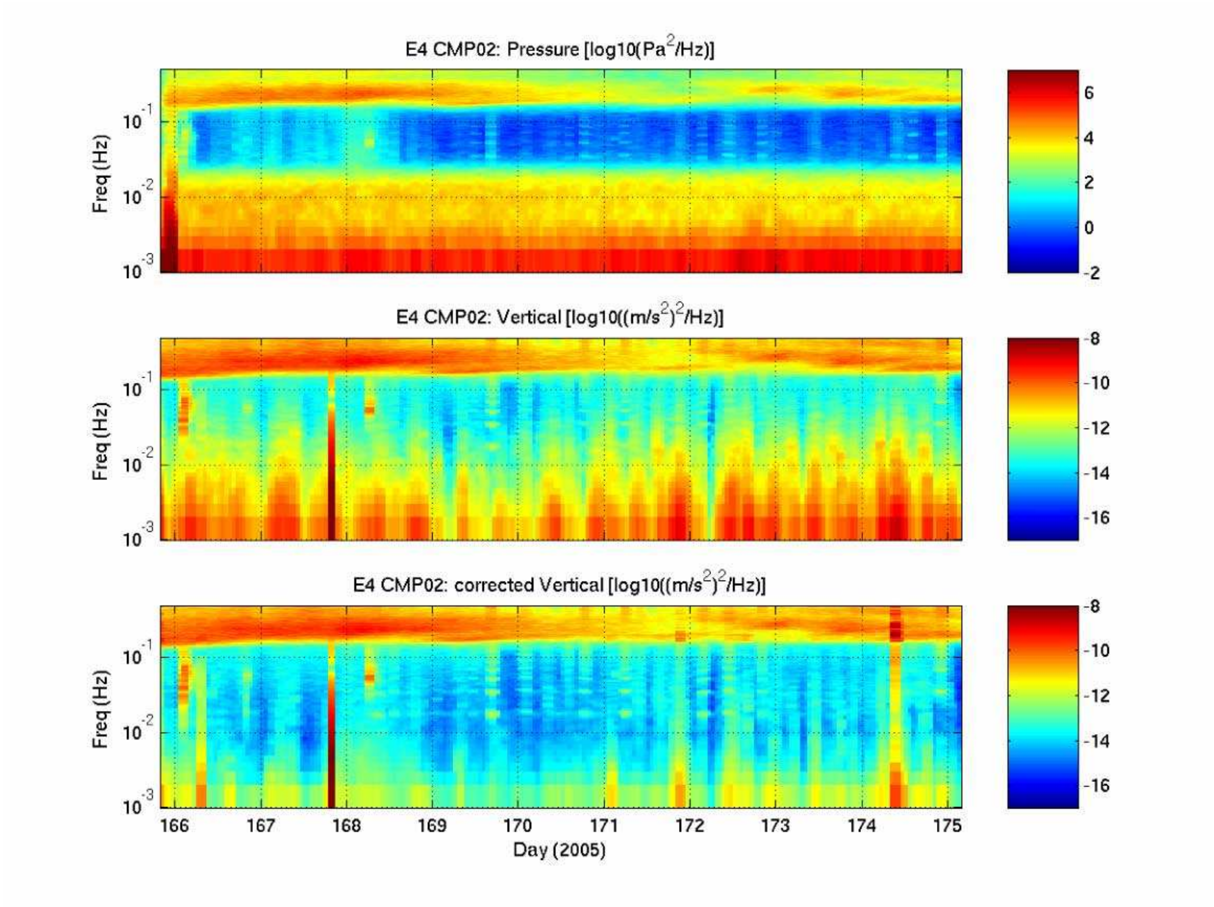
Site E3


1
E3 CMP01
1361656
2005/06/14 15:17:38.098
HX
HY
Z
P
Decimated by 137

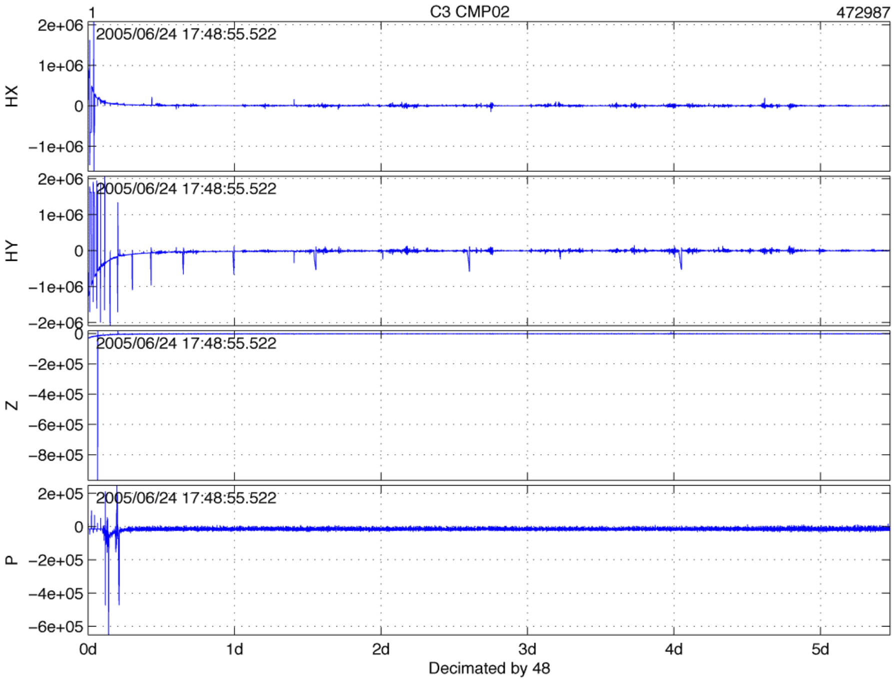

E3 CMP01: Pressure [log10(Pa²/Hz)]
E3 CMP01: Vertical [log10((m/s²)²/Hz)]
E3 CMP01: corrected Vertical [log10((m/s²)²/Hz)]
Freq (Hz)
Day (2005)

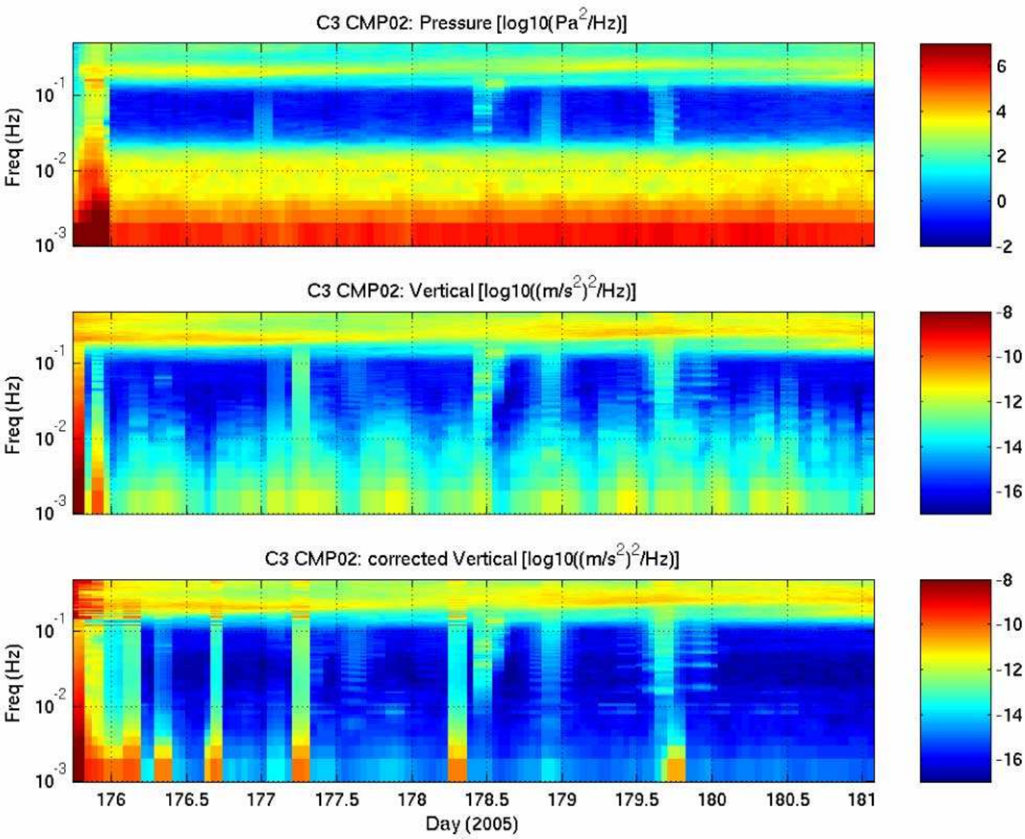
Site E4


1
E4 CMP02
819507
2005/06/14 19:51:34.898
HX
1e+06
0
−1e+06
2005/06/14 19:51:34.898
HY
1e+06
0
−1e+06
2005/06/14 19:51:34.898
Z
0
−2e+05
−4e+05
−6e+05
−8e+05
2005/06/14 19:51:34.898
P
2e+05
0
−2e+05
−4e+05
0d
1d
2d
3d
4d
5d
6d
7d
8d
9d
Decimated by 82


E4 CMP02: Pressure [log10(Pa^2/Hz)]
Freq (Hz)
10^-1
10^-2
10^-3
6
4
2
0
-2
E4 CMP02: Vertical [log10((m/s^2)^2/Hz)]
Freq (Hz)
10^-1
10^-2
10^-3
-8
-10
-12
-14
-16
E4 CMP02: corrected Vertical [log10((m/s^2)^2/Hz)]
Freq (Hz)
10^-1
10^-2
10^-3
-8
-10
-12
-14
-16
166
167
168
169
170
171
172
173
174
175
Day (2005)

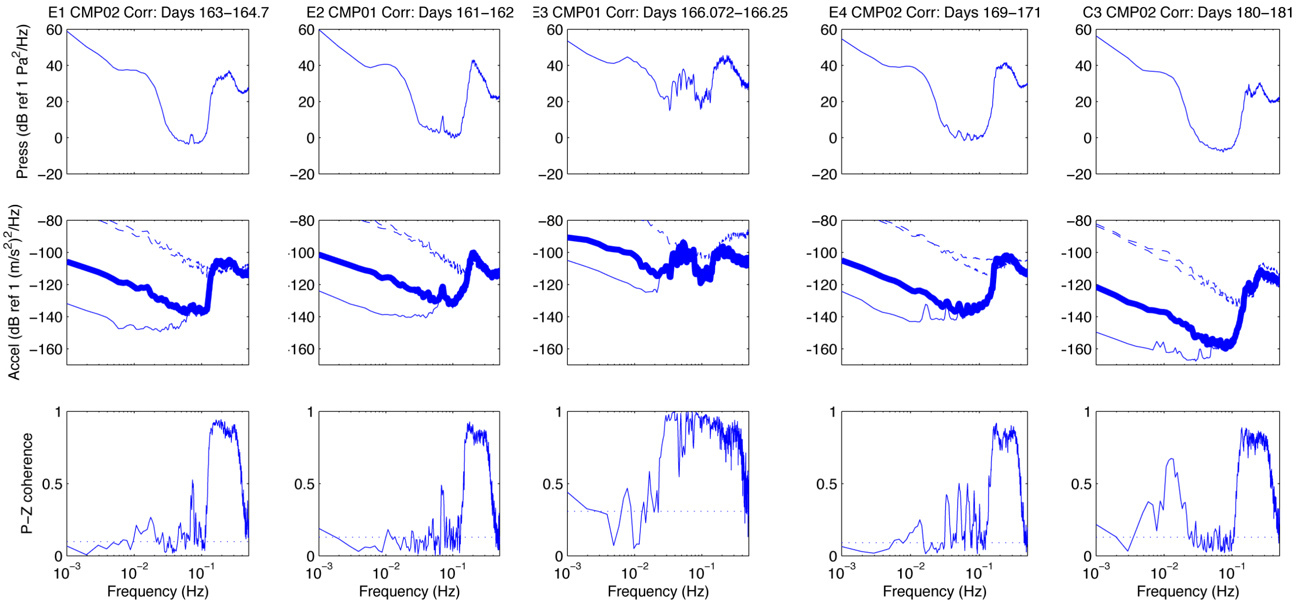
Site C3


C3 CMP02
1
472987
2005/06/24 17:48:55.522
HX
HY
Z
P
Decimated by 48
0d
1d
2d
3d
4d
5d


C3 CMP02: Pressure [log10(Pa^2/Hz)]
C3 CMP02: Vertical [log10((m/s^2)^2/Hz)]
C3 CMP02: corrected Vertical [log10((m/s^2)^2/Hz)]
Freq (Hz)
Day (2005)

2.3.2 Spectra and coherences at each compliance site

Calculated from one "good" time window at each site (picked from time series data and/or spectragrams)



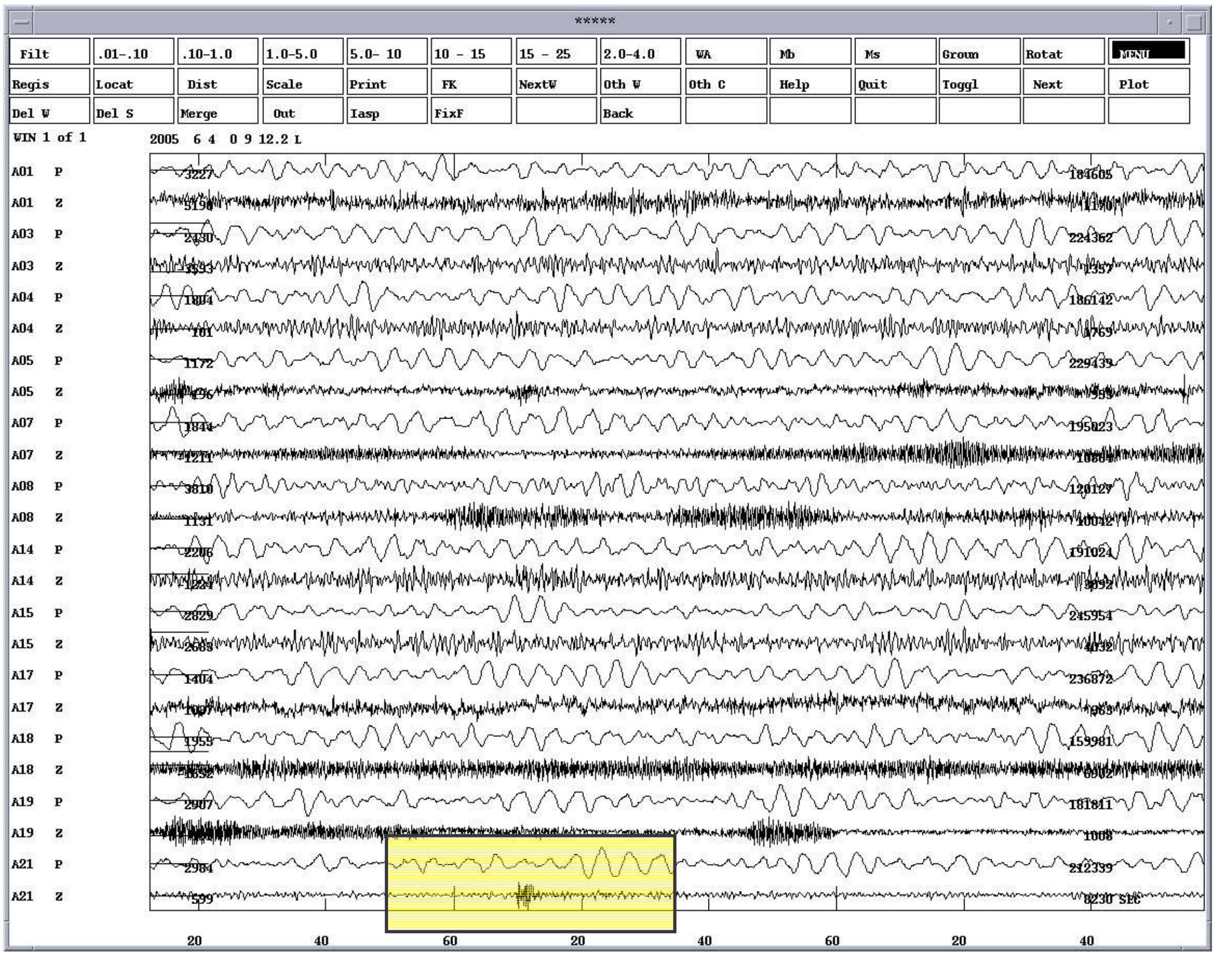
For the Acceleration spectra: thick line is original vertical channel, thin line is corrected vertical channel, dashed lines are horizontal channels

2.4 Seismicity

Doga Dusunur

SEISAN The Earthquake Analysis Software was used to view end extract the selected events from the data. In order to put the data into the database, necessary directory structure was produced by using MAKEREA command. Both REA and WAV directory structures were created and named as SSMAR including the 06-07/ 2005 time range. Waveform files were inserted the database by using AUTOREG command. AUTOREG creates S-files for all events. Events type was selected as local events.

During the 04-06/06/2005 period total 69 events were selected and waveforms extracted from the data. Figure 1 shows the 30 minutes length raw data getting from the 04/06/2005 at 04:00. Figure 2 demonstrates the filtered data (5-10Hz).



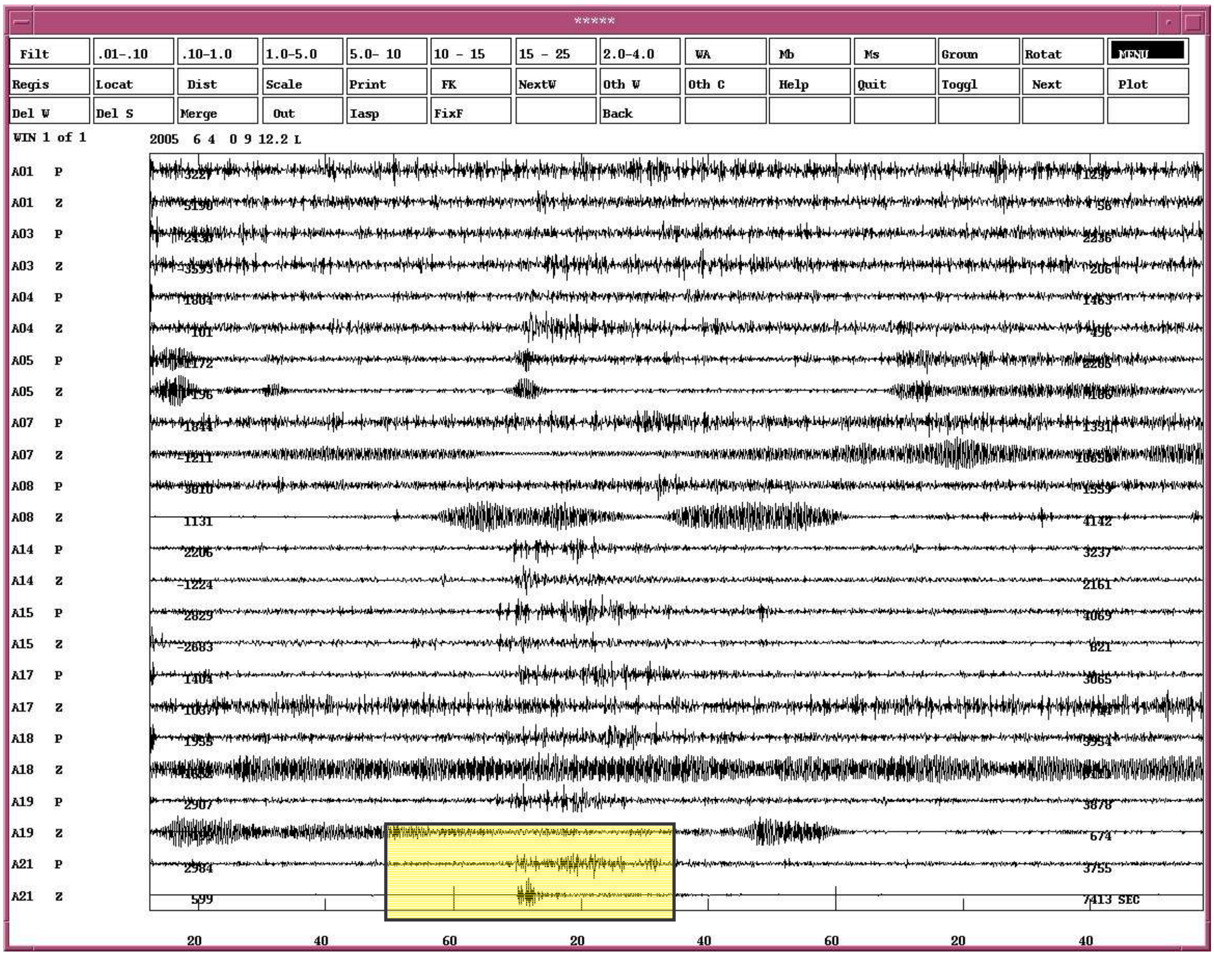


Figure 3a and b demonstrates the one of the selected events. This event selected from the time range that defined in Figure 1-2. Raw data and the filtered data can be seen at Figure 3a and 3b respectively. Most of the selected events show complicated waveform style that makes difficult to determine both P and S phases, although events can be detected at more than 3 stations.

a

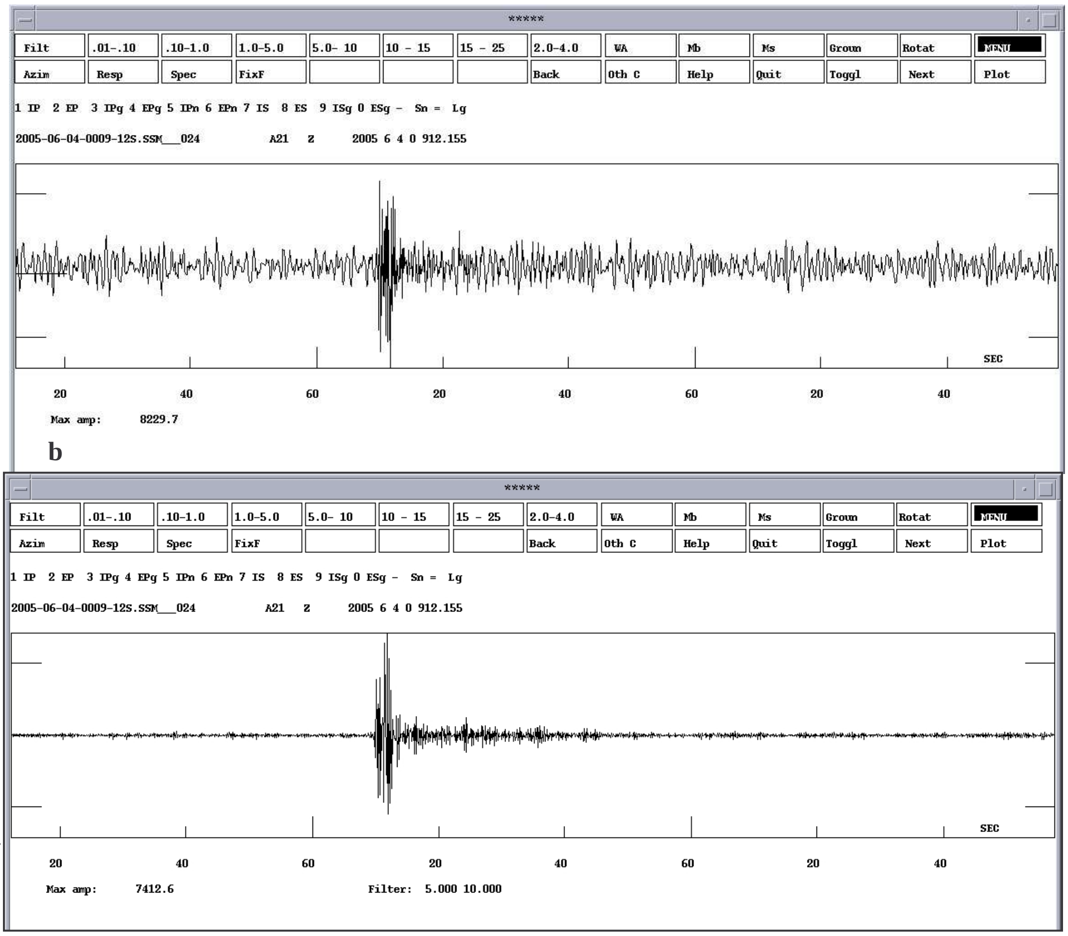

Filt
.01-.10
.10-1.0
1.0-5.0
5.0- 10
10 - 15
15 - 25
2.0-4.0
WA
Mb
Ms
Groun
Rotat
MENU
Azim
Resp
Spec
FixF
Back
Oth C
Help
Quit
Toggl
Next
Plot
1 IP 2 EP 3 IPg 4 EPg 5 IPn 6 EPn 7 IS 8 ES 9 ISg 0 ESg - Sn = Lg
2005-06-04-0009-12S.SSM___024 A21 Z 2005 6 4 0 912.155
SEC
20 40 60 20 40 60 20 40
Max amp: 8229.7
b
Max amp: 7412.6
Filter: 5.000 10.000

Figure3.

2.5 Gravimetry

Mathilde Cannat

2.5.1 Data acquisition

The Atalante's gravimeter is a LOCKHEED MARTIN BGM-5.

The gravimeter itself is a «bobine mobile, placée verticalement entre deux aimants permanents. Les variations verticales de la gravité, et les accélérations verticales du navire altèrent le poids de la bobine et provoquent son déplacement entre les deux aimants. Ces déplacements sont captés par un circuit pont-à-capacité. Un déséquilibre du pont produit un courant dans la bobine, qui retrouve ainsi sa position d'équilibre. La mesure du courant fournit directement les variations de gravité entachées des accélérations verticales ».

This system does not involve a spring as do more traditionnal gravimeters. Yet it is not immune to drift, due to aging of the electronic circuits. This drift is on average of 1.7 mGal/month (Karine Abel Michaux, personal communication). The gravimeter is routinely tight to reference absolute gravity stations at the beginning and end of each cruise, using a SCINTREX portable gravimeter (see Annex for the two SISMOMAR « rattachement » data sheets).

The precision of BGM5, as measured in laboratory conditions, is of 1 mGal. It degrades with rough sea conditions to ~2 mGal.

The gravimeter makes a measurement every 0.1s and is installed on a stabilized platform that compensates for ship's motion. A correction for horizontal accelerations, calculated from GPS navigation data, can also be applied as an option. This option is routinely turned off on the Atalante and was thus not activated during SISMOMAR.

Measurements are then filtered to eliminate vertical accelarations due to ship's motion. The BGM5 filter has three steps. The first step (91 coefficients) is applied to raw measurements (recorded every 0.1s), the second step (91 coefficients), to the result of the first (recorded every 1s), and the third (51 coefficients) to the result of the second (recorded every 10s). Filtered data are thus recorded every 10s, but with a time delay of 304.5 seconds (half duration of the filtering procedure).

The BGM5 system also includes a computer that calculates the Eötvös correction (dgEötvös= 7.487.speed on ground.cos(latitude).sin(heading on ground)+ 0.0042.(speed on ground)2, in mGals, with speed on ground in knots), and the free air anomaly (Gmesured+dgEötvös-Gellipsoid, avec Gellipsoid = 978030 + 5186 sin^2□ – 7sin^{2}2□in mGals), using real time navigation data, and applying the same three-steps filtering procedure to the results.

2.5.2 Data files and map distributions of SISMOMAR gravity data

Three types of files are produced by the gravimeter, two of which (.BG1 and .BG2) have been released daily in the TECHSAS folder. Files.BG1 include filtered gravity, Eötvos corrected gravity, Free Air Anomaly, as well as date, time, navigation data, and information on horizontal and vertical accelerations. Files.BG2 contain the raw unfiltered gravity, plus date and time. Files.BG3 contain calibration info on the gravimeter, with updates every 10 mn. For detailed format of files .BG2 and .BG3, contact the Atalante electronicians at GENAVIR, or Karine ABEL-MICHAUX Karine.Abel.Michaux@brest.ifremer.fr.

Gravimetric data were acquired with no interruption during the SISMOMAR cruise, except for a short period (25/06/05 17 :19 to 25/06/05 18 :42) due to a failure of the ship's electrical system.

Format of. .BG1 files :

Champ	*Contenu/format*	*Unité*	*Type*	*Octets*
Début de message	*$*	-	*ASCII*	*0*
Émetteur	*PA*	-	*ASCII*	*1-2*
Type de données (Mesures scientifiques)	*MES,*	-	*ASCII*	*3-6*
Horodate				
Date (jour, mois, année)	*jj/mm/aa,*	-	*ASCII*	*7-15*
Heure (h, min, s, 1/1000s)	*hh :mm :ss.sss,*	-	*ASCII*	*16-28*
Données				
Indicatif « Gravimétrie »	*BGM51,*	-	*ASCII*	*29-34*

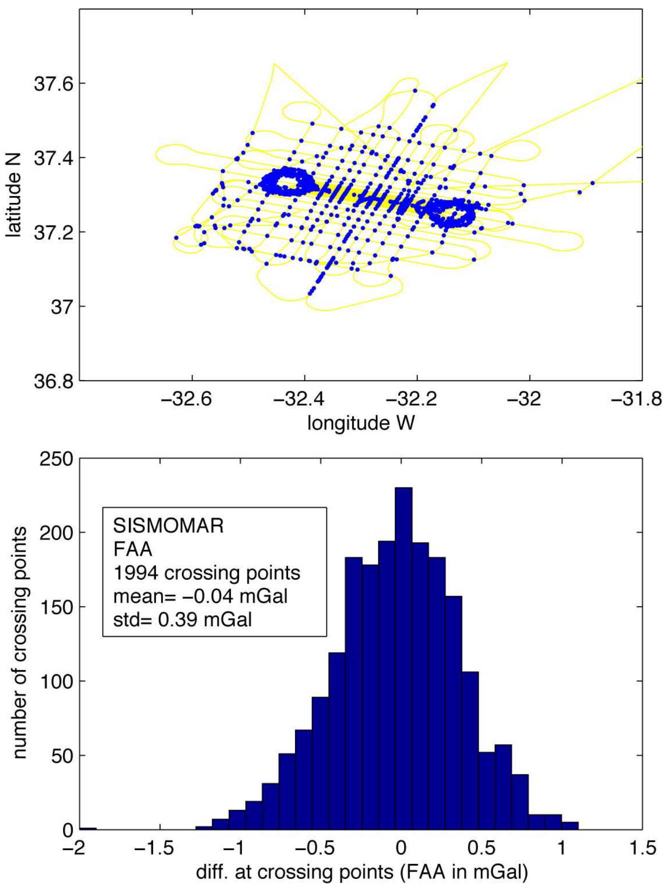
Indicatif du type de fichier	*$1,*	-	*ASCII*	*35-37*
Date interne BGM5	*jj/mm/aaa,*	-	*ASCII*	*38-48*
Heure interne BGM5	*hh:mm:ss*	-	*ASCII*	*49-57*
Code qualification	*xxxx,*	-	*ASCII*	*58-62*
Gravité brute filtrée	*xxxxxx.xxx,*	*mGal*	*ASCII*	*63-73*
Gravité corrigée d'Eötvös	*xxxxxx.xxx,*	*mGal*	*ASCII*	*74-84*
Anomalie à l'air libre	*±xxxx.x*	*mGal*	*ASCII*	*85-92*
Anomalie de Bouger	*±xxxx.x*	*mGal*	*ASCII*	*93-100*
Latitude	*xx.xxxxxx,*	*degrés*	*ASCII*	*101-110*
Signe Latitude (N/S)	*x,*	-	*ASCII*	*111-112*
Longitude	*xxx.xxxxxx,*	*degrés*	*ASCII*	*113-123*
Signe Longitude (E/W)	*x,*	-	*ASCII*	*124-125*
Cap	*xxx.xx*	*degrés*	*ASCII*	*126-132*
Route fond	*xxx.xx,*	*degrés*	*ASCII*	*133-139*
Vitesse fond	*xx.xx,*	*noeuds*	*ASCII*	*140-145*
Acc. moyenne le long du cap	*±xxxxxx,*	*mGal*	*ASCII*	*146-153*
Acc. moyenne perpendiculaire au cap	*±xxxxxx,*	*mGal*	*ASCII*	*154-161*
Acc. en tangage	*±xxxxx,*	*mGal*	*ASCII*	*162-168*
Ecart-type sur Acc. en tangage	*xxxxx,*	*mGal*	*ASCII*	*169-174*
Acc. En roulis	*±xxxxx,*	*mGal*	*ASCII*	*175-181*
Ecart-type sur Acc. en roulis	*xxxxx,*	*mGal*	*ASCII*	*182-187*
Couple du gyro en tangage	*±xx.xxx,*	*degré/heure*	*ASCII*	*188-195*
Couple du gyro en roulis	*±xx.xxx,*	*degré/heure*	*ASCII*	*196-203*
Profondeur	*xxxxx*	*mètre*	*ASCII*	*204-208*
Fin de message	*<CR><LF>*	-	*ASCII*	*209-210*

2.5.3 Shipboard data processing

We used the Caraibes software (@ Ifremer) to tie gravimetric measurements to the ship's recalculated navigation (« .nvi » files), and to recalculate the Eötvös correction and free air anomaly values. In this calculation, we included an inferred linear drift of 1.7 mGal/month. This is the average drift of the instrument over the past year or so. Effective drift will be calculated after our second tie point in Punta Delgada, and the data will be have to be corrected accordingly.

The resulting files (« .syn ») were then exported in ascii format (« .asc » files), and resampled by averaging measurements over an interval of 1 mn (« .gra »). We also produced cleaned « .gra » files, taking out intervals of noisy data. These are :

- First deployement of OBSs : 02/06/05 18 :56 to 04/06/05 07 :50
- Second OBS deployement and bad weather : 14/06/05 05 :05 to 16/06/05 19 :18
- Shorter intervals during turns or during work on station for the third and fourth (final) OBS deployement and recovery operations.
-



We compared the « .asc » Eötvôs and free air values to those in the original BGM5 files (« .BG1 »), after correction for the 304.5 sec delay, and found excellent agreement. Details on the Caraibes processing routine may be found in the Ifremer's web page. We also tested our own routines for Eötvös and free air calculations on a subset of the data, and also found good agreement.

Crossing points shown in Figure 1 correspond to data acquired from the beginning of the cruise, to 24/06/05 6 :40. The accuracy of gravity measurements is good, with a standard deviation of less than 1 mGal.

Figure 1. Location of crossing points for gravity profiles of the SISMOMAR cruise, and histogram of corresponding free air anomaly differences.

Tight multichannel reflection profiles during the first leg of the cruise also provided an excellent opportunity to further check measurement repeatability and the accuracy of the Eötvös correction. Both were found to be fine, as shown in Figure 2 for two parallel profiles, distant by only 100 m, one shot from west to east (SMM16), the other from east to west (SMM17).

