PRAMA s.r.l. Ancona

CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO DI SCIENZE MARINE SEZIONE DI
GEOLOGIA MARINA (BOLOGNA)

JOINT RESEARCH PROJECT "PROMETHEUS"
AN INTEGRATED STUDY OF THE
MARSILI SMT., THYRRHENIAN SEA

PRAMA s.r.l.
UNIVERSITA' CHIETI G.d'A.
ISMAR-CNR, BOLOGNA
INGV, ROMA2

REPORT ON THE MORPHOBATHYMETRIC, MAGNETOMETRIC, GRAVIMETRIC, CTD WATER AND BOTTOM SAMPLING INVESTIGATIONS DURING CRUISE MRS06 ABOARD R/V UNIVERSITATIS

MARSILI PROJECT INTERIM REPORT

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Report on the morphobathymetric, magnetometric, gravimetric, CTD, water and bottom sampling investigations during cruise MRS06 aboard R/V *Universitatis* .

by Paltrinieri D., Viezzoli C., Signanini P., Di Sabatino B., D'Anna G., Calcara M., Bortoluzzi G. etc etc

Includes bibliographical reference and index.
1.Marsili Basin 2.Thyrrhenian Sea 3. Tectonics 5. Volcanology 6. Geochemistry

Abstract - A summary of methodologies, technical details and ship-board results of a swath bathymetry, geophysical and geological survey in the Marsili Basin with R/V *Universitatis* is presented.

During the survey, detailed, full coverage bathymetry, SBP reflection seismic, magnetometric, gravimetric lines, bottom and water sampling were carried out in the Area.

Sommario - Vengono presentati le metodologie e l'insieme dei risultati ottenuti durante una campagna di rilievi batimetrici e geofisici nella zona del Bacino del Vulcano Sommerso Marsili con la R/V *Universitatis* . Sono stati effettuati rilievi batimetrici, magnetometrici e gravimetrici di dettaglio, assieme a linee Chirp e a campionamenti della colonna d'acqua e del fondo mare.

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ACRONYMS

ACRONYM	DESCRIPTION	URL-email
UNICH	University Chieti "G.D'Annunzio"	www.unich.it
CNR	Consiglio Nazionale Delle Ricerche	www.cnr.it
INGV	Ist.Naz.Geofisisica e Vulcanologia	http://www.ingv.it
CONISMA	Consorzio Interuniversitario Sc.Mare	http://www.conisma.it
ISMAR	Istituto di Scienze Marine	www.ismar.cnr.it
DIGAT	Dip.Geotecn.Amb.Territorio - UNICH	
CERSGEO	Centro Ric. Studi Geotecnologie - UNICH	
IAGA	Int.Ass.of Geomagnetism and Aeronomy	www.iugg.org/IAGA/
IGRF	Int.Geomagnetic Reference Field	www.ngdc.noaa.gov/IAGA/vmod/
INTERMAGNET	INTErn.Real-time MAGnetic Obs.NETwork	www.intermagnet.org
GEBCO	General Bathym.Chart Oceans	www.ngdc.noaa.gov/mgg/gebco
SGM	Satellite Gravity Maps	http://topex.ucsd.edu
SEG	Soc. of Exploration Geophysicists	www.seg.org
MBES	MULTIBEAM ECHOSOUNDER SYSTEM	
SBP	Sub Bottom Profiling	
SVP	Sound Velocity Profile	
CTD	Conductivity/Temperature/Depth	
MAW	Modified Atlantic Water	
LIW	Levantine Intermediate Water	
TDW	Thyrrhenian Deep Water	
WMDW	West Mediterranean Deep Water	
OBS	Ocean Bottom Seismograph	
GPS-DGPS-RTK	Global Positioning System	samadhi.jpl.nasa.gov
DTM	Digital Terrain Model	en.wikipedia.org
RESON	Reson	www.reson.it
SBE	Sea Bird Electronics	www.seabird.com
MARINE MAGNETICS	Marine Magnetics	www.mm.com
GEOMETRICS	Geometrics	www.geometrics.com
MB-SYSTEM	MB-SYSTEM	www.ldgo.columbia.edu/MB-System
GMT	Generic Mapping Tool	gmt.soest.hawaii.edu/gmt
GNU,GPL	GNU is not Unix,General Pub. License	www.gnu.org

Table 1: Acronyms of Organizations, Manufacturers and Products

HOW TO READ THIS REPORT

Section 1 gives the introductory and background information, including some technological and scientific issues of the organization and execution of tasks, whereas section 2 summarizes the cruise operations. Section 3 provides the technical aspects that were involved in the data acquisition and processing. Sections 4 and 5 discuss the initial results, the on-going data processing and usage, and give concluding remarks. Some data processing procedures that were used in the production of this report along with additional technical details and data are presented in the Appendix.

ACKNOWLEDGMENTS

Many people contributed to the success of the research cruise (MRS06 R/V *Universitatis*). We are particularly indebted to the officers and crew members of R/V *Universitatis* for their professionalism and efforts in assuring the success of the cruise.

Contents

List of Figures

List of Tables

1 INTRODUCTION

The slow-spreading Marsili basin is the youngest Basin (<2mY), and the centrally located Marsili volcano is amongst the most interesting and prominent topographic features of the SE Thyrrhenian Sea (Fig.1). Several geological/geophysical expeditions were carried out in the Tyrrhenian back-arc basin by ISMAR-CNR, and are well summarized and presented by [Marani, Gamberi and Bonatti(2004)].

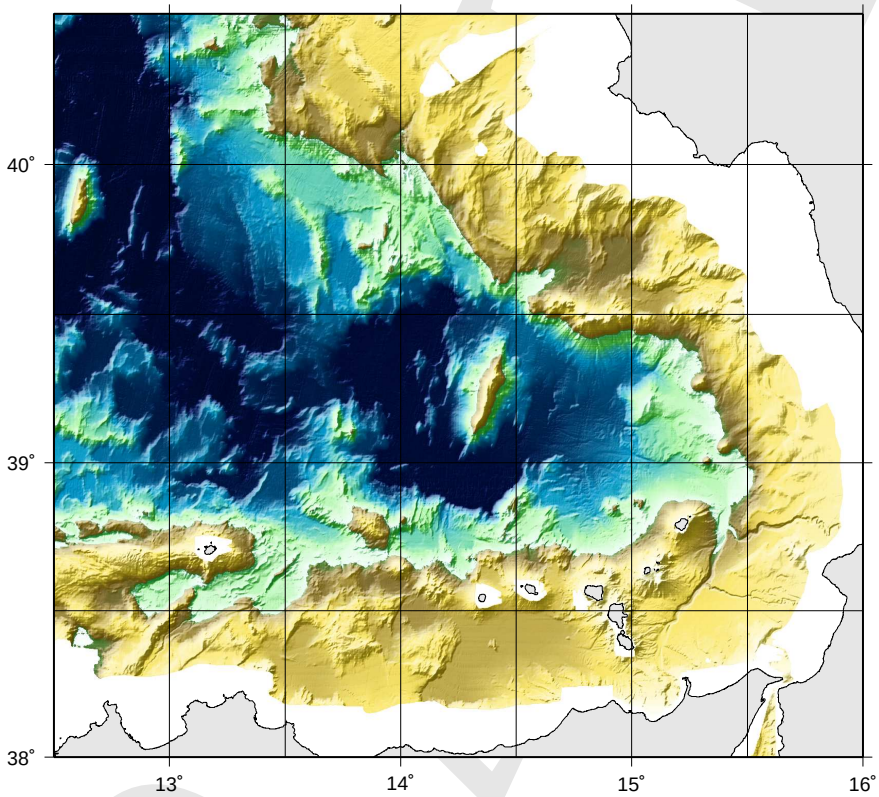

Figure 1: Geographical setting of the Marsili Basin, in the framework of the SE Thyrrhenian Sea. Bathymetric data by [Marani, Gamberi and Bonatti(2004), Bortoluzzi et al.(1999)]

To complement the available data while acquiring new geophysical and oceanographical datasets, a collaborative Project was set up by PRAMA (a private firm active in offshore investigation) and several scientific institutions, among them the University of Chieti, the INGV of Rome and ISMAR-CNR of Bologna, aiming to obtain a better picture of the volcanic edifice, both in the surficial than in the deeper structure.

A request for ship time of R/V *Universitatis* was presented, with the main objectives listed as follows:

- swath bathymetry and Chirp SBP
- magnetometric and gravimetric investigations
- water sampling and investigations
- bottom sampling

A ship period of 11 days, including 1 day of transit was assigned to the project by CONISMA and scheduled for early summer 2006. This paper reports the shipboard activities during the cruise MRS06 with R/V *Universitatis* . The cruise started in Pozzuoli 2006-07-10 and ended in Pozzuoli 2006-07-22. Weather conditions were generally good to very good. Hereafter, a description of the ship, equipment and their usage is given, along with details of the general settings, performances and some scientific and technical results.

GEOLOGICAL AND OCEANOGRAPHICAL SETTING

The Marsili volcano, also believed to be a spreading center, N100-106°[Marani and Trua(2002)], rises 3000 metres from the Marsili basin seafloor to a minimum depth of 499 m. It is elongated 60 km NNE-SSW with mean width of 16 km. A narrow, 1 km wide linear region of lower gradient, approximately bounded by the 1000 metre isobath, marks the summit zone that stretches 20 km along the main axis of the volcano. The volcano summit axis zone and tip regions are characterised by the development of linear structures arranged in segments generated mainly by the alignment of narrow, linear cone ridges, or by the linear arrangement of several circular-based cones .

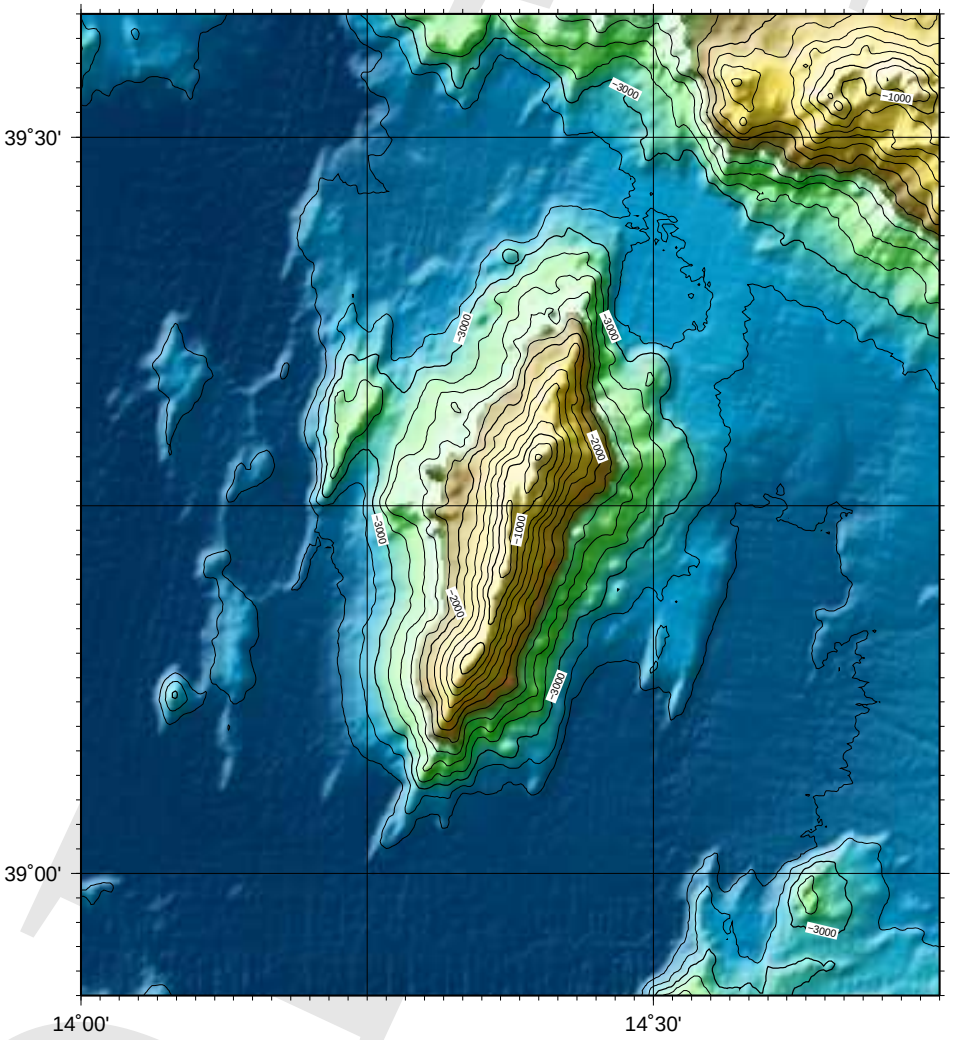

Figure 2: Geographical setting of the Marsili Smt., elevating from the Marsili basin (>3500 m depth). Topographic and bathymetric data by [Marani, Gamberi and Bonatti(2004), Bortoluzzi et al.(1999)]

The Tyrrhenian Sea exchanges water with the rest of the Mediterranean Sea through the Sardinia Channel, the Sicily Strait and the Corsica Channel, that represent morphologic constraints for the circulation of the intermediate and deep waters [Millot C.(1987), Astraldi and Gasparini(1994), Sparnocchia et al.(1999), Astraldi et al.(2001)]. The surface water (0-200m) entering the Tyrrhenian Sea through the Sardinia Channel is the Modified Atlantic Water (MAW) from the Algerian Current (AC). The MAW is characterized by low salinity (on average less than 38 PSU), and flows cyclonically along the italian coast. Through the Sicily Strait and deeper than 200 m down to about 700m, the basin receives the Levantine Intermediate Water (LIW), which is marked by a subsurface temperature maximum and by a higher salinity (on average 38.8 PSU), and mixes with

the surface MAW and deeper water masses. From about 700 m to the bottom the Tyrrhenian Deep Water (TDW) is present, being the result of the modification of the West Mediterranean Deep Water (WMDW) that crosses the Sardinia Channel. The circulation pattern in the Tyrrhenian Sea is normally characterized by two cyclonic gyres in the south and in the northern basins, and by the presence of cyclonic and anticyclonic eddies in the central basin. Interesting features in the TDW [Zodiatis and Gasparini(1995)] are the thermoaline 'staircase' formations.

PLANNING AND STRATEGY

Ship time of the R/V *Universitatis* was provided by CONISMA upon request. The application for clearances to perform the geophysical survey in the Marsili Basin and the plan of the cruise was submitted to the italian authorities in Rome early spring 2006 ...

