

The high resolution bathymetric map of the exhalative area of Panarea (Aeolian Islands, Italy)

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Abstract

On November 3, 2002 a shallow submarine gas eruption occurred in an area of 2.3 km² east of Panarea (Aeolian volcanic arc, Southern Tyrrhenian Sea, Italy). The exhalative area, surrounded by the islets of Dattilo, Panarelli, Lisca Bianca, Bottaro and Lisca Nera, has been known since historical times for the hydrothermal activity related to the Panarea volcanic complex. Due to the exceptional characteristics of the phenomenon, different geological, geochemical, geophysical and studies were carried out in this still poorly known volcanic area. A particular effort was devoted to producing a high resolution bathymetric map that also aimed to estimate the amount and location of the active exhalative centers and their variations in space and time. Data were obtained by three RTK multibeam surveys performed between December 2002 and December 2003. Here we show and discuss the technical details of the bathymetric surveys, the bathymetric map at 0.5 m resolution, and the accurate location of the 606 main exhalative centres active during the 2002-2003 crisis. The bathymetric data and the maps show two prevailing principal NE-SW and NW-SE alignments that match the spatial distribution of the exhalation centres. The accurate positioning at submeter accuracy of the gas vents is useful in the monitoring activity and to study their temporal and spatial variability.

Key words *Panarea – bathimetry – DEM – hydrothermal systems*

1. Introduction

Panarea Island is located in the Southern Tyrrhenian Sea and is part of the volcanic arc of the Aeolian Islands that is made up of seven islands, some minor islets and several seamounts (fig. 1a). The area is characterized by a complex geodynamics (Falsaperla *et al.*, 1999) being affected by shallow to deep seismicity due

to a slab deepening under the Calabrian Arc (Chiarabba *et al.*, 2005), active crustal deformation (Anzidei *et al.*, 2000; Hollenstein *et al.*, 2003; Tallarico *et al.*, 2003; D'Agostino and Selvaggi, 2004; Serpelloni *et al.*, 2005), active volcanoes (Lipari, Vulcano and Stromboli) and hydrothermalism. The above features witness a long lasting activity, as described by Italiano and Nuccio (1991), Gamberi *et al.* (1997), Calanchi *et al.* (1999, 2002), De Astis *et al.* (2003) and Caliro *et al.* (2004).

Panarea is the smallest among the Aeolian Islands, representing the subaerial portion of a submarine stratovolcano about 2000 m high and 20 km wide (Gabbianelli *et al.*, 1993; Gamberi *et al.*, 1997). East of Panarea, the islets of Basiluzzo, Dattilo, Panarelli, Lisca Bianca, Bottaro, Lisca Nera and Le Formiche (hereafter referred as the 'Islets') form an archipelago that

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suddenly, without significant seismicity (Saccarotti *et al.*, 2003) and reached an intensity level never observed before during the last century (SGA, 1996). The gas output was estimated to be 10^9 l/day, two orders of magnitude higher than that previously measured (Caliro *et al.*, 2004). The most active exhalation center (EC-1, fig. 7b) was located close to the SW wall of the islet of Bottaro, with gas flowing vigorously up to the water surface. To provide the present day locations of the submarine gas Exhalation Centres (EC) with respect to previous studies (Gabbianelli *et al.*, 1990; Anzidei, 2000) and a first high resolution morphobathymetric map of the exhalation centres, bathymetric surveys were planned and performed during the maximum activity. Surveys were carried out

in the early days of December 2002, with partial repetitions in selected areas during July 2003 and December 2003.

2. Bathymetric surveys

A multibeam high resolution survey that covered an area of about 9 km² around the Islets was performed for the first time in December 8-12, 2002, using the Alsea boat of Coastal Consulting and Exploration Company (fig. 1c), equipped with an ultra high resolution Reson Seabat 8125 multibeam (240 beams, 120° sector coverage, 455 kHz) (table I).

Before starting the surveys, a check of the health of the GPS/RTK data link was performed

Table I. Instrumentation used during the bathymetric surveys.

Instrumentation	Type	Features
Vessel	M/B ALSEA	-
Differential GPS receiver (RTK mode)	Ashtech-Aquarius 02	10 mm + 0.5 ppm, XY 20 mm + 1.0 ppm, Z
Multi beam	Reson SeaBat 8125	Frequency 455 kHz Angle 120° Beams 240 Max depth 120 m Resolution 6 mm
Gyrocompass	SG Brown Meridian	0.05° static secant latitude 0.2° dynamic secant latitude
Velocity sounder	Navitronic SVP 15	Resolution 0.1 m/s Accuracy ± 0.25 m/s
CTD	Microcat SBE 37-SI	Conductivity accuracy 0.0003 S/m Temperature accuracy 0.002°C
Motion sensor	TSS DMS 2-05	<i>Waves</i> Static accuracy 5 cm Dynamic accuracy 0 + 20 s period <i>Pitch and roll</i> Static accuracy 0.025° Dynamic accuracy 0.03° \pm 5°
Digital tide gauge (at Panarea)	Ott Hydrometry Orphimedes	Accuracy < 1 cm
On board computers	Pentium IV-Windows 2000	Data acquisition
Software	RESON B.V. PDS 2000	Navigation and data analysis
Software	CARIS-HIPS 5.2	Data analysis
Software	ArcView GIS 8.2	Data management

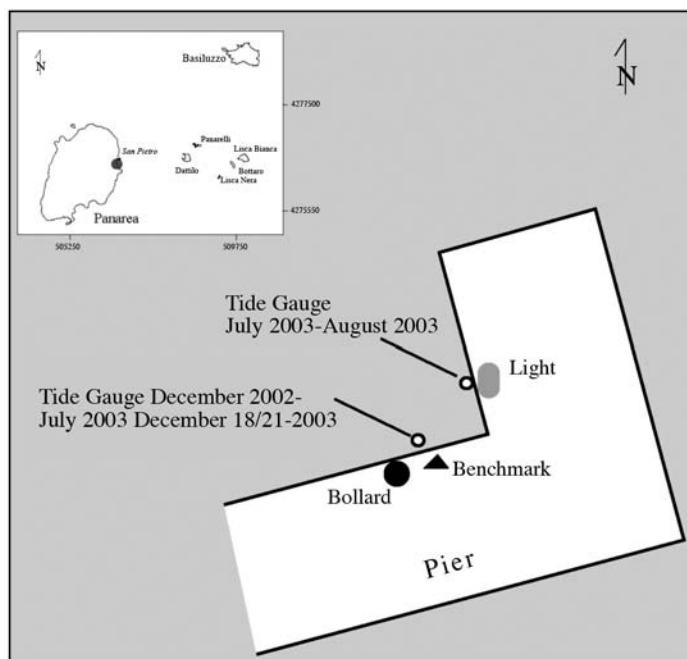


Fig. 2. Sketch (not in scale) of the Panarea Pier with the location of the tide gauge and the geodetic benchmark used to define its coordinates with respect to the TyrGeoNet GPS station of Panarea.