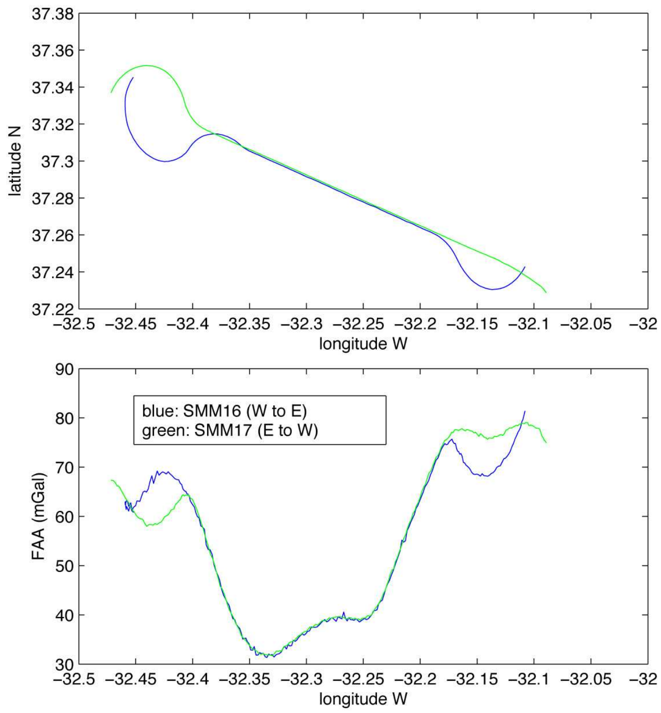


Figure 2. Free air values for two parallel profiles distant by only 100 m with opposite headings.

2.5.4 Preliminary results

Tight seismic profiles provided an excellent coverage of the area. We calculated a Mantle Bouguer correction (with topography at a grid spacing of ~200m, a reference crustal thickness of 6 km, and mantle and crust densities of 3300 and 2700 kg/m3 respectivelly). The shape of the Mantle Bouguer gravity low over Lucky Strike volcanoe, to take one example, is much better resolved than with the data we had previously from the SUDAçORES cruise.

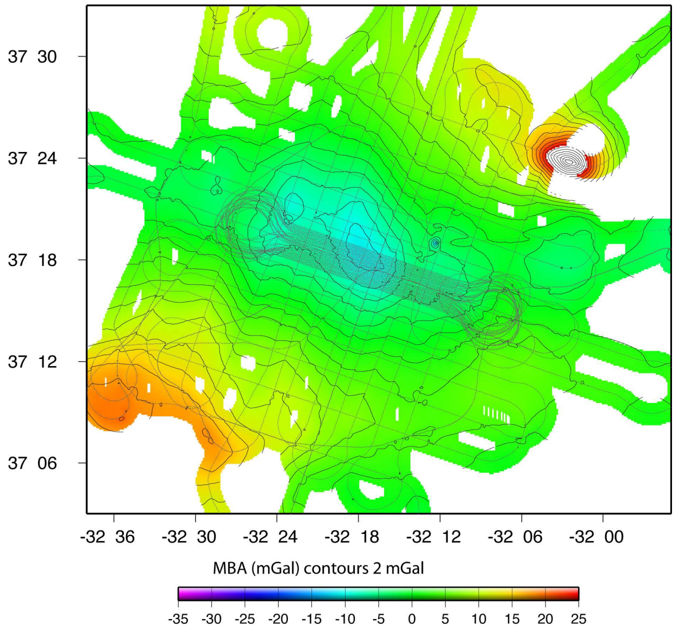


Figure 3. Mantle Bouguer anomaly over the Lucky Strike segment, SISMOMAR gravity data (tracks shown in grey).Grid spacing is ~200 m.

2.6 Magnetism

Mathilde Cannat

2.6.1 Data acquisition

The SeaSPY magnetometer measures the intensity of the Earth's magnetic field. « Il est basé sur le principe de la précession protonique : il utilise les propriétés des protons (spin) qui se comportent comme un gyroscope magnétique. Au contraire des magnétomètres traditionnels qui utilisent un fort courant continu pour être polarisés avant chaque mesure, le magnétomètre à effet Overhauser est constamment polarisé par une source haute fréquence de faible puissance, utilisant ainsi le principe de la Résonance Magnétique Nucléaire. Si un matériau contenant des protons subit une polarisation alternative à haute fréquence, les protons vont pré-cessionner autour de la direction du champ absolu à une fréquence proportionnelle au champ appliqué (f= 42.4763751 MHz/T) ».

« Le capteur donne une mesure valide du champ magnétique tout en étant polarisé, ce qui permet un cadencement des mesures allant de 10 secondes au 1/4 de seconde sans perte de sensibilité (0.015 nTesla) ». During SISMOMAR, a measurement was acquired every 3 s.

The sensor is usually towed behind the ship, at a distance of about three times the ship's length to avoid perturbations due to the ships own magnetic field. During the SISMOMAR cruise, the magnetometer was towed 50 meters behind the end of the seismic streamer (50m behind the rear buoy). Magnetic data were therefore navigated using this rear buoy's recalculated navigation (files sismo_engin-leg1.nvi & sismo_engin-leg2.nvi in the ARCHIV folder).

2.6.2 Data files and map distributions of SISMOMAR EM12D profiles

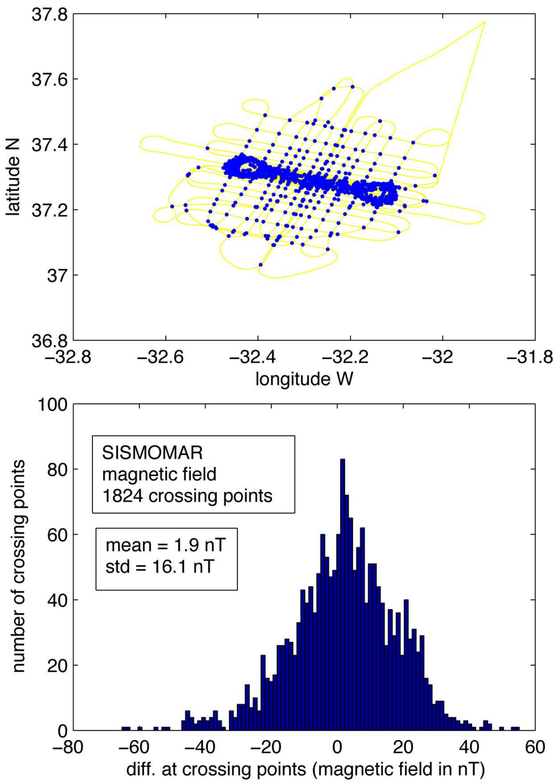
Data were released daily as « .MA » files in the TECHSAS folder, with the following format :
$PAMES,04/06/05,08:00:02.034,MAGNE, 0,043830.8,

Champ	*Contenu/format*	*Unité*	*Type*	*Octets*
Début de message	*$*	-	*ASCII*	*0*
Émetteur	*PA*	-	*ASCII*	*1-2*
Type de données (Mesures scientifiques)	*MES,*	-	*ASCII*	*3-6*
Horodate				
Date (jour, mois, année)	*jj/mm/aa,*	-	*ASCII*	*7-15*
Heure (h, min, s, 1/1000s)	*Hh :mm :ss.sss,*	-	*ASCII*	*16-28*
Données				
	MAGNE,	-	*ASCII*	*29-34*
Code (« 0 »=OK, »-2 »=datation PC)	*xx,*	-	*ASCII*	*35-37*
Magnétisme	*aaaaaa.a,*	*µT*	*ASCII*	*38-46*
Fin du Message	*<CR><LF>*	-	*ASCII*	*47-48*

2.6.3 Shipboard data processing

We used the Caraibes software (@ Ifremer) to tie magnetic measurements to the rear buoy's navigation (taking the 50m distance between buoy and magnetometer into account), and to calculate magnetic anomaly values, using IGRF 2000.

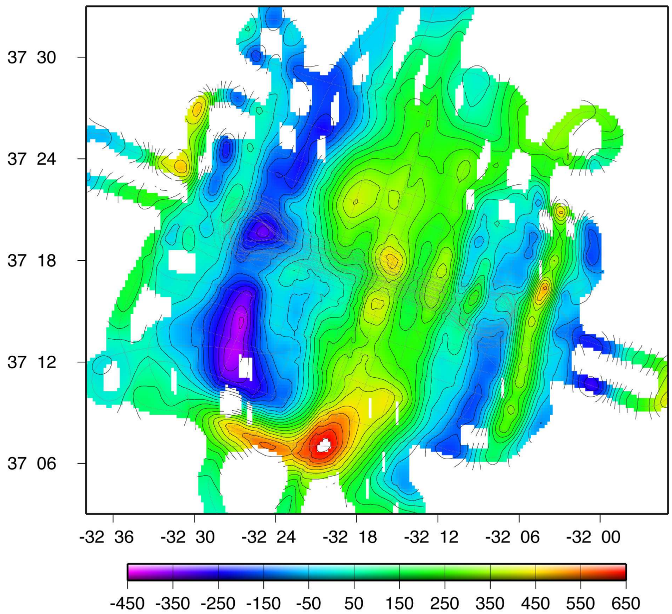
The resulting files (« .syn ») were then exported in ascii format (« .asc » files), and resampled by averaging measurements over an interval of 1 mn (« .mag »).



Crossing points shown in Figure 1 correspond to all of the cruise data. The accuracy of magnetic field measurements is satisfactory, with a standard deviation of 16 nT.

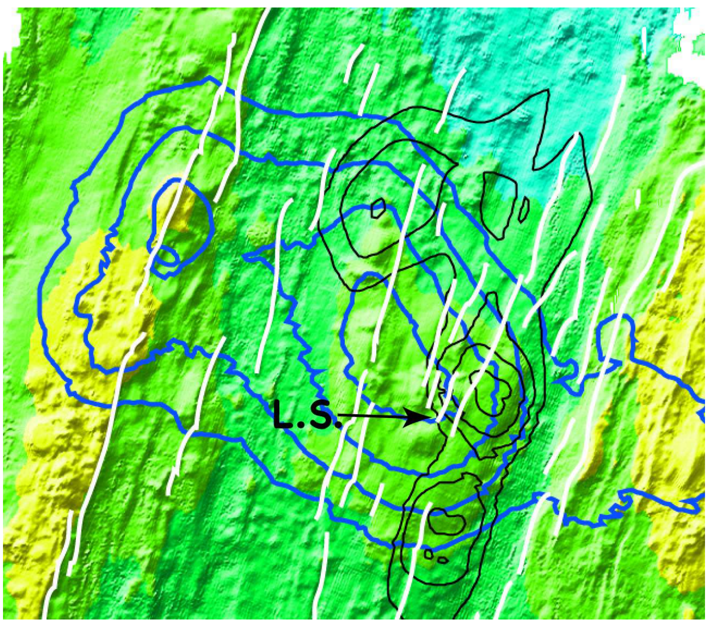
Figure 1. Location of crossing points for magnetic profiles of the SISMOMAR cruise, and histogram of corresponding differences in magnetic field value.

2.6.4 Preliminary results



Tight seismic profiles provided an excellent coverage of the area. The shape of the central positive magnetic anomaly over Lucky Strike volcanoe, to take one example, is much better resolved than with the data we had previously from the SUDAçORES cruise. A prominent positive anomaly is also confirmed at the southern end of the Lucky Strike segment.

Figure 2. Magnetic anomaly values over the Lucky Strike segment, SISMOMAR data (tracks shown in grey).Grid spacing is 0.2nm.



Together, magnetic and gravity data suggest that recent magmatic activity in the axial valley is offset to the NW North of the Lucky Strike volcanoe (Figure 3).

Figure 3. Centre of Lucky Strike segment. In blue contours of Mantle Bouguer gravity anomaly low (below –6 mGal, spacing 2 mGal). In black contours of central magnetic anomaly high (above 350 nT, spacing 50 nT). LS is Lucky Strike vent field. Main fault scarps are underlined in white.

2.7 Multibeam Echosounder (EM12D)

Mathilde Cannat

2.7.1 Data acquisition

The multibeam system mounted on the *R/V L'Atalante* is the EM12 Dual (Kongsberg Simrad). It consists of two rectangular arrays of transducers: one for emission, and one for reception. These two antennas work independently, with an aperture of 80° each and an overlap of 10°. The system emits an acoustic pulse every 10 s (ping rate).

The two antennas of the EM12D are mounted on the hull of the vessel with an inclination of 40° between them. The central frequency of the emission acoustic signal is 13 kHz. The apertures of antennas in the across track (emission) and along track (reception) directions are 3.5° and 1.8°, respectively. Each antenna works with 162 narrow "beams". These beams do not actually exist physically, it is just the way the sounder groups emitted and arriving signals. The maximum total aperture of the multibeam system is 150°. It can be reduced in shallow waters. During the SISMOMAR cruise, it was kept in an automatic mode that adapted aperture to seafloor depths.

In deep water, the EM12D covers approximately 8 times the water depth in the across-track direction.

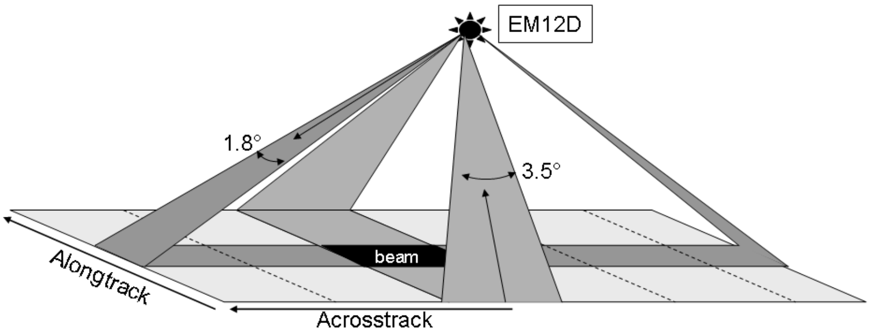
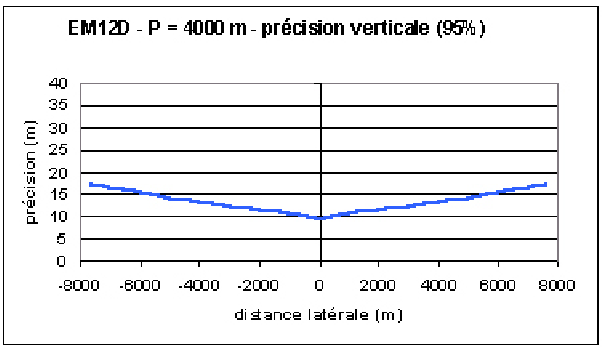


Figure 1 – EM12D. Emission and reception system.

Bathymetry

For each beam, the time propagation of the sound signal between the emission and the reception is related to the topography of the seafloor. Raybending of the waves in the water column is corrected using seawater sound velocity data (see below), and the vessel movements and positions (raw, pitch, heave). EM12D processes the bathymetry with two approaches:



- amplitude detection: this mode is used when the return signal is well localised in time. The seabottom corresponds to the first arrival. This mode is mainly used for vertical beams.
- phase detection: this mode is used when the return signal is stretched in time (lateral beams). It uses the principle of interferometry.

Figure 2.EM12D. Modelled vertical accuracy.

Vertical precision is about 0.2 % of the water depth. Horizontal resolution (the ability to distinguish between 2 neighbouring objects) is about 80 m across track and 40 m along tracks. Vertical accuracy is better than 15 m over most of the swath (Figure 2). During SISMOMAR, ship's speed during EM12D sounding was 10-11 knots on transit, and 4.5 to 5.5 knots when on site, or about 25 m per ping interval of 10 s. This moderate speed insured a good insonification of the seafloor.

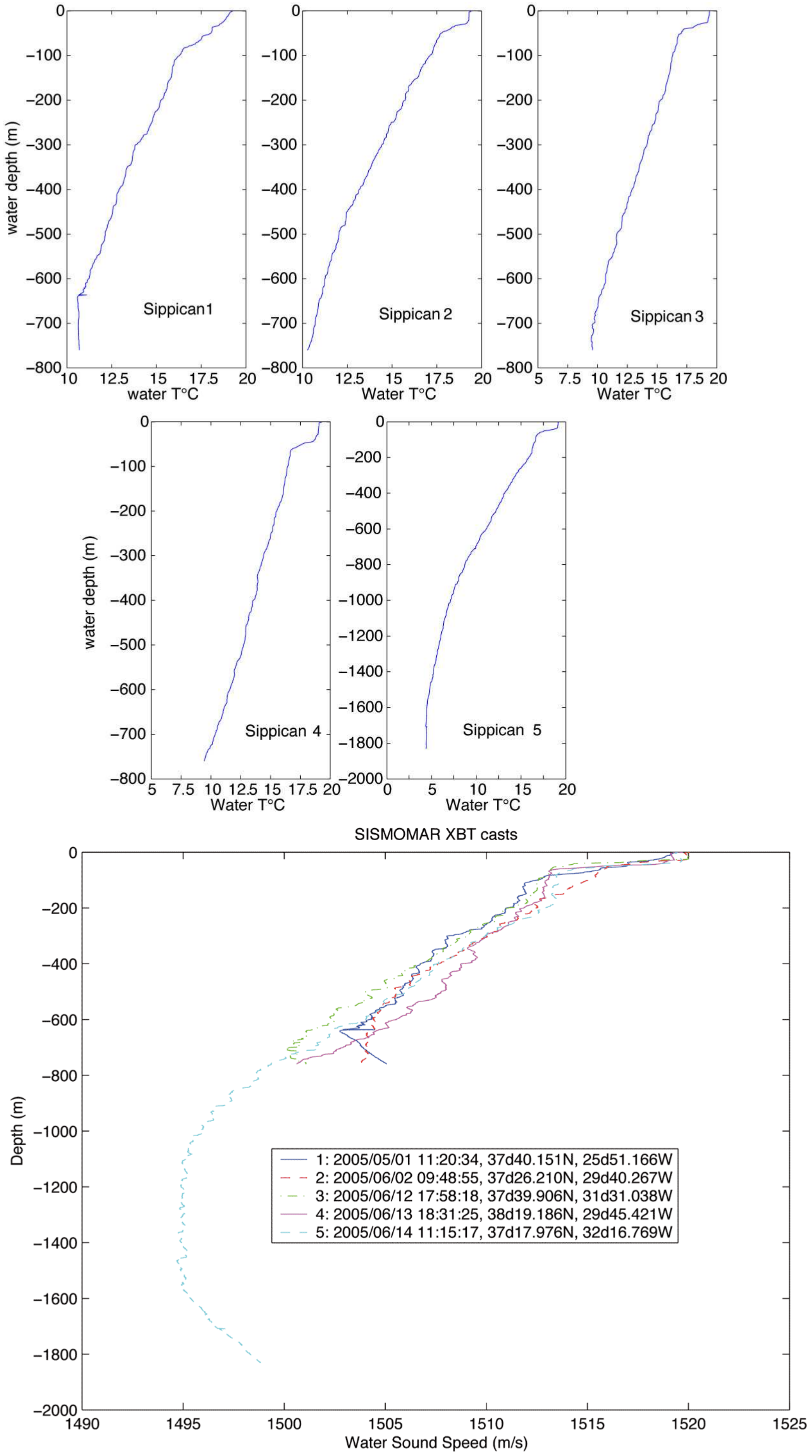


Figure 3: A) Temperature and B) Sound velocity profiles

Imagery

The EM12D emits an acoustic signal of ~240 dB at the source. It then measures the echo level propagated back to the antennas. After applying appropriate corrections for propagation losses and attenuation in the water column (*ca.* 1.1 dB/km), the system deduces the seafloor acoustic response, or backscatter strength. Imagery backscatter strength pixels are typically about 60 m in size and are relocated using the bathymetry.

Geographic positioning of multibeam data

Differential GPS was used to navigate multibeam data during the entire cruise.

Sound velocity profiles

The sound velocity is an important parameter for interpreting multibeam results in terms of depth. It is related to both the salinity and the temperature of the water. During the SISMOMAR cruise, local sound velocity profiles were measured at 5 Sippican soundings (Figures 3 and4). Sippican results are merged with Atlantic data from the Levitus data base, and integrated into the multibeam files.

2.7.2 Data files and map distributions of SISMOMAR EM12D profiles

EM12D data was released daily as .SO files for bathymetry (with .so information files which we then manually renamed .inf to avoid problems when transferring files to Mac), and .IM files for imagery (with .im information files which we then manually renamed .iminf). We also got daily updates of the cruise's navigation file (.nvi). All these files are stored in the "ARCHIV" data folder.

SIPPICAN sound velocity profiles were released as .5 ".edf" ascii files (depth in m, water temperature in °C, and inferred sound velocity in m/s). Sound velocity is calculated for a water salinity of 35.2 ppt.

Multibeam data was recorded only during part of the cruise. In fact, initially, bathymetry was not part of the cruise's operation, so that the EM12 GENAVIR staff was not on board. We nonetheless wished to acquire bathymetry during transits, and during seismic line shooting operations. GENAVIR electronicians were very helpful with setting the system to work, and with releasing data daily (.SO, .so, .IM, .im, and .nvi files).

Although seismic line shooting operations concerned areas that had been mapped previously, we expected that moderate ship's speed (5 knots or less) during these operations would allow for a better definition of the bathymetry. We also wished to compare the new maps with high definition bathymetry acquired, also at moderate speed, over the axial region during the Flores cruise in 1997.

The ingoing transit from Punta Delgada was unfortunately lost due to a misfunction of the sounder. The mid-cruise transit to and from Horta, however, was successfully recorded, as were all the seismic profiles of Leg2. The transit back to Punta was recorded only till 22:28 on july 1st. The reason is that we did not have the authorisation for work there…

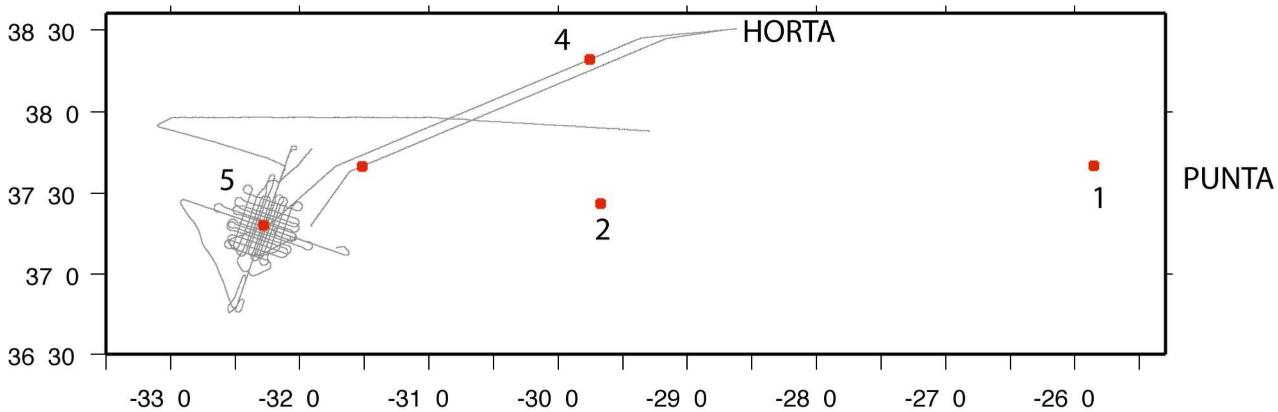


Figure 4- Track map showing the navigation of SISMOMAR bathymetry profiles and the location of SISMOMAR sippican soundings

2.7.3 Shipboard data processing

We used the Caraibes software V3.0 (@Ifremer) to transform .SO bathymetry files into .mbg (Caraibes format for georeferenced bathymetry). We then used .mbg and .nvi files to create preliminary bathymetric grids, with a grid spacing of 40 (Mailla; for larger grid combining many profiles) or 50 m (Maillp for smaller grids of individual profiles), no smoothing, and very little interpolation. The Caraibes parameters used are : 1- for Creaxy (contrôle cap sondeur: non/recherche cycles: non/ échantillonnage cycles: non); 2- for Mailla (cellule élémentaire: 40m/4 sondes affectées/ pas de contrôle mini-maxi/ suppression valeurs isolées: 2b- for Maillp (sondes mini/ interpolation après calcul: 5 lignes-5 colonnes/ sélection de faisceaux: 30 de part et d'autre); 2bis for Maillp (cellule élémentaire: 50m/ rayon d'influence: 100m/ pas de contrôle mini-maxi/ suppression valeurs isolées: 2 sondes mini/ interpolation après calcul: 2 lignes-2 colonnes/ pas de sélection de faisceaux).

Caraibes grids were then exported in GMT format. We did not process the imagery data.

2.7.4 Preliminary results

Bathymetry has a good resolution. We substracted the obtained grids from similarly high resolution bathymetry from the FLORES cruise (1997; EM12D, Atalante, also acquired at moderate ship speed) and found no significant difference: differences are ± 10 m over most flat areas, higher over steep topography (rift valley walls and off-axis). The mean difference between the two grids is –7.5m (std 8.3 m). This indicates that no substantial changes in axial valley floor topography have occurred in the period between the two cruises (1997-2005).

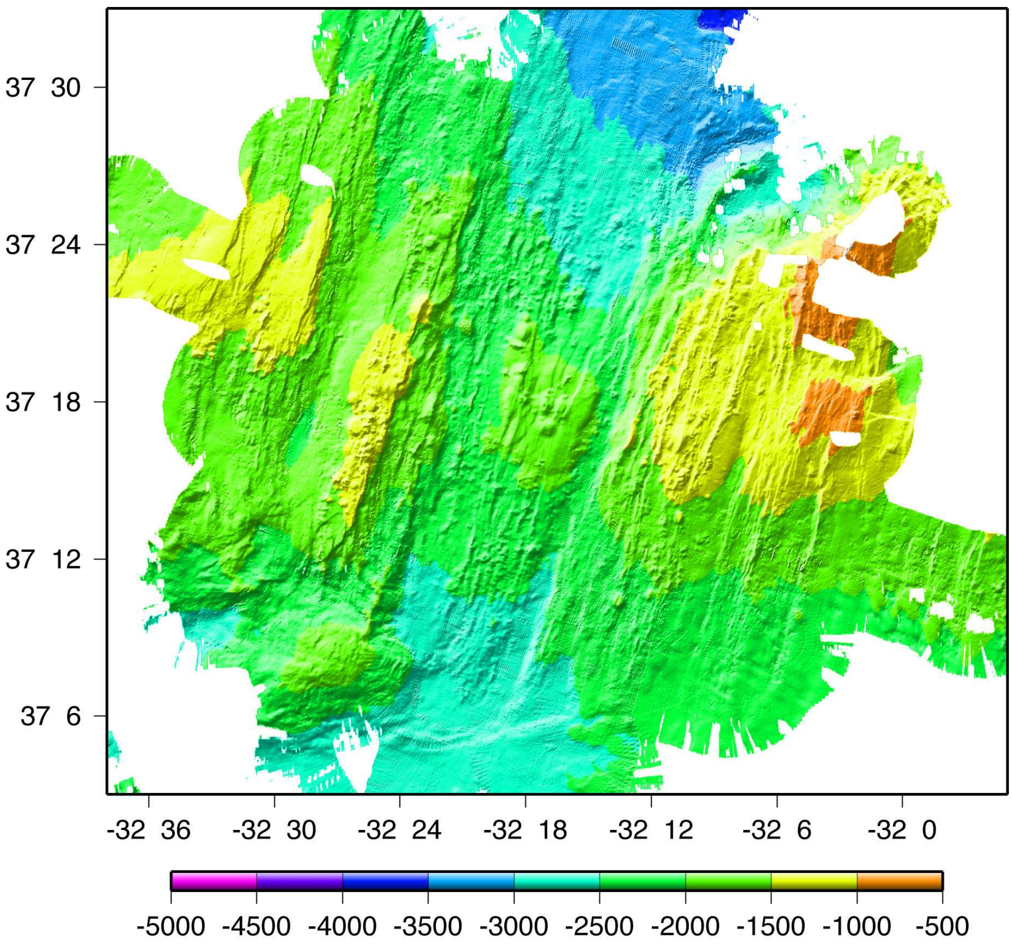


Figure 4- Example of SISMOMAR bathymetry: « Raw » 40m-grid for whole.mbg file, keeping only 60 central beams.

2.8 Chirp (3.5 kHz Echosounder)

Mathilde Cannat

2.8.1 Data acquisition

The Atalante 3.5kHz echosounder is a Raytheon CESP III. Data sampling and initial processing goes through the CHEOPS (Calculateur Hôte Echantillonneur Opérant en Pénétration de Sédiments) computer system. CHEOPS allows a choice between 5 possible source configurations:

- Chirp T=20 ms F=2.5 kHz-3.5 kHz
- Chirp T=20 ms F=2.4 kHz-4.5 kHz
- Chirp T=20 ms F=2.5 kHz-5.5 kHz
- impulse F=3.5 kHz
- impulse F=2.5 kHz

During the SISMOMAR cruise, we used the second configuration.

The return signal is sampled in time with a sampling rate of 24 kHz. The system emits a ping every second. The recorded signal, amplified by a factor 8 at the output, is a seismic-like signal: the return signal is correlated with the source signal (through the Raytheon CESP III system) and filtered in frequency by a 5.5 kHz high-pass and a 1.5 kHz low-pass filters.

2.8.2 Data files and map distribution of SISMOMAR chirp data

CHEOPS data are released in SEG-Y format as “.sgy” files (with “.che” information text files, in the “ARCHEOPS” data folder). The SEG-Y format consists of three parts - an ebcdic header, a binary reel header and the traces. It can be read with the free software Seismic Unix (SU) using the following commands:

- Format conversion: SEG-Y to SU

segyread tape=file.segy endian=0 | *segyclean* > file.su

The endian value depends on the machine architecture: it is 0 for little-endian machines as PC’s. The conversion increases the size of the data, from 92Mo for the SEG-Y format to 191Mo for the SU format.

- Visualization

suattributes < file.su | sugain agc=1 wagc=0.05 | *suximage* perc=99 &

During the SISMOMAR cruise, 3.5kHz chirp data were acquired between 05/06/05 13:36 and 18/06/05 17:03, along the tight “3D” seismic reflection shooting lines, along the transit routes to and from Horta, then along the first refraction-reflection shooting lines (up to profile SMM 105). The system was then turned off to avoid interferences with the multibeam.

2.8.3 Shipboard data processing

None.

3: Ocean Bottom Seismometer Descriptions and Deployments

3.1 OBS Deployment Summary

SITE	Lat	Lon	Depth	Type	Chans	Rate	Start	End
A1	37.3813	-32.2952	2198	INSU	P,Z	250	04/06/2005 16:00	26/06 06:17
A2	37.3678	-32.2470	2604	INSU	P,Z	250	04/06/2005 16:00	01/07 12:30
A3	37.3543	-32.1988	1869	INSU	P,Z	250	04/06/2005 16:00	25/06 21:59
A4	37.3554	-32.3584	1996	INSU	P,Z	250	04/06/2005 16:00	26/06 08:43
A5	37.3423	-32.3117	2057	INSU	P,Z	250	04/06/2005 02:00	26/06 07:43
A6	37.3292	-32.2632	2055	INSU	P,Z	250	04/06/2005 02:00	01/07 10:57
A7	37.3160	-32.2130	1940	INSU	P,Z	250	04/06/2005 02:00	25/06 19:45
A8	37.3030	-32.1667	1290	INSU	P,Z	250	04/06/2005 22:00	25/06 21:11
A9	37.3170	-32.3756	1746	INSU	P,Z	250	04/06/2005 02:00	30/06 09:44
A10	37.3044	-32.3273	1000	INSU	P	250	04/06/2005 16:00	30/06 10:50
A12	37.2775	-32.2321	2000	INSU	P,Z	250	04/06/2005 02:00	30/06 12:00
A13	37.2644	-32.1839	1327	INSU	P,Z	250	04/06/2005 22:00	30/06 12:58
A14	37.2789	-32.3920	1840	INSU	P,Z	250	04/06/2005 16:00	25/06 08:55
A15	37.2655	-32.3443	2101	INSU	P,Z	250	04/06/2005 02:00	25/06 10:46
A16	37.2525	-32.2965	1905	INSU	P,Z	250	04/06/2005 02:00	01/07 08:17
A17	37.2394	-32.2482	2176	INSU	P,Z	250	04/06/2005 02:00	25/06 16:39
A18	37.2263	-32.1985	1758	INSU	P,Z	250	04/06/2005 22:00	25/06 17:44
A19	37.2282	-32.3603	2371	INSU	P,Z	250	04/06/2005 16:00	25/06 11:41
A20	37.2146	-32.3122	2191	INSU	P,Z	250	04/06/2005 22:00	01/07 07:01
A21	37.2014	-32.2638	2245	INSU	P,Z	250	04/06/2005 22:00	25/06 15:21
C0	36.9285	-32.4357	1969	INSU	P,Z	125	27/06/2005 01:00	30/06 23:18
C1	37.0351	-32.3893	2786	INSU	P,Z	125	27/06/2005 01:00	01/07 01:24
C2	37.0946	-32.3647	2899	INSU	P,Z	125	27/06/2005 01:00	01/07 03:13
C3	37.1542	-32.3385	2608	BBOBS	X,Y,Z,P	40	24/06/2005 17:50	30/06 05:12
C4	37.4275	-32.2213	2855	IGIDL	P,X,Y,Z	100	14/06/2005 16:14	26/06 19:44
C5	37.4867	-32.1961	3114	INSU	P,Z	125	26/06/2005 09:00	01/07 16:45
C6	37.5464	-32.1703	3405	INSU	P,Z	125	25/06/2005 20:00	01/07 18:55
C7	37.6525	-32.1234	1294	INSU	P,Z	125	25/06/2005 20:00	01/07 21:02
C8	37.4155	-32.7348	1390	INSU	P,Z	125	26/06/2005 21:00	30/06 03:36
C9	37.3790	-32.6004	1340	INSU	P,Z	125	26/06/2005 21:00	30/06 05:07
C10	37.3583	-32.5258	1374	INSU	P,Z	125	26/06/2005 21:00	30/06 06:08
C11	37.3378	-32.4498	1777	IGIDL	P,X,Y,Z	100	14/06/2005 11:32	25/06 05:59
C12	37.2439	-32.1096	1376	IGIDL	P,X,Y,Z	100	14/06/2005 18:35	22/06 16:32
C13	37.2233	-32.0348	1676	INSU	P,Z	125	27/06/2005 09:00	30/06 16:00
C14	37.2034	-32.9600	1794	INSU	P,Z	125	27/06/2005 09:00	30/06 17:25
C15	37.1658	-31.8277	1985	INSU	P,Z	125	27/06/2005 09:00	30/06 18:59
E01	37.2951	-32.2949	1787	BBOBS	X,Y,Z,P	40	03/06/2005 05:59	14/06 06:47
E02	37.2865	-32.2647	1703	BBOBS	X,Y,Z,P	40	03/06/2005 10:52	14/06 05:50
E03	37.2747	-32.2849		BBOBS	X,Y,Z,P	40	14/06/2005 15:11	30/06 09:32
E04	37.3005	-32.3261	2056	BBOBS	X,Y,Z,P	40	14/06/2005 19:42	24/06 07:19
P01	37.3018	-32.2792	1688	IGIDL	P,X,Y,Z	200	02/06/2005 20:05	14/06 22:37
P02	~~37.2849~~	~~-32.2921~~	~~1771~~	~~IGIDL~~	~~P,X,Y,Z~~	200	~~02/06/2005 22:20~~	~~14/06 14:57~~
P03	37.2834	-32.2699	1708	IGIDL	P,X,Y,Z	200	02/06/2004 22:29	14/06 17:32

3.2 Les OBS INSU

Oualid Aouji and Laurent Beguery

3.2.1-Description des OBS INSU

En 2003, l'INSU a financé la création d'un parc national de 20 OBS à hauteur de 864 000 €. Les objectifs scientifiques de ce parc incluent:

- la structure de la croûte (sismique réfraction, sismicité), que ce soit en contexte de dorsale, de point chaud, de plateaux océaniques, de zones de subduction ou de marge passive;
- la structure profonde du manteau sous les zones actives (en particulier les dorsales et points chauds) et la dynamique du noyau terrestre;
- le risque sismique, avec pour chantiers prioritaires des régions telles que le golfe de Corinthe, la mer de Marmara, les Antilles;
- le risque volcanique (Antilles, Polynésie, Réunion);
- l'étude de la structure et de la stabilité des formations à hydrates de gaz.