The survey was planned to carry out the following tasks

- MBES with a high resolution multibeam, capable of investigating the sea bottom down to depths between 10 and 2500 m, alongwith SV measurements either by CTD or SVP,
- CHIRP SBP high resolution profiling
- gravimetric and magnetometric investigations
- CTD profiling and water sampling
- sediment sampling (by grabs)

2 CRUISE SUMMARY

SHIP: R/V *Universitatis*
START: 2006-07-10 PORT: Pozzuoli
END: 2006-07-22 PORT: Pozzuoli
SEA/OCEAN: Thyrrhenian Sea, Mediterranean Sea
LIMITS: NORTH 39:45.0 SOUTH: 38:55.0 WEST: 14:05 EAST: 14:45
OBJECTIVE: INTEGRATED STUDY OF THE MARSILI SMT.
COORDINATING BODIES: PRAMA
CHIEF OF EXPEDITION: Claudio Viezzoli
CONTACT: diego.paltrinieri@tin.it
DISCIPLINES: SWATH BATHYMETRY, SBP, GRAVIMETRY, MAGNETOMETRY, WATER COLUMN AND SEABED SAMPLING
WORK DONE: 75 KM^2 SURVEY MULTIBEAM, xxxx KM SBP
32 CTD CASTS, 3 CONTINUOUS CTD PROFILES 18 GRABS, 2 CORES

LOCALIZATION:

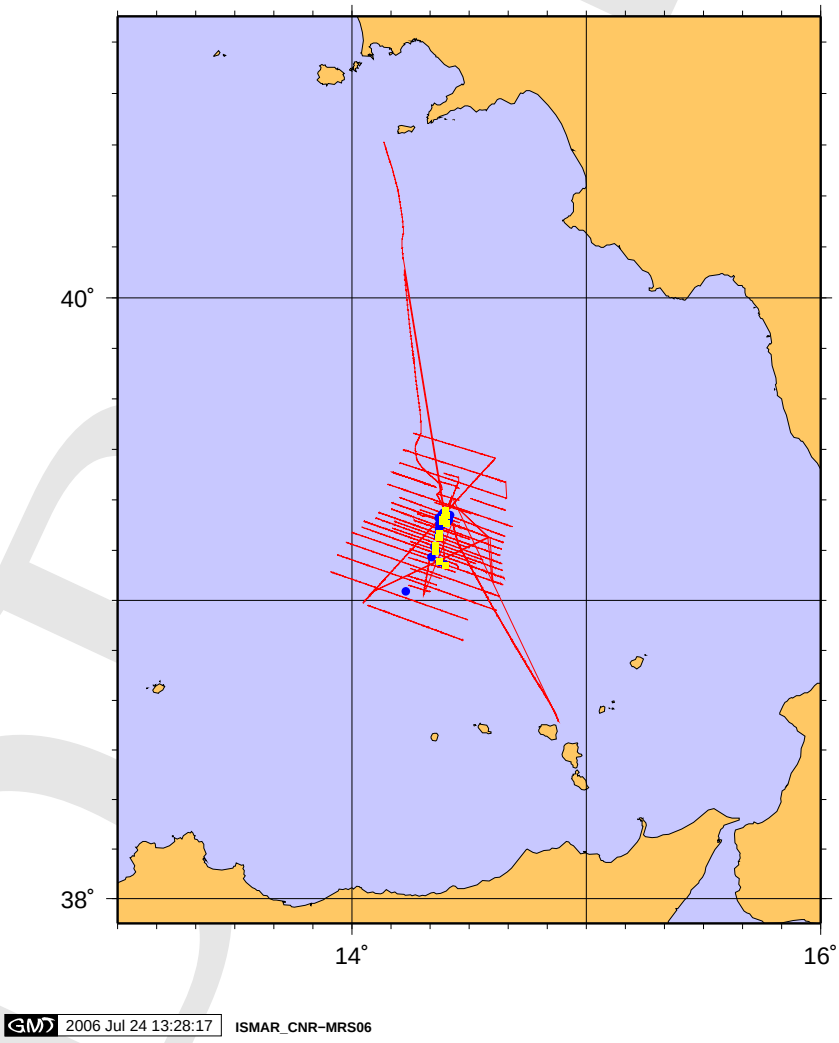

Figure 3: General ship track during Cruise MRS06, including transits from Pozzuoli. The red circles are sediment samples (cores,grabs), the blue squares are CTD casts.

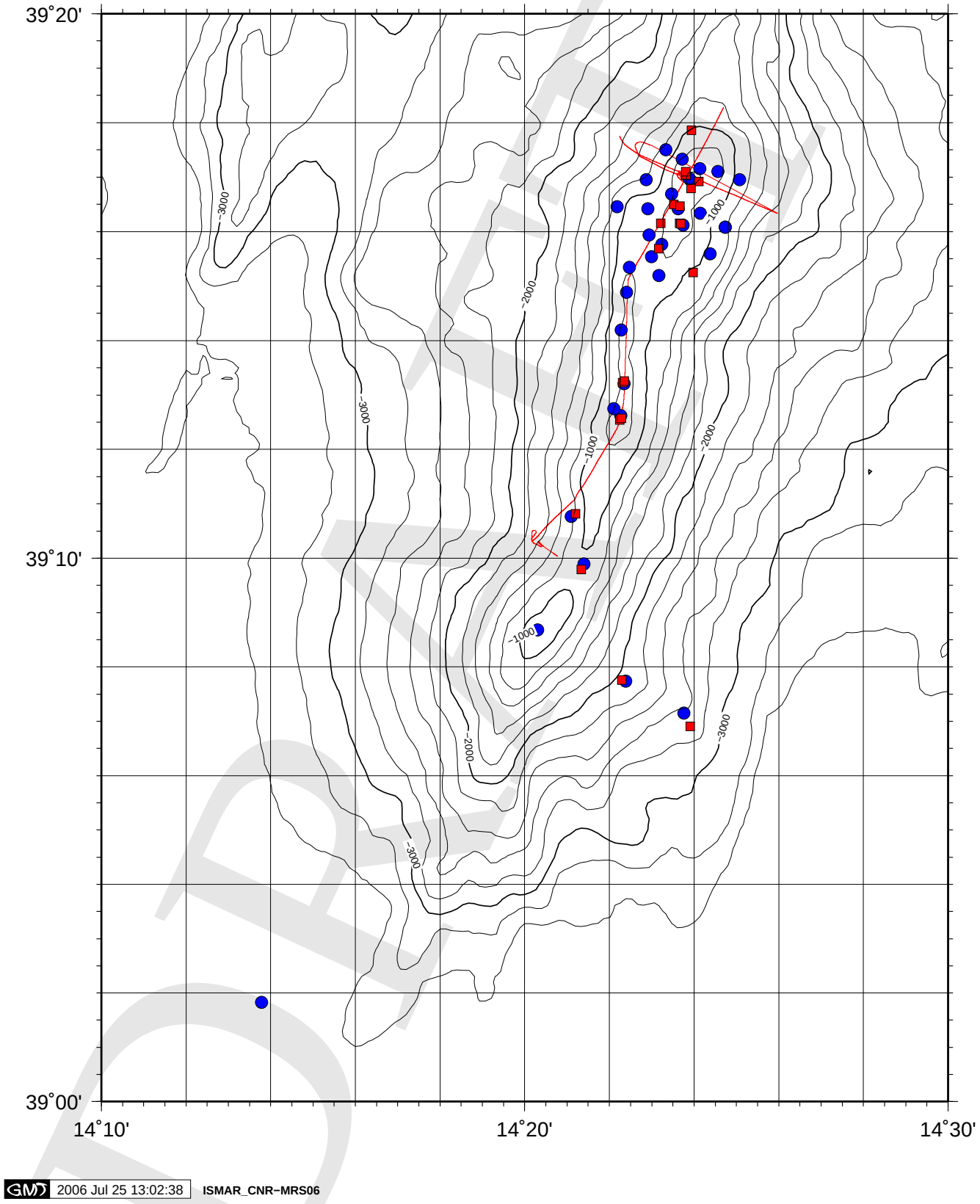

Figure 4: Cruise MRS06 sampling. The red squares are sediment samples (cores,grabs), the blue circles are CTD casts. The red lines are the towed CTD runs.

SCIENTIFIC AND TECHNICAL PARTIES

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Peppe Siena	R/V *Universitatis*	engineer		

Table 2: MRS06: Scientific and technical parties

SUMMARY OF OPERATIONS

The ISMAR, INGV and UNICH staff boarded the R/V *Universitatis* in Pozzuoli, the afternoon 2006-07-10. Noon 2005-07-11 local time ship left port heading S. Late afternoon calibration runlines were performed S of Capri I.. Ship reached operation area early 2006-07-12 and soon CTD, multibeam and magnetometric E-W runlines were started. The survey ended 2006-07-16 in the evening, and the towed CTD profiling was performed up to 2006-07-17, when ship sailed to reach the Island of Salina to perform a dive inspection on propellers having crossed a flying fishnet. Day 2006-07-18 a scientific crew shift was performed and new equipment were installed onboard. A four day of geophysical survey, CTD and water and bottom sampling was performed up to 2006-07-22 early morning, when ship docked in Pozzuoli 08:00 local time.

3 MATERIALS AND METHODS

The research cruise was carried out with the 45 meter R/V *Universitatis* , (Fig.5, owned by CONISMA and operated by xxxxxx. The vessel is normally used for geological, geophysical and oceanographical work in the Mediterranean Sea.

Figure 5: R/V *Universitatis* .

R/V *Universitatis* is equipped with DGPS positioning system (satellite link by FUGRO), single-beam and multibeam bathymetry and integrated geophysical and oceanographical data acquisition systems, including ADCP, CHIRP SBP and other Sonar Equipment, other than water and sediment sampling. Additional equipment can be accommodated on the keel or towed, like Side Scan Sonars.

3.1 NAVIGATION AND DATA ACQUISITION

The vessel was set-up for multibeam data acquisition and navigation with RESON PDS-2000. A workstation was used for the acquisition of (PDS-2000) multibeam data, interfacing by a multiserial and Ethernet link a RESON 8160 P1 processor, an IXEA OCTANS compass, DGPS receiver, by a MOXA Multi/serial I/O, TCP/IP and UDP network sockets.

The MBES was the 50kHz, 126 0.5°, 150°aperture RESON 8160 (5000 m range). The sonar head is positioned on the ship's keel using a low-angle V-shaped steel frame. A sound velocity probe at the Sonar Head is interfaced directly to the MBES processor, thus providing the necessary real-time data for the beam-forming.

The datum WGS84 and the UTM, zone 33, were chosen for navigation and display purposes. Timing was set to UTC for data acquisition. The PDS-2000 production DTM was set to grid sizes ranging from 20 to 25m. The DELPH Seismic SBP-CHIRP workstation received positions trough an NMEA sentence by the DGPS receiver. The positions were therefore recorded on the trace headers as Easting/Northing of the DGPS antenna. An ISMAR's Marine Magnetics SeaSpy Magnetometer tow fish was towed 120m (point STERN-LEFT), on the port side. An INGV's Geometrics G-811 Gradiometer system was towed 150-300m astern, on the starboard side. A gravimeter was installed very close to the center of gravity of ship.

Fig.6 shows the consoles of the main recording instruments on the recording and navigation room.

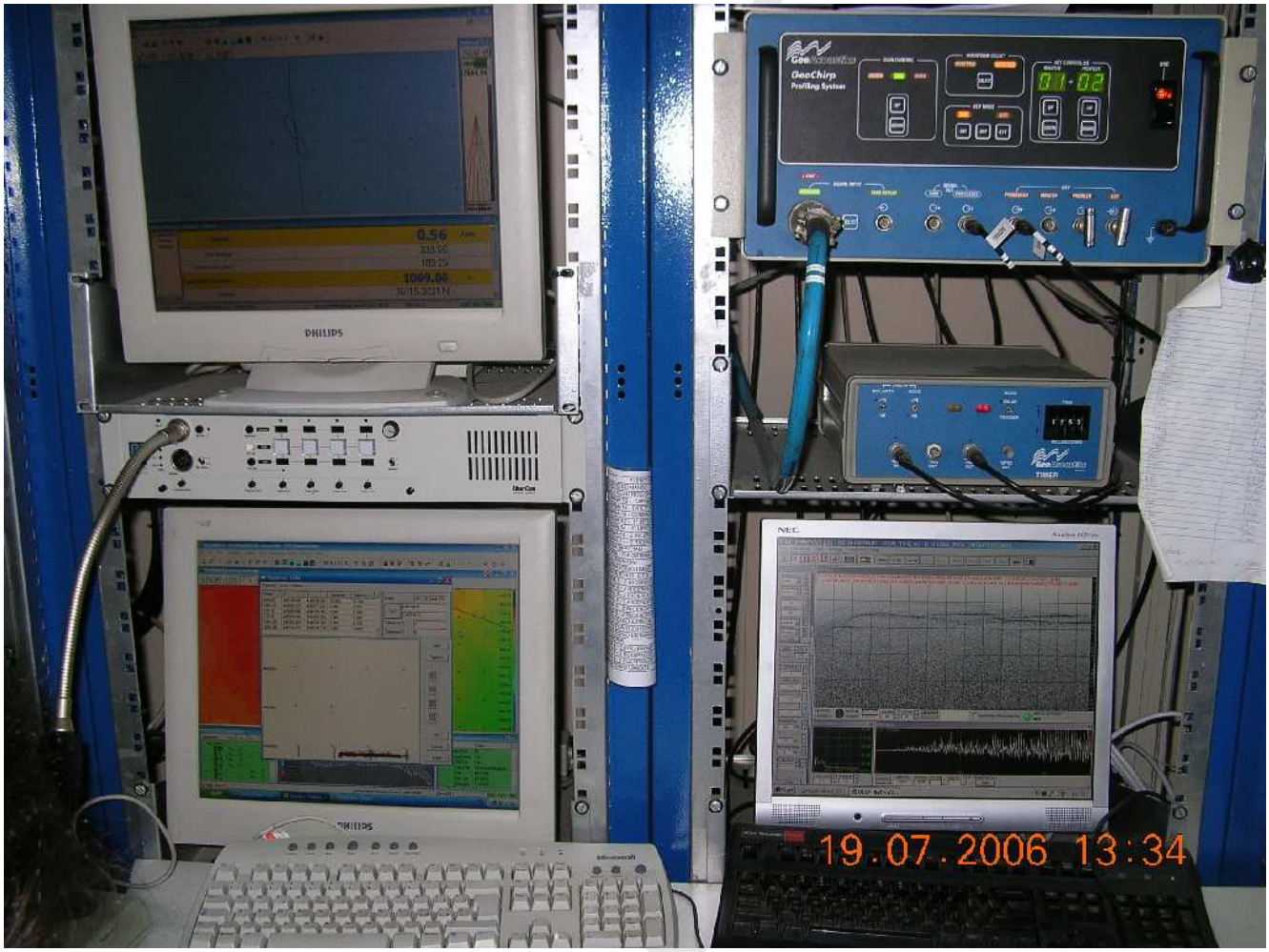
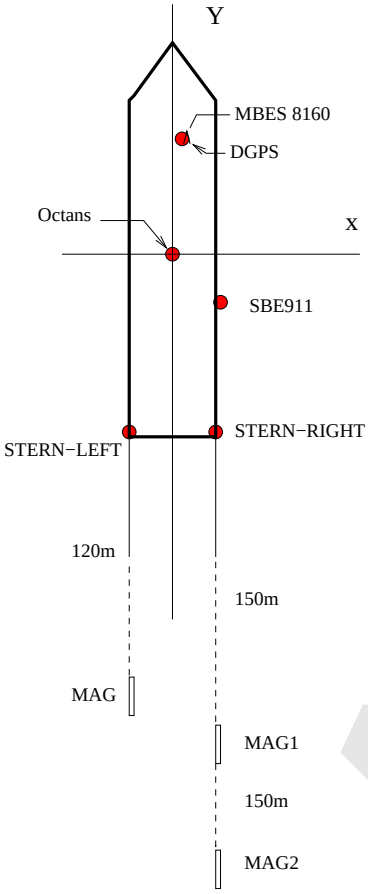


Figure 6: Recording room on R/V *Universitatis*

The instrumental offsets (PDS-2000) are presented in Fig. 7 and in Tab. 3.

POSITION	ACROSS	ALONG	HEIGHT
REFERENCE	0.00	0.00	0.00
DGPS	1.55	11.85	12.45
MBEAM	0.00	11.45	-3.84
OCTANS	0.00	0.0	0.25
SBE-911	5.00	-5.00	0.00
EA-400	0.00	11.45	-3.84
CHIRP	-1.60	5.25	-3.80
STERN	0.00	-21	0.00
STERN-LEFT	-4.38	-21.0	0.0
STERN-RIGHT	4.38	-21.0	0.0
GRAVIMETER	0.5	0.5	-1.0

Table 3: Instrumental Offsets on R/V *Universitatis* (PDS2000). The GPS antenna (primary positioning system) is located on point DGPS.