Table II. Coordinates of PANA TyrGeoNet station and tide gauge benchmark (WGS84, ellipsoidal heights).

Station	Geographic	UTM	Height (m)
PANA (TyrGeoNet)	Lat N 38°37'58.909 Long E 15°04'26.457	N 4276057.468 E 506442.1583	144554
Tide Gauge	Lat N 38°38'16.772 Long E 15°04'40.257	N 4276608.335 E 506775.313	43.30

throughout the planned survey, having previously found a local shadow area behind the eastern wall of Dattilo. The bathymetric datum was established by measuring the sea level through a high accuracy tide gauge, temporarily installed along the pier at S. Pietro, Panarea (fig. 1a and 2). The instrumental height of the zero level was referred to a WGS84 geodetic benchmark previously set up over the pier (fig. 2 and table II). The latter was measured by geodetic space techniques using a couple of dual frequency GPS receivers and by ground meas-

urements using a Total Station, with reference to the GPS geodetic monument of PANA, located at Panarea (fig. 1a), which belongs to the Tyrrhenian Geodetic Network (TyrGeoNet), whose 3D coordinates are known at a few mm level (Anzidei *et al.*, 1995; Serpelloni *et al.*, 2005), (table II).

The decimetric positioning of the vessel was computed by GPS technique in RTK mode. Real time coordinates were obtained by installing an Ashtech Aquarius reference station located on the GPS station PANA and transmit-

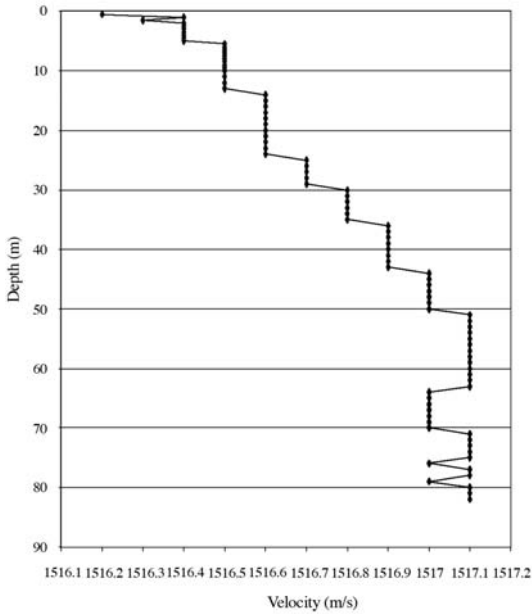


Fig. 3. Sound speed profile. Data were used to calibrate the multibeam system for sound speed velocity in the water to determine depths at 1 cm formal accuracy.

ting the differential corrections by a High Frequency link at 1 Hz rate to the mobile Aquarius receiver which was placed on board of the vessel. In addition to this, a Sg-Brown Meridian Surveyor gyrocompass, a Tss DM505 MRU and a Fugro Omnistar Differential GPS, were interfaced to the Reson PDS2000 Navigation software (www.reson.com) for data acquisition (multibeam and positioning), control, calibration and pre-processing. A SBE 37-SI Microcat CTD probe was located at the sonar head and interfaced to the sonar processor, so providing the real time speed of sound data for the beam forming, while the Navitronics SVP15 and a SeaBird CTD probes were also used for profiling the speed of sound along the water column (fig. 3). Additional details on the instrumentation are reported in table I.

Navigation routes were planned with the aim to achieve the full coverage of the sea bottom (fig. 4), with at least 20-30% overlap of the nearby swaths. The Reson PDS2000 software was able to show in real time to the operator and the pilot the ongoing multibeam and Digital Terrain Model (DTM) and the positioning information that were used for guidance.

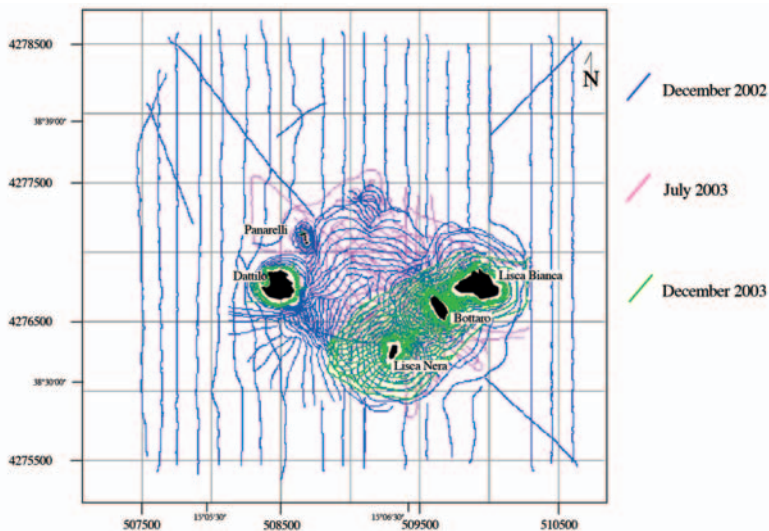


Fig. 4. Course over the ground performed by ALSEA vessel during bathymetric surveys. The 30% overlapping between nearby lines guarantee the full coverage of the area.

At the beginning of each survey, a full set of multibeam calibration lines were acquired, on flat bottoms and steep targets at 30-70 m water depth. The roll, pitch and yaw correction angles were then used to correct the installation geometries. Calibration parameters were taken into account during data analysis to correct the observations.