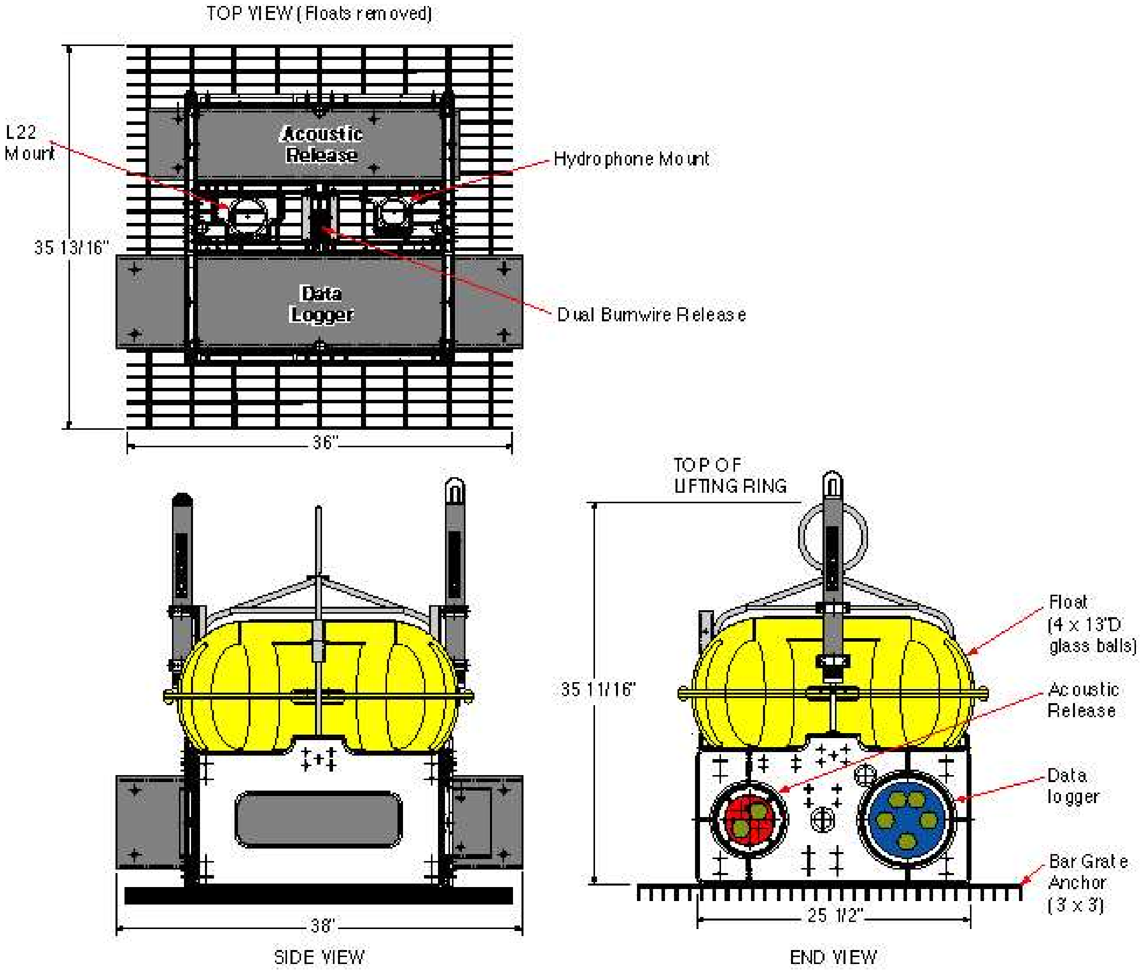


Schéma des OBS du parc national de l'INSU. Ils correspondent au modèle L-CHEAPO (version 2003) développé par J. Orcutt au Scripps Institution of Oceanography à San Diego.

Caractéristiques des OBS :

Appareils de mesure:
- Géophone Mark Products L-22
- Hydrophone Hitech HYI-90-U

Mécanique:
- Dimensions : 1m x 1m x 1m
- Profondeur de plongée maximale : 6000 mètres
- Bilan de masse :
  Poids de l'OBS dans l'air sans lest/ancre (Kg) : 72 Kg
  Poids de l'OBS dans l'air avec lest/ancre (Kg) : 110 Kg
  Poids de l'OBS dans l'eau sans lest/ancre (Kg) : -14 Kg
  Poids de l'OBS dans l'eau avec lest/ancre (Kg) : 19 Kg
- Les caissons:
  matière: Aluminium 7075
  traitement: anodisation dure
  revêtement: peinture époxy

Electronique:
- Nombre de bits effectifs : 21 à 16 Hz ou 20 à 125 Hz
- Nombre de canaux : 2
- Pas d'échantillonnage : 1000 - 500 - 250 - 125 - 62,5 - 32,25 - 16,125 Hz
- Crystal – CS5321 – CS5322
- Stockage : DD 9 Gb
- Horloge : Seascan MCXO SISMTB4SC

Autre équipement:
- Drapeau
- Balise de récupération
- Emetteur radio
- Réflecteurs

Ces informations sont disponibles sur le site internet du parc national INSU :
http://beaufix.ipgp.jussieu.fr/~beguery/

3.2.2-SISMOMAR Mission Deployments

SITE AND INSTRUMENT	A1 OBS10
Deploy Latitude	37º 22.849’ N
Deploy Longitude	32º 17.710’ W
Depth	2198 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 18:38:00
End of experiment sync (GPS)	25.06.2005 07:53:22.997
End of experiment sync (Instrument time)	25.06.2005 07:53:23
Drift rate	0.15e-8
Data files	SMMA01_I10

SITE AND INSTRUMENT	A2 OBS11
Deploy Latitude	37º 32.066’ N
Deploy Longitude	32º 14.621’ W
Depth	2604 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 08:27:00
End of experiment sync (GPS)	30.06.2005 14:11:45.950
End of experiment sync (Instrument time)	30.06.2005 14:11:46
Drift rate	2.12e-8
Data files	SMMA02_I11

SITE AND INSTRUMENT	A3 OBS12
Deploy Latitude	37º 21.257’ N
Deploy Longitude	32º 11.926’ W
Depth	1869 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 08:56:00
End of experiment sync (GPS)	25.06.2005 00:06:23.912
End of experiment sync (Instrument time)	25.06.2005 00:06:24
Drift rate	4.71e-8
Data files	SMMA03_I12

SITE AND INSTRUMENT	A4 OBS09
Deploy Latitude	37º 21.322’ N
Deploy Longitude	32º 21.504’ W
Depth	1996 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 18:09:00
End of experiment sync (GPS)	25.06.2005 11:12:45.985
End of experiment sync (Instrument time)	25.06.2005 11:12:46
Drift rate	0.76e-8
Data files	SMMA03_I09

SITE AND INSTRUMENT	A5 OBS07
Deploy Latitude	37º 20.540’ N
Deploy Longitude	32º 18.700’ W
Depth	2057 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 17:38:00
End of experiment sync (GPS)	25.06.2005 09:37:26.949
End of experiment sync (Instrument time)	25.06.2005 09:37:27
Drift rate	2.60e-8
Data files	SMMA05_I07

SITE AND INSTRUMENT	A6 OBS08
Deploy Latitude	37º 19.752’ N
Deploy Longitude	32º 15.792’ W
Depth	2055 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 17:19:00
End of experiment sync (GPS)	30.06.2005 12:34:34.968
End of experiment sync (Instrument time)	25.06.2005 12:34:35
Drift rate	1.33e-8
Data files	SMMA06_I08

SITE AND INSTRUMENT	A7 OBS01
Deploy Latitude	37º 18.958’ N
Deploy Longitude	32º 12.780’ W
Depth	1940 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 9:00:00
End of experiment sync (GPS)	24.06.2005 21:14:50.998
End of experiment sync (Instrument time)	25.06.2005 21:14:51
Drift rate	0.10e-8
Data files	SMMA07_I01

SITE AND INSTRUMENT	A8 OBS19
Deploy Latitude	37º 18.178’ N
Deploy Longitude	32º 10.001’ W
Depth	1290 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 18:37:00
End of experiment sync (GPS)	24.06.2005 22:35:18.997
End of experiment sync (Instrument time)	24.06.2005 22:35:19
Drift rate	0.16e-8
Data files	SMMA08_I19

SITE AND INSTRUMENT	A9 OBS06
Deploy Latitude	37º 19.020’ N
Deploy Longitude	32º 220538’ W
Depth	1746 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 14:43:00
End of experiment sync (GPS)	29.06.2005 10:50:59.028
End of experiment sync (Instrument time)	29.06.2005 10:50:59
Drift rate	--1.21e-8
Data files	SMMA09_I06

SITE AND INSTRUMENT	A10 OBS20
Deploy Latitude	37º 18.487’ N
Deploy Longitude	32º 19.753’ W
Depth	2071 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 11:56:00
End of experiment sync (GPS)	29.06.2005 11:56:30.931
End of experiment sync (Instrument time)	29.06.2005 11:56:31
Drift rate	3.07e-8
Data files	SMMA10_I20

SITE AND INSTRUMENT	A12 OBS02
Deploy Latitude	37º 16.648’ N
Deploy Longitude	32º 13.925’ W
Depth	2000 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 11:22:00
End of experiment sync (GPS)	29.06.2005 13:11:34.957
End of experiment sync (Instrument time)	29.06.2005 13:11:35
Drift rate	1.84e-8
Data files	SMMA12_I02

SITE AND INSTRUMENT	A13 OBS18
Deploy Latitude	37º 15.867’ N
Deploy Longitude	32º 11.034’ W
Depth	1327 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 18:08:00
End of experiment sync (GPS)	29.06.2005 14:14:16.997
End of experiment sync (Instrument time)	29.06.2005 14:14:17
Drift rate	0.13e-8
Data files	SMMA13_I18

SITE AND INSTRUMENT	A14 OBS13
Deploy Latitude	37º 16.734’ N
Deploy Longitude	32º 23.523’ W
Depth	1840 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 09:42:00
End of experiment sync (GPS)	24.06.2005 10:22:00.971
End of experiment sync (Instrument time)	24.06.2005 10:22:01
Drift rate	1.60e-8
Data files	SMMA14_I13

SITE AND INSTRUMENT	A15 OBS05
Deploy Latitude	37º 15.933’ N
Deploy Longitude	32º 20.658’ W
Depth	2101 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 14:10:00
End of experiment sync (GPS)	24.06.2005 12:16:05.906
End of experiment sync (Instrument time)	24.06.2005 12:16:06
Drift rate	4.96e-8
Data files	SMMA15_I05

SITE AND INSTRUMENT	A16 OBS04
Deploy Latitude	37º 15.148’ N
Deploy Longitude	32º 17.790’ W
Depth	1905 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 13:43:00
End of experiment sync (GPS)	30.06.2005 09:44:00.107
End of experiment sync (Instrument time)	30.06.2005 09:44:00
Drift rate	-4.45e-8
Data files	SMMA16_I04

SITE AND INSTRUMENT	A17 OBS03
Deploy Latitude	37º 14.367’ N
Deploy Longitude	32º 14.892’ W
Depth	2176 meters
Sampling rate	250 sps
Synchronisation	02.06.2005 12:42:00
End of experiment sync (GPS)	24.06.2005 18:15:00.241
End of experiment sync (Instrument time)	24.06.2005 18:15:00
Drift rate	-12.6e-8 (9x drift of 2nd deploy)
Data files	SMMA17_I03

SITE AND INSTRUMENT	A18 OBS17
Deploy Latitude	37º 13.575’ N
Deploy Longitude	32º 11.913’ W
Depth	1758 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 17:29:00
End of experiment sync (GPS)	24.06.2005 19:27:29.928
End of experiment sync (Instrument time)	24.06.2005 19:27:30
Drift rate	3.95e-8
Data files	SMMA18_I17

SITE AND INSTRUMENT	A19 OBS14
Deploy Latitude	37º 13.692’ N
Deploy Longitude	32º 21.620’ W
Depth	2371 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 14:04:00
End of experiment sync (GPS)	24.06.2005 13:30:27.004
End of experiment sync (Instrument time)	25.06.2005 13:30:27
Drift rate	-0.22e-8
Data files	SMMA19_I14

SITE AND INSTRUMENT	A20 OBS15
Deploy Latitude	37º 12.874’ N
Deploy Longitude	32º 18.732’ W
Depth	2191 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 16:12:00
End of experiment sync (GPS)	30.06.2005 08:31:44.953
End of experiment sync (Instrument time)	30.06.2005 08:31:45
Drift rate	2.04e-8
Data files	SMMA20_I15

SITE AND INSTRUMENT	A21 OBS16
Deploy Latitude	37º 12.083’ N
Deploy Longitude	32º 15.826’ W
Depth	2245 meters
Sampling rate	250 sps
Synchronisation	03.06.2005 16:51:00
End of experiment sync (GPS)	24.06.2005 16:52:11.926
End of experiment sync (Instrument time)	24.06.2005 16:52:12
Drift rate	4.08e-8
Data files	SMMA21_I16

SITE AND INSTRUMENT	C0 OBS16
Deploy Latitude	36º 55.710’ N
Deploy Longitude	32º 26.140’ W
Depth	1969 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 20:37:00
End of experiment sync (GPS)	30.06.2005 00:42:38.985
End of experiment sync (Instrument time)	30.06.2005 00:42:39
Drift rate	4.16e-8
Data files	SMMC00_I16

SITE AND INSTRUMENT	C1 OBS17
Deploy Latitude	37º 02.108’ N
Deploy Longitude	32º 23.358’ W
Depth	2786 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 21:19:00
End of experiment sync (GPS)	30.06.2005 03:03:09.985
End of experiment sync (Instrument time)	30.06.2005 03:03:10
Drift rate	4.10e-8
Data files	SMMC01_I17

SITE AND INSTRUMENT	C2 OBS03
Deploy Latitude	37º 05.678’ N
Deploy Longitude	32º 21.882’ W
Depth	2899 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 22:19:00
End of experiment sync (GPS)	30.06.2005 04:43:26.005
End of experiment sync (Instrument time)	30.06.2005 04:43:26
Drift rate	-1.36e-8
Data files	SMMC02_I03

SITE AND INSTRUMENT	C5 OBS14
Deploy Latitude	37º 29.203’ N
Deploy Longitude	32º 11.764’ W
Depth	3114 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 03:22:00
End of experiment sync (GPS)	30.06.2005 18:36:40.001
End of experiment sync (Instrument time)	30.06.2005 18:36:40
Drift rate	-0.21e-8
Data files	SMMC05_I14

SITE AND INSTRUMENT	C6 OBS05
Deploy Latitude	37º 32.783’ N
Deploy Longitude	32º 10.219’ W
Depth	3405 meters
Sampling rate	125 sps
Synchronisation	24.06.2005 13:19:00
End of experiment sync (GPS)	30.06.2005 20:39:57.973
End of experiment sync (Instrument time)	30.06.2005 20:39:58
Drift rate	4.96e-8
Data files	SMMC06_I05

SITE AND INSTRUMENT	C7 OBS13
Deploy Latitude	37º ’39.149 N
Deploy Longitude	32º 07.404’ W
Depth	1294 meters
Sampling rate	125 sps
Synchronisation	24.06.2005 11:59:00
End of experiment sync (GPS)	30.06.2005 22:24:08.992
End of experiment sync (Instrument time)	30.06.2005 22:24:09
Drift rate	1.52e-8
Data files	SMMC07_I13

SITE AND INSTRUMENT	C8 OBS10
Deploy Latitude	37º 24.928’ N
Deploy Longitude	32º 44.088’ W
Depth	1390 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 12:50:00
End of experiment sync (GPS)	29.06.2005 04:46:45.999
End of experiment sync (Instrument time)	29.06.2005 04:46:46
Drift rate	0.32e-8
Data files	SMMC08_I10

SITE AND INSTRUMENT	C9 OBS07
Deploy Latitude	37º 24.929’ N
Deploy Longitude	32º 44.087’ W
Depth	1390 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 13:28:00
End of experiment sync (GPS)	29.06.2005 06:15:40.991
End of experiment sync (Instrument time)	29.06.2005 06:15:41
Drift rate	2.81e-8
Data files	SMMC09_I07

SITE AND INSTRUMENT	C10 OBS09
Deploy Latitude	37º 21.497 N
Deploy Longitude	32º 31.547' W
Depth	1374 meters
Sampling rate	125 sps
Synchronisation	25.06.2005 12:03:00
End of experiment sync (GPS)	29.06.2005 07:14:29.997
End of experiment sync (Instrument time)	29.06.2005 07:14:30
Drift rate	-0.91e-8
Data files	SMMC10_I09

SITE AND INSTRUMENT	C13 OBS01
Deploy Latitude	37º 13.398' N
Deploy Longitude	32º 02.088' W
Depth	1676 meters
Sampling rate	125 sps
Synchronisation	26.06.2005 00:43:00
End of experiment sync (GPS)	29.06.2005 17:09:09.999
End of experiment sync (Instrument time)	30.06.2005 17:09:10
Drift rate	0.31e-8
Data files	SMMC13_I01

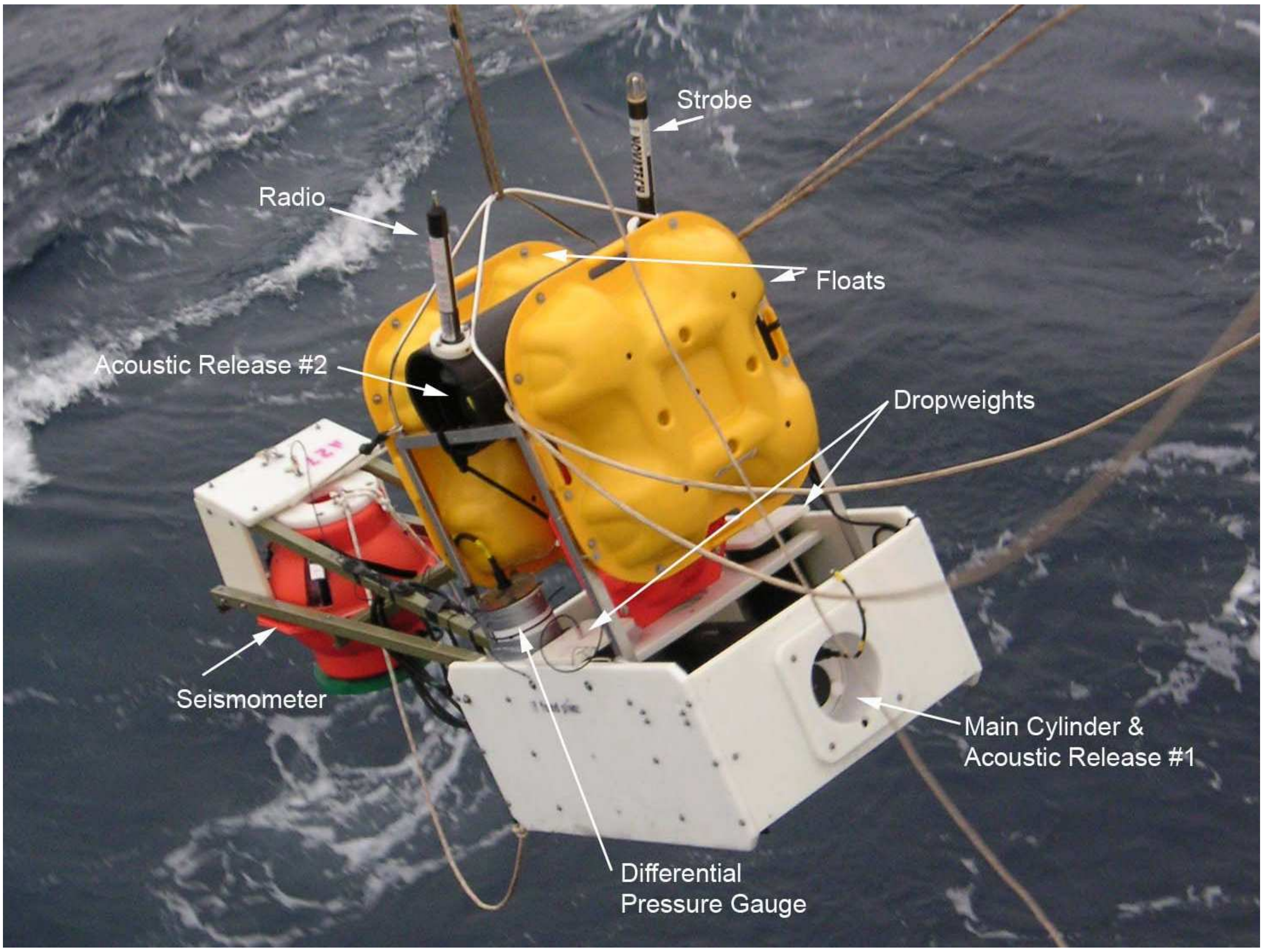
SITE AND INSTRUMENT	C14 OBS12
Deploy Latitude	37º 12.204' N
Deploy Longitude	32º 57.599' W
Depth	1794 meters
Sampling rate	125 sps
Synchronisation	26.06.2005 03:55:00
End of experiment sync (GPS)	29.06.2005 18:34:09.985
End of experiment sync (Instrument time)	29.06.2005 18:34:10
Drift rate	4.81e-8
Data files	SMMC14_I12

SITE AND INSTRUMENT	C15 OBS19
Deploy Latitude	37º 09.951' N
Deploy Longitude	31º 49.660' W
Depth	1985 meters
Sampling rate	125 sps
Synchronisation	26.06.2005 05:08:00
End of experiment sync (GPS)	29.06.2005 20:18:05.999
End of experiment sync (Instrument time)	29.06.2005 20:18:06
Drift rate	0.32e-8
Data files	SMMC15_I19

3.3 IPGP/CNRS compliance sensors

Wayne Crawford

3.3.1 Description



IPGP/CNRS Compliance Sensor

The compliance sensors are composed of a precisely calibrated broadband seismometer and differential pressure gauge, with a precision MCXO clock and individual 24-bit A/Ds for each channel. The instrument has two independent acoustic releases, either of which can release 2 35 kg dropweights. One of the acoustic releases is in its own cylinder, while the other sits in the main cylinder with the instrument electronics. The second release is connected to the computer card via optical isolators, and sends a signal to the computer when released, along the computer to clamp the seismometer and stop recording. The computer sends acoustic status words out this release's transducer when when the transducer receives an "abort release" command.

3.3.2 General Specifications

Seismometer	Guralp-CMG3T
Pressure Gauge	Cox-style differential pressure gauge
Time Base	Q-Tech QT2002 MCXO clock
Computer	Persistor CF2
Batteries	lithium electrochem (analog and digital) alkaline (release) NiCad (seismometer backup)
Weight in air (with dropweights)	
Weight in water (with dropweights)	
Weight in water (without dropweights)	

3.3.3 Instrument-Specific Specifications

Instrument	CMP01
Main Cylinder	01
DPG Card	032
Electronics card	1
Persistor CF2 S/N	2059
Compact Flash card	1
Xilinx code	cm04m2x3
Internal Xponder	30523
Seismometer Sphere	01
Seismometer S/N	T3L69
Slave Card S/N	1
Slave Card Xilinx code	cm04s2p0
Guralp IO Card S/N	1
Guralp IO Card Xilinx code	g2p0
DPG S/N	008

Instrument	CMP02
Main Cylinder	02
DPG Card	031
Electronics card	2
Persistor CF2 S/N	2060
Compact Flash card	2
Xilinx code	cm04m2x3
Internal Xponder	30524
Seismometer Sphere	02
Seismometer S/N	T3J93
Slave Card S/N	2
Slave Card Xilinx code	cm04s2p0
Guralp IO Card S/N	2
Guralp IO Card Xilinx code	g2p0
DPG S/N	013

3.3.4 File Format

The data are stored in files numbered consecutively (for example, 00000010.DAT - 00000020.DAT). Within each file, the data are divided into 1024-byte records with the following format:

Bytes	Contents
1-34	Header
35-37	Multiplexed sample N
38-40	Seismometer X sample N
41-43	Seismometer Y sample N
44-46	Seismometer Z sample N
47-49	DPG sample N
50-52	Multiplexed sample N+1
53-55	Seismometer X sample N+1
56-58	Seismometer Y sample N+1
59-61	Seismometer Z sample N+1
62-64	DPG sample N+1
...	
1019-1021	Seismometer Z sample N+65
1022-1024	DPG sample N+65

The header format is:

Bytes	Contents
1	Header size in bytes (uint8)
2	# of channels (uint8)
3	0x00
4-11	instrument name (up to 8 characters)

12-19	experiment name (up to 8 characters)
20	0x20 (SPACE character)
21-22	Status bits
23	Sample rate in Hz (uint8)
24-28	Time counter (36 bits)
29-34	0x20 (SPACE character)

3.3.5- SISMOMAR Deployments

SITE AND INSTRUMENT	E1 CMP02
Deploy Latitude	37º 17.704’ N
Deploy Longitude	32º 17.694’ W
Depth	1787 meters
Sampling rate	40 sps
Time Zero	03.06.2005 01:09:00
End of experiment sync (GPS)	14.06.2005 09:23:00
End of experiment sync (Instrument time)	14.06.2005 09:23:00.019
Drift rate	1.9x10^-8
Data files	00000033.DAT to 00000050.DAT
Log file	SMM_E1.LOG
Comments	

SITE AND INSTRUMENT	E2 CMP01
Deploy Latitude	37º 17.192’ N
Deploy Longitude	32º 15.881’ W
Depth	1703 meters
Sampling rate	40 sps
Time Zero	03.06.2005 06:02:00
End of experiment sync (GPS)	14.06.2005 07:54:00
End of experiment sync (Instrument time)	14.06.2005 07:54:00.034
Drift rate	3.55x10^-8
Data files	00000021.DAT to 00000038.DAT
Log file	E2.LOG
Comments	

SITE AND INSTRUMENT	E3 CMP01
Deploy Latitude	37º 16.484’ N
Deploy Longitude	32º 17.091’ W
Depth	XXXX meters (from map)
Sampling rate	40 sps
Time Zero	14.06.2005 11:36:00
End of experiment sync (GPS)	30.06.2005 10:45:00
End of experiment sync (Instrument time)	30.06.2005 10:45:00.052
Drift rate	3.77x10^-8
Data files	00000040.DAT to 00000065.DAT
Log file	SMM_E3.LOG
Comments	Lots of recenters, X channel had no data

SITE AND INSTRUMENT	E4 CMP02
Deploy Latitude	37º 18.027’ N
Deploy Longitude	32º 19.565’ W
Depth	2056 meters
Sampling rate	40 sps
Time Zero	14.06.2005 16:07:00
End of experiment sync (GPS)	24.06.2005 08:53:00
End of experiment sync (Instrument time)	24.06.2005 08:53:00.016
Drift rate	1.91x10^-8
Data files	00000055.DAT to 00000070.DAT
Log file	SMM_E4.LOG
Comments	

SITE AND INSTRUMENT	C3 CMP02
Deploy Latitude	37º 09.251’ N
Deploy Longitude	32º 20.311’ W
Depth	2608 meters
Sampling rate	40 sps
Time Zero	24.06.2005 14:05:00
End of experiment sync (GPS)	30.06.2005 06:53:00
End of experiment sync (Instrument time)	30.06.2005 06:53:00.011
Drift rate	2.2x10^-8
Data files	00000073.DAT to 00000081.DAT
Log file	SMM_C3.LOG
Comments	

3.4 Portuguese OBS cruise report

Carlos Corela

3.4.1- Features of the Portuguese IGIDL-OBS

The IGIDL-OBS station (Fig.1) is composed by the following components:

1. SEND GEOLON-MLS acquisition system with SEASCAN oscillator, 4.5Hz GS-11D rotating coil geophone (three components) and CARRACK hydrophone system.
2. Vitrovex 17” glass sphere.
3. Marine acoustic release system

Figure 1 – IGIDL-OBS system

3.4.2- SISMOMAR Deployments

3.4.2.1 First Deployments

The IGIDL-OBS in the first part of the mission were in the position PO1, PO2 and PO3. The table 1, 2 and 3 collects details of each position.

STATION AND POSITION	SEND 303 PO1
Latitude	37º 18.105’ N
Longitude	32º 16.750’ W
Depth	1688 meters
Sampling rate	200 sps, 15 bits
Synchronization	01.06.2005 20:05:00
Start of acquisition	02.06.2005 22:37:15
Stop acquisition	14.06.2005 11:29:09
Drift	-8 ms
Raw data in Kilobytes	939 232 Kbytes
Station close	14.06.2005 11:31:59.992 (11:32:00)

Table 1 – PO1 position

STATION AND POSITION	SEND 302 PO2
Latitude	37º 17.095’ N
Longitude	32º 17.525’ W
Depth	1771 meters
Sampling rate	200 sps, 15 bits
Synchronization	01.06.2005 13:10:00
Start of acquisition	02.06.2005 22:19:34
Stop acquisition	14.06.2005 14:56:31
Drift	-22 ms
Raw data in Kilobytes	32 Kbytes (IBM Microdrive goes to SEND)
Station close	14.06.2005 15:12:59.978 (15:12:00)

Table 2 – PO2 position

STATION AND POSITION	SEND 301 PO3
Latitude	37º 17.002’ N
Longitude	32º 16.194’ W
Depth	1708 meters
Sampling rate	200 sps, 15 bits
Synchronization	01.06.2005 11:48:00
Start of acquisition	02.06.2005 22:29:02
Stop acquisition	14.06.2005 17:31:35
Drift	-10 ms
Raw data in Kilobytes	1 033 664 Kbytes
Station close	14.06.2005 17:33:59.990 (17:34:00)

Table 3 – PO3 Position

3.4.2.2 Second Deployments

The IGIDL-OBS in the second part of the mission were in the position C4, C11 and C12. The table 4, 5 and 6 collects details of each position.

STATION AND POSITION	SEND 302 C4
Latitude	37º 25.650’ N
Longitude	32º 13.280’ W
Depth	2855 meters
Sampling rate	100 sps, 18 bits
Synchronization	14.06.2005 16:12:00
Start of acquisition	14.06.2005 16:14:23
Stop acquisition	26.06.2005 19:44:22
Drift	-
Raw data in Kilobytes	634 496 Kbytes
Station close	30.06.2005 16:33:00

Table 4 – C4 position

STATION AND POSITION	SEND 303 C11
Latitude	37º 20.270’ N
Longitude	32º 26.987’ W
Depth	1777 meters
Sampling rate	100 sps, 18 bits
Synchronization	14.06.2005 12:36:00
Start of acquisition	14.06.2005 11:32:02
Stop acquisition	25.06.2005 05:59:23
Drift	-
Raw data in Kilobytes	510 560 Kbytes
Station close	29.06.2005 09:32:00

Table 5 – C11 position

STATION AND POSITION	SEND 301 C12
Latitude	37º 14.633’ N
Longitude	32º 06.576’ W
Depth	1376 meters
Sampling rate	100 sps, 18 bits
Synchronization	14.06.2005 18:32:00
Start of acquisition	14.06.2005 18:34:54
Stop acquisition	22.06.2005 16:32:13
Drift	-
Raw data in Kilobytes	96 Kbytes (IBM Microdrive goes to SEND)
Station close	29.06.2005 15:55:00

Table 6 – C12 position

3.4.3- Data from IGIDL-OBS

An example of shot data from point C4, took in second part of the mission SISMOMAR (Fig. 2). The figure 3 is from point PO3. The data viewer is SEISAN and the instrument is IGIDL-OBS 1.

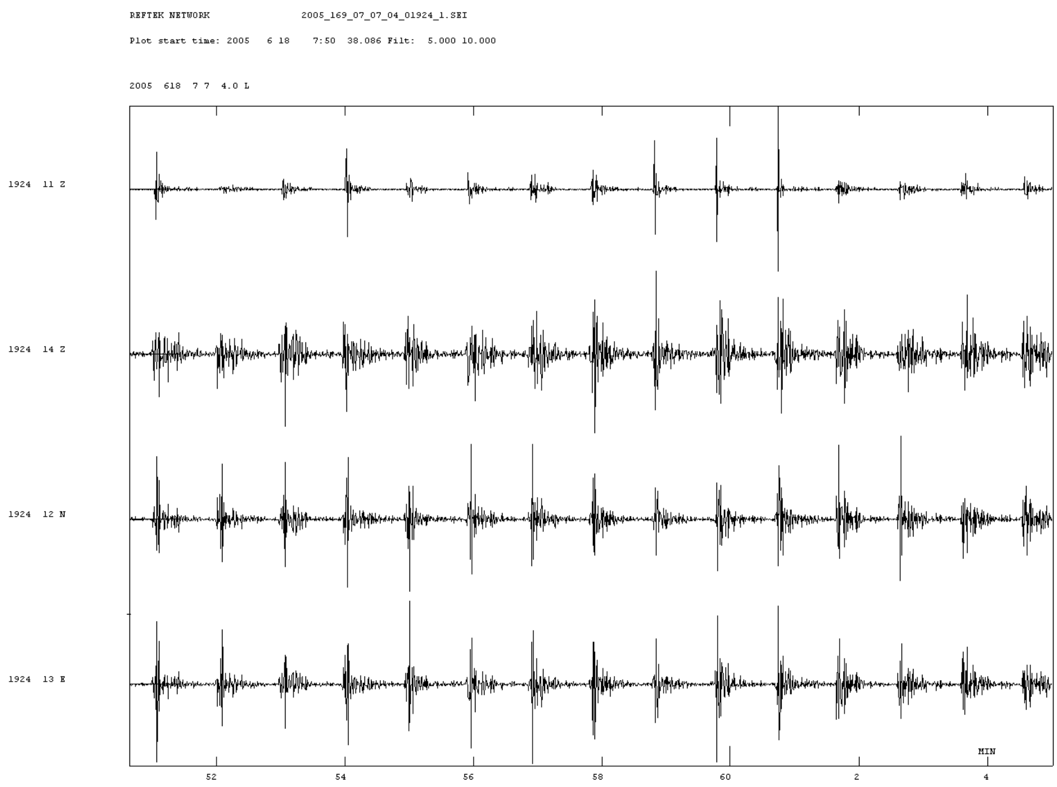


Fig. 2 – Shot data from point C4.