CRUISE MRS06 R/V UNIVERSITATIS 'PROMETHEUS'

ALONG	ACROSS	Z	NAME
0.00	0.00	0.25	OCTANS
1.55	111.85	12.45	DGPS
0.00	11.45	−3.84	MB8160
−4.38	−21.0	0.0	STERN−LEFT
4.38	−21.0	0.0	STERN−RIGHT

Figure 7: Cruise MRS06. Instrumental Offsets (PDS-2000) on R/V *Universitatis*

3.2 MULTIBEAM BATHYMETRY AND BACKSCATTER

The sonar data were collected and recorded in realtime on HD by direct interfacing of the sonar processor 81P to the PDS-2000 software. In addition two data sets were generated and stored on separate computer for backup on HD and CD/DVD. The PDS-2000 was able to build a 20 m DTM during the acquisition of the entire surveyed area. The existing multibeam datasets will therefore be used for an up-to-date regional bathymetric compilation. Backscatter data were recorded in the XTF format, alongwith navigational and .all files, and will be processed post-cruise.

3.1 SOUND VELOCITY

A NAVITRONIC self-recording SV probe was used, in addition to the data obtained by the down-cast profiles with the Mod.911 SBE CTD. In the Marsili Basin the CTD03 profile was used, after comparison with other profiles taken in the area.

3.2 CALIBRATION

The MBES was calibrated S of the Island of Capri, on a flat bottom at 400m and a step rising to 200m. We collected data for roll, pitch and time delay on the same line run three times at different speed and directions, whereas a line run parallel to the others at a distance of a swath was used for yaw calibration (see Fig.8). The ofssets resulting fron the calibration are presented in Table 4. Several lines were acquired during the survey that will be used as further calibration control, including SVP.

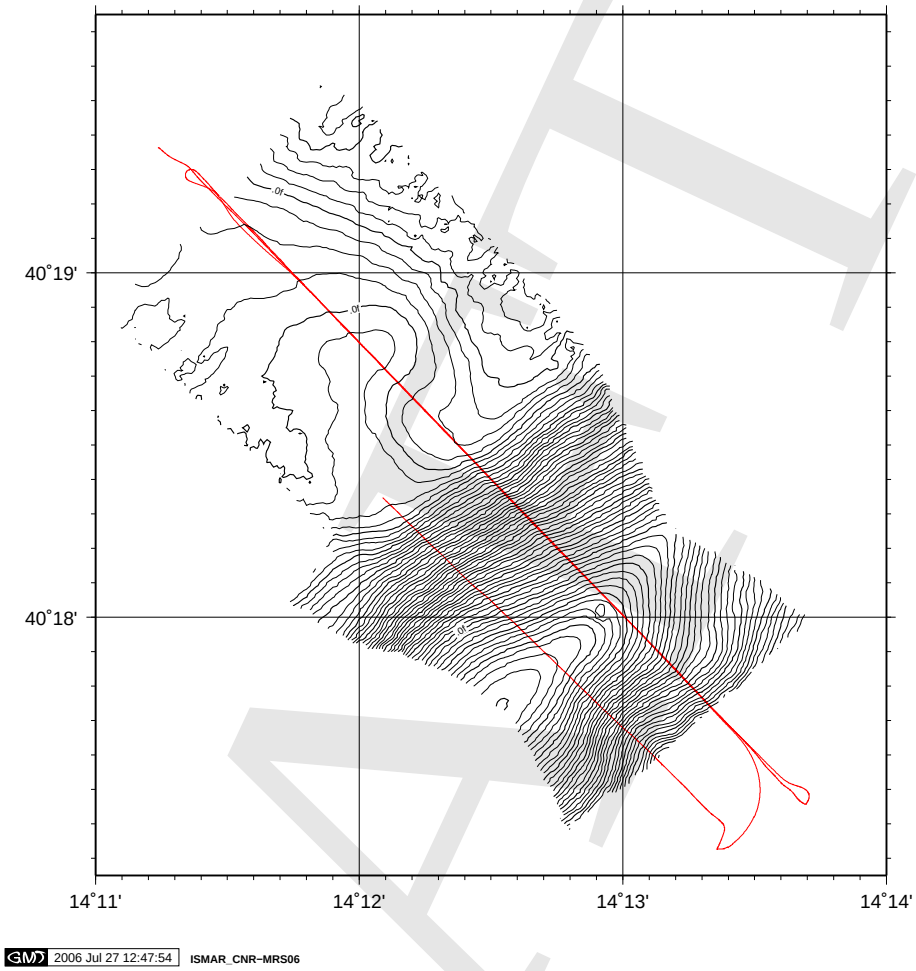


Figure 8: Cruise MRS06. Multibeam 8150 calibration dataset.

8160	MRS06
roll offset	-0.40°
pitch offset	+0.65°
heading offset	1.20°
time delay	0.0 s

Table 4: RESON 8150 Multibeam calibration results.

3.3 CTD AND WATER SAMPLING

CTD casts and water sampling were taken throughout the surveyed area, aiming to detect physical or geochemical anomalies around the volcanic edifice. Data were collected by a Mod. 911Plus SBE profiling system with a 12 bottle water sampling carousel (Fig.9). The position of the CTD stations are reported in Table **??** in Appendix 6.1 and can be viewed in Fig.19 and in Fig.3, respectively. Table 8 in Appendix 6.1 shows the data for the bottles fired for water sampling on the upcast during CTD stations. The water samples were taken at the depths of 1m and 30-50m above the bottom, in addition to some other 'standard' water depths.

Figure 9: The rosette of R/V *Universitatis* .

The 911Plus probe was also towed at aproximate depths 100m above the bottom on western and eastern flanks and over the top of the volcanic edifice by using the ship's 3000m coaxial tow-cable and a twin-wing depressor normally used for high speed tow of seismic guns (see Fig.10). After having calculated the probe position in the water column, using ship's coordinates, layback cable and sensor's depth, the data were used to produce contour maps of selected parameters. Raw data were acquired and processed by SBE's SEASAVE AND SBEdataProcessing software.

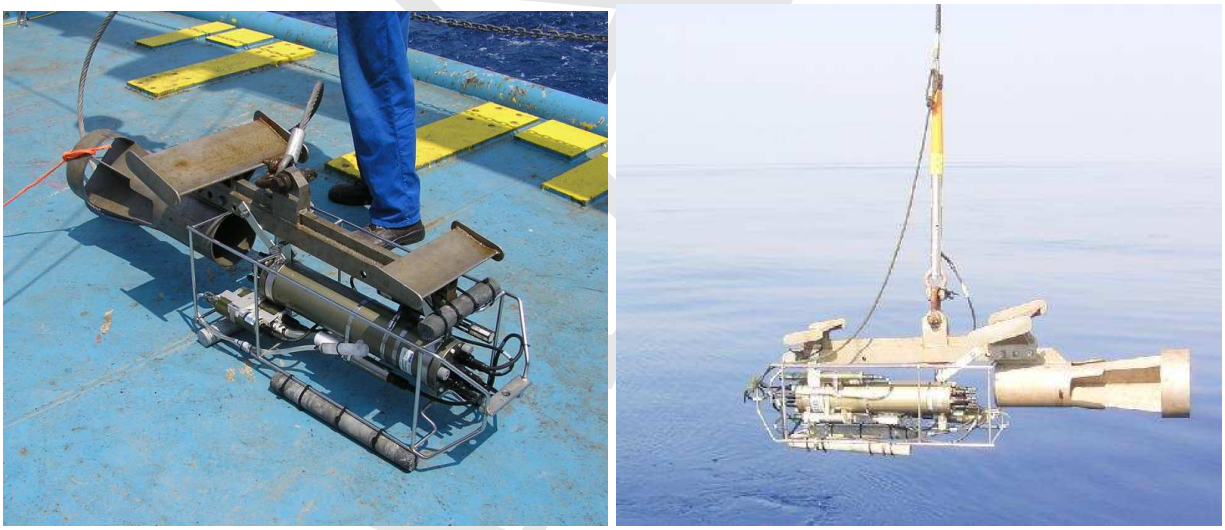


Figure 10: SBE911 CTD tow system ready to go.

3.1 ON BOARD WATER ANALYSIS

Water samples were taken from the bottles immediately after the recovery on deck, and filtrated trough 0.45 μm cellulose acetate.

The INGV group analayzed Fe^{++} by a Lambda-25 Perkin-Elmer U-V spectrophotometer, while CO_3^{--}, HCO_3^- and pH were detected by a Titralab 845 titroner. Eh and temperature were also measured by a meter. TQ samples were acidified with Suprapure HNO_3 0.18 mol. and stored in the refrigerator at 5°.

The UNICH team measured Si and sulphydes on the whole sample by a Smart 2 LaMotte Colorimeter. Metals (among them Al and Mn) chloride, bromide and iodine were detected on some selected samples.

3.4 MAGNETOMETRY

The ISMAR group used a Marine Magnetics SeaSpy magnetometer. The towfish was kept 120 m off the stern, on the port side.The data was collected by the Marine Magnetics SeaLink software on the multibeam and transit lines, The software integrated positional data by the NMEA GGA and VTG strings delivered by the ship's DGPS receiver. Figure 11 shows the acquired lines. Intersecting lines will be used to check and minimize trends, day/night variations, spikes and errors wherever possible.

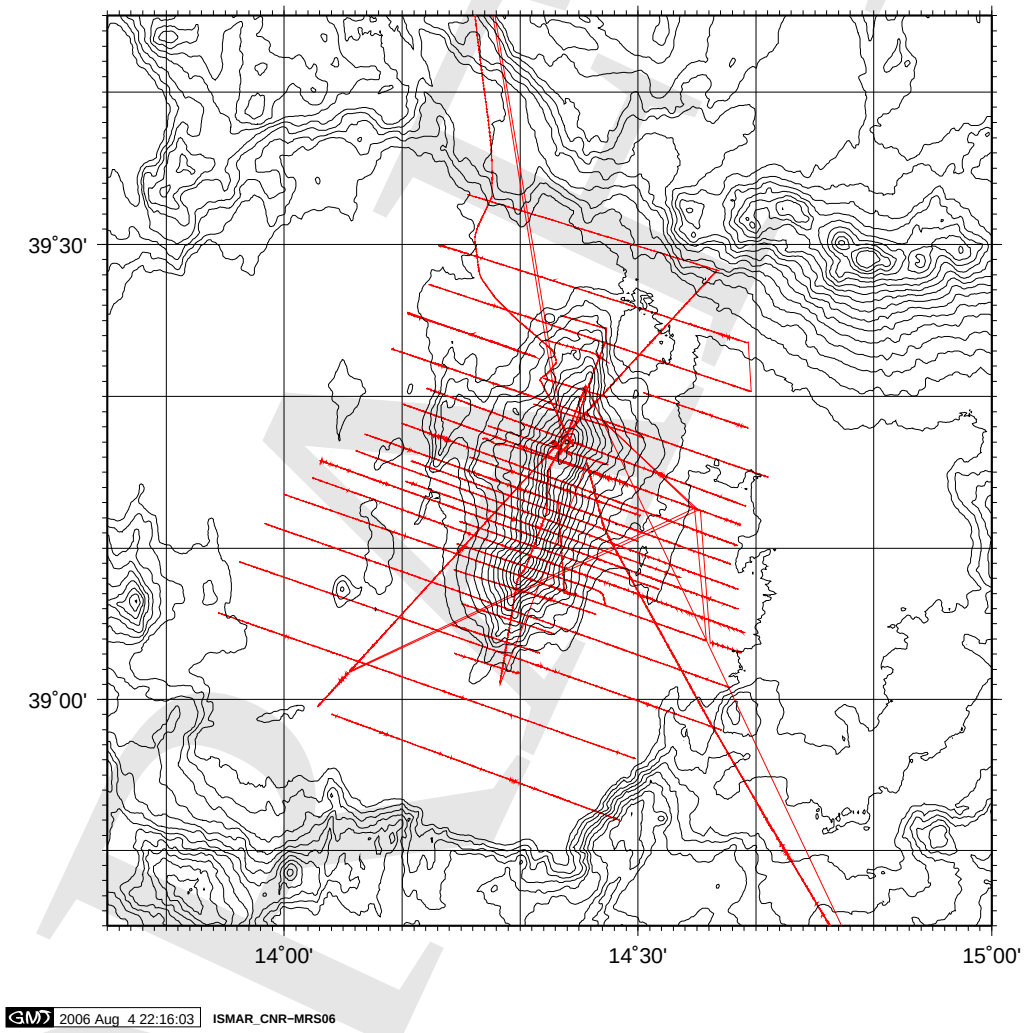


Figure 11: Pattern of acquired magnetic lines.

The following data processing steps were applied:

- extraction of the navigation and total field ASCII data from the SeaLink data files
- application of the IGRF 2010 (IAGA) to every point, to obtain anomalies
- polar transport (GPS antenna offset, angle (hdg-180)) to get the towfish position and conversion of geographical coordinates to UTM-33 WGS84 coordinates
- production of time and wiggle profiles and grids in geographical/metric coordinates for QC and analysis

An example of the data can be viewed in Figures 13 and 12

The INVG team towed two Geometrics Mod-G811 magnetometers in a gradiometer configuration 150+150 m off the stern on the starboard side. The system console received the positional and time data from the ship's DGPS via NMEA GGA sentences. The data were QC checked and processed by the OASIS GEOSOFT software.

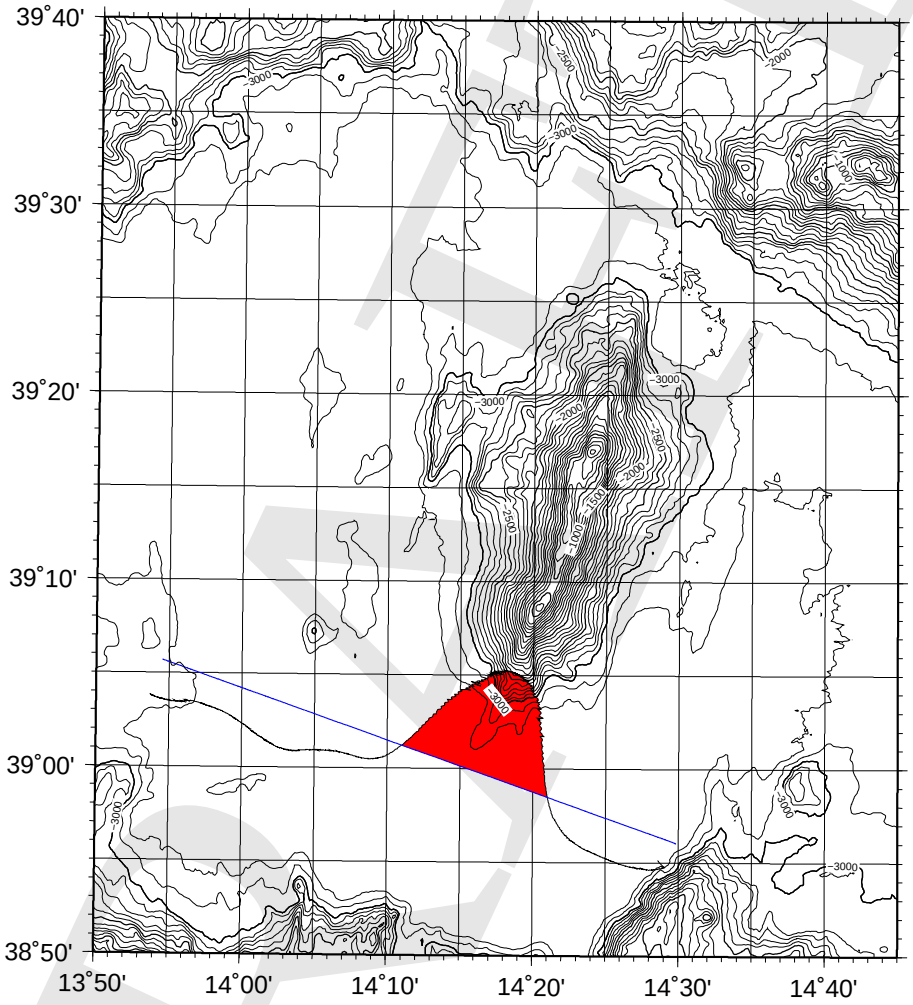


Figure 12: Line 01 IGRF2005 data.