3. Data analysis, bathymetric map and exhalation centres

Data analysis was performed by the Computer Aided Resource Information System-Hydrographic Information Processing System (CARIS-HIPS) Pro v. 5.2 software (CARIS,

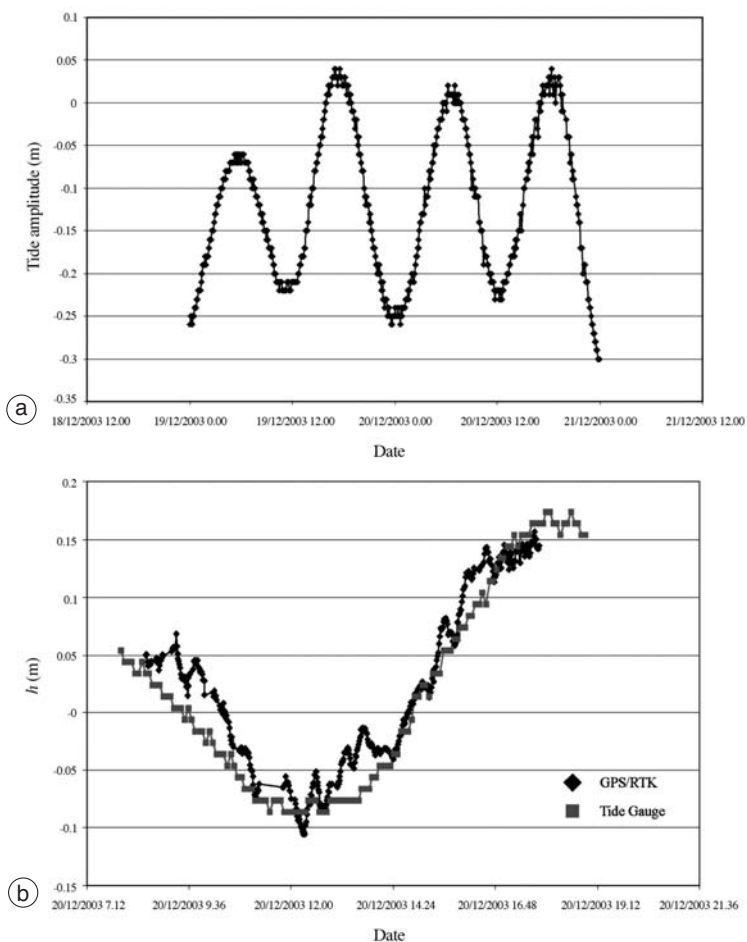


Fig. 5a,b. a) Example of tide gauge recordings collected at 5 min sampling rate at Panarea Pier in the time span December 19-21, 2003 during bathymetric surveys. Tide amplitudes are <0.4 m, typical of the Central Mediterranean Sea. b) Comparison between tide data recorded by the tide gauge located at Panarea (grey line) and those registered by the GPS/RTK system located on board of the vessel (black line) during bathymetric surveys. The GPS/RTK tide data have been collected at 1 min sampling rate but averaged at 10 min to remove the high frequency noise. The two data sets are in good agreement. Tidal values were used to correct depth measurements, that were reduced to a mean sea level.

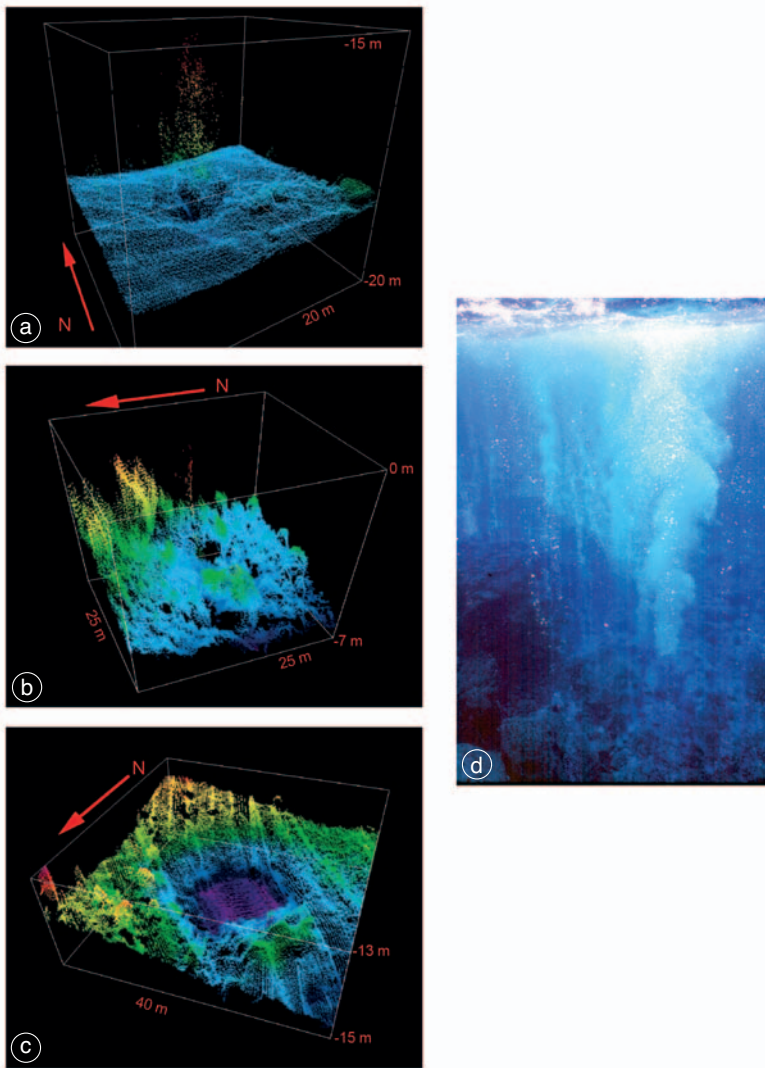


Fig. 6a-d. a-c) Multibeam images of some typical exhalation centres (vertical exaggeration 4X), showing uprising gas bubbles from the seafloor and the related small size craters produced by the exhalation activity; d) underwater picture of exhalation centres west of Bottaro Island. Gas bubbles are reaching the sea surface (0A class).

2000), specifically designed to process multibeam data under Windows NT® and capable to manage images in a mosaic of the seafloor and produce raster and analytical maps. The data processing sequence was as follows:

1. System calibration and multibeam data reprocessing.

2. Data quality check: only 15% of the data were discarded due to a low signal to noise ratio.

3. Sea level correction using the tide gauge and RTK data (fig. 5a,b).

4. High and medium frequency spike removal, keeping intact the signatures produced by the uprising gas bubbles from the seafloor (fig. 6a-d).