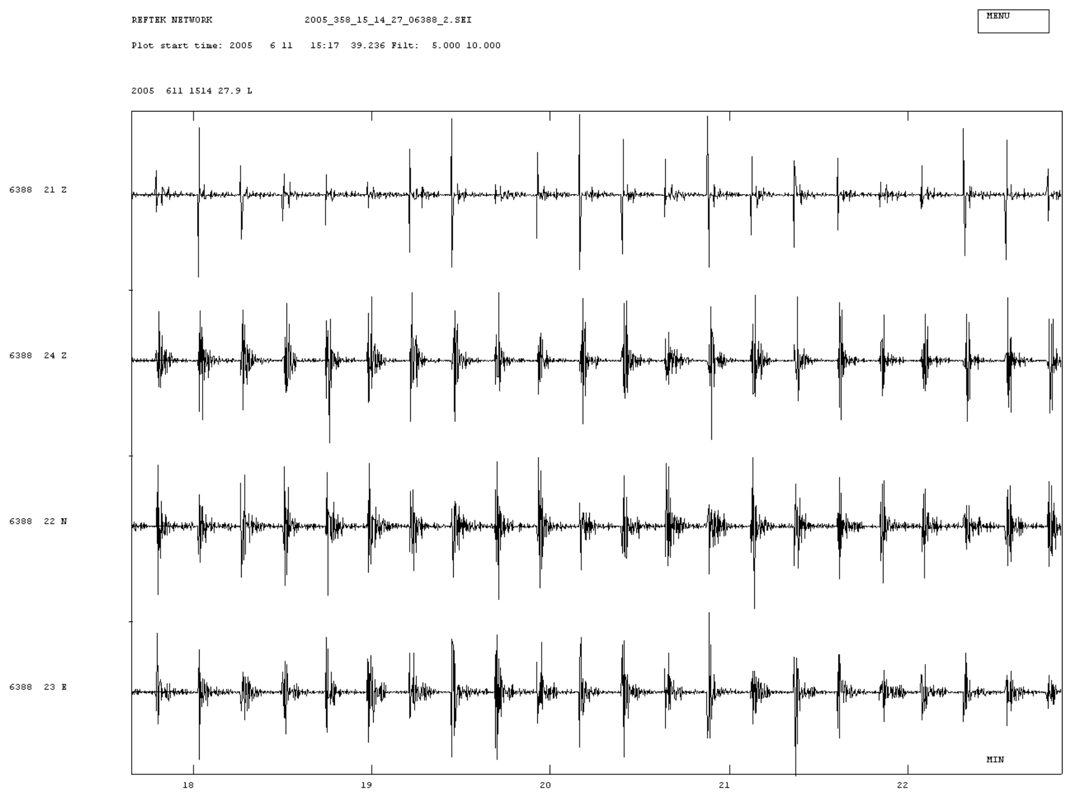


Fig. 3 – Shot data from PO3

An example from data captured in two different stations during the first part of the mission (Fig.4 and 5).

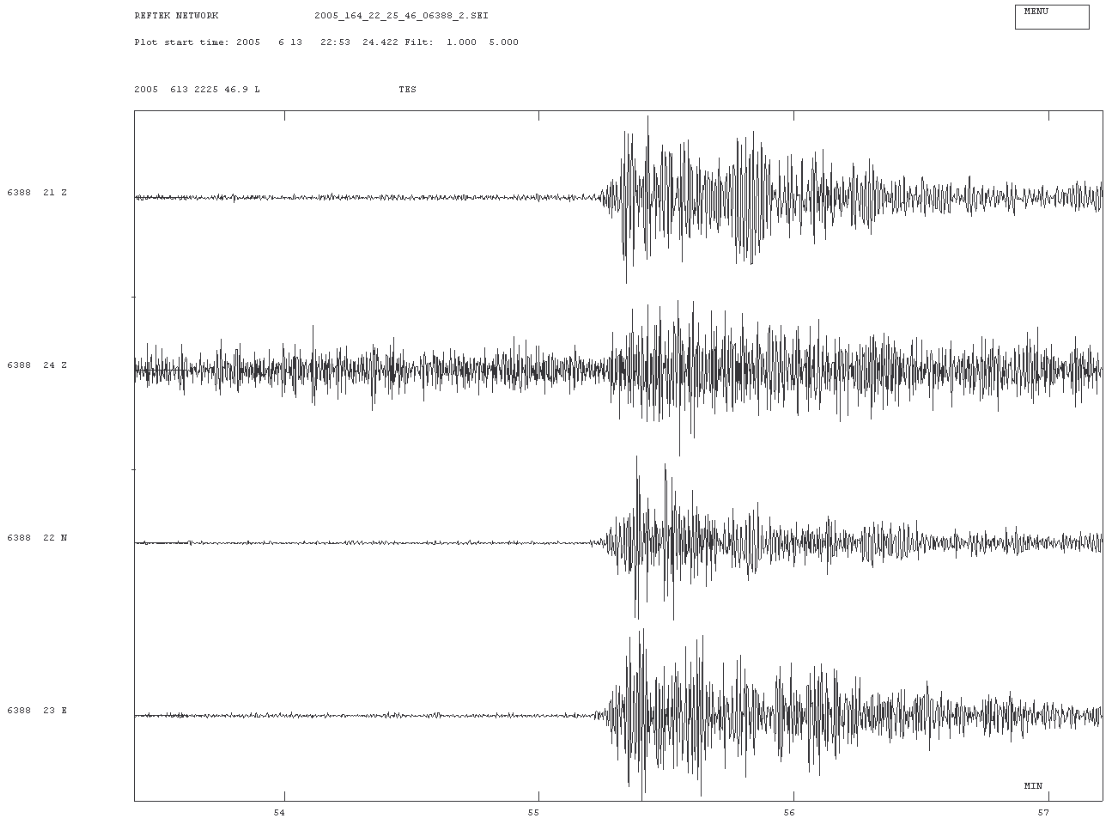


Fig. 4 – Position PO3

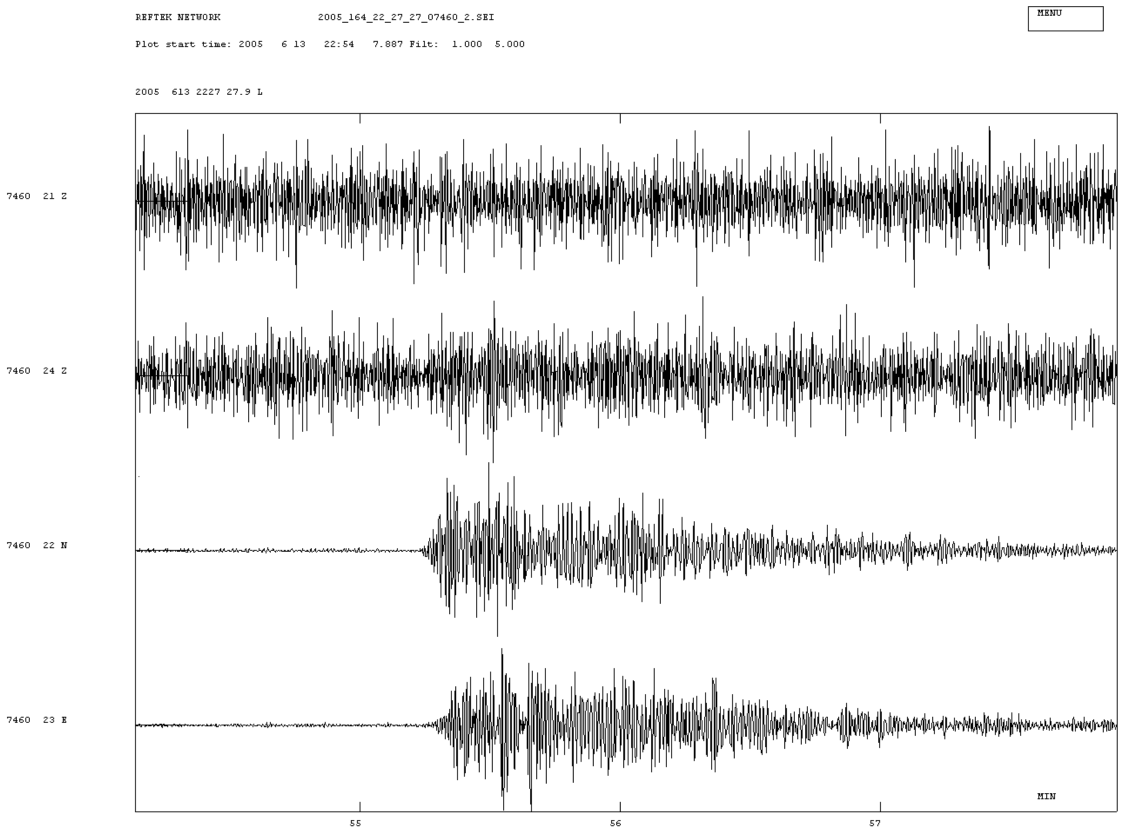
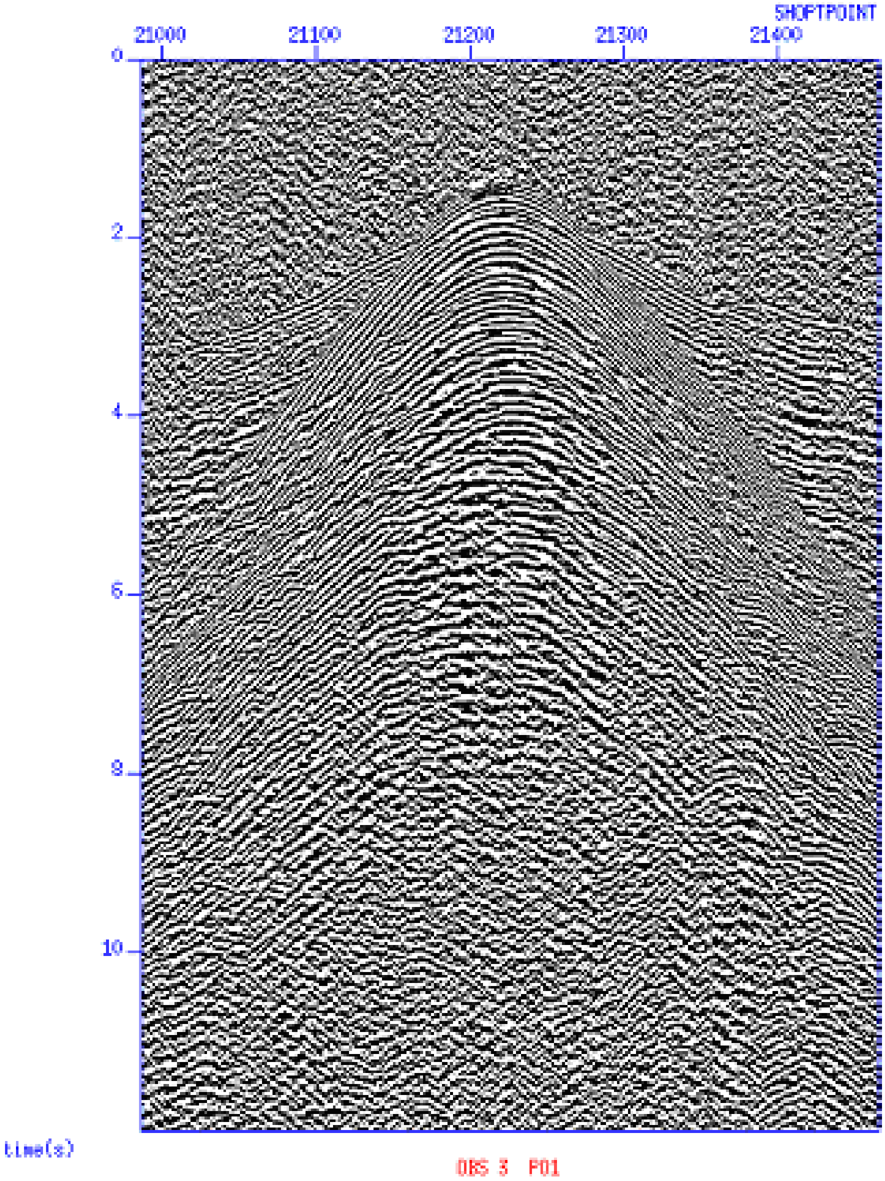


Fig. 5 – Position PO1

The next figure (Fig. 7) is an example of line SSM16, made in the first part of the SISMOMAR cruise



3.5 At-sea instrument relocations

Wayne Crawford

We relocated sites A10 and A12 acoustically during the cruise, during bad-weather days (we also tried to locate site A19 but didn't get enough azimuths).

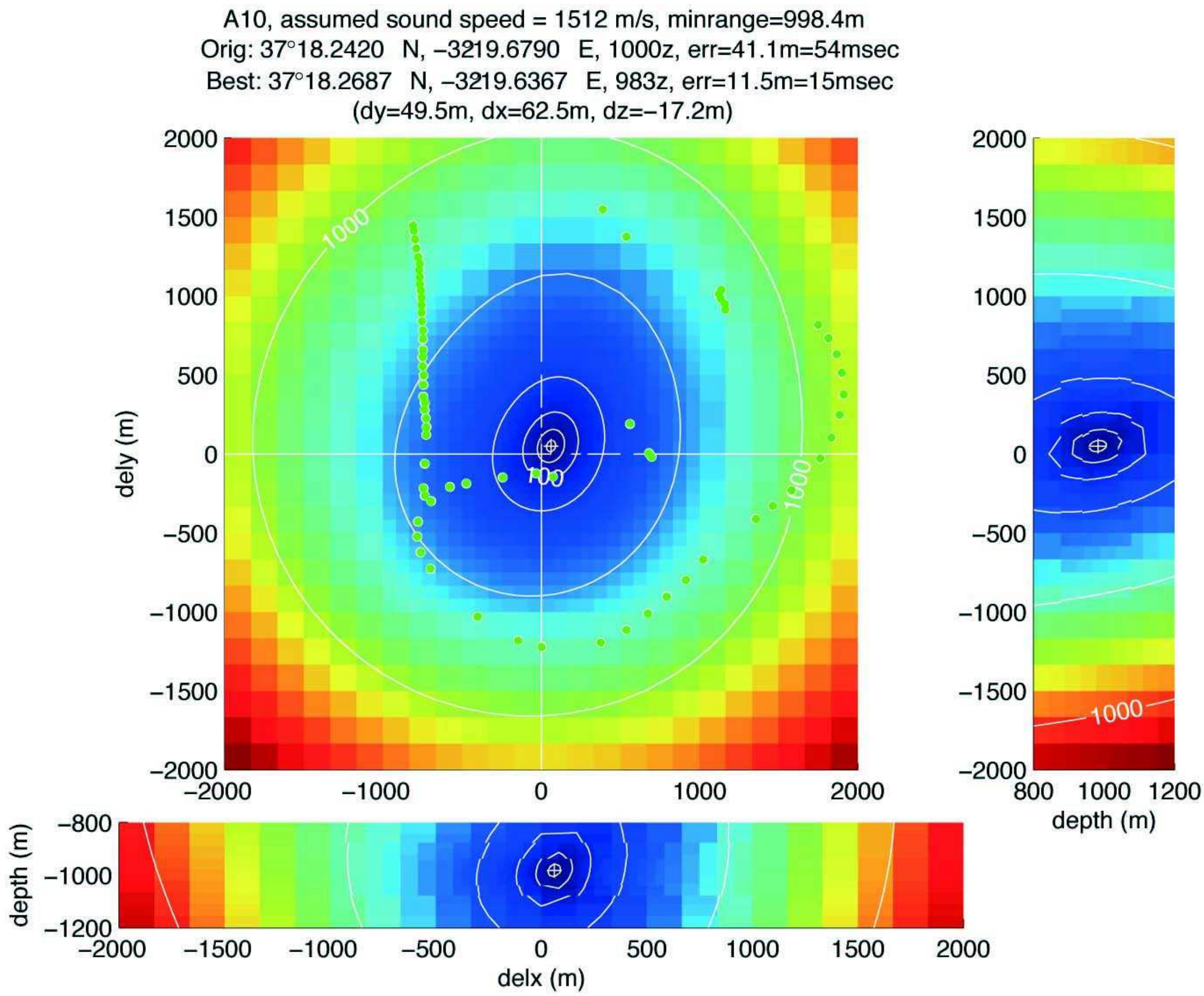
3.5.1 Site A10

Site A10 was relocated on 3 June 2005. This is a water column hydrophone whose position may change with time, depending on the currents.

The target site was 37° 18.300'N, 32°19.600'W.

The A10 sensor was deployed first, then 900 m of line. The line was then towed over the deployment site with the goal that the anchor would fall back to the target site on deployment. The goal distance was 350 m from the target, but the actual distance was 440 m due to some anchor problems. The A10 anchor was deployed at 37°18.479'N, 32°19.779'W.

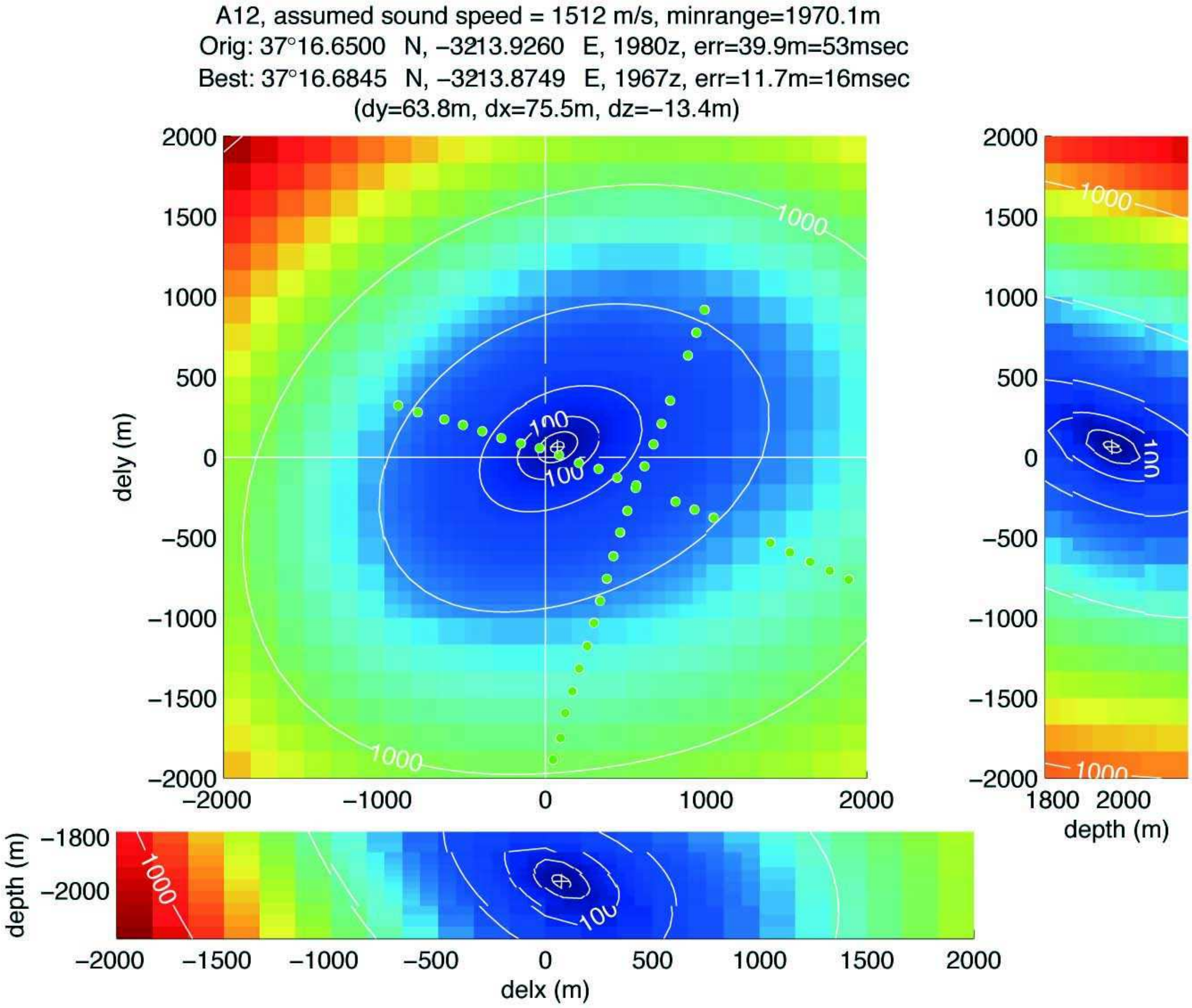
The surveyed position was 37° 18.269'N, 32°19.637'W



site A10 acoustic survey (using obsloc3.m)

3.5.2 Site A12

Site A12 was surveyed on 5 June 2005



site A12 acoustic survey (using obsloc3.m)

4: Miscellaneous

4.1 Onboard Participants

4.1.1 Ship's Crew

Nom	Prénom	Fonction
GLEHEN	JEAN RENE	COMMANDANT
DESMEULLES	ARNAUD	SD CAPITAINE
LE DEUN	ANTHONY	LIEUTENANT
LE BLOAS	JEAN FRANCOIS	LIEUTENANT
GOULOUZELLE	LOIC	CHEF MECANICIEN
SIMON	JEAN MARC	SD MECANICIEN
DAVID	FREDERIC	OFFICIER POLYVALENT
BOUTTIER	ERIC	ELEVE OFFICIER
LE SCAON	PHILIPPE	O.E.S
JAOUEN	YVON	O.E.R
TEAMBOUEON	BERARD	MAITRE EQUIPAGE
LETOURNEL	HENRI	MAITRE EQUIPAGE
NEMOADJOU	VICTOR	MAITRE MANŒUVRE
TAGATAMANOGI	VISESIO	MAITRE MANŒUVRE
THEBAUD	LOMIG	CHARPENTIER
TASSOT	ANDRE	CHEF DE BORDEE
TASSIN	GERARD	MATELOT
GUYADER	LOIC	MATELOT
DIROU	JEAN PIERRE	MATELOT
TANGUY	ERWAN	MATELOT
JACOB	STEPHANE	MAITRE MACHINE
MAURY	FREDERIC	MAITRE ELECTRICIEN
MOREAU	HERVE	OUVRIER MECANICIEN
PAUGAM	PATRICK	OUVRIER MECANICIEN
TANGUY	STEPHANE	NETTOYEUR
LE GOURIEREC	JACQUES	1ER CUISINIER
REBELO	JOSE	SD CUISINIER
COLLET	ROLAND	AIDE CUISINE
BRODU	DENIS	1ER MAITRE D'HOTEL
MARTEEL	FREDERIC	1ER MAITRE D'HOTEL
LE DILY	YANN	GARCON
AGNERAY	DIDIER	GARCON

4.1.2 Science Party

SINGH	SATISH	Chef de Mission 1er Leg	IPGP
CRAWFORD	WAYNE	Chef de Mission 2e Leg	IPGP/CNRS
AOUJI	OUALID	ELECTRONICIEN	IPGP/CNRS
BEGUERY	LAURENT	INGENIEUR	IPGP/CNRS
CANALES	JUAN-PABLO	CHERCHEUR	WHOI
CANNAT	MATHILDE	CHERCHEUR	IPGP/CNRS
CARTON	HÉLÈNE	Etudiante en Thèse	IPGP
COMBIER	VIOLAINE	Etudiante en Thèse	IPGP
CORELA	CARLOS	INGENIEUR	Univ Lisbonne
DUARTE	JOSE	TECHNICIEN	Univ Lisbonne
DUSUNUR	DOGA	Etudiante en Thèse	IPGP

4.1.3 GENAVIR Sismique Crew

NEDELEC	ERWAN	INGENIEUR
GUILCHER	AMBROISE	MAITRE EQUIPAGE
COATANEA	JEROME	TECHNICIEN
GASCON	GILLES	TECHNICIEN
GOURMELON	ANDRE	TECHNICIEN
GUEGUEN	CLAUDE	MECANICIEN
GUYAVARCH	PIERRE	TECHNICIEN
KERGOAT	YOHANN	TECHNICIEN
LE PHILIPPE	JEAN LUC	ELECTRONICIEN
LOUZAOUEN	SERGE	TECHNICIEN
MENEUR	BRUNO	ELECTRONICIEN

4.1.4 Photos of Ship's Crew

L'équipage


Jean-René Glehen


Anthony Le Deun


Jean-François Le Bloas


Loic Goulouzelle


Frédéric Maury


Frédéric David


Jean-Marc Simon


Arnaud Desmeulles

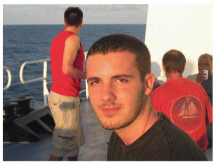

Henri Letournel


Gérard Tassin


Eric Bouttier


José Rebelo

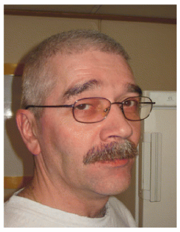

Jacques Le Gourierec


Yann Le dily


Stéphane Tanguy

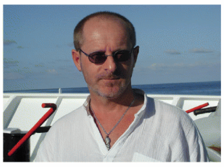

Erwan Tanguy


Roland Collet

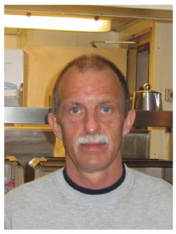

Denis Brodu


Loic Guyadier


Patrick Paugam

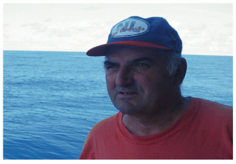

Yvon Jaouen

Lomig Thebaud


Didier Agneray


Philippe Le Scaon


Stéphane Jacob

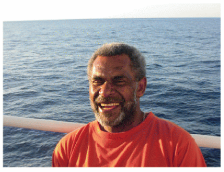

André Tassot

Victor Nemoadjou


Frédéric Marteel


Jean-Pierre Dirou

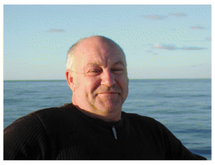

Vincent Tagatamanogi


Bérard Teamboueon

4.1.5 Photos of Scientific and Seismic Crews

L'équipe sismique Génavir


André Gourmelon


Jean Luc Le Philippe

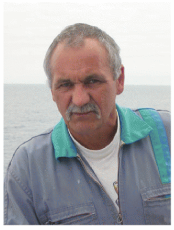

Hervé Moreau


Serge Louzaouen


Erwan Nedelec


Gilles Gascon


Bruno Meneur


Ambroise Guilcher


Claude Gueguen

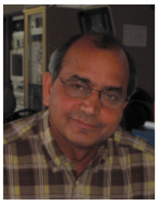

Jérôme Coatanea

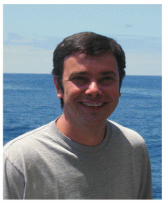

Pierre Guyavarch


Yohann Kergoat

L'équipe scientifique


Wayne Crawford


Satish Singh


Juan-Pablo Canales

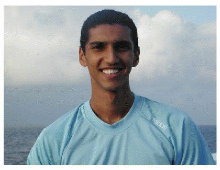

Mathilde Cannat

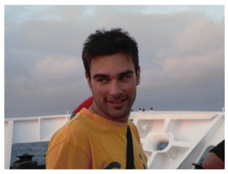

Hélène Carton


Doga Dusunur


Laurent Beguery

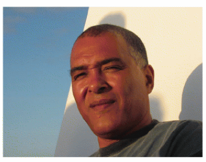

Violaine Combier


Oualid Aouji

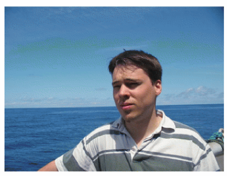

Bastien Sennegon


Carlos Corela


José Duarte


Taoufik Gabsi


Tim Seher


Allande Pouillet-Erguy

4.2 Daily Report

Wayne Crawford

Sunday, May 29 2005: Arrival at Ponta Delgada

The OBS-compliance team (Oualid AOUJI, Laurent BEGUERY, Wayne CRAWFORD, Tim SEHER) arrived at Ponta Delgada in the early afternoon. We learned that the customs papers that had been sent here on May 19 had still not arrived, so the instrument container was still in customs.

Monday, 30 May 2005: Getting the Instruments out of the container

We spent the morning at customs with the agent, trying to get the equipment out of the container. We decided to not take the container out of customs, but rather deliver it to the Atalante, which was in the customs zone. The container arrived at the Atalante at about 15h30. We unpacked it, and with the help of the ship's crew had all of the equipment on the boat by 17h20. The OBS racks and the compliance instruments all are stored in the starboard gangway: 4 racks in the wide part forward of the wet lab, two compliance sensors just aft of the wet lab, then the weight racks and finally 3 more OBS racks (PHOTO)

Tuesday, 31 May 2005: Preparing the instruments

We spent the day preparing the wet lab, tying down instruments, and testing the compliance sensors. Batteries had problem: the ground of digital and analog were not connected. At 15h we craned the compliance sensors over the side for an on-dock test of their seismometers. CMP01-Sphere01 ran without a problem, but CMP02-Sphere02 crashed as soon as the sphere routines started running (twice at the start of leveling, once at the start of mass centering). Hooked up CMP01 to Sphere01, worked fine. Back on the ship, opened up CMP02, retested, could not reproduce problem.

Wednesday, 1 June 2005: First day transit, acoustic unit tests

08h Leave dock at Ponta Delgada. Will collect multibeam data to fill in holes in bathymetric maps.
11h30 Putting Edgetech acoustic head in hull tube.
13h15 Stopped ship, putting rosette with 12 OBS acoustic units overboard
13h20 Multibeam off, lowering rosette
14h00 2000 m line out. Cable stopped.
14h24 All acoustic units checked OK
15h20 Rosette back onboard
15h30 Lowering Portugese OBS
16h03 1000 m line out. Running tests
16h40 Portugese OBS back onboard
16h43 2nd rosette with acoutic units from OBS 13-20 plus CMP01 and CMP02 in water
17h36 2000 m line out. Cable stopped
17h53 end of test, cable back up
18h33 Rosette back onboard. continue transit
I assume that the multibeam was turned back on immediately

Thursday, 2 June 2005:

07h45 Tir SIPPICAN
09h00 Testing OBSs for deployment. Anchors were weakly welded, adding a strengthing bar.
19h10 Arrive at site A7
19h30 Deploy OBS01 at site **A7**
20h03 Deploy OBS02 at site **A12**
20h41 Deploy OBS03 at site **A17**
20h42 Can clearly hear OBS2 at site A12 when interrogate (4.5 km horizontal range). Cannot hear OBS01 at site A7 (9 km horizontal range)
21h30 Deploy OBS04 at site **A16**
22h06 Deploy OBS05 at site **A15**
22h47 Deploy OBS06 at site **A9**
23h29 Deploy OBS07 at site **A5**
23h57 Deploy OBS08 at site **A6**

Friday, 3 June 2005:

01h55 Deploy compliance sensor 02 at site **E1**
02h30 Deploy Portugese OBS1 at site **P2**
04h06 Deploy Portugese OBS2 at site **P3**
04h41 Deploy Portugese OBS3 at site **P1**. Trouble ranging acoustically.

06h33 Deploy Compliance sensor 01 at site **E2**
07h02 At site E1, interrogate CMP02: 58 minutes good recording (predicted start recording at _________).
GOOD SITE
08h38 Deploy OBS09 at site **A4**
09h19 Deploy OBS10 at site **A1**
09h50 Deploy OBS11 at site **A2**
10h36 Deploy OBS12 at site **A3**
12h51 OBS20 (water column hydrophone) in water, start deploying 900 meters of line, drift towards site A10.
13h33 Putting 2 OBS dropweights as anchor because line is very bouyant
13h50 All line out, continue dragging OBS to drop spot
14h10 Deployment of anchor failed: rope broke, recovered rope and attaching new anchor (2 CMP dropweights).
14h28 Deployed OBS20 anchor at site **A10** (water column hydrophone)
14h41 Radio signal lost, OBS must be sinking now
14h43 Bathymetry echosounder off to start ranging
15h09 OBS 20 anchor confirmed at bottom. Echosounder back on.
16h03 Deploy OBS13 at site **A14**
16h24 Ship slows down to put out airgun supports
16h57 Deploy OBS14 at site **A19**
17h29 Deploy OBS15 at site **A20**
17h58 Deploy OBS16 at site **A21** (lost flag)
18h34 Deploy OBS17 at site **A18**
19h18 Deploy OBS18 at site **A13**
19h59 Deploy OBS19 at site **A8**. END OF OBS DEPLOYMENTS
20h56 At site E2, interrogate CMP01: 10 hours good data (predicted start recording at 10h52). GOOD SITE
21h35 At site P1, testing Portugese OBS 3. It is fine (interference with echosounder first time?)

The weather is bad and so the seismic team is not keen on deploying the streamer at night. They will start at 6 AM tomorrow and we will do an acoustic survey on site A10 (water column hydrophone) in the meantime.
22h29 Enable OBS20 at site A10
22h30 Begin acoustic survey

Saturday, 4 June 2005: Acoustic survey site A10, deploy streamer, airgun problems

01h01 End acoustic survey: Disable OBS20 (A10), head to streamer deployment site
06h48 Magnetometer put in the water, 50 m behind the tail buoy.
06h52 Tail buoy in water.
13h30 Start putting in airguns
14h30 One starboard gun cable broken. Recovering gear
15h06 Cable fixed, redeploying
16h22 Compressors getting ready.
17h00 Repairing electrical problems on 1 compressor
17h10 Testing guns individually
17h41 Several guns not working, bringing back out.
18h27 Steel cables between canons were broken, putting tension on the electrical cables. bring all airguns onboard to redo all strength cables (problem is at the connector). We will do acoustic surveys (with the streamer still out) while they fix the problem.

Sunday, 5 June 2005: Acoustic surveys of sites A7, A12, A19. MCS lines 01, 17, start 02.

00h26 OBS 01 enabled at site A7.
00h31 start of acoustic survey of site **A7**
01h09 Disable OBS 01 (A7). No confirmation
01h15 OBS 02 (**A12**) enabled.
03h35 Anomalously long offset. OBS 01?
03h40 Trying to disable OBS01 again. No response. Continue pinging OBS02
03h51 Try to disable OBS01 again. No response. Continue pinging OBS02
04h10 Disable OB02 (A12). Confirmed.
04h16 Enable compliance inst#1.
04h17 Send abort release, but response not consistent (they were listening to deck unit pings, not directly to the sound in water).
04h29 Try disable compliance inst. No response but does not answer subsequent pinging. This may not mean anything, as the CMP internal transponder doesn't ever seem to respond to pinging.
05h50 Enable OBS14 at site 19

05h54 Start ranging OBS14 (**A19**)
06h07 Disable OBS 14: hear two pings. No answer to ranging. Disable again, hear one ping (probably disabled).
11h30 Airguns in water.
11h52 Testing airguns
12h08 Shooting every 40 seconds
12h30 Shooting every 15 seconds.
13h16 Begin test line
14h15 Begin first MCS line.

Monday, 6 June 2005: MCS lines 02, 18, 03, 19, 04, 20

During the night of 6-7 June, lost forward set of port airgun floats.

Tuesday, 7 June 2005: MCS lines 05, 21, 06, 22, 07, 23 (start)

02h37 Streamer no longer seen on CINNA screen in PC scientifique
09h04 Starboard compressor problem, stopped.
09h46 Compressor repaired, pressure back up, restart shots.