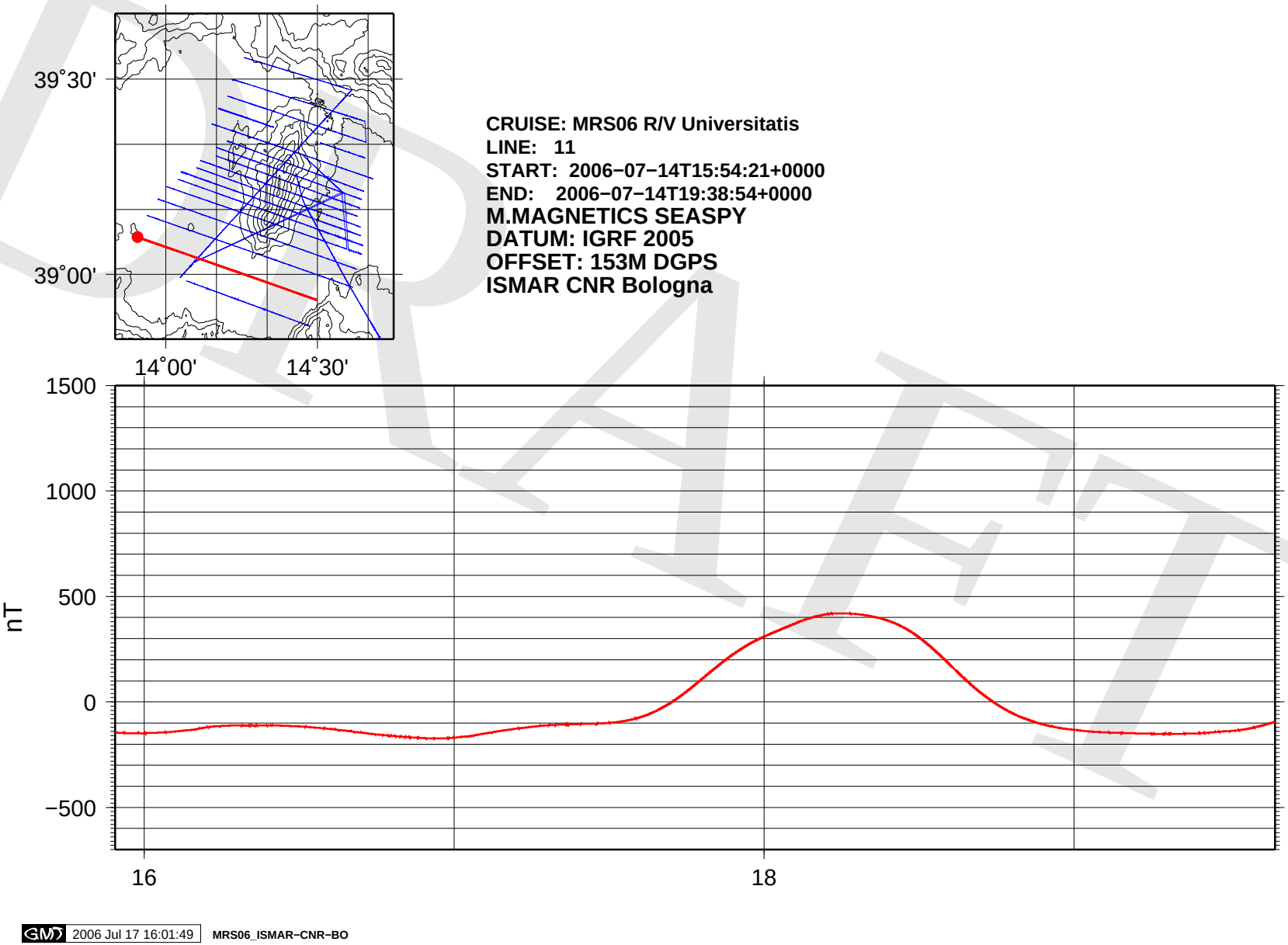


Figure 13: Line 01 IGRF2005 data.

3.5 GRAVIMETRY

During the second Leg a gravimeter was installed very close to center of gravity of R/V *Universitatis* . A pattern of runlines displaced half way between first leg's magnetometric lines were run, thus increasing the resolution of magnetic data. Table 5 shows the data taken on shore stations for drift measurements. Tie lines were also run for control. System was operating also during transits and sampling stations, positioning data being taken on separate files by a second acquisition computer.

DATE	SITE	SHIP
2007-07-		
2007-07-		

Table 5: Gravimeter drift measurement.

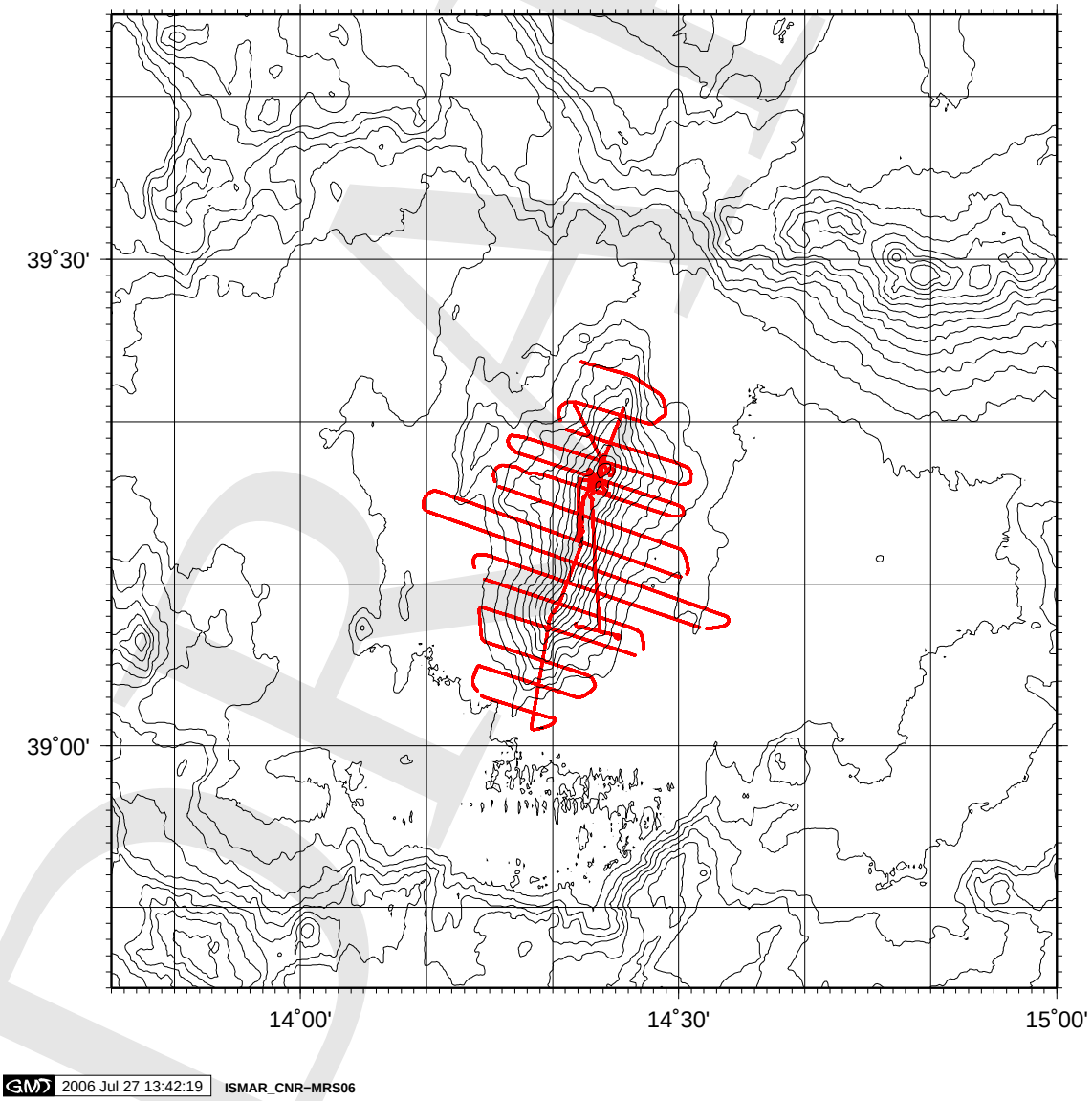


Figure 14: Pattern of acquired gravimetric lines.

3.6 OBS

After a test of deployment/recovery on an area S of the Marsili on a plain 3500 w depth, an OBS was deployed by the INGV team on a gentle depression at 800m depth just SSE of the top of the Marsili. The site was chosen by examining available ISMAR's bathymetric data complemented by this cruise's newly acquired data. The OBS was released 2006-07-12 15:21 UTC. Ship was then positioned on three stations 120˚apart at a distance of aproximately 1200m, and range measurements were taken for object's detection by trilateration, other than acquiring status and health messages. Table 11 in Appendix 6.3 report the positioning data, while figures 15 and 16 show the topography of the deployment area. At the ane of the cruise the OBS was fired 2006-07-21 06:41, reached surface 07:07:40 some 180m SW of ship and was succesfully recovered on deck 07:17 UTC.

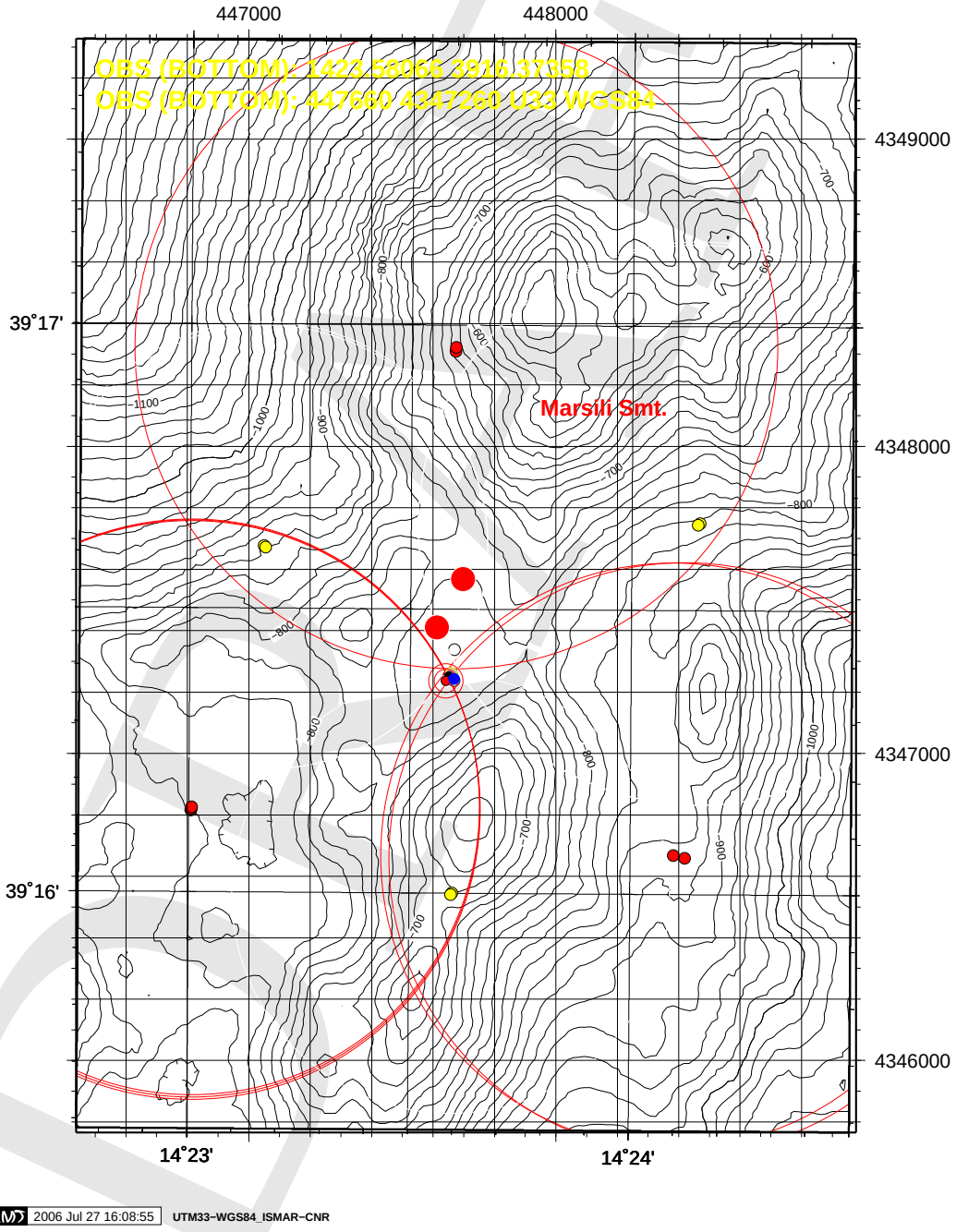


Figure 15: OBS deployment area. White and red circles are the ranges measured during the positioning of the system.

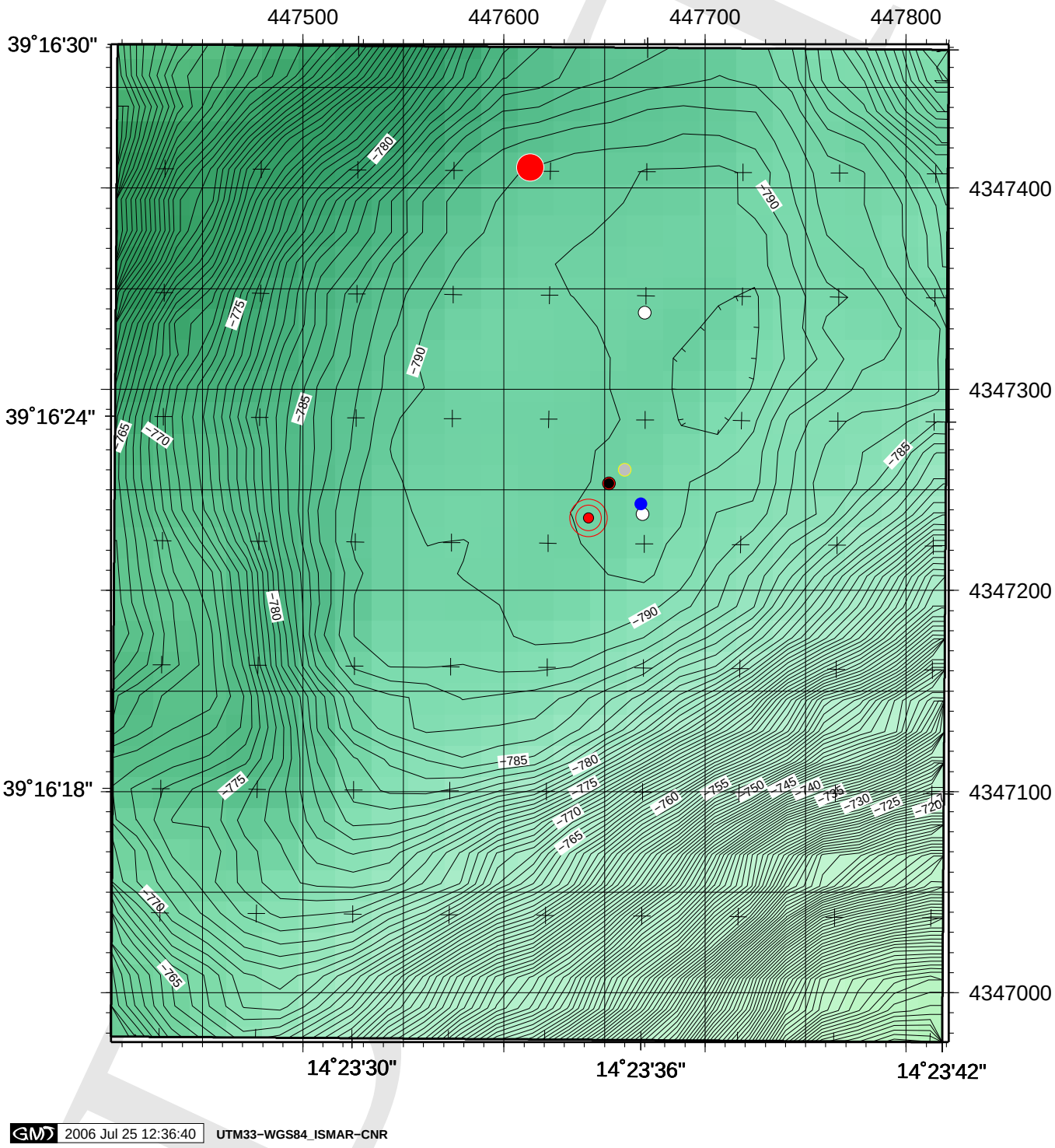


Figure 16: OBS deployment area. The three red circles show the deployment position off stern, the black dot is the antenna position during above deployment, the gray circle is the OBS's position on the bottom resulting by trilateration shown on fig.15 and in table 11.