5. Production of high accuracy Marine Digital Elevation Models (MDEM) (table III).

Through the repeated computations, the signal to noise ratio was greatly improved, allowing a precise discrimination of the significant signal and the subsequent identification and location of EC (table IV).

A total of 606 EC were detected (Appendix) and classified by intensity and significance level (fig. 7b). The latter criteria were expressed by the number of soundings that identified each EC from multiple overlapping swaths (0-1-2 levels of table IV) and from their height above the seafloor (A-B-C levels of table IV).

The exhalation centres were further divided into three classes (table IV):

A) High activity centres, with bubbles columns interesting the entire water column up to the sea surface (figs. 6d and 8).

B) Medium activity centres, with bubble columns extending for 3 to 4 m from the bottom but not reaching the sea surface (fig. 8).

C) Moderate activity centres, with bubble columns extending up to 2 m from the ground floor, not reaching the sea surface (fig. 6a).

The classified EC were mapped over the MDEM, allowing a view of the active exhalation centres for the whole area during the time span 2002-2003 (fig. 7a), and at December 2002, during the maximum intensity of the crisis (fig. 7b). Bathymetric surveys were partially repeated during July and December 2003 (fig. 4), focusing on the most active area around Lisca Bianca, Bottaro and EC-1 (fig. 7b).

To produce the MDEM at 0.5 m average pixel size, of 9 million of 3D punctual data in the UTM33-WGS84 coordinate system were used.

The MDEM for each survey data set (December 2002, July and December 2003), was analysed to reduce any positioning offset or error. The difference grids display pixels whose values are the difference of depth at two survey epochs. The residuals between the three MDEMs were estimated, as reported in table III. By the average standard deviations and excluding values > 1 m, supposed to be related to the active exhalation centres, the statistical difference between the surveys for all the investigated area was estimated within 14 cm.

Table III. Accuracy of the MDEMs.

Survey epoch (month/year)	Average of the residuals between grids (m)	Average standard deviation between grids (m)
12/03-12/02	+0.02	0.14
07/03-12/02	+0.10	0.13
12/03-07/03	-0.09	0.11

Table IV. Classification of the exhalation centres.

Detection level	Based on the number of lines which detected the exhalation centre	Based on the height extension of the gas column	Based on the quality of the detection
High	0 (>3 lines)	A (all water column, from seafloor to sea surface)	0A (high) 0B (medium) 0C (low)
Medium	1 (2+3 lines)	B (4 m height from the seafloor)	1A (high) 1B (medium) 1C (low)
Low	2 (1+2 lines)	C (2 m height from seafloor)	2A (high) 2B (medium) 2C (low)

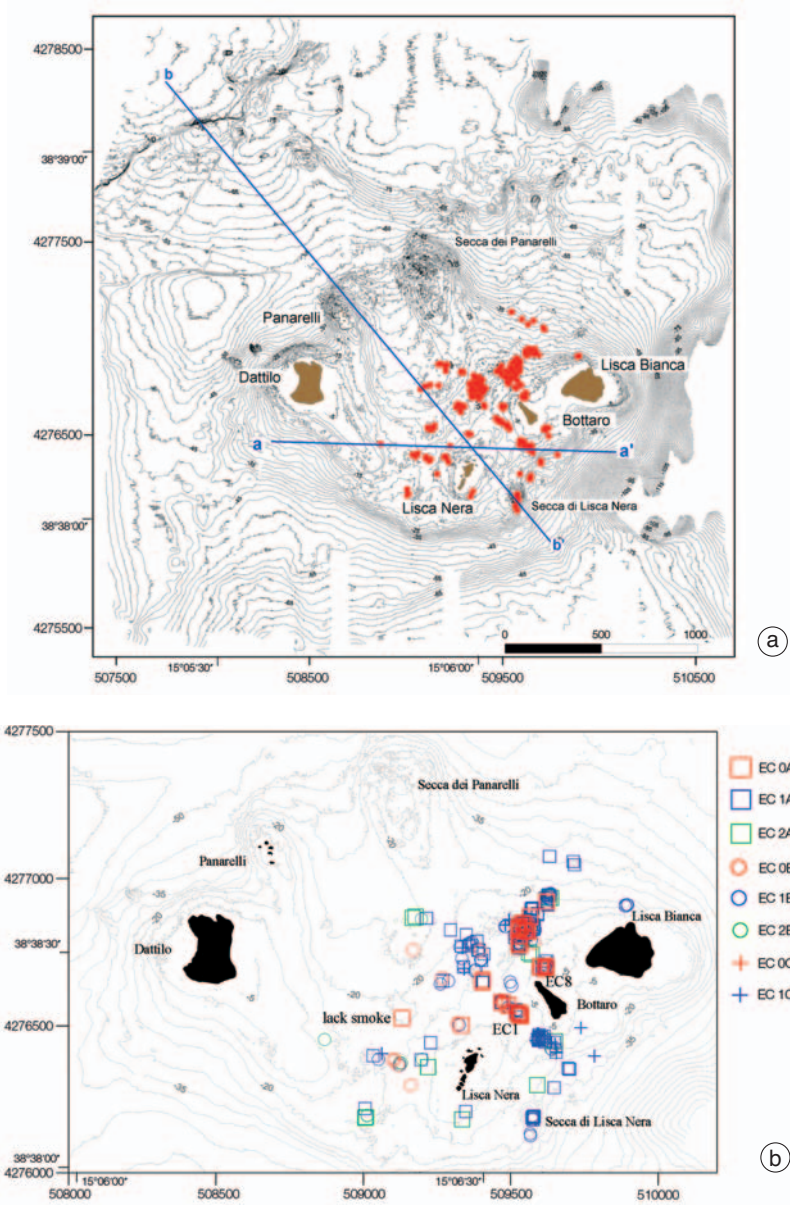


Fig. 7a,b. a) Bathymetry of Panarea Archipelago at 2.0 m countour level. The red dots are the A and B classes of exhalation centres, respectively, detected in the time span December 2002-December 2003. Blue lines are the cross sections aa' and bb'; b) location of the main exhalation centres active during December 2002, based on their classification (Appendix). In the map are shown the EC-1 (latitude 383818.8N; longitude 150634.0E, depth 13.3 m), EC-8 (latitude 383819.9N, longitude 150637.1E, depth 8.7 m), which were the largest exhalation centres and the EC named black smoke (latitude 383815.1N, longitude 150617.4E, depth 20.8 m). The latter is a 175 m wide and 5 m deep subcircular depression, interested by moderate dark exhalation, surrounded by lava outcrops that show deposition of alunite, sulfur and sulfates.