Wednesday, 8 June 2005: MCS lines 23(end), 8, 24, 9, 25, 10

00h20 The ship started drifting away from the line. By 00h45 the offset between the ship and the line was 73 meters. The ship changed course to go back to the line at 00h45. By 00h56 the offset was down to 18 meters.
05h15 Port airguns 15-20 meters deep. Starboard airguns 12-17 meters deep. Strong currents. Increased speed to 5 knots over the bottom to try to lift up the airguns. Afterwards, the starboard airguns are OK but the port airguns are too deep (due to the loss of floats?)
06h45 Airgun depths higher again (port 10-15, starboard 8-14).
07h46 port airguns 8-13 meters deep, starboard airguns 9-11 deep.
08h34 No chirp 3.5 until 09h15

Thursday, 9 June 2005: MCS lines 30, 16, 36, 11A, 31, 12

0h00 Problem with the DLT. Switch to #11
1h15 Problem with the DLT. Switch to #12
02h34 Acquistion system was shut down for maintenance. We keep shooting but not recording
03h04 Acquisition system fixed/restarted at shot #20595. All lost data were in the turn between lines 30 and 16.
04h39 **We were supposed to shoot line 11, but strong currents pushed us 500 m north. Shoot line 16 instead, modify sequence of following lines to account for this.**
When did data come back on line?
06h15 Problem with echosounder and 3.5 kHz? Reboot echosounder
06h45 The GENAVIR file name for line 11 will be 111 (because they had already started recording what ending up being line 16 in a file called 11). We also refer to this (correct) line as 11A.
09h00 The position of the tail buoy doesn't show up any more on the CINNA display in the PC scientifique. Will go into the GENAVIR seismic container to measure it from now on
13h55 Streamer data acquisition doesn't work since shot#23256
14h05 Restart acquisition

Friday, 10 June 2005: MCS lines 32, 13, 33, 14, 34, 15

15h03 Bridge has not been receiving nav info from the tail buoy since yesterday. This doesn't affect us, as everything is being recorded OK [JPC].
~17h46 Small problem of time offset on the 3.5 kHz recording system. Resolved.
19h00 Ship speed a little high (5.7 knots) because of currents.
23h15 Bad traces noted: 249, 251, 331

Saturday, 11 June 2005: MCS lines 35, 26, 37, 27, 38, 28 partial

03h15 Bad traces noted: 249, 331
~17h30 We lost a group of floats on the starboard array
18h35 Port airgun #6 (9 litres bolt) stopped shooting (shot #36380)
18h46 Port airgun #5 stopped shooting (shot #36429)
18h50 Activated port airgun #8 (16 litres bolt) and turned off starboard #6 (5 litre bolt) to compensate for lost guns (shot #36446?)

Sunday, 12 June 2005: MCS lines 28,39, 29. End of MCS profiles

08h43: End of profile 29. Shot # 39939.
This was the last MCS line
We shot 60 more times beyond the line to allow the same folding on this line as on the others.
08h56: Stop airguns. Recording for two more minutes at the same speed to characterize streamer noise.

09h10: Stop recording 3.5 kHz "chirp" data
10h10 Airguns onboard. Start recovering streamer.
We then recovered the canons, one of the lost buoy sets and the flute.
13h15: Start out for Horta, Faial to drop off Satish and Helene and pick up Taoufik GABSI and two ship people.
EM12 acquisition on with route selected by Mathilde to fill in map holes
15h53 Arrive at point A of bathy profile, change course to follow profile
15h58 XBT measurement (#???)
Note: CASINO crashed at about 13h13, was restarted at 23h38

Monday, 13 June 2005: Transfer of personnel at Horta, Faial

02h07 Arrived at point B of bathy profile, change course
04h30 En vue de Faial
06h42 Arret 3.5 kHz and EM12 (multibeam bathy)
09h00 Depart SINGH, NEMOADJOU et CARTON, arrivé de GABSI, SENNEGON (etude fatigue), BOUTTIER (stagiere pont), TEAMBOUEON (marin).
10h30 Arrivé des fraises et cerises
10h52 Leave Horta.
11h00 EM12 and 3.5 kHz back on
14h35 Passing over point A of second bathy profile, change course
16h41 SIPPICAN (XBT) profile #?

Tuesday, 14 June 2005: Back at site, recover and redeploy 2 CMP and 3 Portugese OBSs

02h07 Position A2
~04h00 real-time bathy (vidosc) blocked
04h10 no more paper for 3.5 kHz
~04h30 vidosc restarted
05h25 arrival at Lucky Strike. The weather is bad, so wait for daylight to recover
05h43 Interrogate CMP01 at site E2: 10 days good data
05h47 Send internal release to CMP01
05h50 Confirm that it has clamped beam (stops release)
05h56 External release CMP01
06h43 CMP01 At surface
06h51 External release CMP02 at site **E1**
07h23 CMP01 onboard after one failed pass
07h40 CMP02 at surface (radio signal)
09h02 CMP02 onboard
09h33 Over site **P01**, sending range/release
10h00 Instrument sited at surface
10h56 Instrument onboard
11h54 CMP01 deployed at site **E3**
12h20 At site **P2**
12h55 P2 OBS release command sent
13h11 P2 OBS confirmed release
13h40 P2 OBS sighted at surface
13h56 P2 OBS on board
14h20 At site **P3**
14h22 P3 OBS release command sent
14h39 P3 OBS confirmed released
15h09 P3 OBS sighted at surface
15h32 P3 OBS on board
15h59 Over site E3, CMP01 has 40 minutes good data. Go to site E4
16h38 Deploy CMP02 at site **E4**. Go to site C11. turn off bathy for Portugese OBS deployments.
17h52 Portugese OBS #3 deployed at site **C11**. Head to site C4
19h19 Portugese OBS #1 deployed at site **C4**. Ping acoustically to determine drop rate. Head to site C12
21h05 Portugese OBS #2 deployed at site **C12**
The weather is too bad to deploy the streamer and airguns. Will do acoustic survey of instruments instead. Takes longer than usual because we won't go across-wind.
22h09 Site **A18**, OBS 17. Enabled, pinged, disabled
22h37 Site **A13**, OBS 18. Enabled, pinged, disabled.
22h51 Site **A8**, OBS 19. Enabled, pinged, disabled.
23h13 Site **A7**, OBS 01. Enabled, pinged, disabled.

Wednesday,15 June 2005: Bad weather, acoustic interrogate INSU OBSs
00h36 Site **A12**, OBS01. Enabled, pinged, disabled.
02h03 Site **A16**, OBS04. Enabled, pinged, disabled.
02h18 Site **E3**, CMP01. Enabled, pinged, disabled. 10 hours good data.
02h59 Site **A6**, OBS08. Enabled, pinged, disabled.
04h23 Site **A5**, OBS07. Enabled, pinged, disabled.
05h11 Site **E4**, CMP02. Enabled, pinged, disabled. No clear good data time.
05h36 Site **A15**, OBS05. Enabled, pinged, disabled.
08h44 Site **A4**, OBS09. Enabled, pinged, disabled.
09h29 Site **A9**, OBS 06 Enabled, pinged, disabled.
10h07 Site **A14**, OBS13 Enabled, pinged, disabled.
11h06 Site **A01**, OBS10 Enabled, pinged, disabled.
12h30 Site **E4**, CMP02 abort release code = 16 hours good data
13h55 Site **A19**, OBS14 Enabled, pinged, disabled.
16h14 Site **A20**, OBS15 Enabled, pinged, disabled.
17h35 Site **A03** OBS12 Enabled, pinged, disabled(?).
18h37 Site **A02**, OBS11 Enabled, pinged, disabled.
23h06 Site **A17**, OBS03 Enabled, pinged, disabled.
23h28 Site **A16**, OBS21 Enabled, pinged, disabled.

Thursday, 16 June 2005: deploy streamer and guns, start line 101
16h31 Deploy magnetometer and tail buoy
19h05 Flute deployed. Noise problem.
20h00 Start deploying airguns
21h38 Airguns in water
21h48 First shot, streamer at 20 m depth
22h16 Start line 101
22h20 Change streamer depth to 15m on Juan Pablo's advice

Friday, 17 June 2005: lines 101, 104, 106, 108,
00h05 Tape problem (#20). New tape put in (#21)
00h57 Stopped airgun 6port (6 litre) because it was only shooting 2 out of 3 times
06h15 At daybreak, notice that one of the three port float clusters is gone.
10h54 Stop Airgun 9 port (leaking).
14h40 Gun #9 port is fixed and back in water (guns 9 are on their own support and so can be repaired during lines)

Saturday, 18 June 2005: lines 110, 109, 107, 105
12h53 Stop airgun 9 starboard because of leak
15h31 Started profile 105 wrong: bridge had bad N coordinate. Change course to get back on profile.
16h00 Sailboat passed near to magnetometre -> anomaly
16h28 Changed course to avoid a fishing buoy
18h34 Streamer acquisition stopped, probably isolation fault
18h38 Streamer acquistion restarted
18h49 Streamer acquistion stopped again, can't restart.
19h03 Stop shooting, reel in streamer to find problem. Line 105 ends prematurely (80% done).
20h55 Problem was at the shock absorber at the beginning of the streamer. Replaced
20h59 Magnetometre disconnected during repairs
22h00 Streamer going back into the water
23h35 Airguns back in water, with repaired 6 port

Sunday, 19 June 2005: lines 103, 123, 121, 119
00h52 First test shot
01h19 Start line 103
01h29 CASINO down. Not discovered until 04h30

Monday, 20 June 2005: lines 118, 114, 116, 115
00h00 Starboard airgun #7 is broken (start of line 118). Stopped shooting. Bringing on board for repairs. Acquisition stopped. Go back to start of 118
03h09 Guns back in water
03h13 Acquisition back on

Tuesday, 21 June 2005: lines 117, 112, 120,

01h45 Canon #2 starboard broken (-2% power). Note at 07h30 says that Canon #2 port (150cc) was broken since 1h40. Same airgun, or its twin?
01h51 Started line 117 150m of the real point (autopilot problem).
02h15 Back on line
06h00 Extend line 117 to prepare for long W-E line 112
~8h00 Lost a group of floats on starboard side

Wednesday, 22 June 2005: lines 122, 124, 125(partial), 111(partial), 113

09h30 Airgun 5 port stopped for 5 minutes
11h34 Starboard airguns tangled with streamer. All shots from beginning of line 125 are shifted in time. bring in airguns to untangle them
11h46 Starboard airgun shots stopped
12h00 Ship going off profile to facilitate airgun recovery
15h00 Line 111 started 3.25 nm north of the planned startpoint,, not totally aligned, and with only port airguns firing
15h43 All guns firing except #9 starboard and #2 port

Thursday, 23 June 2005: lines 102, 125b, 1011, 130

06h03 Acquisition stopped to change shot interval from 150m to 75 m
06h55 Problems with bubble pulse alignment, change delay
07h43 Ship engine problems, decrease speed, canons too far to port, streamer compressed
11h25 Airgune 6 starboard stopped because of leak.
19h23 Slow down to let a sailboat pass in front of us
20h40 Slow to 4.5 knots (between lines 1011 and 130) to test change in airgun depth

Friday, 24 June 2005: Recover airguns, recovering and redeploy INSU OBSs

02h00 Start recovering airguns
03h30 All airguns onboard. Starting streamer recovery
06h30 Tail buoy onboard., go to site E4 for recovery
07h19 Internal release CMP02 (Site **E4**)
07h22 Abort release CMP02 -> locked
07h24 External release CMP02 (AC02)
08h20 CMP02 at surface
08h37 CMP02 recovered
08h55 OBS13 release1 acknowledged (Site **A13**)
09h43 OBS13 at surface
09h49 OBS05 release1 acknowledged
10h10 OBS13 recovered (after one false pass)
10h46 OBS05 still at seafloor? Send release again
11h37 OBS05 at surface
11h41 OBS14 release1 acknowledged (Site **A19**)
11h53 OBS05 recovered
12h41 OBS14 on surface. One mile away
13h06 OBS14 recovered.

Instrument	**Site**	Released	Surface	Recovered	Comments
CMP02	**E4**	7h24	8h20	8h37	Internal release 3 minutes,
INSU13	**A13**	8h55	9h43	10h10	One false pass on recovery
INSU05		10h46	11h37	11h53	1st rls at 9h49. Rusty wire?
INSU14	**A19**	11h41	12h41	13h06	

14h46 Deploy CMP02 at site **C3**
Continue recoveries...

Instrument	**Site**	Released	Surface	Recovered	Comments
INSU16	**A21**	15h39	16h15	16h32	
INSU03	**A17**	16h39	17h28	17h42	
INSU17		17h44	18h28	18h43	
INSU01	**A07**	19h45	20h35	20h47	
INSU19		21h10	21h46	22h02	
INSU12		21h59	22h47	23h39	Weren't at site yet when surfaced?

Saturday, 25 June 2005: Deploy INSU OBSs on large 2D lines
02h47 Deploy INSU13 at **C7**
04h17 Deploy INSU05 at **C6**
05h15 Deploy INSU14 at **C5**

Instrument	**Site**	Released	Surface	Recovered	Comments
INSU10	**A01**	06h17	07h06	07h26	
INSU07	**A05**	07h42	08h32	08h42	
INSU09		08h43	09h33	09h47	

10h00 Ship stops for more engine tests (only one working since ???)
14h11 Deploy INSU09 at **C10**
15h14 Deploy INSU07 at **C9** (flaky acoustic release, stopped burning after one minute in tests)
16h28 Deploy INSU10 at **C8**
16h28 Stop for motor tests
18h00 Electrical shutdown for motor tests.
19h00 CASINO restarted (1 hour hole)
22h04 Deploy INSU16 at **C0**
23h45 Deploy INSU17 at **C1**

Sunday, 26 June 2005: Finish deploying INSU OBSs on large 2D lines, start 2D lines
00h39 Deploy INSU03 at **C2**
01h18 Testing CMP02 at **C3**: 1 day recording.
03h43 Deploy INSU01 at **C13**
04h40 Deploy INSU12 at **C14**
05h57 Deploy INSU19 at **C15**
Go to beginning of line 212.
07h00 Start deploying airguns
09h11 Start line 212 at shot#26. 425m shot spacing = 184 seconds at 4.5 knots.
22h58 End line 212. Head to 201 (44 nm)

Monday, 27 June 2005: Transit, engine repairs, begin line 201
01h33 Port aitguns 3&4 stopped to repair elastic(?, "flexible")
01h41 Port airguns back on
08h28 Start first try at line 201
10h00 Stop for more engine tests, airguns out of water, go back to start of line.
18h00 Engine results look good, put airguns back in water
18h24 Start line 201

Tuesday, 28 June 2005: End line 201, lines 301 and 312.
00h43 Problems with automatic pilot made us deviate from our line
03h30 "la Bathy s'est arretée"
03h59 "la bathy "sauve" a pb d'archivage"
4h27 "la bathy est de nouveau archivee"
4h30 de nouveau pas de bathy...
5h35 bathy de nouveau enregistree
~8h15 End line 201, turn around to head back down 201 to start of line 301
8h16 shot interval changed from 425 to 300 meters
8h28 shot interval changed to 200 meters
~8h30 Change to 150m
9h30 Back on the track of line 201

Wednesday, 29 June 2005: End seismic surveys, start recovering OBSs
00h54 Last shot (1859, will become 201859)
02h30 All guns aboard. On the way to site **C8**

Instrument	Site	Released	Surface	Recovered	Comments
INSU10	C8	3h36	4h13	4h29	read problems (resolved) due to filename longer than 8 characters
INSU07	C9	5h07	5h43	6h03	
INSU09	C10	6h08	6h45	7h02	
P03	C11		8h45	9h07	
INSU06	A09	9h44	10h40	10h41	Vertical problem: badly leveled?
INSU20	A10	10h50	11h13	11h32	

INSU02	A12	12h00	12h48	12h53	
INSU18	A13	12h58	13h31	13h44	
P	C12	14h32	15h17	15h33	
INSU01	C13	16h00	16h42	16h57	
INSU12	C14	17h25	18h10	18h21	
INSU19	C15	18h59	19h48	20h01	

20h10 Transit to **C0** (33 nm)

Thursday, 30 June 2005: Recovering OBSs

Instrument	Site	Released	Surface	Recovered	Comments
INSU16	C0	23h18	00h09	00h27	
INSU17	C1	01h24	02h30	03h11	
INSU03	C2	03h13	04h20	04h32	
CMP02	C3	05h16	06h30	06h42	
INSU15	A20	07h01	07h57	08h12	
INSU04	A16	08h17	09h04	09h16	
CMP01	E3	09h37	10h27	10h35	
INSU08	A6	10h57	11h48	12h11	
INSU11	A2	~12h20	13h34	13h57	
PORT	C4	14h45	15h53	16h07	
INSU14	C5	16h45	18h00	18h20	
INSU05	C6	18h55		20h28	
INSU13	C7	21h03		22h00	

22h17 Start bathy profile C1
23h42 New profile T1

Friday, 1 July 2005: bathy profiles and start transit to port
09h02 New profile
~22h30 Start Transit home

Saturday, 2 July 2005: Transit to port

Sunday, 3 July 2005: Arrive Ponta Delgada
~08h00 Arrive at dock, Ponta Delgada, Acores

4.3 Saved Data

4.3.1 Onboard notes

Violaine Combier

Sismique multi-traces

- 25 Cassettes DLT : données brutes
  - Elles sont numérotées de 1 à 27, les cassettes 2 et 19 n'existent pas.
  - Leg 1 : 17 cassettes de 1 à 18
  - Leg 2 : 8 cassettes de 20 à 27
  - Une copie de chaque cassette est gardée Génavir.
- 10 DVD : données brutes du Leg 1 en format .dsk (format du logiciel Focus)
- 4 DVD : stacks et stacks migrés du Leg 1 en format .dsk et en format .segy
- 1 CD de navigation : fichiers ECOS et centrale CINNA, informations sur l'acquisition et les problèmes techniques du Leg 1. Les données de ce CD sont contenues dans le DVD donné en fin de mission par l'équipe Génavir.
- 3 DVD : stacks et stacks migrés du Leg 2 en format .dsk et en format .segy
- 2 DVD : images des profils stackés et migrés imprimés par l'équipe Génavir à bord, en .tiff et .vs (format vectoriel)
- 1 CD : jobs et images des profils traités sous Focus pour les 2 legs
- 1DVD donné par l'équipe Génavir contenant tous les paramètres d'acquisition : fichiers de navigation CINNA, fichiers ECOS, signatures et paramètres des canons, paramètres de flûte, problèmes techniques etc …

À la fin de la mission, les données brutes, les données traitées, les jobs et images des profils étaient également sauvegardés en double exemplaire sur les 2 disques durs du PC « Voxel ».

OBS

- 20 DVD, soit 1 par instrument, contiennent les données brutes.

Sondeur 3.5kHz

- 2 DVD

Bathymétrie multi-faisceaux, gravimétrie, magnétisme, salino, navigation

- 1 DVD donné par l'électronicien contenant toutes les données Texas et Archiv
- 1 DVD gravé par Mathilde contenant Archiv (bathymétrie et navigation), Archeops (démo des données), Texas (gravimétrie, sonde verticale, navigation), les fichiers bathy transcrits en .mbb et ceux traités pendant la mission, et enfin la force des vents.

Profileur acoustique (ADCP ou analyse des courants) :

- 1 DVD donné par l'électronicien

4.3.2 Digital Data

Wayne Crawford

	Title	Contents	Media	Created by	Stored at	Comments
OBS						
X	Portugese OBS (SEG-Y Data)	SEG-Y data for sites po3, po1, C4 and c11	1 DVD-R (Princo)	C Corela	WCC	just shots (not relocated, either)
X	INSU OBS	raw format	Archive hard disk	L Beguery	SMR	
X	INSU OBS	raw format	10 DVD 5 DVD-9 (copy)	L Beguery	SMR	2nd copy should be at Jussieu
X	Compliance	raw format	1 DVD-R	W Crawford	WCC	
MCS						
X	Leg 1 MCS Data	SSM1-39	16 DLTtape IV (#3-18)	G SISMIQUE	WCC	
X	Leg 2 MCS data	SSM101-125b, SSM130, SSM1001	8 DLTtape IV (#20-27)	G SISMIQUE	WCC	
X	Streamer and shot info	CINNA/, ECOS/, ...	1 DVD-R (Verbatim)	G SISMIQUE	WCC	
X	Donnees Mission (1)	CELERITE/, CASINO/, CINNA/	1 DVD-RW (imation)	G ATALANTE	WCC SMR	
X	Donnees Mission (2)	ADCP/	1 DVD-R (imation)	G ATALANTE	WCC	
X	CHEOPS	SISMO001-088	2 DVD-RW (imation)	G ATALANTE	WCC	3.5 kHz chirp
	Leg 1 GENAVIR SISMIQUE	CINNA/, ECOS/, canon drawings, gps drawings, rapport technique	1 CD-R (maxell)	G SISMIQUE	WCC	should be duplicated and added to on "Streamer and shot info" DVD
	Leg 1 MCS test line		1 DLTtape IV (#1)	G SISMIQUE	WCC	
	Leg 1 MCS data	SSM1-39 "raw"	10 DVD+R (imation)	V Combier	WCC	Cut versions from FOCUS computer
	Leg 2 stacks & migrated stacks	SSM 112-125b, SSM130	1 DVD+R (imation)	V Combier	WCC	.dsk format
	Leg 2 stacks & migrated stacks	SSM 101-111, SSM1011	1 DVD+R (imation)	V Combier	WCC	.dsk format
	Leg 2 stacks & migrated stacks	All lines: SSM 101-125b, SSM130, SSM1001	1 DVD+R (imation)	V Combier	WCC	.segy format
	Leg 1 MCS Images	.tiff, .vs, .ras formats		V Combier	WCC	
	Leg 2 MCS profiles	.tiff, .ras, .vs formats	1 DVD+R (imation)	V Combier	WCC	
	MCS Survey jobs and Pictures	of all lines	1 CD-R (Memorex)	V Combier	WCC	
Other						
	SISMOMAR ancillary data	ARCHEOPS/ (samples of chirp), ARCHIV/ (EM12D info), CELERITE/ (5 XBTs), SISMOMAR_MSFO/ (bathy for SISMOMAR+), SISMOMAR_caraibes/ (MC's bathy work files) TECH_SAS/ (vents,mag,grav, center beam, nav),	1 DVD+R (imation)	M CANNAT	WCC	

5.4.3 NOTES and hardcopies

Title	Contents	Media	Created by	Stored at	Comments
MCS Profile Descriptions	SSM21-39	Pink 2-ring binder	SMM Team	WCC	
MCS Profile Descriptions	SSM101-111	Pink 2-ring binder	SMM Team	WCC	
MCS Profile Descriptions	SSM1-11, SSM112-125b, SSM130	Turquoise 2-ring binder	SMM Team	WCC	
FOCUS Processing notes	Leg 2 lines	back of log book#2	SMM Team	WCC	
Source information		Yellow Chemise	D DUSUNUR?	WCC	
Dossier de preparation		Ring bound	W Crawford	WCC	
SISMOMAR Log books		2 green notebooks	SMM Team	WCC	

X = primary data, must be backed up

WCC = Wayne Crawford's office (Jussieu)

SMR = Atelier Saint Maur

4.4 Navigation Files: Format description

Extracted from GENAVIR documents by Tim Seher

The ECOS navigation system automatically monitors data related to the navigation and the parameters related to the acquisition of the seismic data. There exist two file types, which are registered by the navigation system:

A.) A file with navigation info (**trinav** *.NA)
B.) file for the information specific to seismic (**ecos** *.ECO)

In the following sections the different messages, which can be encountered in the navigation files are described. They vary in length and information content, so a detailed description of the parameters and the parameter length contained in the navigation messages is given as well. Not all the messages are recorded and not all the parameters mentioned in messages might be recorded. In the latter case the message contain default values. For example the temperature sensors on the steamer allegedly were not operating during the course of the campaign.

4.4.1 Messages of the navigation system

General structure :

$APSTM,DATE,HEADER,MESSAGE

The message starts with the date. The rest of the message varies with the content of the message

a.) NACON : Configuration of navigation system
b.) NACOU : Current navigation
c.) NAAD1-2 : Brute navigation

<u>a.) Configuration messages</u>

General structure :

$APSTM,DATE, HEADER, MESSAGE

General header .... $APSTM
Date
Date .... jj/mm/aa
Time .... hh:mm:ss.sss
Header .... NACON
Message
Header .... PTREF
Definition of reference point .... <30 caracteres>
Header NAAD1
Instrument .... <20 caracteres>
X of antenna / (m) .... +mmm.m
Y of antenna / (m) .... +mmm.m
Z of antenna / (m) .... +mmm.m
Header secondary navigation NAAD2
Instrument .... <20 caracteres>
X of antenna / (m) .... +mmm.m
Y of antenna / (m) .... +mmm.m
Z of antenna / (m) .... +mmm.m
Header navigation engin NAEN1
Instrument .... <20 caracteres>
X of antenna / (m) .... +mmm.m
Y of antenna / (m) .... +mmm.m
Z of antenna / (m) .... +mmm.m

Header for bathymetry .... BATHY
Instrument .... <20 caracteres>
X of antenna / (m) .... +mmm.m
Y of antenna / (m) .... +mmm.m
Z of antenna / (m) .... +mmm.m
Immersion of base (m) .... +mmm.m
End of message .... <CR><LF>

b.) Message of current navigation

$APSTM,DATE,HEADER,MESSAGE

registered every 10s.

Header .... $APSTM
Date
Date .... jj/mm/aa
Time .... hh:mm:ss.sss
Header
Header .... NACOU
Message
Latitude .... s,dd,mm.mmmmm
Longitude .... s,ddd,mm.mmmmm
Loch Doppler longitudinal (nds) .... +nnn.nn
Loch Doppler transversal (nds) .... +nnn.nn
Loch electromagnetic longitudinal (nds) .... +nnn.nn
Loch electromagnetic transversal (nds) .... +nnn.nn
Direction scientific compass (deg) .... ccc.cc
Compass on bridge (deg) .... ccc.cc
Quality of navigation (0 -> 9) x
Geodetic system xxxx
Wind speed (nods) xx
Wind direction (degrees) xxx

c.) Brute navigation

$APSTM,DATE, EN-TETE, MESSAGE DE NAVIGATION BRUTE, [CR][LF]

registered every 10 s.

General Header .... $APSTM
Date
Date .... jj/mm/aa
Time .... hh:mm:ss.sss
Message Header .... NAADn
(NAAD1 = system nominal, NAAD2 = secondary system)
Message
Latitude .... s,dd,mm.mmmmm
Longitude .... s,ddd,mm.mmmmm
Differential flag x
Hdop .... xx.x
Geodetic system xxxx
Internal date of receiver .... xx/xx/xx
Internal time of receiver .... xx:xx:xx
End of message .... [CR][LF]

4.4.2 Format of ECOS files

General structure of ECOS files

$APSEC,DATE, EN-TETE, MESSAGE TO REGISTER

Several types of information are recorded :

a.) TRINAV : NACON : Configuration of the navigation system
b.) NATAM : Information about the steamer
c.) DEPRO : Beginning of profiles
d.) FIPRO : End of profiles
e.) COFLU: Configuration of steamer, where are the birds on the steamer

<u>b.) Streamer information</u>

$APSEC, DATE, HEADER, MESSAGE

The information is registered for every shot.

General header ....$APSEC
Date
Date..jj/mm/aa
Time ....hh:mm:ss.sss
Beginning of shot information.. NATAM
Message
Date of shot point (GPS time) .... jj/mm/aa
Time of shot point (GPS time) ....hh:mm:ss.sss
Flag for validity of GPS time... f
0 : not valid 1 : valid
Latitude of shot point ....s,dd,mm.mmmmm
Longitude of shot point ....s,ddd,mm.mmmmm
Shot number.. ttttt
Bathymetry.. bbbb.bb
Magnetism .... mmmmm.mm
Direction to buoy ....ggg.gg
Distance to buoy ....dddd.d
Birds (Directions, Depth, Inclination, Temperature) .... 22*(ccc.cppp.p+ii.itt.t)
In course of the mission just 16 birds were used, not the described 22. The temperature sensors are not working.
(values not registered 999.9)
End of message ....[CR][LF]

<u>c.) Beginning of the profile</u>

$APSEC, DATE, HEADER, MESSAGE FOR BEGINNING OF PROFILE

registered at the beginning of every profile

General Header ....$APSEC
Date
Date ....jj/mm/aa
Time..hh:mm:ss.sss
Beginning of profile information ....DEPRO
Message
Number of profile ....nnnn
End of message ....[CR][LF]

d.) End of profile

$APSEC, DATE, EN-TETE, MESSAGE FOR END OF PROFILE

registered at the end of every profile

General Header ....$APSEC
Date
Date..jj/mm/aa
Time..hh:mm:ss.sss

End of profile information ....FIPRO
Message
Profile number ....nnnn
End of message ....[CR][LF]

5: Shot Information

5.1 Shot Information for each Line

Tim Seher and Violaine Combier

5.1.1 Shot information for all lines from science notebook and ECOS files (Tim Seher)

The approximate geographic positions and times of the start- and endpoints of all the profiles are summarized in tables giving the latitude and longitude of the first and last shot of all the seismic profiles

For the seismic reflection and refraction profiles the first and last shot point was noted electronically by the Genavir crew and in by the IPGP staff manually in the cruise logbook. Where there were differences bigger than five shot points between values noted by the Genavir crew and the IPGP staff for the first and last shot of every profile, the values as noted by the IPGP staff in the logbook were used. Otherwise the shot positions as recorded by the Genavir crew were used. To get a first estimate of the actual start of the measured profiles the positions for these shot points were extracted from the Ecos navigation files and are summarized in the following tables.

The differences between the start and the end of the line as recorded by the staff from Genavir and the IPGP show that this information should not be used for the relocation of the seismic lines. Furthermore the positions of the first and the last shot differ strongly from the planned positions for the end and the start of a profile. This highlights the need to relocate the profiles based on the navigational information as recorded by the differential GPS, which should give positions to within one meter variance.

Line	First Shot				Last Shot			
	#	Lat	Lon	Day/Year Time	#	Lat	Lon	Day/Year Time
Seismic Reflection 3D (2594 cu in airgun array, 37.5 m shot spacing)								
SSM1	1	37,302	-32,392	156/2005 14:13	498	37,247	-32,190	156/2005 16:18
SSM2	2220	37,302	-32,389	156/2005 23:24	2718	37,249	-32,191	157/2005 01:29
SSM3	4342	37,303	-32,388	157/2005 08:06	4842	37,249	-32,191	157/2005 10:04
SSM4	6434	37,304	-32,388	157/2005 16:52	6934	37,250	-32,190	157/2005 18:52
SSM5	8542	37,305	-32,388	158/2005 01:25	9040	37,251	-32,191	158/2005 03:27
SSM6	10629	37,306	-32,387	158/2005 10:07	11130	37,252	-32,189	158/2005 120:8
SSM7	12768	37,307	-32,387	158/2005 18:47	13272	37,252	-32,188	158/2005 20:47
SSM8	14868	37,308	-32,387	159/2005 03:25	15368	37,253	-32,189	159/2005 05:27
SSM9	16922	37,308	-32,385	159/2005 11:51	17418	37,254	-32,189	159/2005 13:53
SSM10	18937	37,310	-32,385	159/2005 20:10	19437	37,255	-32,188	159/2005 22:10
SSM11A	22978	37,310	-32,385	160/2005 12:49	23478	37,256	-32,188	160/2005 14:52
SSM12	24991	37,311	-32,385	160/2005 21:08	25490	37,257	-32,188	160/2005 23:06
SSM13	27015	37,312	-32,385	161/2005 05:29	27514	37,258	-32,187	161/2005 07:31
SSM14	29064	37,313	-32,384	161/2005 13:37	29562	37,259	-32,188	161/2005 15:36
SSM15	31118	37,313	-32,381	161/2005 21:47	31608	37,259	-32,187	161/2005 23:41
SSM16	20986	37,315	-32,377	160/2005 04:39	21468	37,260	-32,187	160/2005 06:40
SSM17	1154	37,262	-32,188	156/2005 19:08	1655	37,316	-32,386	156/2005 21:10
SSM18	3272	37,263	-32,187	157/2005 03:48	3775	37,317	-32,387	157/2005 05:48
SSM19	5370	37,264	-32,188	157/2005 12:15	5870	37,318	-32,385	157/2005 14:27
SSM20	7488	37,263	-32,187	157/2005 21:08	7988	37,319	-32,384	157/2005 23:10
SSM21	9594	37,265	-32,186	158/2005 05:46	10092	37,319	-32,383	158/2005 07:52
SSM22	11682	37,266	-32,185	158/2005 14:23	12183	37,320	-32,383	158/2005 16:23
SSM23	13820	37,267	-32,186	158/2005 23:05	14318	37,321	-32,383	159/2005 01:11
SSM24	15933	37,268	-32,186	159/2005 07:46	16432	37,322	-32,383	159/2005 09:48
SSM25	17927	37,268	-32,182	159/2005 15:59	18433	37,323	-32,382	159/2005 18:05
SSM26	33193	37,323	-32,380	162/2005 06:03	33691	37,269	-32,182	162/2005 07:59

SSM27	35220	37,323	-32,380	162/2005 13:59	35718	37,270	-32,182	162/2005 15:57
SSM28	37319	37,325	-32,379	162/2005 22:14	37818	37,271	-32,182	163/2005 00:09
SSM29	39439	37,325	-32,379	163/2005 06:47	39939	37,271	-32,182	163/2005 08:43
SSM30	19946	37,273	-32,183	160/2005 00:16	20450	37,328	-32,382	160/2005 02:24
SSM31	23983	37,274	-32,183	160/2005 17:00	24482	37,328	-32,380	160/2005 19:04
SSM32	25981	37,274	-32,182	161/2005 01:10	26481	37,329	-32,380	161/2005 03:13
SSM33	28048	37,275	-32,182	161/2005 09:40	28548	37,330	-32,379	161/2005 11:36
SSM34	30095	37,276	-32,181	161/2005 17:46	30595	37,330	-32,379	161/2005 19:43
SSM35	32114	37,277	-32,182	162/2005 01:44	32615	37,332	-32,380	162/2005 03:44
SSM36	21990	37,278	-32,181	160/2005 08:51	22492	37,332	-32,378	160/2005 10:52
SSM37	34209	37,279	-32,181	162/2005 10:01	34707	37,333	-32,378	162/2005 11:58
SSM38	36279	37,279	-32,180	162/2005 18:12	36778	37,334	-32,377	162/2005 20:07
SSM39	38371	37,280	-32,179	163/2005 02:27	38871	37,335	-32,377	163/2005 04:27
Seismic Refraction Part 1 (3D Box, 8410 cu in airgun array, 150 m shot spacing)								
SSM101	1	37,531	-32,176	167/2005 22:16	350	37,086	-32,368	168/2005 03:48
SSM102	8852	37,490	-32,387	174/2005 02:09	9091	37,184	-32,515	174/2005 06:01
SSM103	3035	37,477	-32,335	170/2005 01:17	3275	37,174	-32,475	170/2005 05:03
SSM104	492	37,096	-32,480	168/2005 06:04	788	37,468	-32,300	168/2005 11:02
SSM105	2542	37,152	-32,395	169/2005 15:28	2751	37,419	-32,278	169/2005 18:50
SSM106	850	37,450	-32,233	168/2005 12:02	1091	37,141	-32,362	168/2005 15:57
SSM107	2234	37,439	-32,197	169/2005 10:35	2474	37,132	-32,331	169/2005 14:23
SSM108	1191	37,128	-32,312	168/2005 17:36	1432	37,435	-32,172	168/2005 21:28
SSM109	1889	37,121	-32,282	169/2005 04:52	2126	37,426	-32,152	169/2005 08:49
SSM110	1525	37,421	-32,116	168/2005 23:00	1768	37,111	-32,250	169/2005 02:53
SSM111	8179	37,143	-32,176	173/2005 14:59	8384	37,405	-32,068	173/2005 18:29
SSM112	6406	37,378	-32,600	172/2005 09:06	6805	37,203	-31,960	172/2005 15:33
SSM113	8495	37,392	-32,022	173/2005 20:23	8735	37,497	-32,407	174/2005 00:14
SSM114	5295	37,346	-32,042	171/2005 14:45	5534	37,451	-32,427	171/2005 18:40
SSM115	5627	37,418	-32,470	171/2005 20:11	5885	37,315	-32,053	172/2005 00:19
SSM116	4984	37,400	-32,446	171/2005 00:40	5223	37,295	-32,061	171/2005 13:34
SSM117	5974	37,273	-32,073	172/2005 01:51	6294	37,414	-32,587	172/2005 07:17
SSM118	4402	37,261	-32,079	170/2005 23:26	4883	37,368	-32,462	171/2005 08:02
SSM119	4068	37,318	-32,483	170/2005 18:05	4309	37,214	-32,096	170/2005 21:59
SSM120	6905	37,165	-31,979	172/2005 17:14	7222	37,305	-32,488	172/2005 22:28
SSM121	3721	37,180	-32,114	170/2005 12:20	3959	37,286	-32,497	170/2005 16:16
SSM122	7329	37,267	-32,504	173/2005 00:10	7568	37,162	-32,120	173/2005 04:01
SSM123	3398	37,241	-32,513	170/2005 07:09	3635	37,134	-32,133	170/2005 10:56
SSM124	7638	37,103	-32,148	173/2005 5:16	7876	37,207	-32,530	173/2005 09:16
SSM125	9155	37,147	-32,494	174/2005 06:33	9460	37,083	-32,249	174/2005 09:08
Seismic Refraction Part 2 (3D box, 5658 cu in airgun array, 75 m shot spacing)								
SSM125a	7973	37,155	-32,512	173/2005 10:49	8032	37,129	-32,418	173/2005 11:46
SSM1011	9806	37,036	-32,390	174/2005 11:58	10609	37,547	-32,169	174/2005 18:38
SSM130	10903	37,460	-32,279	174/2005 21:11	11418	37,132	-32,421	175/2005 01:22
Seismic Refraction Part 3 (2D lines, 8410 cu in airgun array, 425 m shot spacing)								
SSM212	26	37,123	-31,672	177/2005 09:12	295	37,459	-32,893	177/2005 22:56
SSM201	504	36,787	-32,502	178/2005 15:29	883	37,786	-32,030	179/2005 08:36

Seismic Refraction Part 4 (2D lines, 8410 cu in airgun array, 150 m shot spacing)								
SSM301	1169	37,444	-32,214	179/2005 13:35	1409	37,137	-32,346	179/2005 17:40
SSM312	1619	37,238	-32,089	179/2005 21:02	1859	37,344	-32,474	180/2005 00:54

5.1.2 Description des profils pour MCS (Violaine Combier)

The shot and CDP numbers are the ones used for Focus processing on board.