3.7 CHIRP SBP

Ship's hull mounted GEOACOUSTIC CHIRP Subbottom was used. The data were recorded in the proprietary format (.TRA, .PAR extensions, TEI). The .TRA file is a SEG-Y like file, therefore the ISMAR's SEIPRO routine was able to input data without data conversions.

3.8 SEABED SAMPLING

The sea bottom samples were collected with a 60L Van-Veen grab (Fig.17) and with a 1.2T gravity corer mounted with a3m pipe (Fig.18. Whenever possible one or two sub-cores were taken on the grab sample (Fig.17, right).

The sample locations are shown in Figg.4 and are reported also in Tab.9 in Appendix 6.2.

Core 02 was measured for magnetic suceptibility χ (2cm resolution) using the ISMAR's automatic logger SAAS-01 by a Bartington loop sensor [Masini L. (2001)]. χ (adimensional) measures the capability of the material to become magnetized and to produce a noise in the inducing magnetic field. Knowing χ and density, is it possible to determine the mass susceptibility. The obtained χ data were corrected for the loop sensor diameter (10 cm or 12,5 cm) and the sediment thickness, cleaned, filtered and plotted against core depth.

Figure 17: Sediments recovered with the 60L. grab.

Figure 18: Corer.

3.9 MISCELLANEOUS

The datum was set to WGS84 and the UTM, zone 33 was chosen for navigation and display, and data acquisition. The time zone was set to the UTC for the instrumental data acquisition. The positioning maps and bathymetric images were produced with GMT [Wessel and Smith (1995)]. The multibeam data were pre processed on board by the PDS2000 and GMT software and ISMAR's routines and scripts, using the PDS-2000 production DTMS or XYZ ASCII converted data. ISMAR's computing center employed two INTEL based PC running the SUSE GNU-Linux and the Microsoft Windows 2000 O.S. in addition to portable computer for data acquisition and personal processing. The Linux machine was used as data repositories using the SAMBA software, providing alse network services like WWW server, to share ongoing information and results, and DHCP and NAT. Photographs and video were taken by digital cameras and video-camera.

4 INITIAL RESULTS

Initial results are presented, in order to address the importance of the preliminary findings and processing sequence of the data acquired.

4.1 BATHYMETRY

A surface of approximately 75 km^2 was covered in the surveyed areas during the cruise. Mapping on board was performed by using the PDS-2000 production DTM, converted to ASCII, filtered by ISMAR's routine `filter_bat` (Marco Ligi, personal communication), gridded by the `nearneighbor` GMT routine. The so obtained grids were used sfor navigation, planning, geomorphological and structural analysis.

4.2 CTD

Figure 19 shows the SV, temperature and salinity profiles, the TS diagram and location of the CTD casts. The principal water masses are clearly identified (MAW, LIW, TDW) by their temperature/salinity characteristics. The LIW waters are present down to 600-700m, where they start to mix with the TDW. Also evident are the staircase formations in the TDW. These anomalies and stratifications of the water masses should be clearly identified in the attempt of interpreting the CTD towed runs and the water sample data.

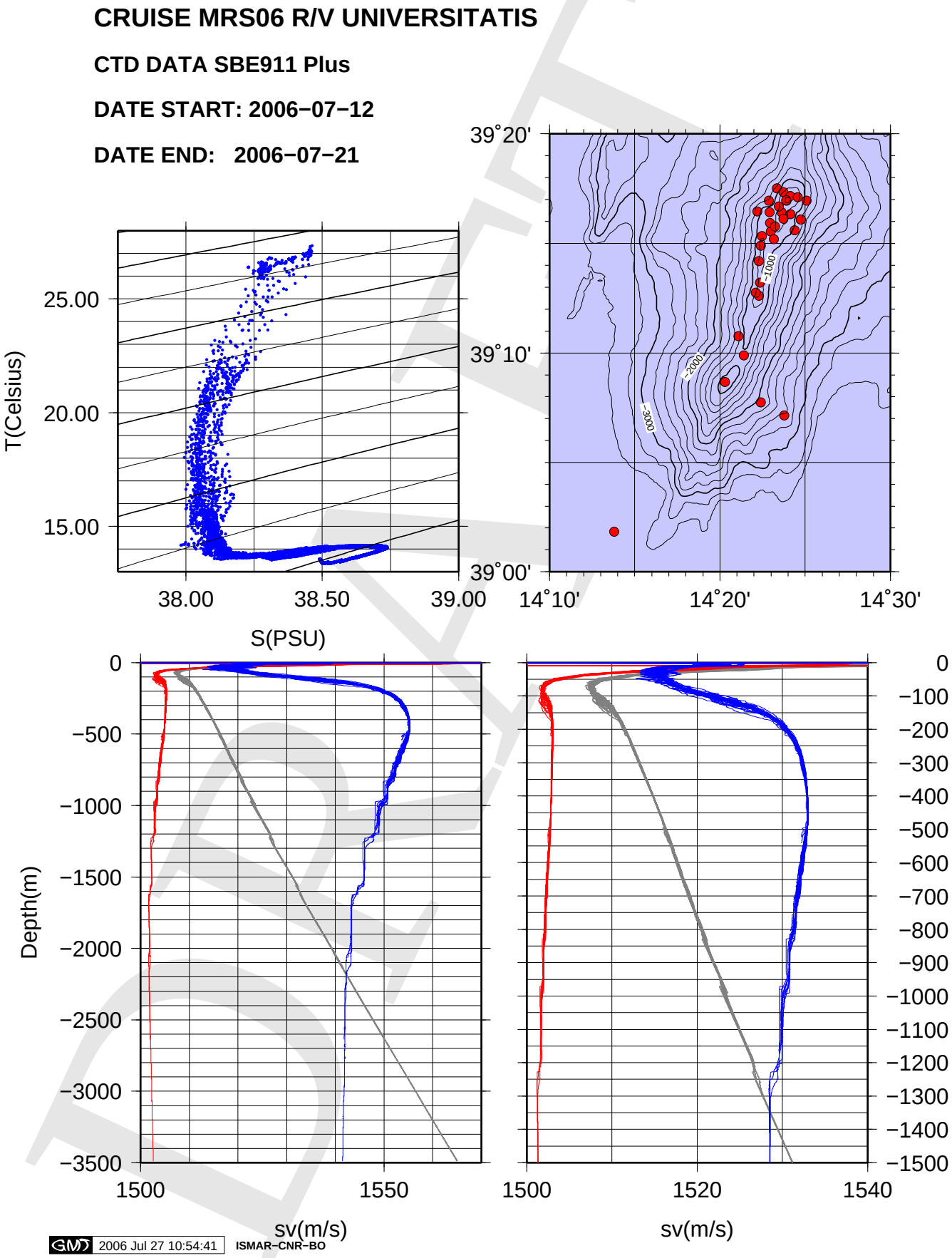


Figure 19: Cruise MRS06 CTD casts. Lower left,right: Sound Velocity(gray), T(red,13-28°), S(blue, 37.75-39PSU). Upper left: TS diagram.

4.3 SEABED SAMPLING

A total of 18 grabs and two cores were recovered during the cruise. They were subsampled, described and photographed onboard (Fig.20). Figure 21 shows the magnetic susceptibility data for CORE02. Appendix 6.2) reports the description (Table 10).

Figure 20: Sample G9.

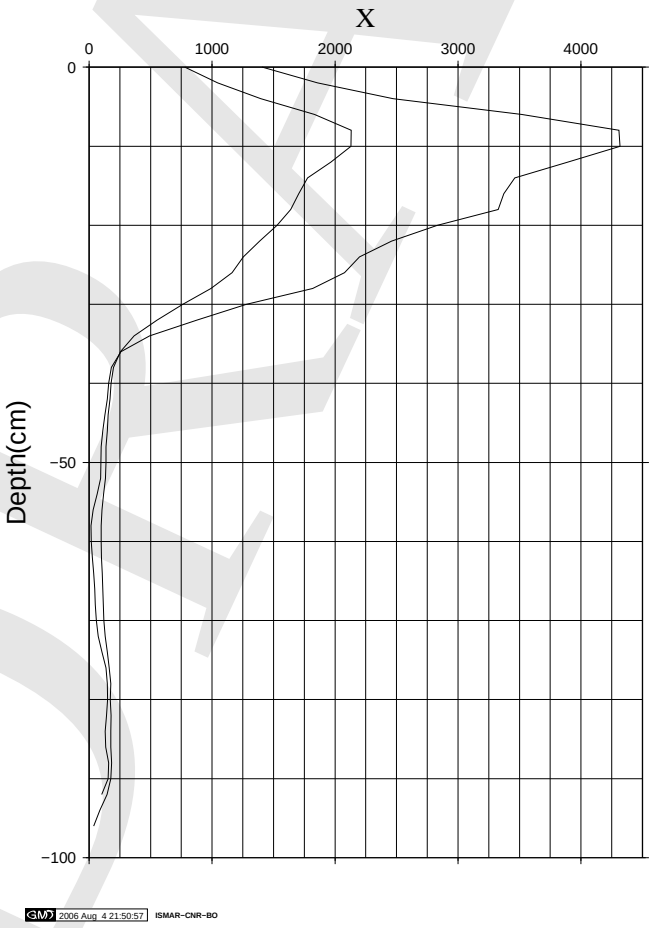


Figure 21: Magnetic susceptibility data of CORE02. The two curves were taken with 125 and 100 mm Bartington loops.

4.4 CHIRP SBP

Figure 22 shows an example of data taken at the OBS deployment site.

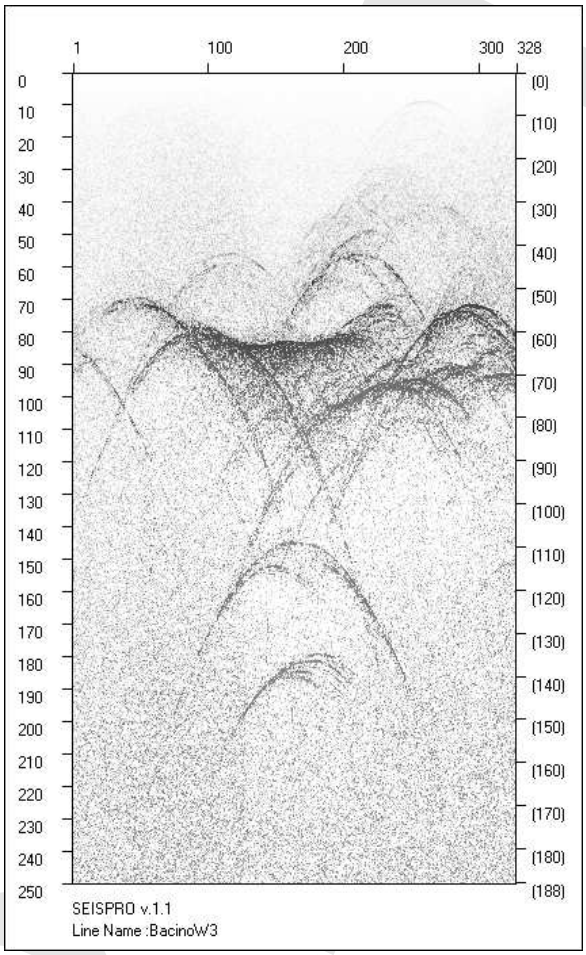


Figure 22: Cruise MRS06. Example of CHIRP data, processed by ISMAR's SEISPRO after conversion of raw data to SEGY.

5 CONCLUSIONS

Analysis of the data collected during the MRS06 expedition is under process, and will continue during the forthcoming several months. During a 10 days (of total 11 including transits) cruise in the Marsili Basin we obtained:

- high resolution bathymetric images and DTMs of the investigated areas (aproximately 75 km^2 from 2000 to 500 m depth).
- high resolution gravimetric and magnetometric data
- bottom samples (18 grabs, 2 cores)
- 32 CTD casts and 3 CTD tow continuous profiling
- geochemical data and water properties

The data is under detailed processing and analysis, and we expect to have new insights into the geology of the investigated areas.

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6 APPENDIX

6.1 CTD AND BOTTLES LOCATION

Table 6: CTD data from SBE CNV files.