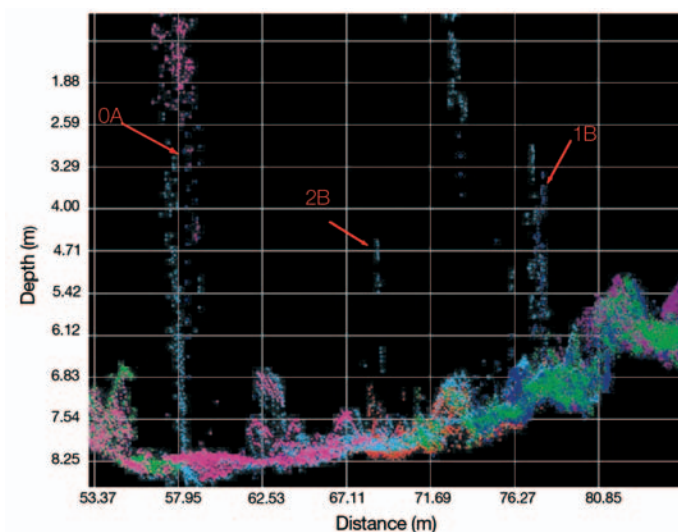


Fig. 8. Classification of the exhalation centres based on their intensity, as detected by the multibeam sensor. See also table III.

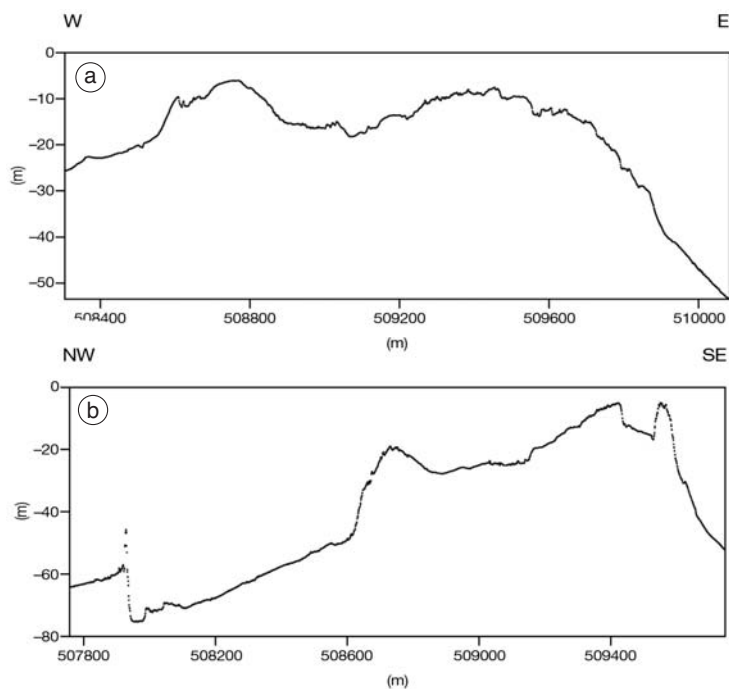


Fig. 9a,b. Cross sections of the investigated area: aa', bb', running a) W-E and b) NW-SE, respectively. It is remarkable the 20 m height vertical slope in cross section aa', that could be related with a tectonic structure running SW-NE (labelled with A in fig.10a).

Once the offsets were analysed and applied, the final MDEMs were produced and made available for the morphostructural analysis, including the Exhalation Center (EC) detection, production of contour maps at 1:2500 scale (fig. 7a,b), cross sections (fig. 9a,b) and shaded relief (fig. 10a,b), which show the roughness and complexity of this sector of the Panarea volcano surface.

Applying this analysis to a limited area including the EC-1, a crater about 40 m long, 15 m wide and 9 m deep (fig. 11), which was the largest activated on December 2002, the morphological differences during time were evidenced. Figure 12 shows the results obtained by comparing the December 2002-December 2003 data: starting from a reference surface which fits the average surface of the seafloor around