5.1.2.1- Description des profils du Leg 1

For Leg 1, 60 shots were added after the ship passed the end of line to ensure full fold of all CDPs between the line boundaries.

Line	Orientation	1st CDP	1st shot ECOS	Last shot ECOS	Last shot used	DLT #	Shot spacing
1	W-E	780	8	498	558	3	37,5
2	W-E	8940	2220	2718	2777	4	37,5
3	W-E	2388	4341	4842	4902	5	37,5
4	W-E	14868	6434	6934	6994	5	37,5
5	W-E	8646	8542	9040	9100	6	37,5
6	W-E	2670	10628	11130	11190	7	37,5
7	W-E	15474	12769	13272	13332	7	37,5
8	W-E	9012	14869	15368	15428	8	37,5
9	W-E	2214	16919	17418	17478	9	37,5
10	W-E	14280	18937	19437	19497	9	37,5
11	W-E	14880	22978	23478	23538	13	37,5
12	W-E	8430	24991	25490	25549	14	37,5
13	W-E	2718	27015	27514	27574	15	37,5
14	W-E	14982	29064	29562	29622	15	37,5
15	W-E	8400	31110	31608	31668	16	37,5
16	W-E	2982	20986	21468	21528	13	37,5
17	E-W	2574	1154	1655	1715	4	37,5
18	E-W	15228	3272	3776	3836	4	37,5
19	E-W	8526	5368	5870	5930	5	37,5
20	E-W	2418	7488	7988	8048	6	37,5
21	E-W	14850	9594	10092	10152	6	37,5
22	E-W	8970	11683	12183	12243	7	37,5
23	E-W	2724	13819	14318	14378	8	37,5
24	E-W	15330	15930	16432	16492	8	37,5
25	E-W	8274	17933	18433	18493	9	37,5
26	W-E	2466	33192	33691	33751	17	37,5
27	W-E	14598	35221	35718	35778	17	37,5
28	W-E	8682	37319	37818	37878	18	37,5
29	W-E	21366	39441	39939	39999	18	37,5
30	E-W	1200	19946	20450	20510	11+12	37,5
31	E-W	2292	23983	24482	24542	14	37,5
32	E-W	14226	25981	26481	26541	14	37,5
33	E-W	8904	28048	28548	28608	15	37,5
34	E-W	2340	30096	30595	30655	16	37,5
35	E-W	14304	32111	32615	32675	16	37,5
36	E-W	8964	21990	22492	22552	13	37,5
37	E-W	8550	34208	34707	34767	17	37,5
38	E-W	2484	36280	36778	36858	18	37,5
39	E-W	14976	38371	38871	38931	18	37,5

5.1.2.2- Description of Leg 2 profiles

Line	Orientation	1st CDP	Last CDP	1st shot ECOS	Last shot ECOS	Number of CDPs	DLT #	Shot spacing	Remarque
101	N-S	379	10866	50000	422	10488	21	150m	2nd shot ECOS=1
102	N-S	1603	7122	6907	7161	5520	26	150m	
103	N-S	6715	13194	3035	3290	6480	23	150m	
104	S-N	1939	9762	492	803	7824	22	150m	
105	S-N	1099	5970	2542	2731	4872	23	150m	
106	N-S	10531	17034	850	1106	6504	22	150m	
107	N-S	43699	50178	2234	2489	6480	22	150m	
108	S-N	18715	25218	1191	1447	6504	22	150m	
109	S-N	35443	41850	1889	2141	6408	22	150m	
110	N-S	26707	33258	1525	1783	6552	22	150m	
111	S-N	32035	37674	8179	8399	5640	25	150m	
112	W-E	35707	46002	6406	6820	10296	24	150m	
113	E-W	39619	46098	8495	8750	6480	25	150m	
114	E-W	9043	15498	5295	5549	6456	24	150m	
115	W-E	17491	23898	5647	5899	6408	24	150m	
116	W-E	1603	8058	4984	5238	6456	24	150m	
117	E-W	25339	33738	5974	6309	8400	24	150m	
118	E-W	42043	48498	4644	4898	6456	23	150m	
119	W-E	31387	38010	4063	4324	6624	23	150m	
120	E-W	1555	9882	6905	7237	8328	25	150m	
121	E-W	25314	29610	3795	3974	4297	23	150m	
122	W-E	11707	17682	7329	7563	5976	25	150m	
123	W-E	15427	21834	3398	3650	6408	23	150m	
124	E-W	19075	25506	7638	7891	6432	25	150m	
125b	W-E	379	5070	9129	9490	4692	27	75m	
130	N-S	21643	28182	10903	11418	6540	27	75m	
1011_v	S-N	8491	18486	9806	10609	9996	27	75m	

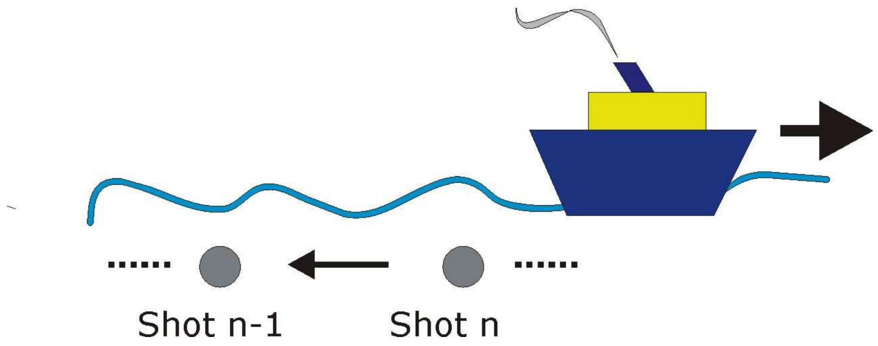
5.2 Airgun configurations and shot delays

	dx (m)	dy (m)	Babord Depth (m)			Tribord Depth (m)			Delay (ms)
			1	2	3	1	2	3	
MCS (cadence 37.5 m (15s)) LEG 1 (05/06-12/06/2005)	0	94,7	7-12	9-15	13-18	9-11	11-15	14-19	24,95
3D OBS (cadence 150m (58 s)) LEG 2 (Source 1) (16/06/2005)	0	114,7	15-19	20-24	25-31	16-19	22-25	26-29	142,15
3D OBS (cadence 75m (29 s)) LEG 2 (Source 2) (New configuration 23/06/05 after 7:00)	0	119.45	18-22	23-28	28-32	14-18	18-24	21-26	150.4
2D OBS (cadence 425m (165 s)) LEG 2 (Source 1)	0	119,45	19-23	25-26	30-35	17-20	21-25	23-27	150,4

5.2 Shot position calculations

Tim Seher

To derive the true positions of the seismic shots from the shot positions recorded by the ECOS navigation system, the ECOS positions had to be corrected for the offset between the maximum bubble pulse and the DGPS antenna mounted on the ship. The offset is of the order of 100 m and bigger than the error on the localisation of our shots. So to accurately locate our shots, the offset between the ship and the maximum bubble must be corrected.



To do this the direction ***a*** to the last shot as recorded by the ECOS system was calculated (see illustration above). The distance ***d*** to the bubble pulse was known from the source information (see table below). The source configuration 1 was used during the seismic reflection survey, the second source configuration applies for the first part of the seismic refraction survey (150 m shot interval) and the third source configuration to the rest of the refraction survey (75 m, 300 m and 425 m shot interval).

	Offset	Start	End
Source Configuration 1	94,7	156/2005 14:13	167/2005 22 :16
Source Configuration 2	114,7	167/2005 22 :16	174/2005 06 :02
Source Configuration 3	119,45	174/2005 06 :02	180/2005 00:54

The geographic positions (latitude and longitude) were converted to ***x***-***y***-positions, the direction ***a*** between two shots calculated and the corrected positions ***x' y'*** derived using the following formulas.

$$x' = x + d \cos a$$
$$y' = y + d \sin a$$

Afterwards the positions were converted back to geographic positions (latitude and longitude) and used as the corrected shot points for locating the shots in the refraction survey and generating the shot sections.

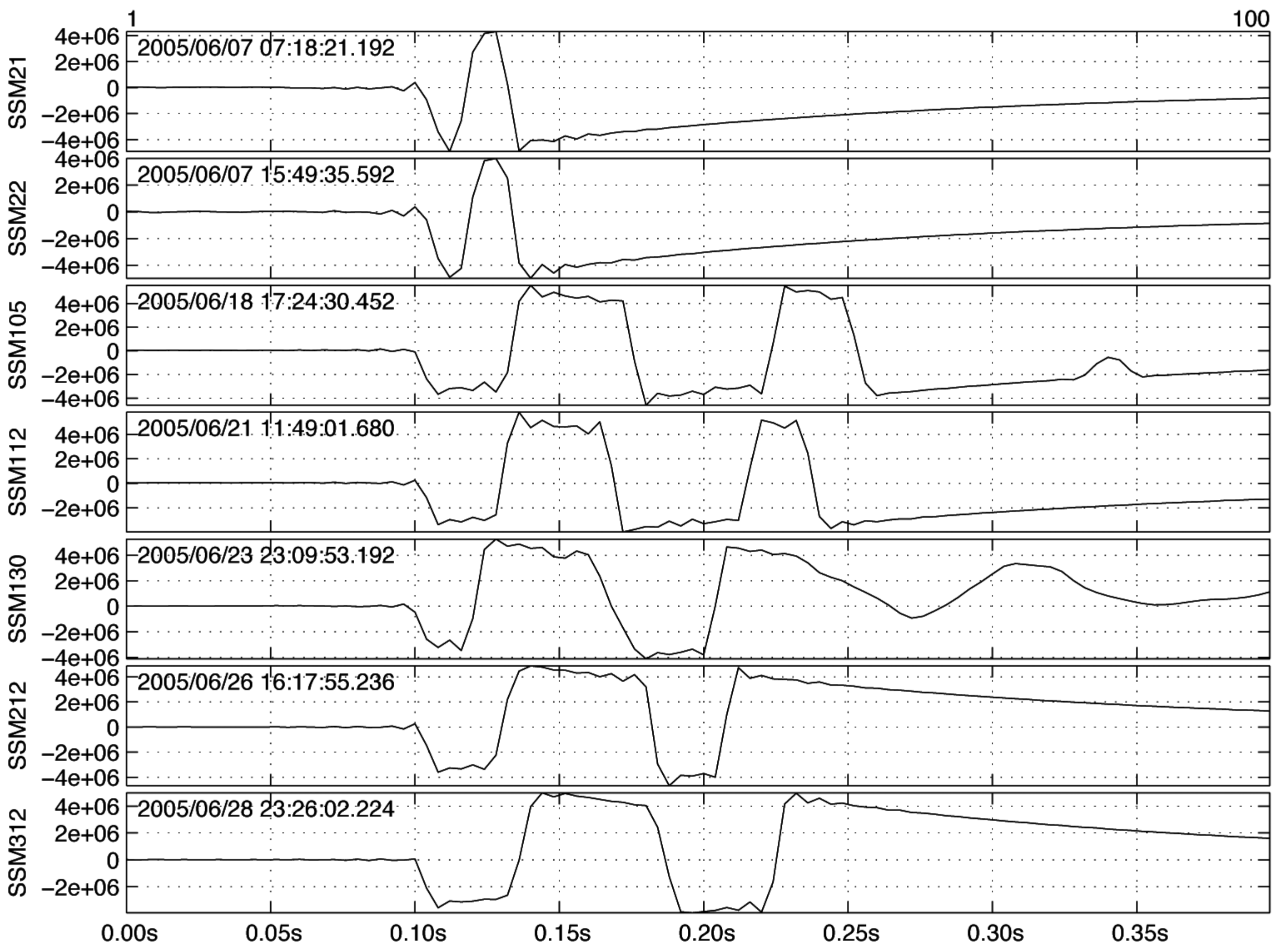
5.3 Airgun signature

Wayne Crawford

Site A10 was an INSU OBS approx 1000 m deep in the water column and 900 m above the seafloor. The site was on the principal across-axis line, and so was shot over with almost all of the airgun configurations. The idea was to allow us to characterise the airgun source signature. The figure below shows the closest shot recorded from each of the gun configurations that crossed this site.

Sample lines	Airgun config	Lines used on
SSM21&SSM22	2594 cu in "MCS centrale" source, 37.5 m spacing, 12 m shot depth	SSM1-SSM39
SSM105&112	8410 cu in "3D OBS first part", 150 m spacing, 25 m shot depth	SSM101-125
SSM130	5658 cu in "3D OBS 2nd part", 75 m spacing, 25 m depth	SSM125b, SSM130, SSM1011
SSM212	8410 cu in "2D OBS", 425 m spacing, 25 m depth	SSM212, 201
SSM312	8410 cu in "2D OBS", 150 m spacing, 25 m depth	SSM301, 312

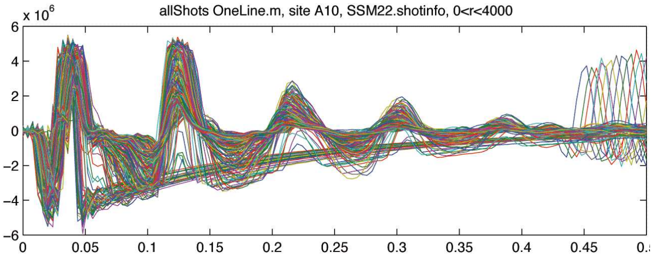
All of the shots shown are the closest shots from the given line. All are within 100 m horizontally except SSM112 (191m) and SSM130 (1708m). The SSM 130 shot shown is the closest shot we had with the 5658 cu in configuration.



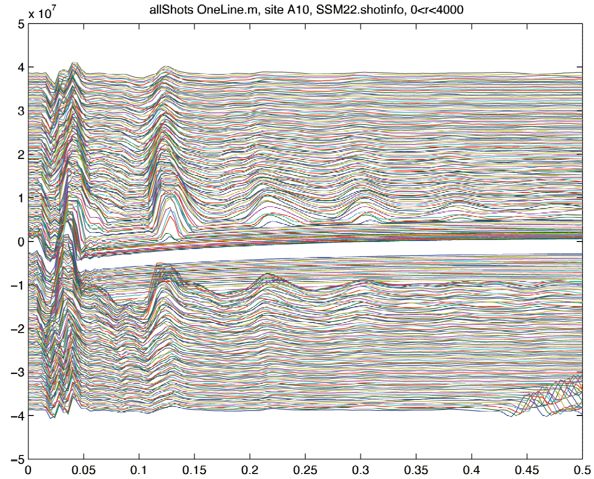
Airgun shots for major lines. Figure generated using Matlab program 'closestShots.m', in which I specify the closest shot time and location and the code extracts the data from the raw A10 LCHEAPO file.

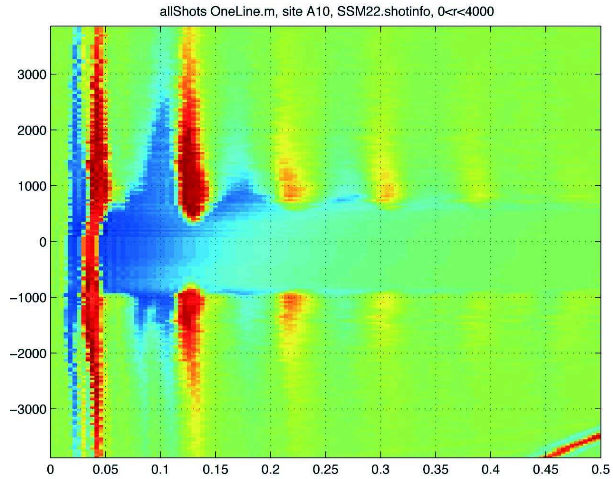
All of the arrivals except the 2594 cu in configuration are clipped, which will hinder shot signature reconstruction. It may be possible to use shots farther away, but multiples become a problem especially since the source signature is clipped to several km away (as seen on line 130's cloests shot). The exponential tail-off seen on almost all the shots also appears to be an instrument clipping/near limit problem, and goes away at greater distances (see below)

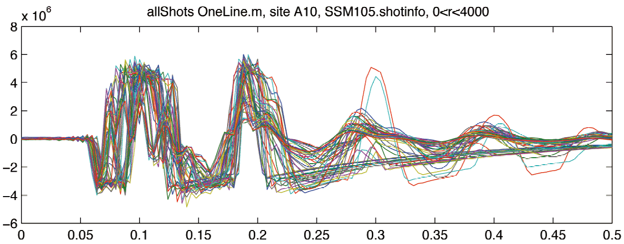
Below are some compilations of shots from each line. I tried to stack them using the shot-instrument distance but this gives errors. So for each line I "modified" A10's position, often by several tenths of a minute (a few hundred meters?). A10 is one of only two sites we relocated during the cruise, but it may drift about with time (it is on a 900 m line above the seafloor). Or, the shot locations I used may be the DGPS antenna location and uncorrected to the actual shot location (about 100 m "behind", which changes with which airgun array was out and of course the ship direction during the line).



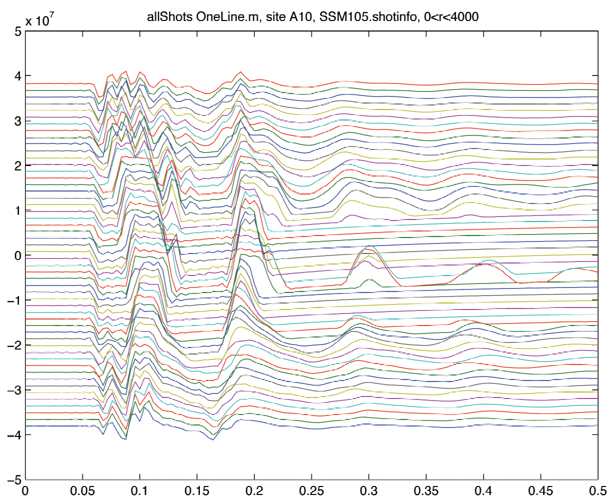
SSM22

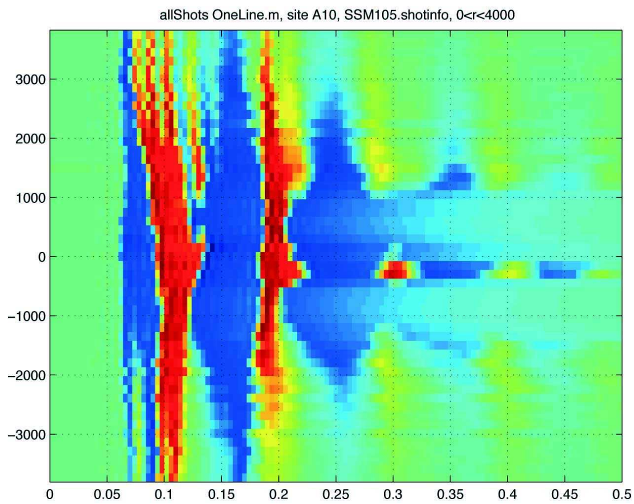


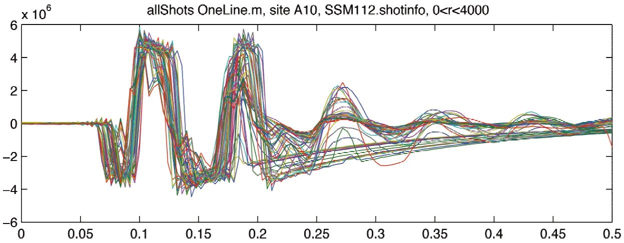




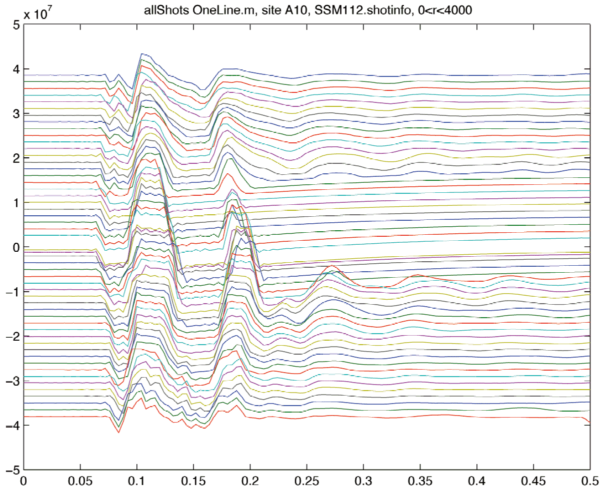
SSM105

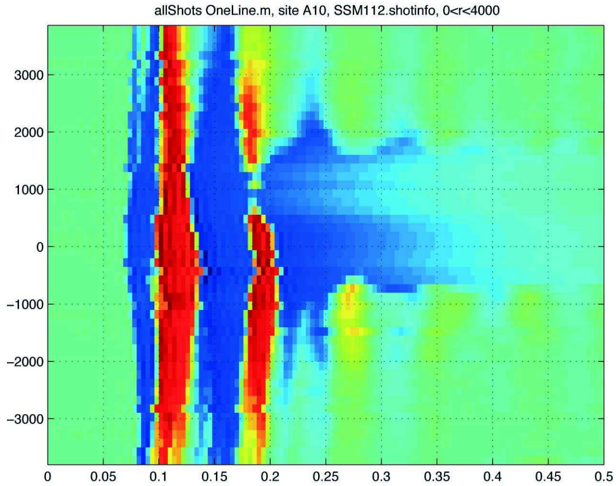


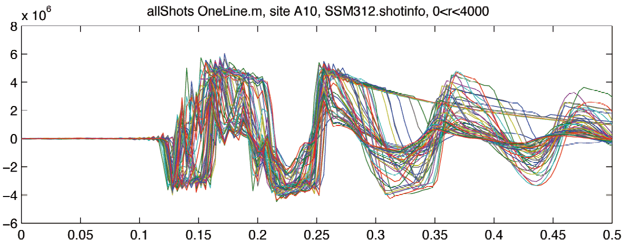




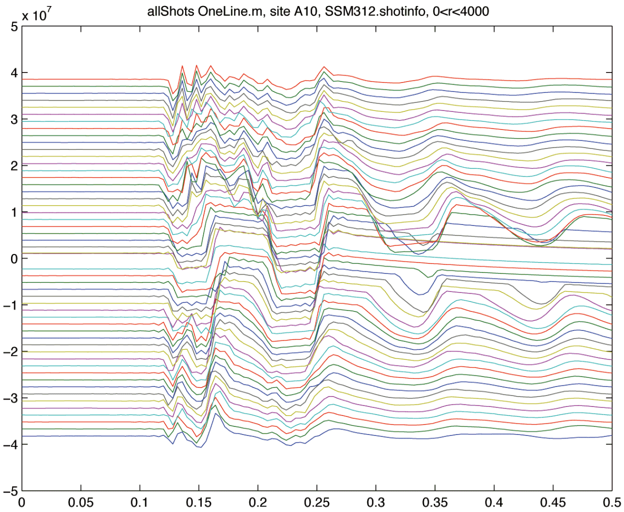
SSM112

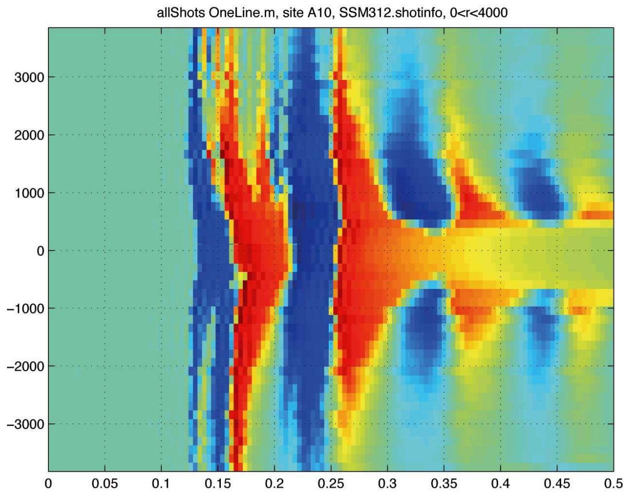






SSM312

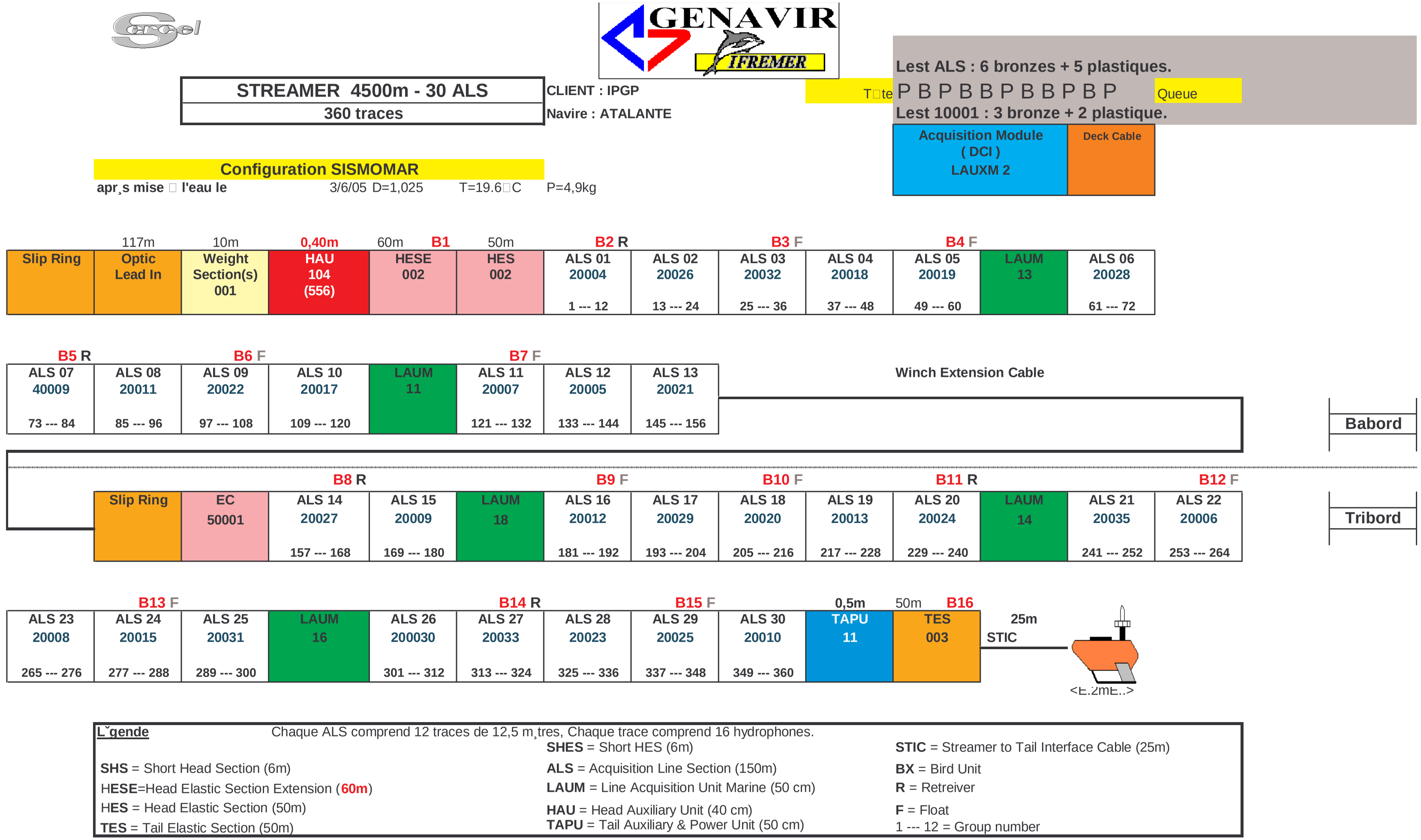




6: Streamer and Airgun Information, and Ship Geometry

6.1 Streamer Configuration

Doga Dusunur and Violaine Combier

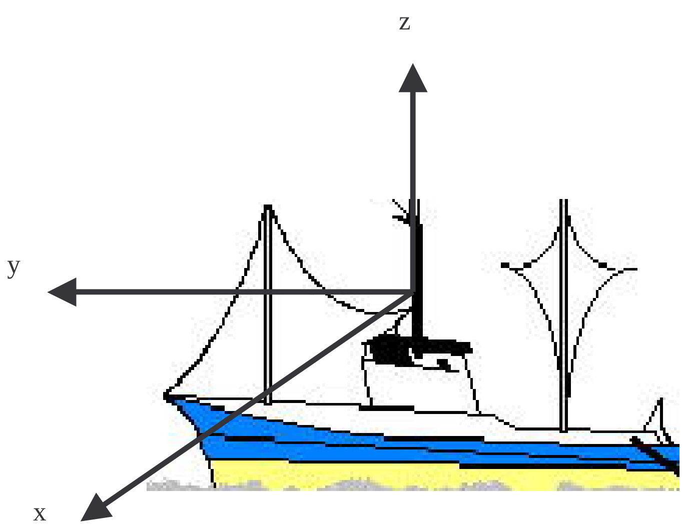


Note: lengths of HAU (in figure) and HESE (in legend) were modified from original file by V Combier after post-cruise conversations with Serge (figure and legend values were inconsistent in original)

6.1.2- MCS- Décalage Antenne NR 103 (for TAIL BUOY DATA)

Navigation Secondaire

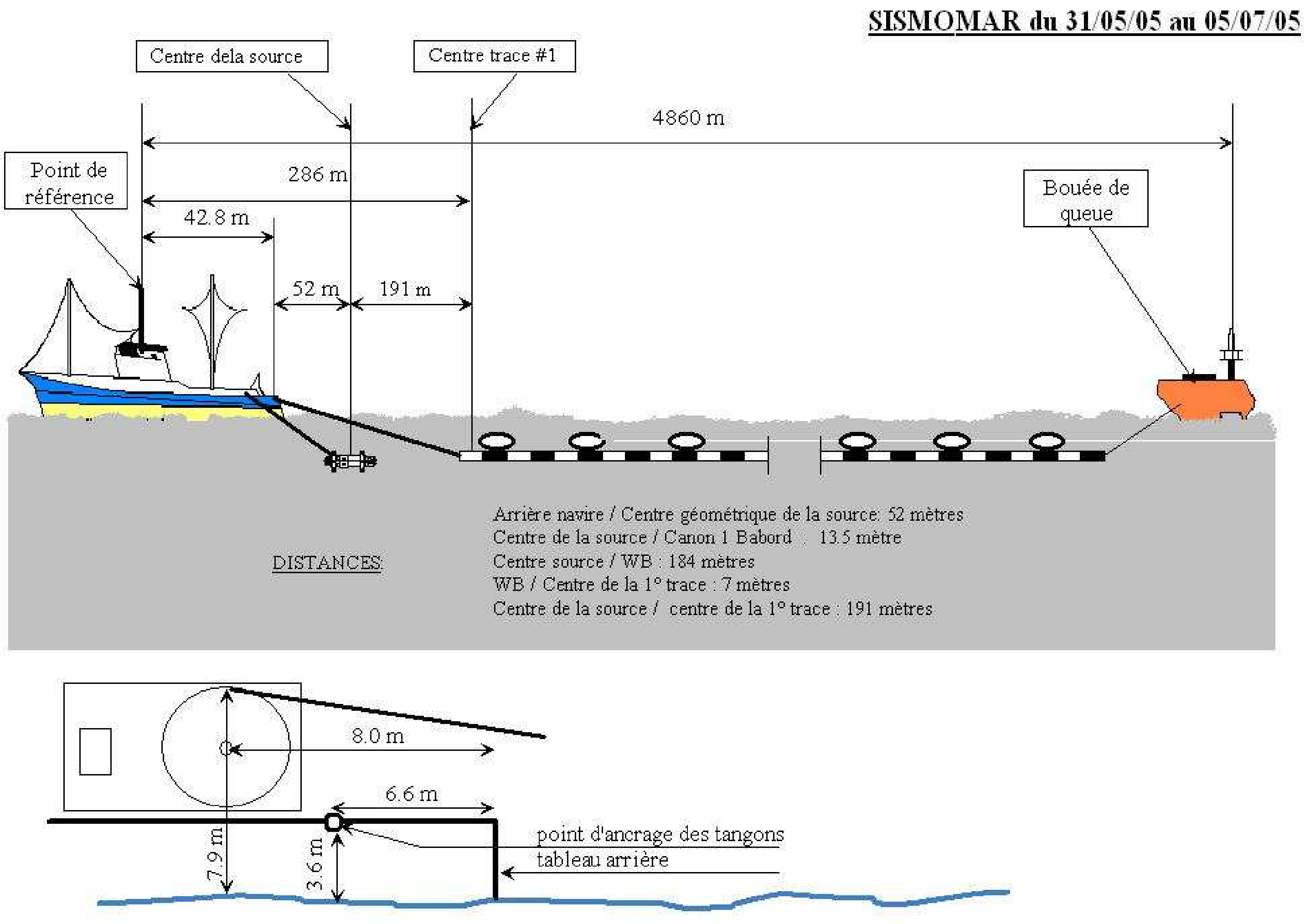
En X : -7.925 m
En Y : -20.30 m
En Z : 13.80 m