STA	DATE	TIME	LON	LAT	EASTING	NORTHING	DPTH	DPTH_DTM
		UTC	WGS84		UTM-33	WGS84	m	m
CTD01	2006-07-12	00:12:00	14.392125	39.284722	447574.5	4348549.3	538	-739.7
CTD02A	2006-07-12	02:50:20	14.338080	39.144940	442800.0	4333069.5	780	-800.9
CTD02A	2006-07-12	03:19:20	14.338080	39.144940	442800.0	4333069.5	780	-800.9
CDT03	2006-07-12	10:50:06	14.230127	39.029628	433362.7	4320346.4	3415	-3496.7
CTD04	2006-07-18	21:38:36	14.394250	39.274000	447749.8	4347358.2	791	-789.0
CTD05	2006-07-18	23:42:39	14.381483	39.282200	446654.7	4348275.7	1136	-1161.4
CTD06	2006-07-19	01:27:52	14.391183	39.278250	447488.4	4347831.7	805	-813.1
CTD07	2006-07-19	03:18:10	14.402750	39.272733	448482.0	4347212.7	785	-795.7
CTD08	2006-07-19	04:56:01	14.411433	39.269283	449228.5	4346825.0	1146	-1164.5
CTD09	2006-07-19	08:39:02	14.383170	39.260347	446783.7	4345849.5	882	-881.2
CTD10	2006-07-19	12:14:23	14.374115	39.257150	446000.0	4345500.1	882	-790.5
CTD11	2006-07-19	13:06:18	14.373152	39.248133	445910.0	4344500.0	675	-688.2
CTD12	2006-07-19	13:51:23	14.371398	39.236770	445749.9	4343240.0	700	-742.3
CTD13	2006-07-19	14:51:43	14.372520	39.220772	445834.4	4341463.9	694	-708.8
CTD14	2006-07-19	17:05:59	14.371390	39.209732	445728.4	4340239.4	772	-771.7
CTD15	2006-07-19	19:10:43	14.368260	39.212063	445460.0	4340500.0	798	-808.4
CTD16	2006-07-19	21:03:49	14.370317	39.273983	445685.3	4347370.4	970	-1065.2
CTD17	2006-07-19	22:34:56	14.382220	39.273297	446711.5	4347287.2	795	-798.1
CTD18	2006-07-19	23:59:50	14.381603	39.266423	446653.1	4346524.7	861	-853.3
CTD19	2006-07-20	01:22:36	14.394200	39.268620	447741.5	4346761.2	631	-636.7
CTD20	2006-07-20	02:37:36	14.406278	39.259837	448777.0	4345779.6	1082	-1074.3
CTD21	2006-07-20	04:02:57	14.386050	39.263090	447034.2	4346152.2	820	-840.8
CTD22	2006-07-20	04:49:00	14.385907	39.253807	447014.9	4345122.1	-884.7	
CTD23	2006-07-20	10:45:50	14.397242	39.119342	447893.7	4330193.2	2660	-2655.0
CTD24	2006-07-20	14:45:44	14.397242	39.119342	447893.7	4330193.2	2060	-2655.0
CTD25	2006-07-20	17:17:17	14.354468	39.165173	444232.2	4335304.7	1000	-1014.2
CTD26	2006-07-20	21:13:09	14.350350	39.181650	443889.5	4337135.8	1222	-1281.2
CTD27	2006-07-20	23:14:04	14.388750	39.291483	447288.4	4349301.6	1151	-1094.0
CTD28	2006-07-21	00:33:38	14.395950	39.289350	447907.8	4349060.8	750	-788.7
CTD29	2006-07-21	01:37:58	14.402950	39.286033	448509.0	4348688.6	517	-565.2
CTD30	2006-07-21	02:51:45	14.410200	39.285083	449133.6	4348579.1	759	-792.6
CTD31	2006-07-21	03:49:23	14.418723	39.282550	449866.8	4348293.2	1078	-1132.8
CTD32	2006-07-21	04:57:54	14.398133	39.282700	448091.1	4348321.5	544	-550.4

Table 7: CTD data from PDS-2000 Waypoints.

STA	DATE	TIME	WHAT	LON	LAT	EASTING	NORTHING	WDEPT
		UTC		WGS84		UTM-33	WGS84	
SVP01	2006-07-11	13:36:24	amare	14.1915068	40.3177278	431307.81	4463336.46	
SVP01	2006-07-11	13:44:53	fondo	14.1911412	40.3175763	431276.60	4463319.93	
SVP01	2006-07-11	13:54:37	abordo	14.1917336	40.3172713	431326.62	4463285.62	
CTD01	2006-07-12	00:04:56	amare	14.3989419	39.2829537	448161.07	4348349.18	-559.
CTD01	2006-07-12	00:24:30	fondo	14.3985687	39.2824660	448128.52	4348295.28	-560.
CTD01	2006-07-12	00:51:41	abordo	14.3980914	39.2826218	448087.47	4348312.84	-551.
CTD02	2006-07-12	02:46:48	amare	14.3382032	39.1450722	442810.80	4333084.11	-795.
CTD02	2006-07-12	03:05:01	fondo	14.3383402	39.1447543	442822.38	4333048.75	-789.
CTD02	2006-07-12	03:36:36	abordo	14.3430515	39.1422846	443227.53	4332771.71	-959.
CTD03	2006-07-12	10:37:57	amare	14.2295211	39.0281324	433308.89	4320180.85	-3497.
CTD03b	2006-07-12	10:50:48	amare	14.2297903	39.0297256	433333.69	4320357.45	-3496.
CTD03	2006-07-12	11:56:42	fondo	14.2296968	39.0304178	433326.24	4320434.34	-3496.
CTD03	2006-07-12	12:50:17	abordo	14.2265991	39.0310049	433058.67	4320501.77	-3495.
CTDTOW	2006-07-16	23:19:54	amare	14.3378987	39.1729736	442807.08	4336180.68	-1616.
CTD04	2006-07-18	21:39:40	amare	14.3940625	39.2738728	447733.49	4347344.22	-791.
CTD04	2006-07-18	21:56:13	fondo	14.3936726	39.2736810	447699.71	4347323.15	-792.
CTD04	2006-07-18	22:06:34	abordo	14.3935774	39.2736187	447691.45	4347316.30	-791.
CTD05	2006-07-18	23:42:49	amare	14.3815432	39.2822464	446659.95	4348280.80	-1161.
CTD05	2006-07-19	00:03:53	fondo	14.3812329	39.2825134	446633.39	4348310.62	-1175.
CTD05	2006-07-19	00:21:26	abordo	14.3809616	39.2828143	446610.22	4348344.17	-1189.
CTD06	2006-07-19	01:27:37	amare	14.3913218	39.2782522	447500.35	4347831.82	-809.
CTD06	2006-07-19	01:42:43	fondo	14.3911168	39.2781739	447482.61	4347823.25	-813.
CTD06	2006-07-19	01:55:26	abordo	14.3914825	39.2781446	447514.13	4347819.78	-805.
CTD07	2006-07-19	03:16:37	amare	14.4028903	39.2727602	448494.14	4347215.68	-794.
CTD07	2006-07-19	03:33:19	fondo	14.4023682	39.2722899	448448.76	4347163.78	-804.
CTD07	2006-07-19	03:44:22	abordo	14.4025810	39.2718459	448466.79	4347114.39	-804.
CTD08	2006-07-19	04:54:26	amare	14.4115075	39.2693435	449234.99	4346831.63	-1166.
CTD08	2006-07-19	05:19:47	fondo	14.4122900	39.2680850	449301.58	4346691.53	-1178.
CTD08	2006-07-19	05:20:30	fondo	14.4122850	39.2680308	449301.11	4346685.52	-1177.
CTD08	2006-07-19	05:34:15	abordo	14.4124458	39.2671555	449314.35	4346588.29	-1171.
CTD09	2006-07-19	08:39:10	amare	14.3832769	39.2602339	446792.83	4345836.89	-880.
CTD09	2006-07-19	08:55:19	fondo	14.3831911	39.2590584	446784.54	4345706.48	-865.
CTD09	2006-07-19	09:05:53	abordo	14.3832961	39.2584376	446793.13	4345637.53	-868.
CTD10	2006-07-19	12:10:57	amare	14.3738311	39.2568760	445975.32	4345469.83	-786.
CTD10	2006-07-19	12:29:09	fondo	14.3745501	39.2557013	446036.45	4345339.04	-778.
CTD10	2006-07-19	12:41:06	abordo	14.3742244	39.2559290	446008.53	4345364.50	-764.
CTD11	2006-07-19	13:04:11	amare	14.3730536	39.2482325	445901.60	4344511.06	-689.
CTD11	2006-07-19	13:19:13	fondo	14.3733957	39.2481367	445931.04	4344500.23	-687.
CTD11	2006-07-19	13:29:57	abordo	14.3725904	39.2478298	445861.32	4344466.65	-708.
CTD12	2006-07-19	13:49:56	amare	14.3715930	39.2369297	445766.86	4343257.59	-734.
CTD12	2006-07-19	14:06:01	fondo	14.3713784	39.2365664	445748.06	4343217.40	-741.
CTD12	2006-07-19	14:17:52	abordo	14.3709644	39.2367390	445712.46	4343236.80	-756.
CTD13	2006-07-19	14:52:15	amare	14.3726895	39.2203224	445848.73	4341413.90	-705.
CTD13	2006-07-19	15:05:15	fondo	14.3724040	39.2201436	445823.95	4341394.23	-707.
CTD13	2006-07-19	15:19:40	abordo	14.3718447	39.2203673	445775.84	4341419.39	-721.
CTD14	2006-07-19	17:04:09	amare	14.3713898	39.2097312	445728.38	4340239.31	-771.
CTD14	2006-07-19	17:24:15	fondo	14.3711865	39.2103041	445711.27	4340303.01	-769.
CTD14	2006-07-19	17:38:26	abordo	14.3707737	39.2107547	445675.98	4340353.26	-757.
CTD15	2006-07-19	19:10:47	amare	14.3679170	39.2119268	445430.25	4340485.05	-813.
CTD15	2006-07-19	19:25:06	fondo	14.3683916	39.2124657	445471.64	4340544.57	-801.
CTD15	2006-07-19	19:36:45	abordo	14.3679357	39.2129238	445432.64	4340595.69	-806.
CTD16	2006-07-19	21:03:07	amare	14.3701515	39.2739394	445671.02	4347365.69	-1076.

CTD16	2006-07-19	21:27:00	fondo	14.3696833	39.2743000	445630.92	4347405.99	-1096.
CTD16	2006-07-19	21:41:03	abordo	14.3688284	39.2744516	445557.29	4347423.32	-1136.
CTD17	2006-07-19	22:35:05	amare	14.3821528	39.2733476	446705.78	4347292.88	-796.
CTD17	2006-07-19	22:49:35	fondo	14.3818540	39.2737076	446680.28	4347333.00	-795.
CTD17	2006-07-19	23:01:44	abordo	14.3818300	39.2739122	446678.37	4347355.72	-800.
CTD18	2006-07-19	23:59:58	amare	14.3816822	39.2663707	446659.90	4346518.87	-853.
CTD18	2006-07-20	00:15:19	fondo	14.3823317	39.2656193	446715.36	4346435.10	-841.
CTD18	2006-07-20	00:31:49	abordo	14.3830403	39.2659501	446776.74	4346471.40	-835.
CTD19	2006-07-20	01:22:38	amare	14.3943300	39.2687247	447752.74	4346772.74	-637.
CTD19	2006-07-20	01:34:20	fondo	14.3955924	39.2686638	447861.59	4346765.25	-671.
CTD19	2006-07-20	01:43:29	abordo	14.3965850	39.2688729	447947.37	4346787.88	-718.
CTD20	2006-07-20	02:37:41	amare	14.4064319	39.2597642	448790.18	4345771.41	-1075.
CTD20	2006-07-20	02:57:21	fondo	14.4063647	39.2599199	448784.49	4345788.73	-1074.
CTD20	2006-07-20	03:11:36	abordo	14.4068822	39.2600286	448829.22	4345800.50	-1076.
CTD21	2006-07-20	04:02:55	amare	14.3862305	39.2628501	447049.62	4346125.50	-831.
CTD21	2006-07-20	04:20:25	fondo	14.3873062	39.2627977	447142.38	4346119.05	-779.
CTD21	2006-07-20	04:29:31	abordo	14.3871543	39.2625186	447129.07	4346088.17	-782.
CTD22	2006-07-20	04:49:01	amare	14.3858412	39.2536019	447009.07	4345099.38	-891.
CTD22	2006-07-20	05:05:54	fondo	14.3861522	39.2532091	447035.61	4345055.61	-881.
CTD22	2006-07-20	05:15:57	abordo	14.3858898	39.2533174	447013.05	4345067.78	-892.
CTD23	2006-07-20	10:45:28	amare	14.3972421	39.1192810	447893.69	4330186.39	-2656.
CTD23	2006-07-20	11:31:07	fondo	14.3960689	39.1192415	447792.24	4330182.68	-2645.
CTD23	2006-07-20	12:09:27	abordo	14.3958936	39.1205136	447778.02	4330323.95	-2615.
CTD24	2006-07-20	14:45:19	amare	14.3716246	39.1294928	445686.97	4331334.66	-2036.
CTD24	2006-07-20	15:22:40	fondo	14.3731117	39.1290051	445815.13	4331279.64	-2056.
CTD24	2006-07-20	15:48:02	abordo	14.3745573	39.1285042	445939.70	4331223.20	-2076.
CTD25	2006-07-20	17:15:01	amare	14.3544677	39.1651733	444232.18	4335304.72	-1014.
CTD25	2006-07-20	17:34:40	fondo	14.3565949	39.1648939	444415.73	4335272.40	-1009.
CTD25	2006-07-20	17:47:51	abordo	14.3568758	39.1664161	444441.20	4335441.16	-1029.
CTD26	2006-07-20	21:09:19	amare	14.3503514	39.1815187	443889.56	4337121.20	-1279.
CTD26	2006-07-20	21:38:23	fondo	14.3516023	39.1795152	443996.01	4336898.09	-1194.
CTD26	2006-07-20	21:53:34	abordo	14.3528635	39.1783111	444103.99	4336763.68	-1122.
CTD27	2006-07-20	23:14:09	amare	14.3890429	39.2915328	447313.74	4349306.99	-1086.
CTD27	2006-07-20	23:33:11	fondo	14.3889607	39.2917755	447306.83	4349333.98	-1097.
CTD27	2006-07-20	23:46:13	abordo	14.3883493	39.2914370	447253.85	4349296.77	-1105.
CTD28	2006-07-21	00:33:36	amare	14.3960931	39.2890735	447919.90	4349029.98	-768.
CTD28	2006-07-21	00:47:31	fondo	14.3953874	39.2888786	447858.90	4349008.76	-780.
CTD28	2006-07-21	00:58:05	abordo	14.3945532	39.2890580	447787.09	4349029.15	-818.
CTD29	2006-07-21	01:37:59	amare	14.4030264	39.2860902	448515.64	4348694.93	-564.
CTD29	2006-07-21	01:49:10	fondo	14.4022595	39.2859600	448449.40	4348680.92	-574.
CTD29	2006-07-21	01:57:38	abordo	14.4019935	39.2859283	448426.44	4348677.56	-587.
CTD30	2006-07-21	02:51:52	amare	14.4102692	39.2851567	449139.60	4348587.24	-795.
CTD30	2006-07-21	03:05:57	fondo	14.4094393	39.2851120	449068.00	4348582.75	-765.
CTD30	2006-07-21	03:16:54	abordo	14.4089306	39.2851079	449024.12	4348582.58	-747.
CTD31	2006-07-21	03:49:20	amare	14.4188319	39.2826560	449876.30	4348304.94	-1135.
CTD31	2006-07-21	04:23:58	fondo	14.4179634	39.2825925	449801.35	4348298.37	-1105.
CTD31	2006-07-21	04:25:58	abordo	14.4179384	39.2825563	449799.17	4348294.37	-1105.
CTD32	2006-07-21	04:57:19	amare	14.3981776	39.2827968	448095.03	4348332.21	-549.
CTD32	2006-07-21	05:08:05	fondo	14.3981087	39.2828876	448089.16	4348342.33	-546.
CTD32	2006-07-21	05:14:27	abordo	14.3978865	39.2828686	448069.98	4348340.35	-541.

Table 8: Bottle data.