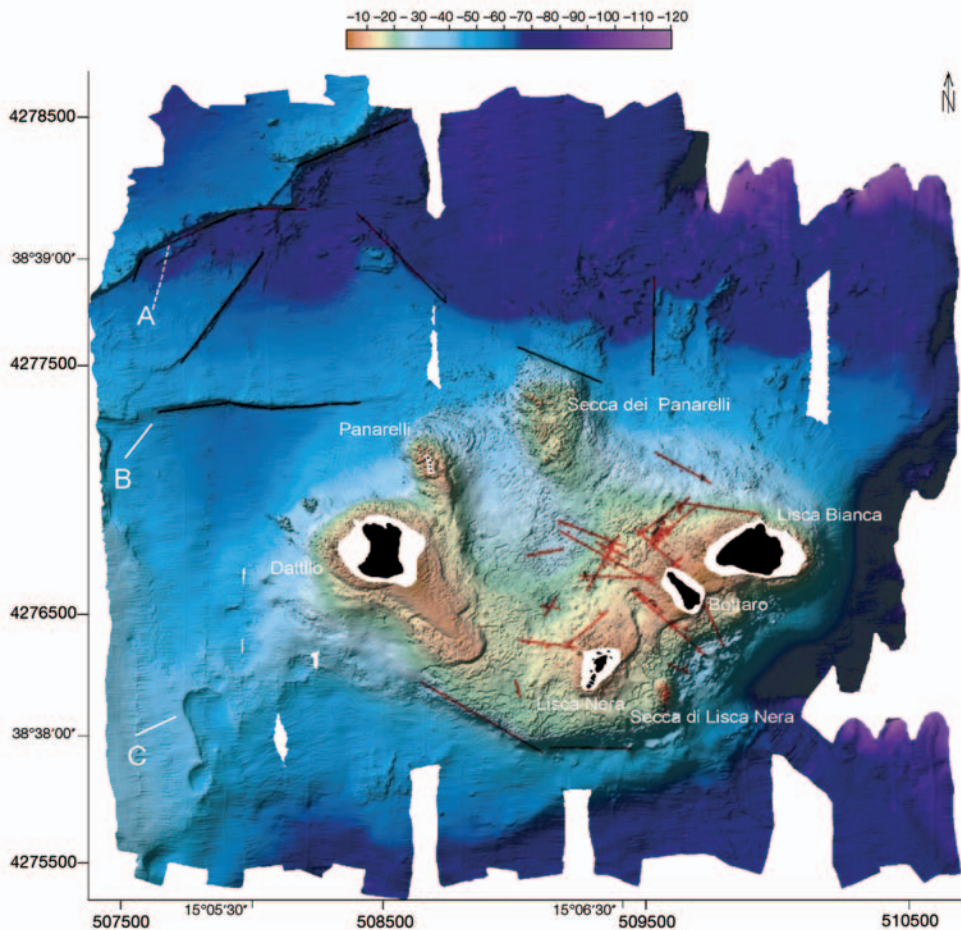


Fig. 10a. Marine Digital Elevation Model (MDEM) showing the morphobathymetry of the area. Scale colour shows depths ranging between 0 and -60 m. Exhalation centres (red dots) and main lineaments (red lines) revealed by the exhalation centres distribution are reported in the map. The exhalation area is located at the top of the stratovolcano. A and B, are two areas that displays relevant tectonic features; C, is likely to be a past exhalation centre.

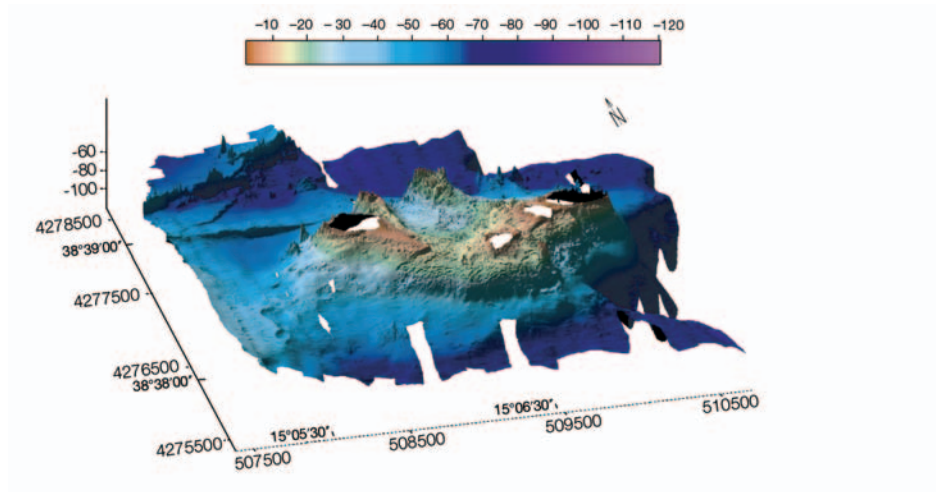


Fig. 10b. Three dimensional view of the area (vertical exaggaration = 2).

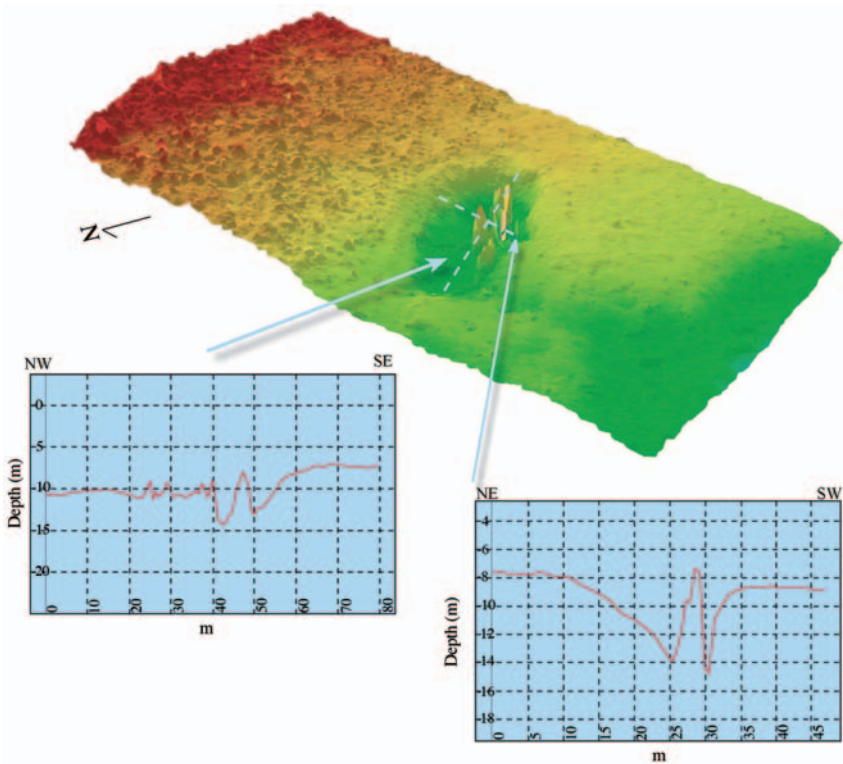


Fig. 11. Digital Terrain Model of the EC-1. The cross section profiles obtained by multibeam data displayed a crater about 40 m long, 15 m wide and 9 m deep. The spikes located in the deepest part of the crater are the up-rising gas bubbles.

the EC-1, we tentatively estimated that the explosive opening of the crater produced an extraction at 3852 m³ of rock during the maximum of the crisis. One year after its opening, the crater was partially filled with approximately 221 m³ of debris due to rock falls of the inner flank of the crater the upwelling gas and water flows.

4. Discussion and conclusions

The high resolution multibeam technique provided the first 3D detailed bathymetric map of the seafloor at 0.5 m average pixel resolution and the location and distribution of the exhalation centres, during the crisis that has affected the Panarea area since November 2002 (fig. 10a,b). These data are useful to improve and support the geological, volcanological, geochemical, geophysical research and monitoring of this still poorly known volcanic area. Moreover, they represent the first accurate record of the last submarine exhalation crisis which occurred at Panarea.

The MDEM (fig. 10a,b) shows that the area of Panarea Archipelago represents a positive geomorphic feature which is defined by the the coalescence of individual volcanic edifices. This is an asymmetric structure sloping at high angle in its southeastern flank while the others flanks display smoother slopes. The area within the Islets is characterised by a shallow seafloor platform, between 0 and -30 m, gently sloping to NW between Panarelli and Secca dei Panarelli (fig. 10a,b). Lisca Bianca, Bottaro and Lisca Nera islets are NE-trending coalescent structures. The Dattilo structure shows an elongated tongue-like marine abrasion platform, SE trending, for 0.8 km at depths between -5 and -8 m.