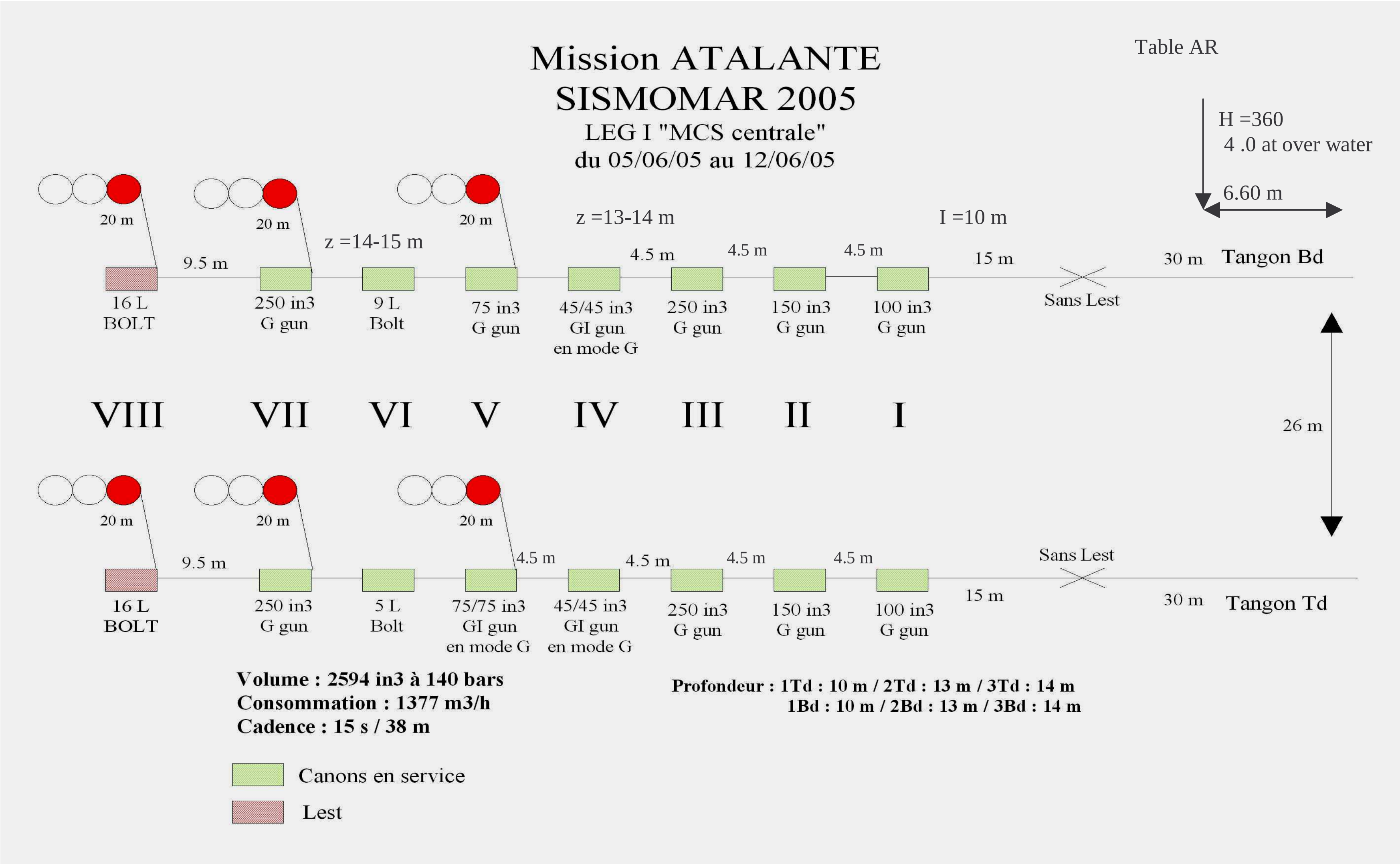


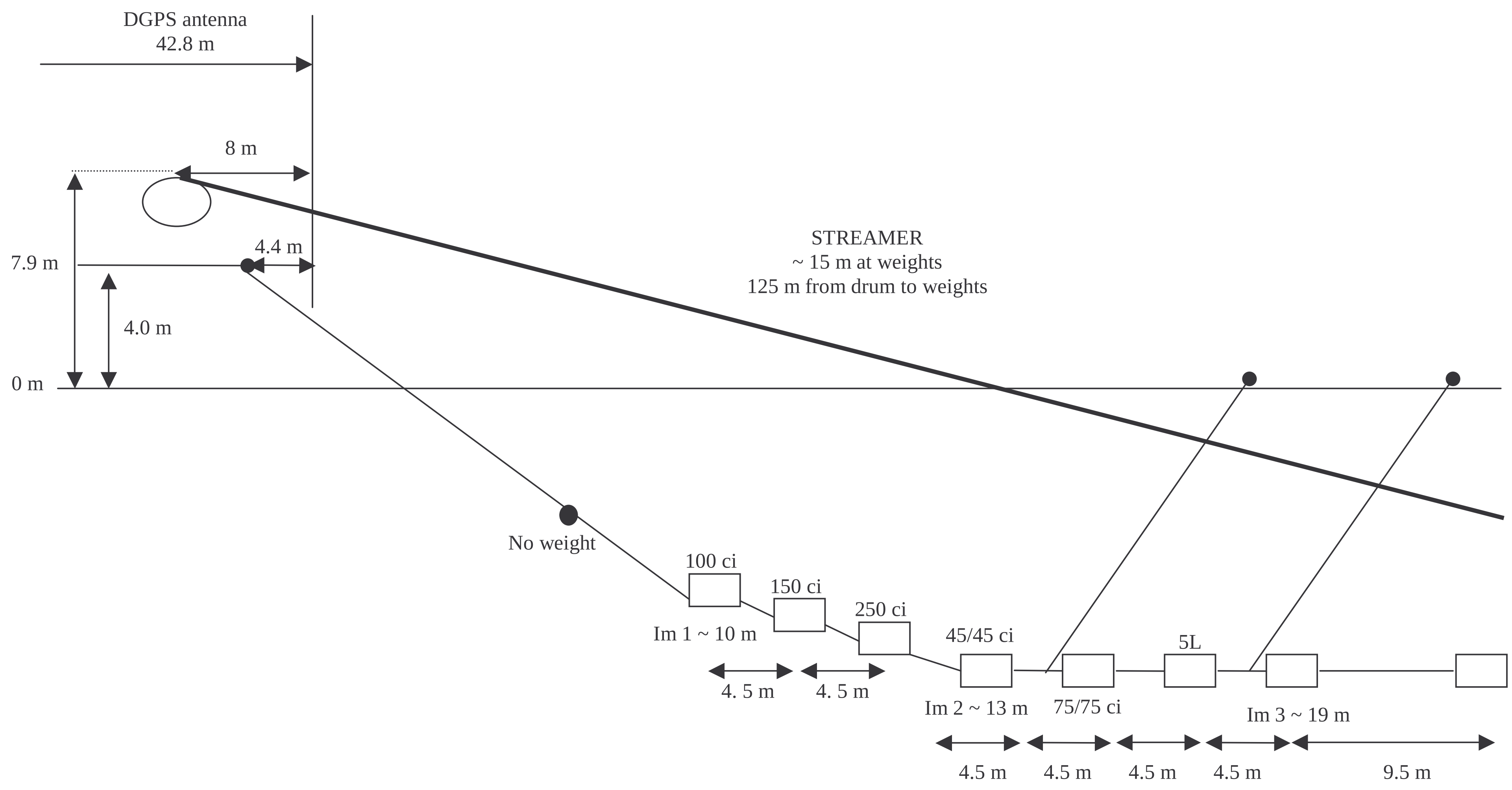
6.2 Airgun Configurations

Doga Dusunur

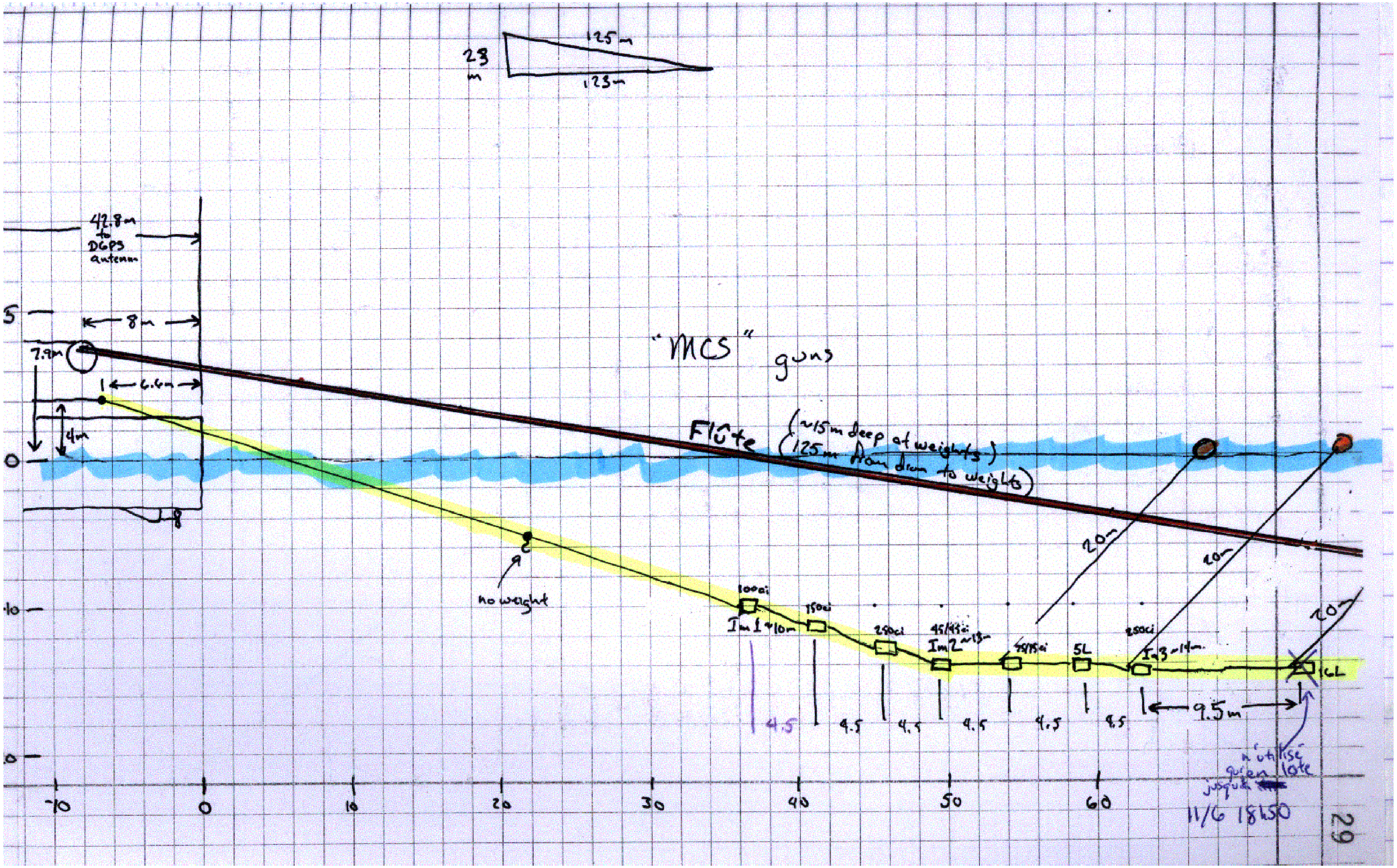
6.2.1 Airgun-Streamer configuration Leg 1 (3D MCS)




Mission ATALANTE
SISMOMAR 2005
LEG I "MCS centrale"
du 05/06/05 au 12/06/05
Table AR
H =360
4 .0 at over water
6.60 m
I =10 m
z =13-14 m
z =14-15 m
20 m
9.5 m
4.5 m
15 m
30 m
Tangon Bd
Sans Lest
16 L
BOLT
250 in3
G gun
9 L
Bolt
75 in3
G gun
45/45 in3
GI gun
en mode G
250 in3
G gun
150 in3
G gun
100 in3
G gun
VIII
VII
VI
V
IV
III
II
I
26 m
16 L
BOLT
250 in3
G gun
5 L
Bolt
75/75 in3
GI gun
en mode G
45/45 in3
GI gun
en mode G
250 in3
G gun
150 in3
G gun
100 in3
G gun
Tangon Td
Volume : 2594 in3 à 140 bars
Consommation : 1377 m3/h
Cadence : 15 s / 38 m
Profondeur : 1Td : 10 m / 2Td : 13 m / 3Td : 14 m
1Bd : 10 m / 2Bd : 13 m / 3Bd : 14 m
Canons en service
Lest

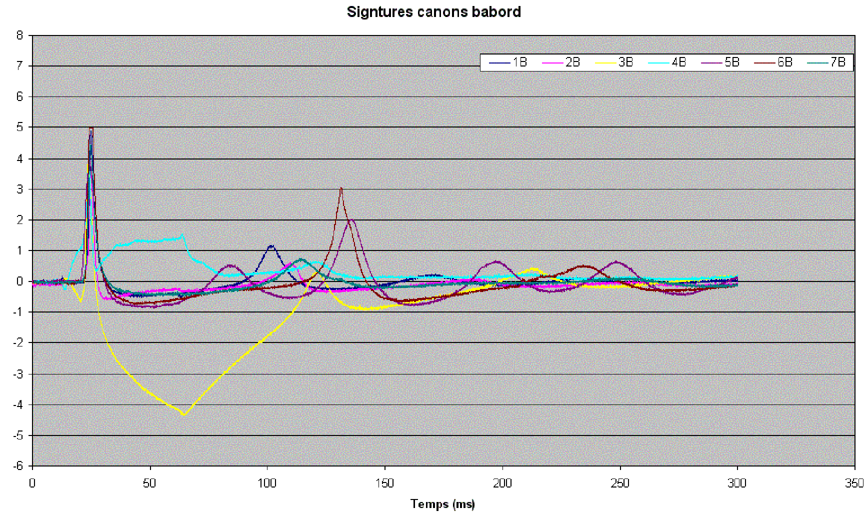


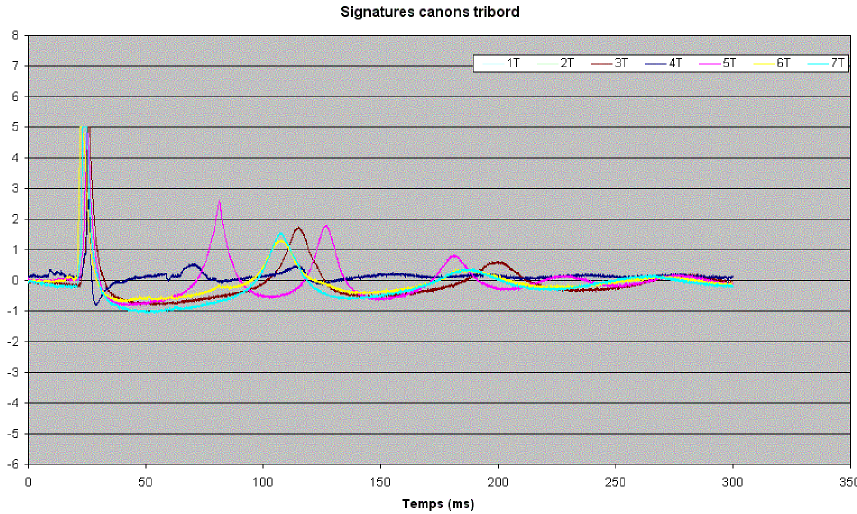
DGPS antenna
42.8 m
8 m
7.9 m
4.4 m
4.0 m
0 m
STREAMER
~ 15 m at weights
125 m from drum to weights
No weight
100 ci
150 ci
250 ci
45/45 ci
5L
Im 1 ~ 10 m
4. 5 m
4. 5 m
Im 2 ~ 13 m
75/75 ci
Im 3 ~ 19 m
4.5 m
4.5 m
4.5 m
4.5 m
9.5 m

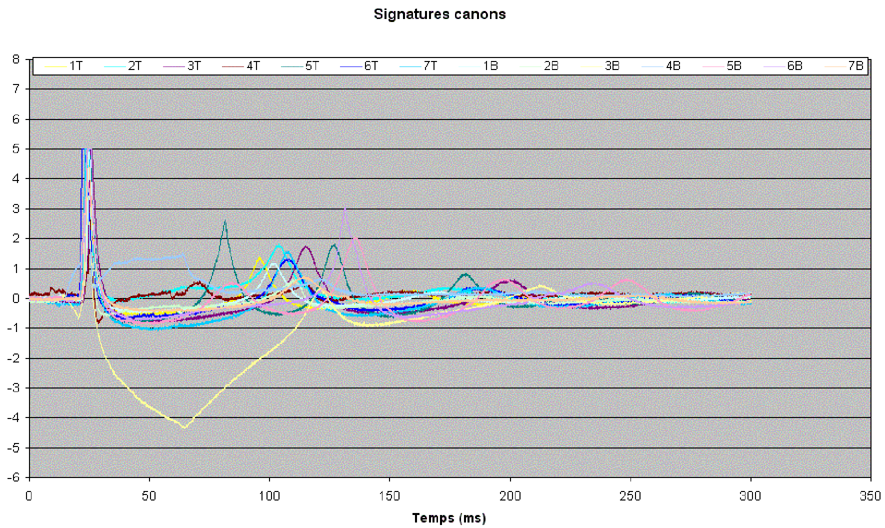


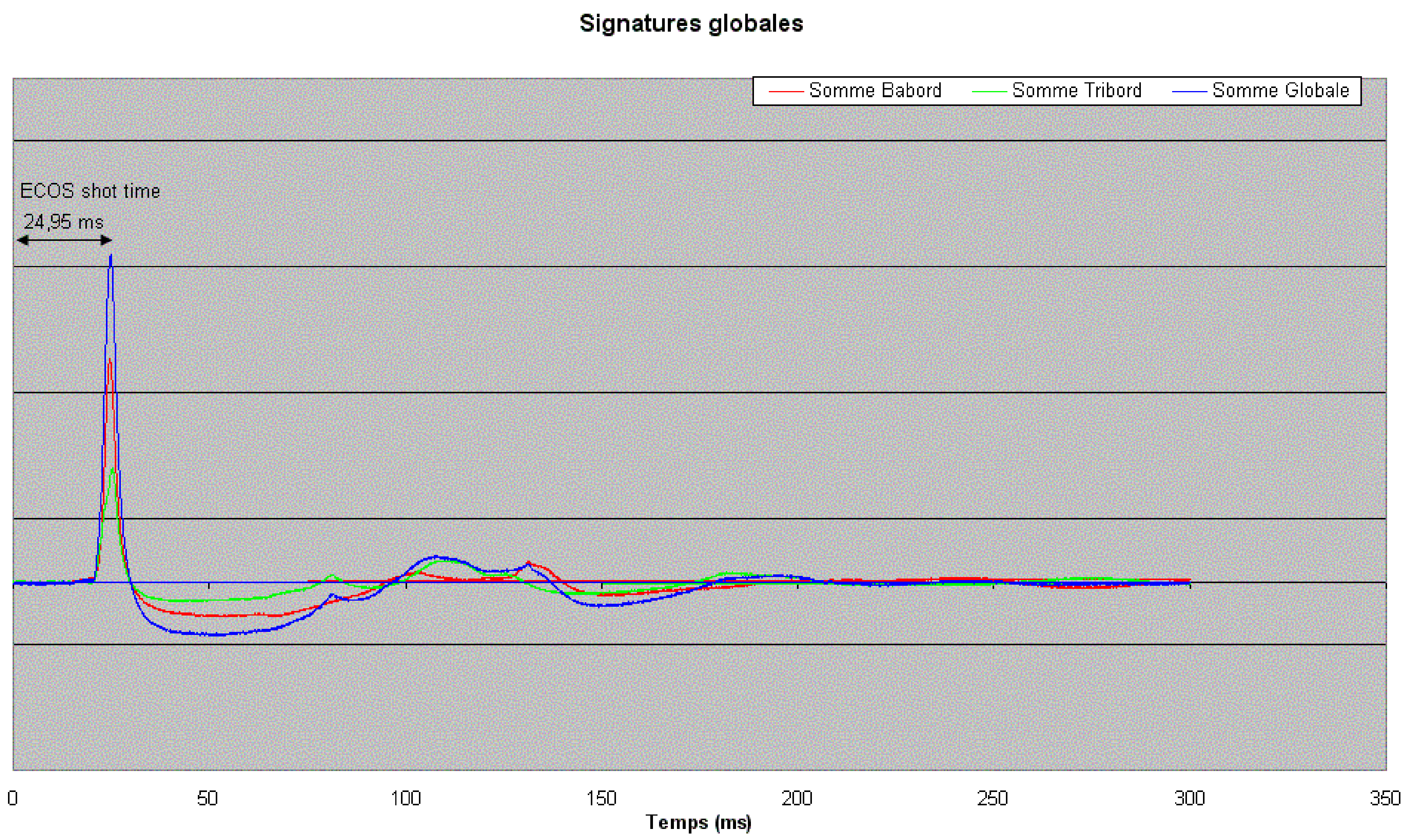
"MCS" guns
Flute (~15m deep at weights) (125m from drum to weights)
42.8m to DGPS antenna
8m
7.9m
6.4m
4m
125m
123m
23 m
no weight
100ci
150ci
250ci
45/45ci
45/45ci
5L
250ci
6L
20m
20m
20m
9.5m
4.5
11/6 18h50
29

6.2.2 Airgun signatures, 3D MCS (37.5 meters)

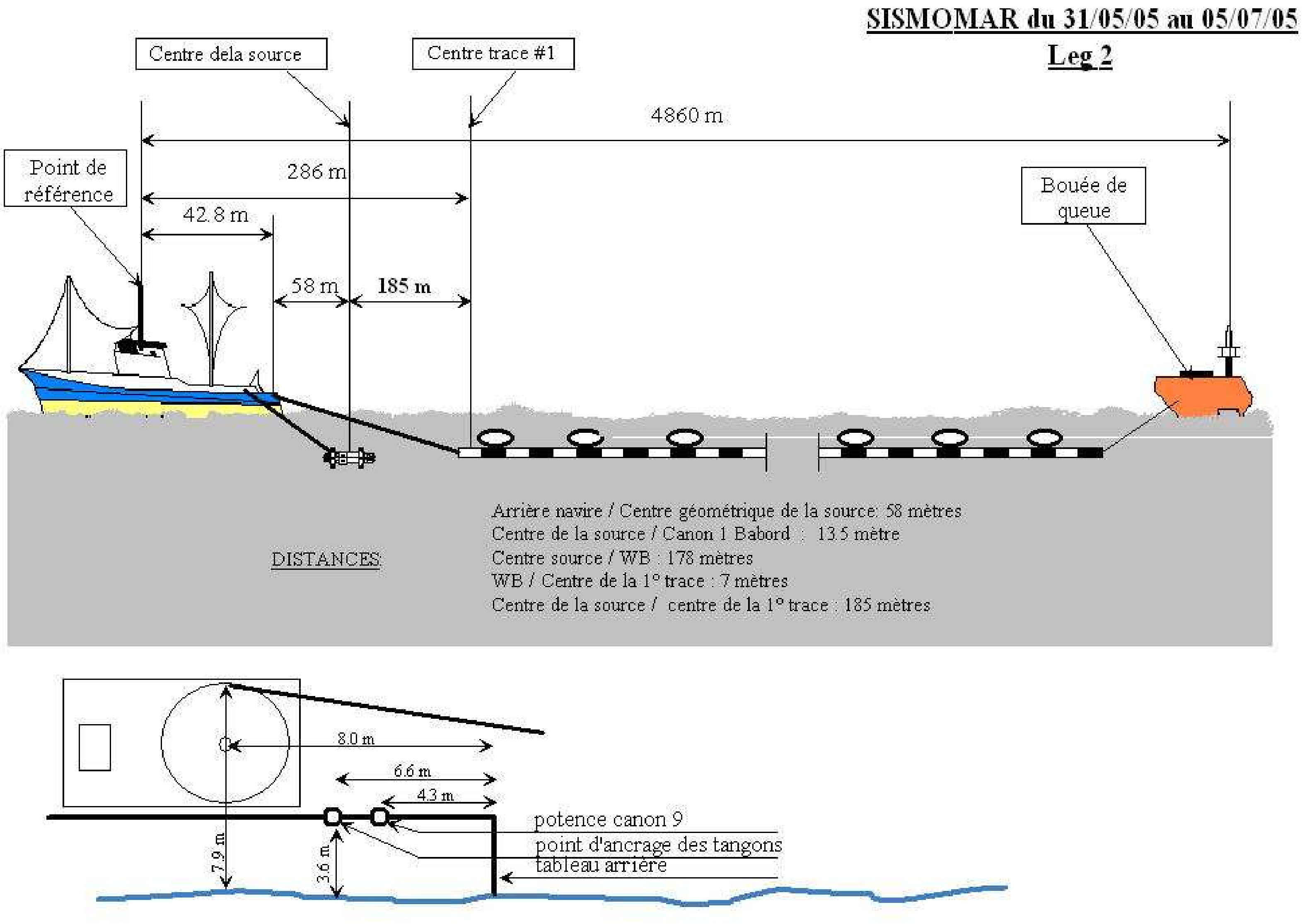







Signatures globales
Somme Babord
Somme Tribord
Somme Globale
ECOS shot time
24,95 ms
0
50
100
150
200
250
300
350
Temps (ms)

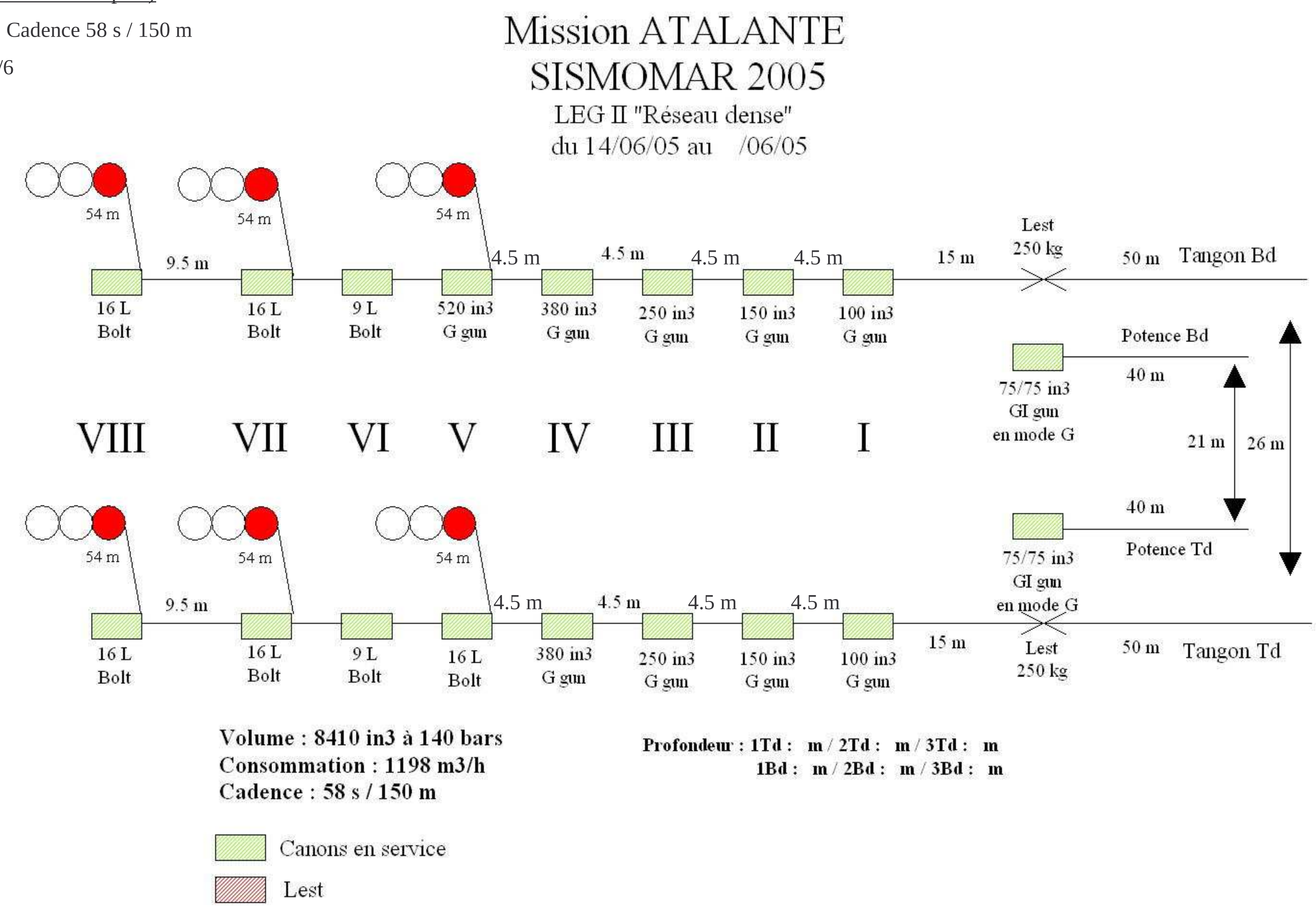
6.2.3 Airgun and Streamer configurations, LEG 2



LEG2 (3D OBS 1st part)

Source 1: Cadence 58 s / 150 m

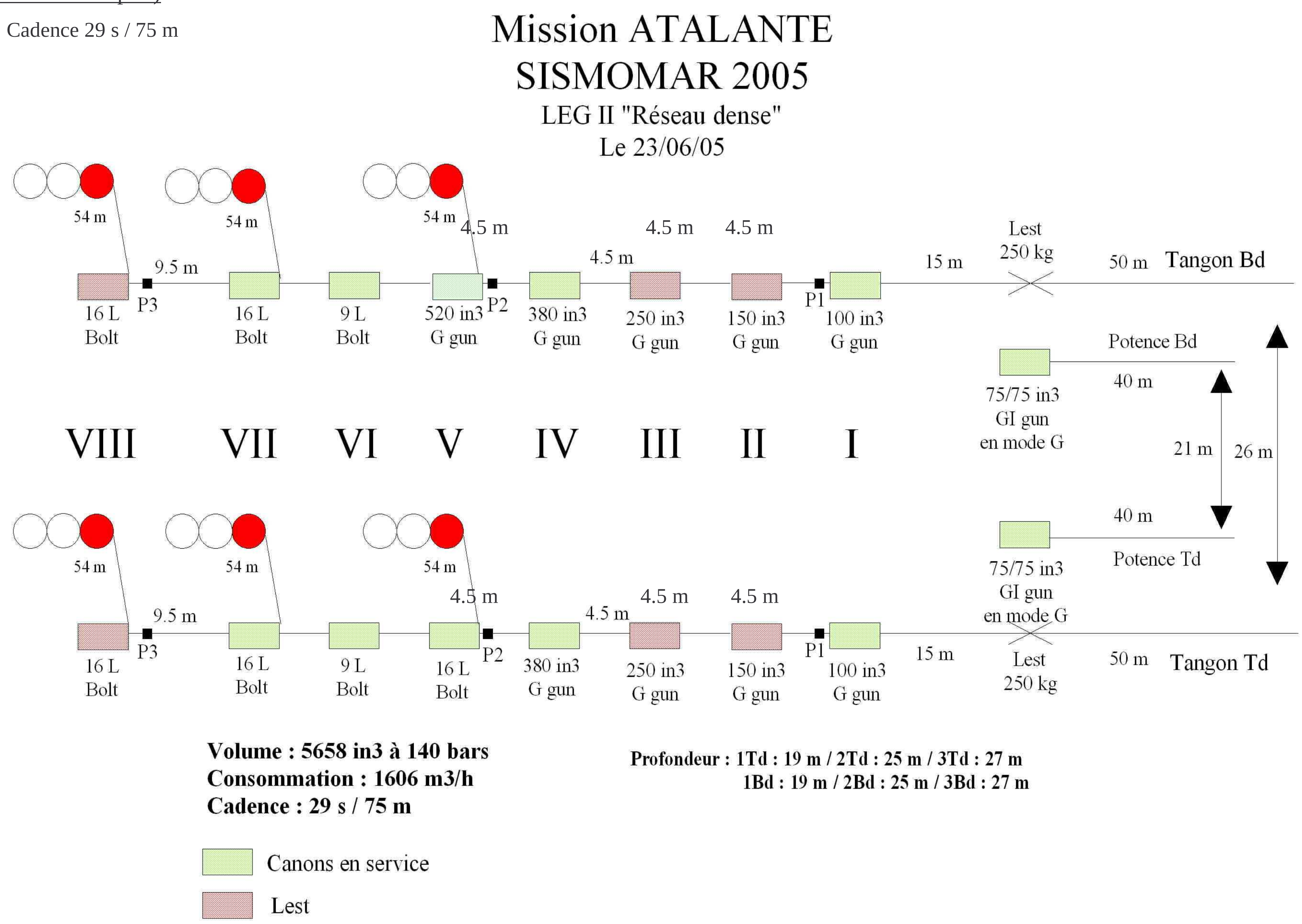
14/6 - 23/6



LEG2 (3D OBS 2nd part)

Source 2: Cadence 29 s / 75 m

23/6



LEG2 (2D OBS)