STA	DATE	TIME	BT	PR	DSM	T	S	SV	OXG	PH	EH	AL
		UTC		dB	m	deg	psu	m/s	ml/l		mv	r
CTD01	2006-07-12	00:24:11	1	545.5	540.7	13.913	38.707	1516.6	4.06	8.84	201	15.4
CTD01	2006-07-12	00:26:32	2	504.7	500.3	14.004	38.727	1516.2	4.06	8.84	202	
CTD01	2006-07-12	00:28:30	3	453.8	449.9	14.059	38.736	1515.6	4.06	8.84	202	
CTD01	2006-07-12	00:33:18	4	403.5	400.0	14.086	38.734	1514.8	4.06	8.84	204	
CTD01	2006-07-12	00:35:46	5	352.7	349.7	14.109	38.727	1514.0	4.05	8.85	204	
CTD01	2006-07-12	00:38:06	6	303.4	300.9	14.117	38.718	1513.2	4.07	8.85	205	
CTD01	2006-07-12	00:40:32	7	252.5	250.4	14.140	38.693	1512.5	4.08	8.85	205	
CTD01	2006-07-12	00:42:37	8	202.2	200.6	14.144	38.644	1511.6	4.10	8.85	205	
CTD01	2006-07-12	00:44:26	9	151.5	150.3	14.072	38.537	1510.4	4.21	8.85	206	
CTD01	2006-07-12	00:46:26	10	101.2	100.4	13.665	38.243	1507.9	4.84	8.87	206	
CTD01	2006-07-12	00:48:28	11	50.7	50.3	14.239	38.054	1508.7	5.79	8.91	206	
CTD01	2006-07-12	00:50:25	12	1.4	1.3	26.466	38.232	1541.3	4.50	8.81	201	
CTD02A	2006-07-12	03:05:23	1	774.8	767.5	13.836	38.684	1520.1	4.08	8.85		9.0
CTD02A	2006-07-12	03:08:16	2	754.6	747.5	13.834	38.684	1519.8	4.07	8.85		27.0
CTD02A	2006-07-12	03:10:45	3	733.7	726.9	13.836	38.685	1519.4	4.07	8.86		
CTD02A	2006-07-12	03:12:20	4	707.2	700.6	13.897	38.700	1519.2	4.07	8.86		
CTD02A	2006-07-12	03:15:57	5	636.0	630.2	13.904	38.705	1518.1	4.06	8.86		
CTD02A	2006-07-12	03:17:53	6	573.4	568.2	13.961	38.718	1517.2	4.06	8.86		
CTD02A	2006-07-12	03:22:18	1	504.4	500.0	14.019	38.731	1516.3	4.05	8.87		
CTD02A	2006-07-12	03:25:11	2	403.7	400.3	14.079	38.735	1514.8	4.04	8.87		
CTD02A	2006-07-12	03:27:39	3	302.8	300.2	14.123	38.719	1513.3	4.05	8.87		
CTD02A	2006-07-12	03:30:57	4	202.4	200.7	14.145	38.657	1511.6	4.08	8.87		
CTD02A	2006-07-12	03:33:33	5	101.5	100.7	13.707	38.332	1508.1	4.70	8.89		
CTD02A	2006-07-12	03:36:09	6	1.4	1.4	26.334	38.295	1541.1	4.50	8.82		1.6
CDT03	2006-07-12	11:56:39	1	3545.8	3489.7	13.564	38.491	1565.1	4.26			10.0
CDT03	2006-07-12	12:02:20	2	3300.7	3250.3	13.527	38.493	1560.8	4.23			
CDT03	2006-07-12	12:06:34	3	3044.9	3000.2	13.493	38.496	1556.5	4.21			
CDT03	2006-07-12	12:10:31	4	2789.2	2749.9	13.456	38.499	1552.1	4.19			
CDT03	2006-07-12	12:18:40	5	2200.4	2172.4	13.379	38.505	1542.1	4.16			
CDT03	2006-07-12	12:25:22	6	1680.5	1661.1	13.352	38.523	1533.4	4.13			
CDT03	2006-07-12	12:30:52	7	1270.2	1256.7	13.461	38.571	1527.0	4.07			
CDT03	2006-07-12	12:32:40	8	1200.5	1187.9	13.604	38.609	1526.3	4.03			
CDT03	2006-07-12	12:36:03	9	990.5	980.7	13.578	38.612	1522.8	4.03			
CDT03	2006-07-12	12:38:47	10	850.2	842.1	13.681	38.642	1520.8	4.01			
CDT03	2006-07-12	12:40:30	11	750.5	743.4	13.801	38.674	1519.6	4.00			
CDT03	2006-07-12	12:49:36	12	1.2	1.2	26.652	38.303	1541.8	4.45			1.3
CTD04	2006-07-18	21:55:57	1	792.9	785.4	13.819	38.680	1520.4	4.03	6.67	237	
CTD04	2006-07-18	21:57:00	3	740.7	733.7	13.845	38.688	1519.6	4.04	6.66	238	
CTD04	2006-07-18	22:00:03	5	505.3	500.8	14.027	38.734	1516.3	4.03	6.66	238	
CTD04	2006-07-18	22:01:04	7	455.1	451.1	14.059	38.738	1515.6	4.03	6.67	239	
CTD04	2006-07-18	22:05:14	9	101.3	100.5	13.842	38.343	1508.6	4.63	6.68	240	
CTD05	2006-07-19	00:03:57	1	1183.0	1170.8	13.614	38.614	1526.1	4.09	8.94	227	2.3
CTD05	2006-07-19	00:05:36	3	1132.1	1120.5	13.623	38.619	1525.3	4.08	8.94	228	
CTD05	2006-07-19	00:13:54	5	505.6	501.2	14.029	38.734	1516.3	4.02	8.96	230	
CTD05	2006-07-19	00:15:08	7	454.5	450.5	14.060	38.738	1515.6	4.02	8.97	230	
CTD05	2006-07-19	00:19:26	9	101.8	101.0	13.827	38.330	1508.5	4.64	8.98	232	
CTD06	2006-07-19	01:42:55	1	811.3	803.6	13.748	38.661	1520.4	4.01	8.94	226	1.5
CTD06	2006-07-19	01:44:28	3	759.8	752.7	13.817	38.680	1519.8	4.04	8.94	227	
CTD06	2006-07-19	01:48:07	5	505.0	500.5	14.024	38.732	1516.3	4.02	8.95	228	
CTD06	2006-07-19	01:49:16	7	454.6	450.7	14.063	38.738	1515.6	4.02	8.95	228	
CTD06	2006-07-19	01:53:53	9	101.5	100.7	13.789	38.300	1508.4	4.69	8.97	230	
CTD07	2006-07-19	03:33:49	1	795.3	787.8	13.819	38.680	1520.4	4.05	8.93	221	3.0

CTD07	2006-07-19	03:35:20	3	745.8	738.8	13.830	38.684	1519.6	4.04	8.93	222	
CTD07	2006-07-19	03:38:48	5	505.9	501.5	14.031	38.734	1516.3	4.03	8.94	224	
CTD07	2006-07-19	03:40:03	7	455.0	451.1	14.055	38.737	1515.6	4.02	8.94	225	
CTD07	2006-07-19	03:44:20	9	101.5	100.7	13.760	38.292	1508.3	4.70	8.96	227	
CTD08	2006-07-19	05:20:45	1	1176.8	1164.6	13.595	38.610	1525.9	4.09	8.91	240	2.0
CTD08	2006-07-19	05:21:42	3	1125.4	1113.9	13.642	38.625	1525.2	4.07	8.91	240	
CTD08	2006-07-19	05:26:42	5	706.5	699.9	13.863	38.693	1519.1	4.02	8.93	242	
CTD08	2006-07-19	05:29:21	7	505.6	501.2	14.022	38.733	1516.3	4.02	8.94	242	
CTD08	2006-07-19	05:30:11	9	455.2	451.3	14.052	38.737	1515.6	4.01	8.94	242	
CTD08	2006-07-19	05:34:16	11	102.4	101.6	13.796	38.334	1508.4	4.59	8.96	243	
CTD09	2006-07-19	08:55:25	1	871.4	862.9	13.748	38.660	1521.4	4.05	9.03	230	
CTD09	2006-07-19	08:55:32	2	866.6	858.3	13.750	38.661	1521.3	4.06	9.03	231	4.0
CTD10	2006-07-19	12:29:22	1	774.6	767.4	13.822	38.681	1520.1	4.04	9.06	285	
CTD11	2006-07-19	13:19:34	1	677.7	671.4	13.829	38.686	1518.5	4.03	9.18	260	
CTD12	2006-07-19	14:06:28	1	741.1	734.2	13.816	38.680	1519.5	4.04	9.17	255	28.5
CTD13	2006-07-19	15:05:25	1	714.8	708.1	13.835	38.686	1519.1	4.04	9.23	252	0.9
CTD13	2006-07-19	15:06:57	3	664.6	658.5	13.854	38.693	1518.4	4.04	9.23	253	
CTD13	2006-07-19	15:10:25	5	504.9	500.5	14.026	38.733	1516.3	4.02	9.23	254	
CTD13	2006-07-19	15:12:03	7	454.3	450.4	14.053	38.736	1515.6	4.03	9.23	255	
CTD13	2006-07-19	15:17:34	9	101.2	100.4	13.755	38.355	1508.3	4.58	9.24	257	
CTD14	2006-07-19	17:24:11	1	772.8	765.5	13.828	38.682	1520.0	4.04	9.21	259	
CTD14	2006-07-19	17:26:01	3	722.1	715.4	13.826	38.684	1519.2	4.04	9.21	260	
CTD14	2006-07-19	17:30:26	5	504.7	500.3	14.023	38.733	1516.3	4.02	9.22	261	
CTD14	2006-07-19	17:32:13	7	453.7	449.8	14.049	38.736	1515.5	3.99	9.22	261	
CTD14	2006-07-19	17:37:47	9	102.1	101.3	13.938	38.388	1509.0	4.46	9.23	262	
CTD15	2006-07-19	19:25:04	1	827.5	819.6	13.767	38.665	1520.7	4.05	9.18	244	
CTD15	2006-07-19	19:26:14	3	773.9	766.6	13.829	38.682	1520.1	4.04	9.18	245	
CTD15	2006-07-19	19:30:01	5	505.0	500.6	14.013	38.731	1516.3	4.01	9.19	247	
CTD15	2006-07-19	19:31:07	7	453.3	449.4	14.052	38.736	1515.5	4.01	9.19	248	
CTD15	2006-07-19	19:35:19	9	101.5	100.7	13.942	38.392	1509.0	4.44	9.20	250	
CTD16	2006-07-19	21:26:46	1	1085.4	1074.4	13.610	38.617	1524.5	4.08	9.15	237	3.2
CTD16	2006-07-19	21:27:55	3	1036.8	1026.4	13.620	38.622	1523.7	4.07	9.15	237	
CTD16	2006-07-19	21:34:29	5	505.9	501.4	14.020	38.731	1516.3	4.01	9.17	239	
CTD16	2006-07-19	21:35:21	7	454.9	451.0	14.052	38.736	1515.6	4.00	9.18	240	
CTD16	2006-07-19	21:39:42	9	101.9	101.1	13.860	38.349	1508.7	4.61	9.19	242	
CTD17	2006-07-19	22:49:27	1	794.4	786.9	13.800	38.675	1520.3	4.04	9.14	248	1.0
CTD17	2006-07-19	22:51:07	3	742.8	735.8	13.815	38.680	1519.5	4.04	9.15	249	
CTD17	2006-07-19	22:55:17	5	505.5	501.0	14.027	38.733	1516.3	4.02	9.16	250	
CTD17	2006-07-19	22:56:35	7	454.5	450.5	14.055	38.738	1515.6	4.02	9.16	250	
CTD17	2006-07-19	23:01:42	9	101.2	100.4	13.873	38.355	1508.7	4.56	9.18	252	
CTD18	2006-07-20	00:15:51	1	859.9	851.6	13.731	38.656	1521.2	4.05	9.14	241	1.5
CTD18	2006-07-20	00:17:20	3	808.4	800.7	13.793	38.672	1520.5	4.04	9.14	242	
CTD18	2006-07-20	00:22:32	5	505.3	500.9	14.011	38.731	1516.3	3.98	9.16	244	
CTD18	2006-07-20	00:23:56	7	454.6	450.6	14.052	38.738	1515.6	4.02	9.15	245	
CTD18	2006-07-20	00:29:17	9	101.6	100.8	13.893	38.358	1508.8	4.62	9.18	247	
CTD18	2006-07-20	00:30:36	11	51.0	50.6	14.357	38.090	1509.1	5.68	9.23	247	
CTD19	2006-07-20	01:35:00	1	634.4	628.6	13.867	38.696	1517.9	4.04	9.14	238	
CTD19	2006-07-20	01:36:27	3	582.7	577.5	13.925	38.710	1517.2	4.02	9.14	239	
CTD19	2006-07-20	01:43:22	5	101.7	100.9	13.821	38.338	1508.5	4.59	9.16	242	
CTD20	2006-07-20	02:57:24	1	1088.7	1077.7	13.643	38.627	1524.6	4.09	9.12	201	1.2
CTD20	2006-07-20	02:59:04	3	1037.9	1027.4	13.654	38.631	1523.8	4.07	9.12	201	
CTD20	2006-07-20	03:09:54	5	101.9	101.1	13.835	38.343	1508.6	4.58	9.16	208	
CTD21	2006-07-20	04:20:27	1	802.6	795.0	13.764	38.666	1520.3	4.05	9.12	238	1.1
CTD22	2006-07-20	05:05:46	1	920.0	911.0	13.743	38.657	1522.2	4.05	9.12	245	1.3
CTD23	2006-07-20	11:31:06	1	2675.2	2638.1	13.428	38.496	1550.1	4.23			
CTD23	2006-07-20	11:32:47	3	2645.3	2608.8	13.428	38.498	1549.6	4.21			

CTD23	2006-07-20	11:34:14	5	2624.9	2588.9	13.426	38.498	1549.3	4.22			
CTD23	2006-07-20	11:36:24	7	2573.5	2538.4	13.417	38.498	1548.4	4.21			
CTD23	2006-07-20	11:38:11	9	2522.8	2488.8	13.411	38.499	1547.5	4.21			
CTD23	2006-07-20	12:07:53	11	101.0	100.2	13.605	38.289	1507.8	4.74			
CTD24	2006-07-20	15:22:36	1	2087.9	2061.8	13.374	38.509	1540.2	4.21			
CTD24	2006-07-20	15:24:13	3	2038.0	2012.7	13.385	38.515	1539.4	4.19			
CTD25	2006-07-20	17:34:57	1	1026.2	1015.9	13.613	38.620	1523.5	4.08	9.12	245	1.0
CTD25	2006-07-20	17:36:20	3	975.2	965.6	13.639	38.629	1522.7	4.07	9.12	246	
CTD26	2006-07-20	21:38:22	1	1227.0	1214.1	13.540	38.593	1526.5	4.10	9.12	239	1.0
CTD26	2006-07-20	21:39:22	3	1176.8	1164.6	13.607	38.613	1526.0	4.08	9.12	240	
CTD26	2006-07-20	21:52:08	5	102.0	101.2	13.713	38.337	1508.2	4.64	9.17	244	
CTD27	2006-07-20	23:33:23	1	1104.1	1092.9	13.648	38.627	1524.9	4.09	9.12	250	1.5
CTD27	2006-07-20	23:35:01	3	1054.8	1044.2	13.621	38.622	1524.0	4.08	9.12	251	
CTD27	2006-07-20	23:46:18	5	102.3	101.5	13.762	38.321	1508.3	4.57	9.16	254	
CTD28	2006-07-21	00:47:37	1	783.8	776.4	13.834	38.684	1520.3	4.04	9.12	241	1.0
CTD28	2006-07-21	00:49:00	3	733.5	726.6	13.832	38.684	1519.4	4.04	9.12	242	
CTD28	2006-07-21	00:57:02	5	102.1	101.3	13.758	38.299	1508.3	4.71	9.16	246	
CTD29	2006-07-21	01:49:33	1	528.2	523.5	13.925	38.709	1516.3	4.01	9.12	234	2.8
CTD29	2006-07-21	01:50:42	3	477.7	473.5	14.051	38.737	1516.0	4.02	9.13	234	
CTD29	2006-07-21	01:55:39	5	101.9	101.1	13.774	38.315	1508.3	4.68	9.15	240	
CTD30	2006-07-21	03:05:43	1	788.6	781.1	13.786	38.670	1520.2	4.04	9.12	236	
CTD30	2006-07-21	03:06:51	3	737.3	730.4	13.805	38.676	1519.4	4.03	9.12	237	
CTD30	2006-07-21	03:14:40	5	101.7	100.9	13.777	38.307	1508.3	4.71	9.16	243	
CTD31	2006-07-21	04:11:12	1	1131.2	1119.6	13.627	38.620	1525.3	4.08	9.10	248	1.7
CTD31	2006-07-21	04:12:45	3	1080.8	1069.8	13.621	38.620	1524.4	4.07	9.11	249	
CTD31	2006-07-21	04:24:23	5	102.2	101.4	13.795	38.321	1508.4	4.65	9.16	253	
CTD32	2006-07-21	05:07:59	1	539.9	535.1	13.981	38.720	1516.7	3.99	9.12	246	1.3
CTD32	2006-07-21	05:08:58	3	487.4	483.2	14.010	38.728	1516.0	4.01	9.12	246	
CTD32	2006-07-21	05:13:21	5	101.7	100.9	13.757	38.301	1508.3	4.68	9.14	248	

6.2 BOTTOM SAMPLE LOCATION AND DESCRIPTION

Table 9: GRAB and CORE location data from PDS-2000 Waypoint file. D_DTM is water depth obtained by sampling previous and this cruise DTM bathymetric grids.