The area within the Islets is dotted by hundreds of circular or horseshoe-shaped depressions up to several metres deep and wide, largely distributed especially surrounding Dattilo, Lisca Nera and Bottaro. The high frequency relief of coarse textured morphology, at metre to decimetre size pinnacles and troughs, is well developed between Lisca Bianca, Bottaro and Secca dei Panarelli. In the area between

Panarelli and Secca dei Panarelli the map reveals large lava flow surfaces, smooth and lobed.

The deepest sector displays evident morphological structures such as those located in the northwest area, NE- NNE- NNW- and E-trending lineaments (fig. 10a: A,B). The southwest sector displays a sub-elliptical shape wide depression probably due gravitative movements (C in fig. 10a).

The shaded relief (fig. 10a,b) does not show a caldera-like structure as suggested in Gabianelli *et al.* (1990) and Caliro *et al.* (2004).

The high quality of the surveys disclosed 606 exhalation centres (Appendix), which were classified on the basis of their different size and activity level, as estimated from the interferences on the multibeam sensor. The location of the gas vents, mapped on the bathymetric maps, revealed the existence of preferential EC alignments NE-SW and NW-SE trending (fig. 10a,b) and along which the gas eruption took place. These alignments match those measured from the fractures, the alunite veins and the fossil gas-pipes exposed on the lava of the seafloor and along the Islets' cliffs (Anzidei *et al.*, 2003, 2004a,b; Esposito *et al.*, 2005). Therefore we suggest that the NE-SW and NW-SE systems are the main pathways for the upwelling of hydrothermal fluids.

The comparison between the gas bubble alignments and those inferred by morphological analysis, suggests that presently the gas path is mainly driven by an active extension along the NE- and NW-trending fracture systems. The trends of the fracture systems are in agreement with the main regional tectonic structures (De Astis *et al.*, 2003).

The maximum number of exhalation centres was located in a limited extended zone, west of Bottaro and Lisca Bianca islets, whereas clusters of minor centres were sparse in the area. The largest and most active exhalation centre EC-1 was located a few tenths of metres south of Bottaro (figs. 7b and 11). The ellipsoidal crater rim spans between -8 m and -15 m. Its main axis, NW-oriented, is 40 m long and the minor axis is 25 m long. The hundreds of depression features identified on the seafloor (fig. 10a,b) can be related to fossil exhalation cen-

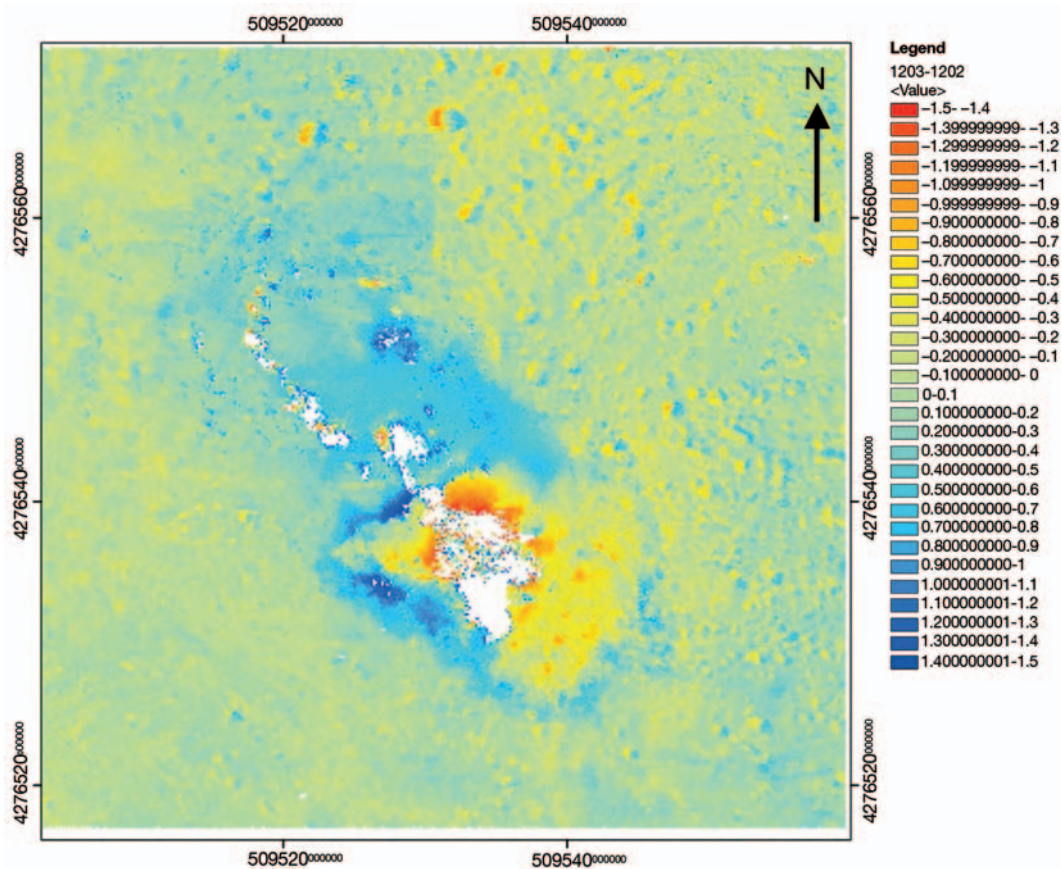


Fig. 12. Topographic changes of the groundfloor at the EC-1, after one year from its opening. The differential MDEM obtained from multibeam data in the time span 2002-December 2003, estimated 3852 m³ of extracted rock during the gas explosion; 221 m³ were recovered after 12 months, due to a continuous but decreasing gas flux from the seafloor. Positive values are negative groundfloor changes (blue) due to slides inside the crater; negative values (red) are positive groundfloor changes, due to the progressive filling of the bottom of the crater.

tres suggesting that the area has been the site of past episodes of gas eruptions similar to that of November 2002 (Anzidei *et al.*, 2003, 2004 a,b; Esposito *et al.*, 2005).