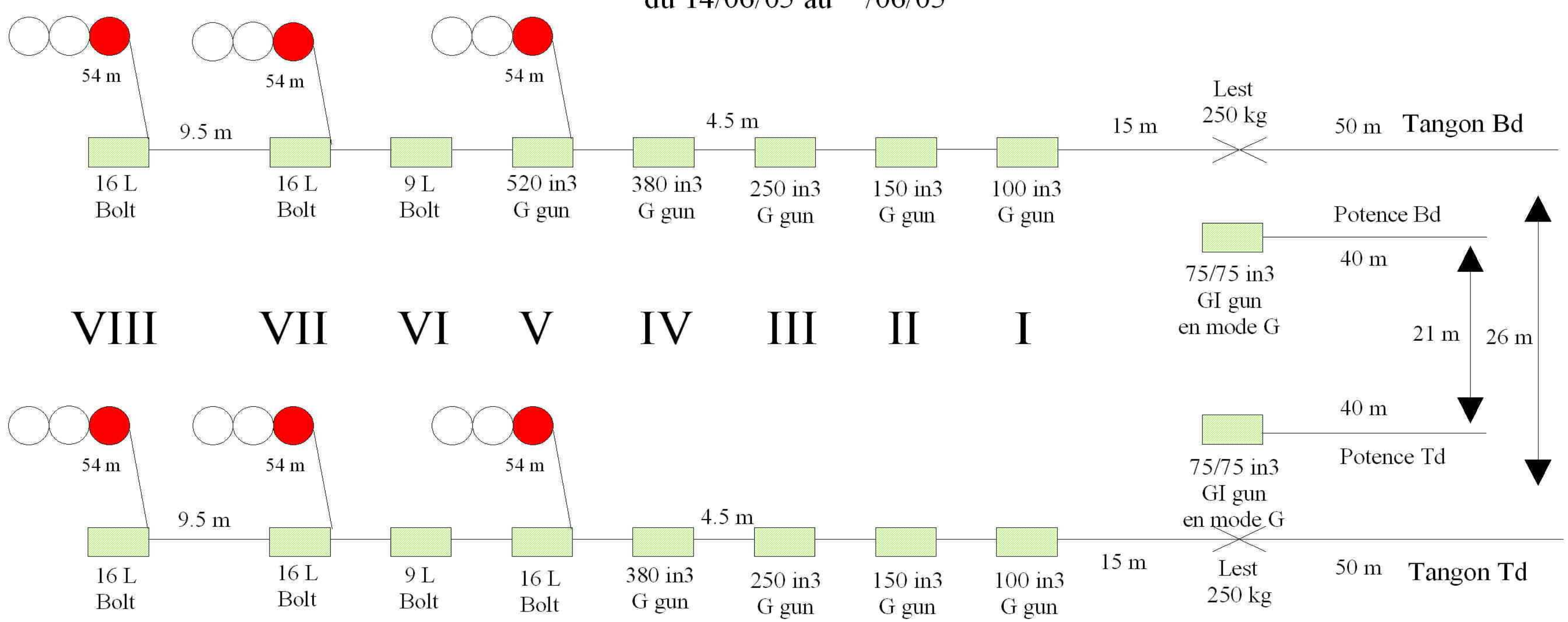
Source 1: Cadence 165 s / 425 m

26/6 - 29/6

Mission ATALANTE SISMOMAR 2005

LEG II "Réseau dense"

du 14/06/05 au /06/05



Volume : 8410 in3 à 140 bars
Consommation : 1198 m3/h
Cadence : 165s / 425 m

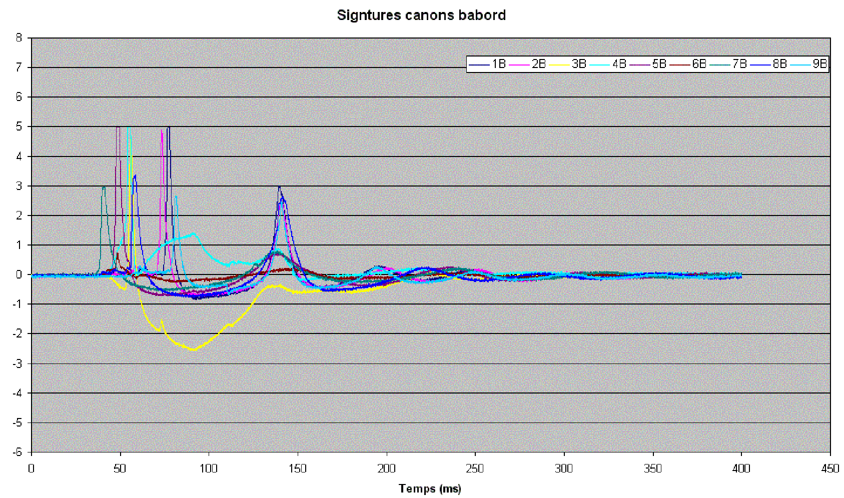
Profondeur : 1Td : 19 m / 2Td : 25m / 3Td : 27 m
1Bd : 19 m / 2Bd : 25m / 3Bd : 27m

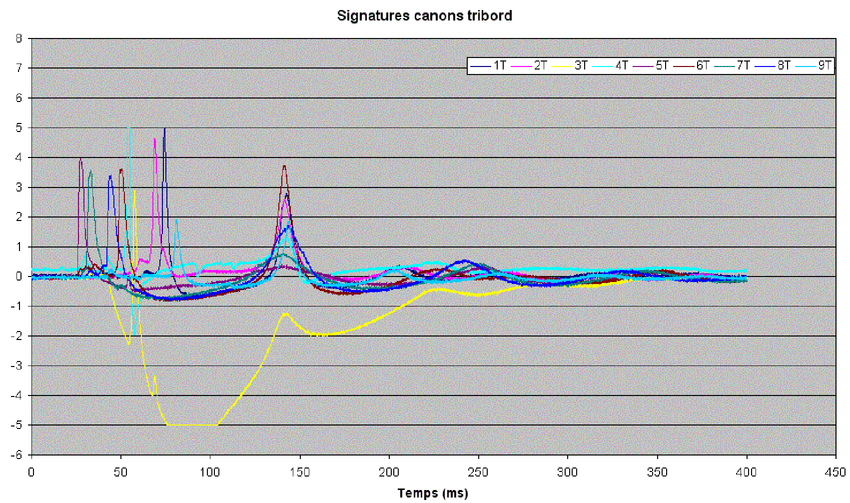
Canons en service

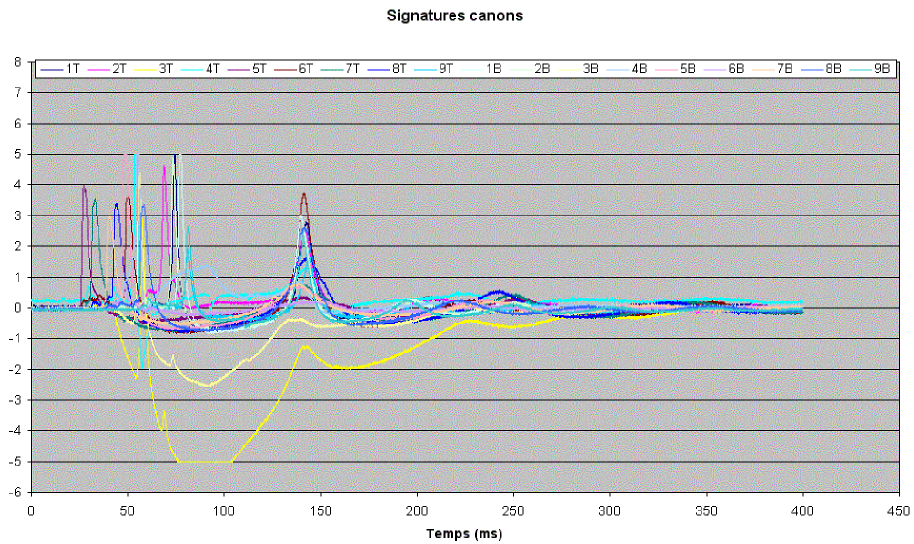
Lest

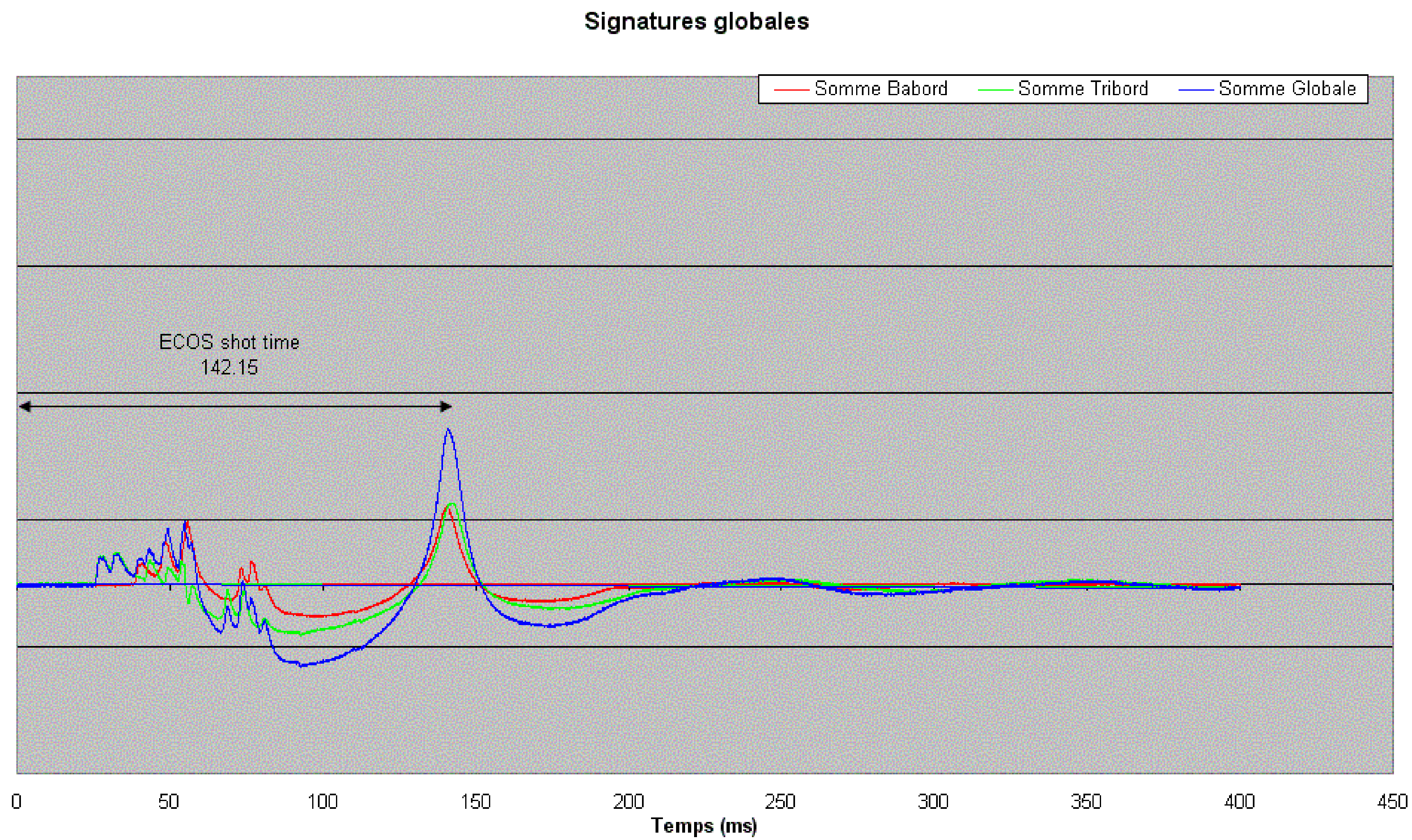
6.2.4- Airgun Signatures, Leg 2

6.2.4.1- SOURCE 1

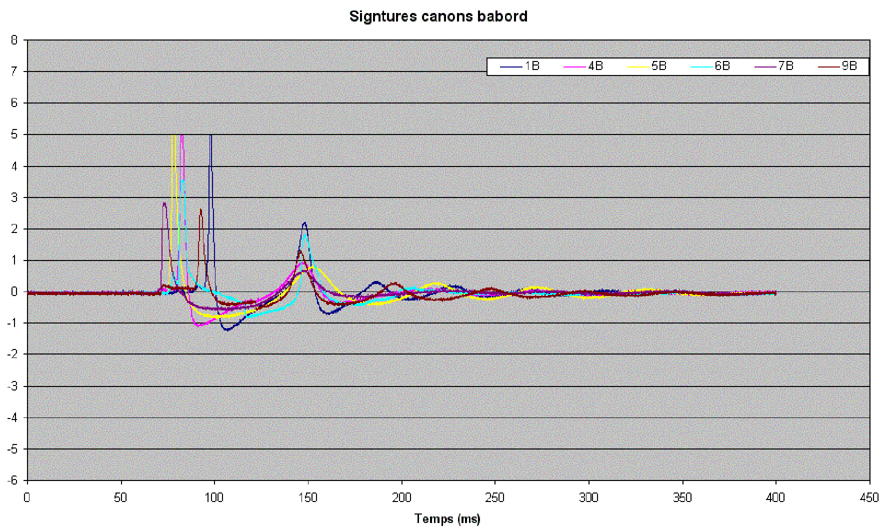


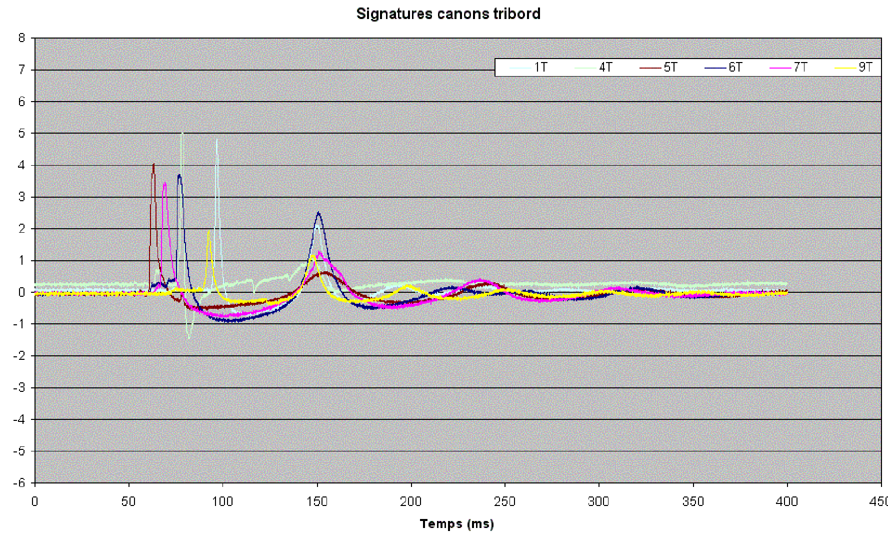




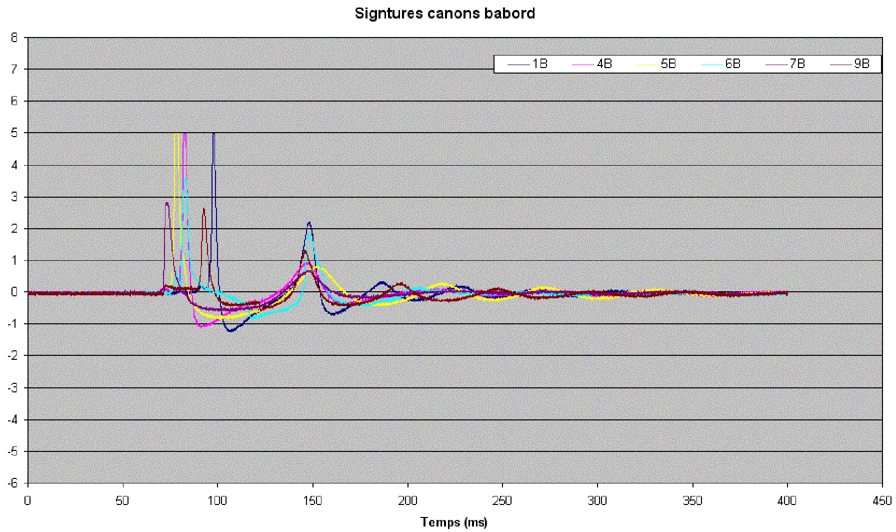

Signatures globales
Somme Babord
Somme Tribord
Somme Globale
ECOS shot time
142.15
0
50
100
150
200
250
300
350
400
450
Temps (ms)

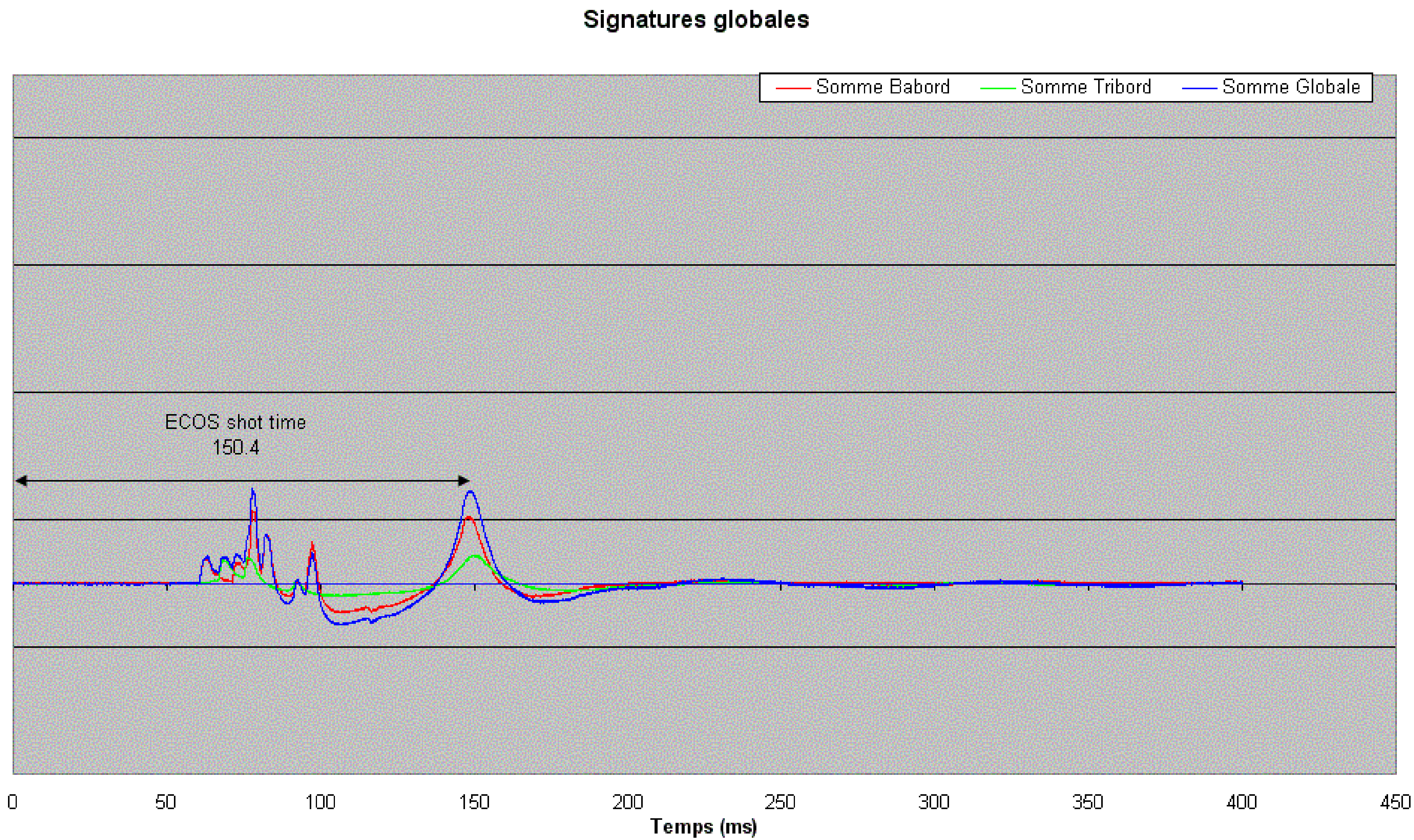
6.2.4.2- SOURCE 2





Figures come from 17/06/2005 03:24 (not sure this is right, as source 2 was only 23/6)

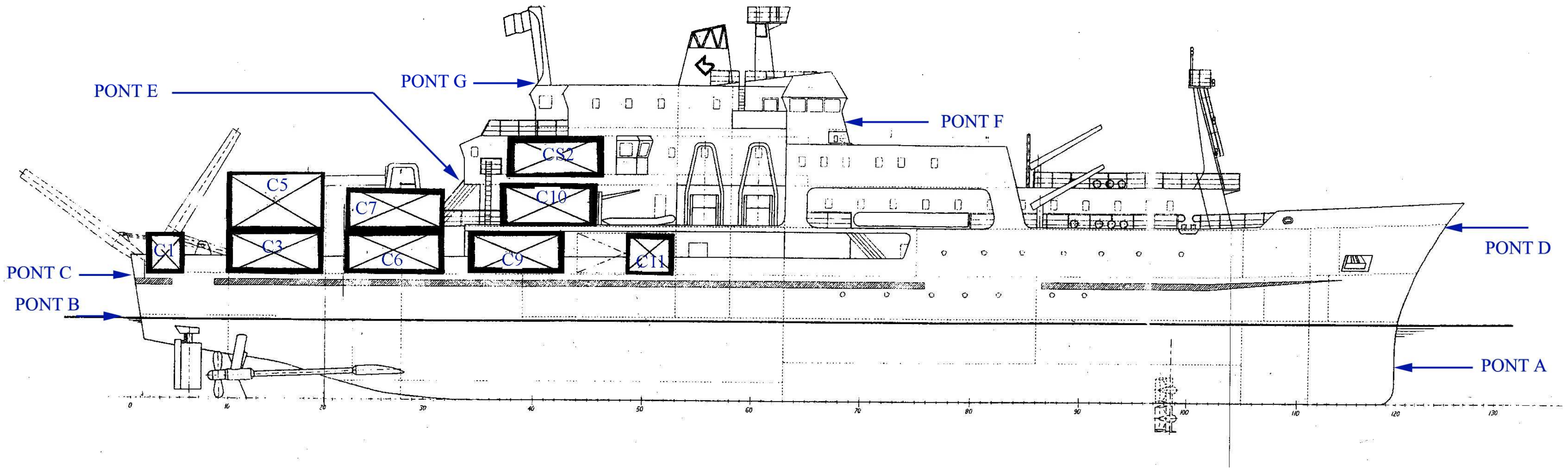



Signatures globales
Somme Babord
Somme Tribord
Somme Globale
ECOS shot time
150.4
0
50
100
150
200
250
300
350
400
450
Temps (ms)

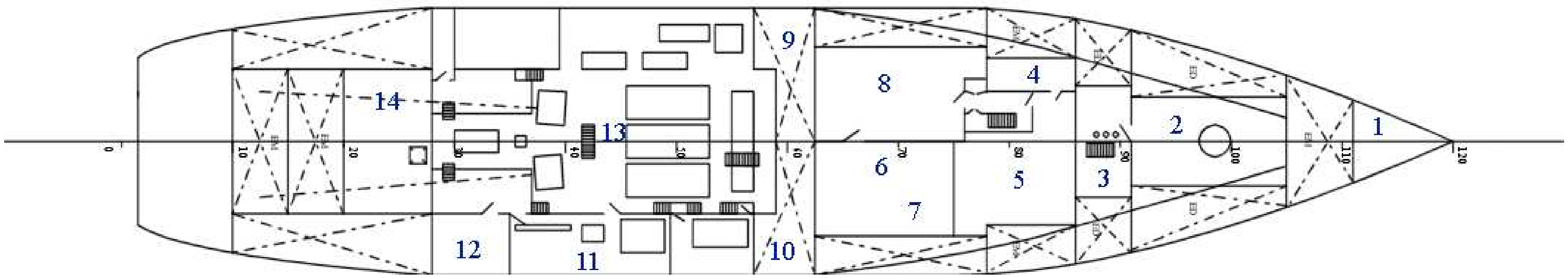
6.3 Ship Layout

Allande Pouillet-Erguy

L'ATALANTE VUE TRIBORD

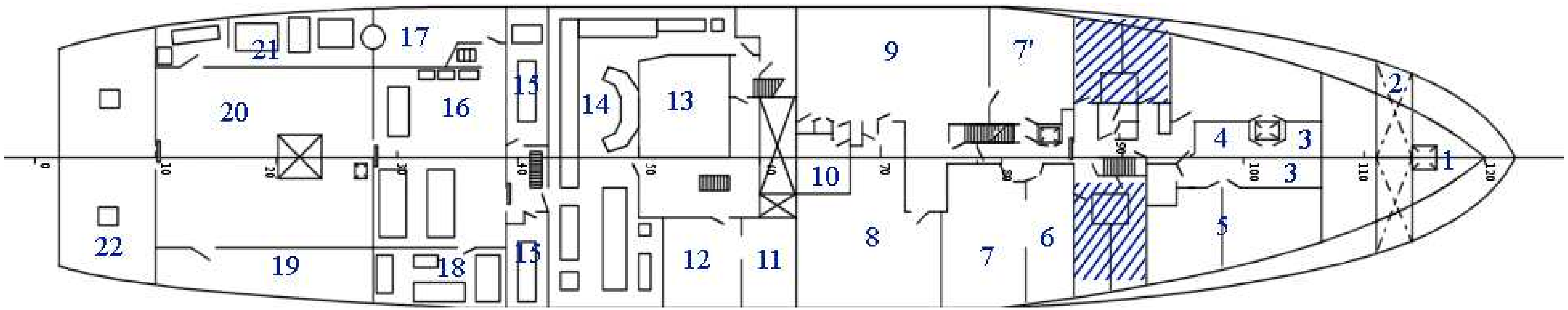


PONT A



Légende	
1	Sondeur
2	Local propulseur
3	Local sondeur
4	Local sous-douane
5	Réserve
6	Traitement eaux usées
7	Centrale eau glacée + centrale frogo
8	Salle de sport
9	Stabilisateur
10	Stabilisateur
11	Transformateur
12	Local batteries courant régulé
13	Machine
14	Magasin

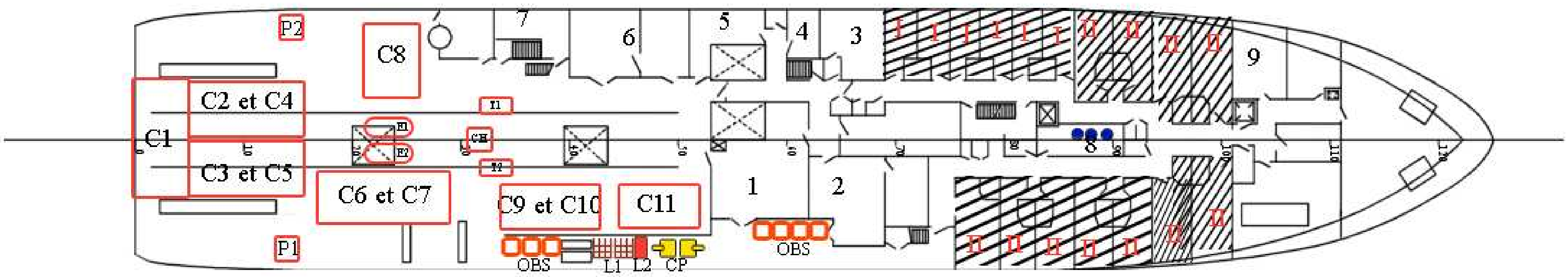
PONT B



Légende

1	Puit	**12**	Atelier machine
2	Magasin	**13**	Tambour machine
3	Stockage pain	**14**	PC machine – Cabine de contrôle
4	Congélation	**15**	Local convert.
5	Chambres froides	**16**	Treuil océanographique
6	Salle de réception	**17**	Magasin machine
7	Salon officier	**18**	C.H. treuils
7'	Salon équipage	**19**	Cale à tube
8	Cuisine	**20**	Cale à conteneurs
9	Cafétéria	**21**	Centrale hydraulique portique arrière
10	Gravimètre	**22**	Appareil à gouverner
11	Atelier électrique		(en hachuré sont représentées les cabines)

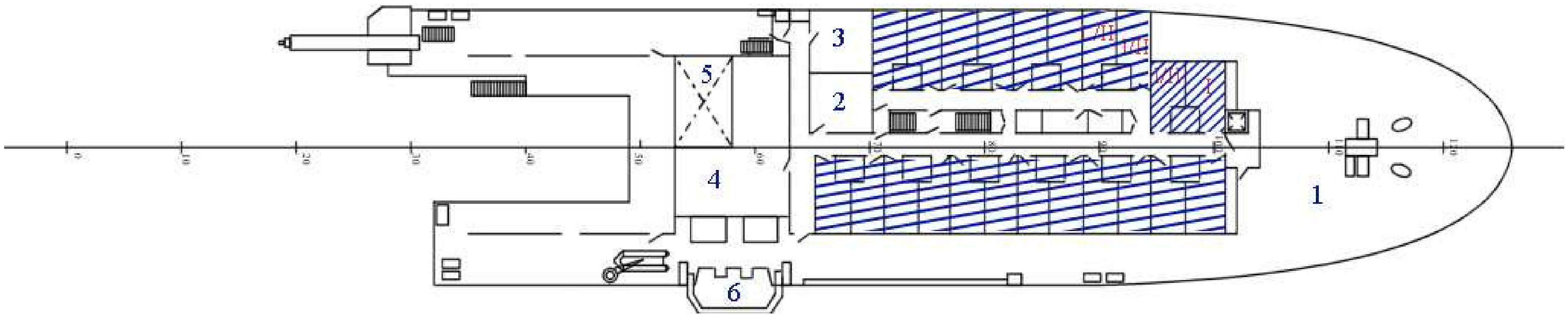
PONT C



Légende :

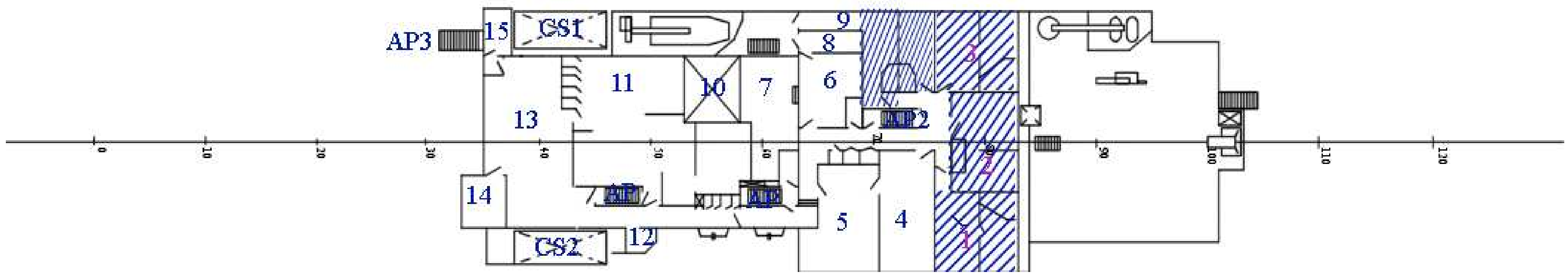
EQUIPESISMIQUE :			EQUIPE SCIENTIFIQUE	
C1	Conteneur pagode		**OBS**	Chaque petit rectangle représente un pack de 3 OBS (sauf 1 où il y en a 2)
C2	Conteneur Bunker babord		**L1**	2 « stocks » de lestes (« grille ») pour les OBS
C3	Conteneur Bunker tribord		**L2**	« Stocks » de lestes pour les capteurs de compliance
C4 (au dessus de C2)	Conteneur touret de flûte babord		**CP**	2 capteurs de compliance
C5 (au dessus de C3)	Conteneur touret de flûte tribord		**EQUIPEMENT « BATEAU »**	
C6	Conteneur atelier			
C7(au dessus de C6)	Conteneur réserve flûte		**1**	Laboratoire humide :Préparation des OBS et compliance et OBS portuguais
C8	Conteneur compresseur 300 m^3/h (babord)		**2**	Salle propre tribord :Stockage des boites, radios et flash IPGP/INSU
C9	Conteneur compresseur 660 m^3/h		**3**	Salle propre babord – Stockage pour équipe portuguaise
C10 (au dessus de C9)	« BDS »		**4**	Labo photo
C11	Conteneur compresseur 300 m^3/h (tribord)		**5**	Local plongeurs
P1	Potence sismique tribord		**6**	Laboratoire utilisé par GENAVIR
P2	Potence sismique babord		**7**	Magasin bosco
E1	Enrouleur de ligne de tir babord		**8**	Puits (puit arrière : acoustique ; milieu :12KHz (M12) ; avant :?)
E2	Enrouleur de ligne de tir tribord		**9**	Machines à laver
T1	Treuil canons babord + chèvre		(en hachuré sont représentées les cabines et le nombre de places est spécifié par l'indice rouge. L'équipe sismique occupe les 5 premières cabines tribord en partant de l'arrière du bateau et les 4 premières cabines babord sont occupées par l'équipage)	
T2	Treuil canons tribord + chèvre			
CH	Centrale hydraulique + Flexible			

PONT D



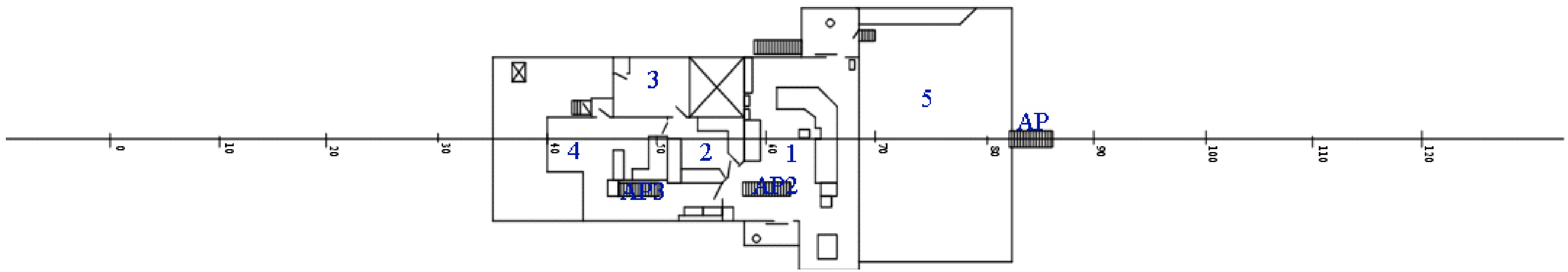
Légende	
1	Plage avant
2	Secrétariat de bord
3	Bureau technique machine
4	Conditionnement d'air
5	Tambour machine
6	Treuil (en dessous du labo humide et OBS)
	(en hachuré sont représentées les cabines)

PONT E



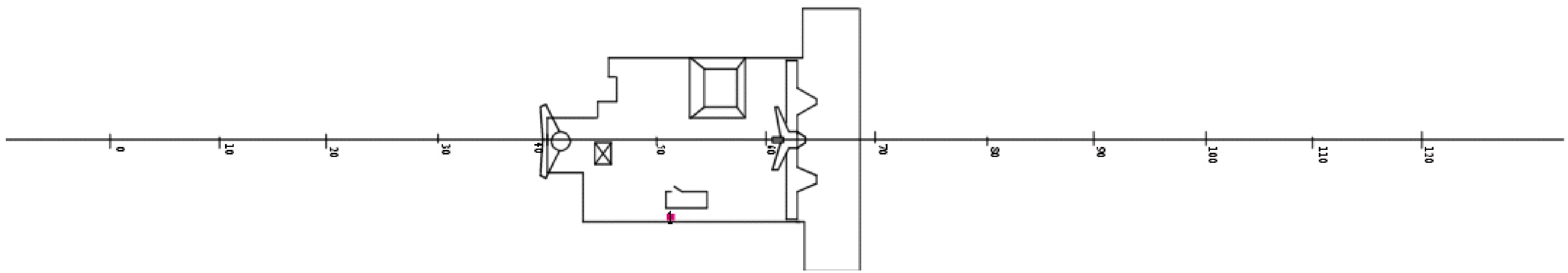
Légende			
Equipe sismique			
CS1	Conteneur labo d'acquisition sismique		
CS2	Conteneur labo traitement de données sismiques		
Installation bateau			
AP	Accès passerelle (pontF)	**7**	Atelier életronique
AP2	Accès ponts inférieurs « internes »	**8**	Chargeurs batteries
AP3	Accès ponts inférieurs « externes »	**9**	Accumulateurs
1	Cabine commandant	**10**	Tambour machine
2	Cabine chef de mission	**11**	Laboratoire de mesure électronique (non dispo sciences)
3	Cabine chef mécanicien	**12**	Commande bathysonde – hydrologie
4	Salle de dessin (dispo sciences)	**13**	PC scientifique (dispo sciences)
5	Salle polyvalente (dispo sciences)	**14**	Cabine de commandes
6	Magasin électronique	**15**	Balcon
	(en hachuré sont représentées les cabines)		

PONT F



Légende	
AP	Accès plage avant « externe »
AP2	Accès ponts inférieurs « interne »
AP3	Accès PC scientifique
1	Timonerie avant
2	Chambre des cartes
3	Local radio
4	Timonerie arrière
5	Plage à l'air libre

PONT G



Légende	
Ce pont contient toutes les antennes de communication (satellites, radar, etc…) du bateau	
1	Le petit carré magenta représente l’emplacement choisi pour « notre » antenne GPS. Celle –ci est reliée par un câble de 2x15 m