STA	DATE	TIME	LON	LAT	EAST	NORTH	WHAT	D_DTM
		UTC	WGS84		UTM-33	WGS84		m
GRA01	2006-07-16	06:42:21	14.3927529	39.2757460	447621.92	4347552.85	amare	-769.82
GRA01	2006-07-16	06:51:56	14.3920262	39.2750219	447558.70	4347472.92	fondo	-766.04
GRA01	2006-07-16	07:03:01	14.3916470	39.2741561	447525.34	4347377.05	abordo	-782.01
GRA02	2006-07-17	07:33:13	14.3958209	39.2841714	447892.79	4348486.12	amare	-528.29
GRA02-bis	2006-07-17	07:59:37	14.3967809	39.2838876	447975.38	4348454.07	amare	-505.17
GRA02-bis	2006-07-17	08:07:44	14.3966950	39.2839266	447968.00	4348458.45	fondo	-504.89
GRA02-bis	2006-07-17	08:15:40	14.3952345	39.2838806	447842.00	4348454.18	abordo	-551.61
GRA02-ter	2006-07-17	08:23:32	14.3972617	39.2838579	448016.82	4348450.49	amare	-516.16
GRA02-ter	2006-07-17	08:30:51	14.3968354	39.2840324	447980.19	4348470.10	fondo	-508.24
GRA02-ter	2006-07-17	08:37:35	14.3953833	39.2842329	447855.10	4348493.19	abordo	-552.53
GRA03	2006-07-17	09:03:42	14.4026104	39.2815134	448476.41	4348187.25	amare	-657.21
GRA03	2006-07-17	09:14:30	14.4018277	39.2819640	448409.23	4348237.70	fondo	-645.16
GRA03	2006-07-17	09:24:43	14.4007347	39.2822162	448315.15	4348266.31	abordo	-614.99
GRA04	2006-07-17	09:36:49	14.4002596	39.2818031	448273.87	4348220.74	amare	-619.61
GRA04bis	2006-07-17	09:46:46	14.3995233	39.2820385	448210.54	4348247.29	amare	-582.28
GRA05	2006-07-19	06:15:20	14.3942687	39.2691790	447747.79	4346823.19	fondo	-637.77
GRA05	2006-07-19	06:24:06	14.3944900	39.2682273	447766.17	4346717.44	abordo	-643.16
GRA5b	2006-07-19	06:43:15	14.3943460	39.2695772	447754.75	4346867.34	amare	-646.38
GRA5b	2006-07-19	06:47:51	14.3947551	39.2690350	447789.64	4346806.93	fondo	-640.54
GRA5b	2006-07-19	06:56:34	14.3953124	39.2682826	447837.16	4346723.11	abordo	-666.34
GRA06	2006-07-19	07:38:54	14.3851055	39.2695556	446957.62	4346870.31	amare	-838.87
GRA06	2006-07-19	07:51:46	14.3868003	39.2692618	447103.60	4346836.72	fondo	-835.59
GRA06	2006-07-19	08:02:16	14.3876054	39.2681695	447172.23	4346715.02	abordo	-805.96
GRA07	2006-07-19	09:24:30	14.3851731	39.2613644	446957.28	4345961.24	amare	-844.76
GRA07	2006-07-19	09:27:59	14.3860042	39.2614839	447029.07	4345974.01	fondo	-816.24
GRA07	2006-07-19	09:42:16	14.3866537	39.2591230	447083.33	4345711.62	abordo	-820.51
GRA08	2006-07-19	11:12:23	14.4012881	39.2544088	448342.47	4345180.00	amare	-999.42
GRA08	2006-07-19	11:23:42	14.3995807	39.2541723	448194.97	4345154.73	fondo	-1004.87
GRA08	2006-07-19	11:37:54	14.3995298	39.2518631	448188.88	4344898.49	abordo	-1018.52
GRA09	2006-07-19	15:42:00	14.3729201	39.2209323	445869.10	4341481.45	amare	-710.68
GRA09	2006-07-19	15:51:25	14.3719133	39.2203989	445781.78	4341422.86	fondo	-718.47
GRA09bis	2006-07-19	16:08:50	14.3731875	39.2208825	445892.15	4341475.76	amare	-712.13
GRA09bis	2006-07-19	16:18:32	14.3725826	39.2209497	445839.98	4341483.58	fondo	-712.62
GRA09bis	2006-07-19	16:27:31	14.3716591	39.2205013	445759.92	4341434.38	abordo	-732.01
GRA10	2006-07-19	17:53:53	14.3714765	39.2090100	445735.31	4340159.22	amare	-766.87
GRA10	2006-07-19	18:04:16	14.3707066	39.2090134	445668.84	4340160.06	fondo	-750.48
GRA10bis	2006-07-19	18:26:09	14.3718607	39.2094248	445768.80	4340205.02	amare	-771.15
GRA10bis	2006-07-19	18:37:16	14.3714212	39.2095750	445730.97	4340221.95	fondo	-771.40
GRA10bis	2006-07-19	18:47:36	14.3706245	39.2097843	445662.35	4340245.66	abordo	-759.39
GRA11	2006-07-20	08:51:25	14.3991637	39.1173413	448058.38	4329970.03	amare	-2701.37
GRA11	2006-07-20	09:29:25	14.3985393	39.1151596	448002.80	4329728.28	fondo	-2730.34
GRA11	2006-07-20	10:07:09	14.3970146	39.1123211	447868.89	4329414.15	abordo	-2775.59
GRA12	2006-07-20	13:39:46	14.3715365	39.1297028	445679.51	4331358.01	amare	-2033.28
GRA12	2006-07-20	14:08:26	14.3714925	39.1293603	445675.45	4331320.03	fondo	-2037.66
GRA13	2006-07-20	18:01:22	14.3537720	39.1644709	444171.52	4335227.20	amare	-1019.41
GRA13	2006-07-20	18:15:28	14.3556594	39.1631650	444333.55	4335081.11	fondo	-990.62
GRA13	2006-07-20	18:28:15	14.3578728	39.1620504	444523.90	4334956.06	abordo	-1010.21
GRA14	2006-07-20	19:16:15	14.3508326	39.1812796	443930.93	4337094.37	amare	-1254.55
GRA14bis	2006-07-20	20:06:58	14.3510155	39.1815831	443946.97	4337127.93	amare	-1252.97
GRA14bis	2006-07-20	20:25:04	14.3533163	39.1803271	444144.70	4336987.13	fondo	-1132.54

GRA14bis	2006-07-20	20:40:21	14.3547619	39.1784947	444268.11	4336782.89	abordo	-1033.45
GRA15	2006-07-21	05:33:34	14.3986208	39.2805802	448131.62	4348085.96	amare	-601.98
GRA15	2006-07-21	05:44:00	14.3988388	39.2798389	448149.88	4348003.57	fondo	-642.08
GRA15	2006-07-21	05:53:32	14.3990887	39.2795478	448171.22	4347971.12	abordo	-669.09
GRA16	2006-07-21	06:08:51	14.3970839	39.2852034	448002.48	4348599.92	amare	-525.88
GRA16	2006-07-21	06:17:37	14.3966803	39.2850231	447967.54	4348580.14	fondo	-521.10
GRA17	2006-07-21	08:20:15	14.3992240	39.2980178	448196.50	4350020.81	amare	-924.25
GRA17	2006-07-21	08:33:35	14.3988873	39.2976592	448167.20	4349981.20	fondo	-924.29
GRA17	2006-07-21	08:45:02	14.3982742	39.2975838	448114.28	4349973.19	abordo	-933.38
GRA18	2006-07-21	09:27:57	14.3943021	39.2742931	447754.47	4347390.72	amare	-785.96
GRA18	2006-07-21	09:39:07	14.3944956	39.2744760	447771.29	4347410.91	fondo	-783.25
GRA18	2006-07-21	09:50:58	14.3947438	39.2746201	447792.81	4347426.76	abordo	-778.56
COR01	2006-07-21	14:00:58	14.3941188	39.2734923	447738.06	4347301.96	amare	-789.08
COR01	2006-07-21	14:12:28	14.3940345	39.2734709	447730.77	4347299.63	fondo	-789.20
COR01	2006-07-21	14:38:36	14.3965976	39.2742017	447952.40	4347379.25	abordo	-788.42
COR02	2006-07-21	15:23:05	14.3936765	39.2743523	447700.55	4347397.65	amare	-796.93
COR02	2006-07-21	16:16:58	14.4012624	39.2706329	448352.16	4346980.52	fondo	-848.53
COR02	2006-07-21	16:32:38	14.4041217	39.2693895	448597.90	4346840.91	abordo	-911.35

Table 10: Cruise MRS06: bottom sample description.

GRAB	DESCRIPTION
G01	25L mud; Sandy silt on top, silt on bottom; sieved gross fraction contains iron oxide and hydroxide scoria; volcanic ashes and one pumice (1cmdia.)
G02	empty
G02-bis	Small rock fragments. La Benna arrivata in superficie priva di sedimenti fini. La frazione fine stata campionata dopo la setacciatura del materiale grossolano, per decantazione. La frazione grossolana costituita in prevalenza da clasti di varie dimensioni (dal centimetro a qualche millimetro) e forme e da scarsi bioclasti. I frammenti pi grandi, dell'ordine del centimetro, hanno una forma appiattita ed un colore dal rosso ruggine fino al nero (ossidi di Fe?). in sezione trasversale si osservano stratificazioni. Tali campioni sono stati interpretati come incrostazioni. I frammenti pi piccoli presentano una forma arrotondata con spigoli arrotondati. stato rinvenuto un "clasto" di dimensioni inferiori al centimetro, dal colore bianco-giallastro. All'osservazione con la lente la sua superficie non liscia ma costituita da un aggregato di sferule. I bioclasti rinvenuti consistono di resti di gusci di organismi non identificati.
G02-ter	Small rock fragments. Il materiale campionato in percentuale maggiore rispetto alla benna precedente ma presenta le medesime caratteristiche
G03	Small rock fragments. Rispetto alle benne G2bis e ter, la quantit di frazione fine sembra percentualmente maggiore ed comunque stata ricavata per decantazione. Nella frazione grossolana sono stati ritrovati frammenti di materiale incrostante come quello descritto precedentemennte ed un frammento di circa 7 mm di pomice. La frazione grossolana di natura organica scarsa.
G04	empty
G04-bis	empty
G05	empty
G05-bis	Al recupero della benna il fango freddo. Top limi argillosi-debolmente sabbiosi estremamente plastico di colore bruno per uno spessore di circa 14 cm. Segue un livello di spessore di 4 cm di colore nerastro con inclusi di colore rossastro. Campione 5-bis-TOP: limi Campione 5-bis-BOTTOM: livello nerastro
G06	Temperatura del sedimento 13.7C Dal top limo argilloso debolmente sabbioso, salto di granulometria tra un livello (1 cm) superiore grossolano e livello inferiore molto pi fine. Al bottom un livello di 3-4 cm di sabbia addensata di colore pi scuro.
G07	Temperatura 13.7C. Dal Top limo argilloso molto plastico con livello superiore leggermente sabbioso. Bottom livello 3-4 cm di sabbia addensata di colore scuro. Al tatto il livello centrale risulta molto plastico e argilloso.
G08	Recuperato solo poco materiale, argilla-limo plastico, nessuna matrice grossolana.
G09	empty
G09-bis	Temperatura del fango 13.8C, situazione simile alla precedente con spessore di 20 cm di uno strato argillo-limoso plastico, presenza di un bottom di 2-3 cm di scorie vulcaniche prevalentemente di colore nero, con presenza di ciottoli di pomice e altri ciottoli rossastri.
G10	empty
G10-bis	Temperatura del fango 13.8C. Materiale simile alla G9bis, ma lo spessore pi limitato . Il bottom di scorie nerastre ridotto (1-2 cm) con scorie comunque di dimensioni pi piccole.
G11	
G12	empty
G13	Volume del sedimento 15-20 L, fango compatto e molto plastico con presenza di pochissime scorie anche organiche. Trovati 3 pezzi di crosta dura delle dimensioni di 1x2 cm. Nessuna presenza di straterelli alternati.
G14	empty

G14-bis	Poco recupero, fango del tipo G13 con presenza di piccole pietre vulcaniche.
G15	Pochissimo recupero.
G16	empty
G17	Dal top lapilli e ceneri (circa 1cm) in matrice limo-argillosa, mediamente consistente con frazione sabbiosa medio-grossolana.
G18	empty
C01	Nel naso: due livelli distinti, fondo fango con scarsissima componente cineritica. Materiale totalmente incoerente compattato (maggiormente la componente cineritica). Top: sabbia di color grigio scuro debolmente limo-sabbiosa con microfossili, privo di consistenza. arte media: limo argilloso di colore nocciola di media consistenza e media plasticit. Bottom: materiale sabbioso limoso argilloso di colore nocciola scuro con bassa consistenza e bassa plasticit.
C02	Recovery 110 cm; Materiale esterno al carotiere e parte del naso: argilloso limoso sabbioso di colore nocciola di media consistenza E media plasticit. Sono presenti livelli di cinerite (sabbia di colore grigio scuro). Bottom: cineriti (sabbie) di colore grigio scuro prive di coesione.

6.3 OBS

DATE	TIME UTC	LON DDMM.xx	LAT WGS84	EASTING UTM-33	NORTHING WGS84	RANGE (m)	WHAT
2006-07-12	15:51:20	1423.5876	3916.3829	447652.16	4347253.30	0	RELEASE
2006-07-12	-	1423.5930	3916.3866	447660.00	4347260.00	0	ON_BOTTOM
2006-07-12	16:27:00	1423.5987	3916.9541	447675.21	4348309.61	1284	tr1
2006-07-12	16:28:00	1423.5995	3916.9610	447676.43	4348322.51	1298	tr1bis
2006-07-12	16:47:34	1424.1241	3916.0642	448419.49	4346658.69	1233	tr2
2006-07-12	16:50:00	1424.0981	3916.0690	448382.16	4346667.84	1226	tr2bis
2006-07-12	17:05:00	1423.0050	3916.1433	446811.53	4346815.69	1218	tr3
2006-07-12	17:06:00	1423.0056	3916.1463	446812.45	4346821.36	1216	tr3bis
2006-07-12	17:07:00	1423.0068	3916.1488	446814.25	4346825.91	1214	tr3ter
2006-07-16	05:57:48	1423.5974	3916.0002	447661.45	4346545.28	1052	TR4
2006-07-16	05:58:42	1423.5946	3915.9975	447657.49	4346540.40	1055	TR4
2006-07-16	06:17:27	1424.1540	3916.6531	448469.78	4347747.57	1199	TR5
2006-07-16	06:19:24	1424.1501	3916.6505	448464.07	4347742.78	1195	TR5
2006-07-16	07:23:03	1423.1671	3916.6096	447050.49	4347676.64	1066	TR6
2006-07-16	07:23:31	1423.1707	3916.6072	447055.68	4347672.20	1062	TR6

Table 11: OBS Positioning and trilateration data.

6.4 DIARY OF OPERATIONS