The differential MDEM obtained from multibeam data in the time span December 2002-December 2003, estimated 3852 m³ of extracted rock during the gas explosion; 221 m³ were recovered after 12 months, due to a continuous but decreasing gas flux from the seafloor (fig. 12). As far as the tectonic and vol-

canic interpretations are not the object of this paper, which aims to show bathymetric survey data and results applied to the submarine part of Panarea volcano, we think that a change in the regional and local strain fields in this area may have produced a reactivation of previous fractures or the opening of new ones, causing a subsequent gas exhalation during the 2002-2003 Panarea crisis, as more extensively described in Caliro *et al.* (2004), Caracausi *et al.* (2005) and Esposito *et al.* (2005).

Appendix.

Coordinates of the 606 exhalation centres (UTM 33 coordinates). Their depth reported to the mean sea level during surveys, classification and epoch of detection, are also reported.

EC 0A 12/02						EC 0B 12/02					
No.	Long	Lat	Depth	Class	Date	No.	Long	Lat	Depth	Class	Date
1	150634.05	383823.87	13.6	0A	12/02	39	150637.10	383819.65	8	0A	12/02
2	150634.41	383814.31	13.2	0A	12/02	40	150637.27	383819.65	8.1	0A	12/02
3	150634.41	383814.35	13.1	0A	12/02	41	150637.77	383819.72	8	0A	12/02
4	150631.68	383815.80	11.8	0A	12/02	42	150626.09	383813.30	12.5	0A	12/02
5	150629.03	383818.20	12.4	0A	12/02	43	150617.69	383814.06	22.5	0A	12/02
6	150629.03	383818.17	12.5	0A	12/02						
7	150628.99	383818.04	12.3	0A	12/02						
8	150634.32	383814.30	13	0A	12/02						
9	150634.12	383814.56	11.3	0A	12/02						
10	150634.16	383814.52	11.2	0A	12/02						
11	150634.09	383814.51	11.3	0A	12/02						
12	150634.20	383814.48	11.3	0A	12/02						
13	150634.20	383814.43	11.3	0A	12/02						
14	150633.83	383814.66	11.4	0A	12/02						
15	150632.67	383815.37	11.2	0A	12/02						
16	150632.69	383815.44	11.5	0A	12/02						
17	150634.01	383823.68	13.7	0A	12/02						
18	150634.05	383823.84	12.7	0A	12/02						
19	150634.88	383823.74	16	0A	12/02						
20	150634.09	383823.94	13	0A	12/02						
21	150634.13	383824.00	12.6	0A	12/02						
22	150635.17	383824.03	16.2	0A	12/02						
23	150634.26	383824.16	11.9	0A	12/02						
24	150634.88	383824.39	15.1	0A	12/02						
25	150634.63	383824.49	14.7	0A	12/02						
26	150635.70	383825.14	17.5	0A	12/02						
27	150635.71	383825.20	17.5	0A	12/02						
28	150638.02	383826.82	19.2	0A	12/02						
29	150638.07	383826.85	19.2	0A	12/02						
30	150634.09	383821.99	10.8	0A	12/02						
31	150634.21	383822.06	10.7	0A	12/02						
32	150634.25	383822.12	10.9	0A	12/02						
33	150634.96	383823.58	15.7	0A	12/02						
34	150635.21	383823.55	15.2	0A	12/02						
35	150635.37	383823.51	15.2	0A	12/02						
36	150634.09	383823.00	12.6	0A	12/02						
37	150637.76	383819.49	6.7	0A	12/02						
38	150637.97	383819.59	6.6	0A	12/02						
						44	150631.80	383815.70	11.9	0B	12/02
						45	150631.84	383815.67	11.7	0B	12/02
						46	150631.80	383815.70	11.7	0B	12/02
						47	150631.80	383815.76	11.8	0B	12/02
						48	150631.80	383815.76	11.9	0B	12/02
						49	150631.89	383815.76	12.2	0B	12/02
						50	150631.89	383815.83	12.2	0B	12/02
						51	150631.89	383815.83	12	0B	12/02
						52	150631.72	383815.83	12.1	0B	12/02
						53	150631.55	383816.02	12.2	0B	12/02
						54	150631.72	383815.86	12.1	0B	12/02
						55	150633.93	383814.60	11.3	0B	12/02
						56	150633.77	383814.73	11.3	0B	12/02
						57	150623.37	383818.43	21.5	0B	12/02
						58	150628.63	383821.44	13.2	0B	12/02
						59	150634.54	383823.78	17	0B	12/02
						60	150635.04	383823.94	16.5	0B	12/02
						61	150634.09	383822.02	10.8	0B	12/02
						62	150634.54	383822.22	10.9	0B	12/02
						63	150636.20	383822.28	10.3	0B	12/02
						64	150634.67	383823.58	16.1	0B	12/02
						65	150634.59	383823.52	15.8	0B	12/02
						66	150634.17	383822.96	12.5	0B	12/02
						67	150637.97	383819.55	6.3	0B	12/02
						68	150638.01	383819.62	6.7	0B	12/02
						69	150637.64	383819.62	7.7	0B	12/02
						70	150637.56	383819.75	8.2	0B	12/02
						71	150619.28	383821.52	25.4	0B	12/02
						72	150625.47	383813.40	12.4	0B	12/02
						73	150617.15	383808.87	13.4	0B	12/02
						74	150616.49	383809.35	14	0B	12/02
						75	150616.57	383809.55	13.9	0B	12/02
						76	150618.92	383806.66	12.5	0B	12/02

EC 0C 12/02						
No.	Long	Lat	Depth	Class	Date	
77	150632.71	383815.54	11.6	0C	12/02	
78	150634.88	383823.81	16.4	0C	12/02	
79	150637.23	383819.75	8	0C	12/02	
EC 1A 12/02						
No.	Long	Lat	Depth	Class	Date	
80	150639.03	383806.35	28.8	1A	12/02	118 150623.41 383818.14 20.9 1A 12/02
81	150641.02	383808.49	27.5	1A	12/02	119 150626.73 383823.20 18.9 1A 12/02
82	150639.03	383806.35	29	1A	12/02	120 150627.47 383822.00 16.7 1A 12/02
83	150641.18	383808.39	27.6	1A	12/02	121 150626.02 383821.93 17 1A 12/02
84	150641.22	383808.39	27.7	1A	12/02	122 150626.35 383819.63 17.2 1A 12/02
85	150639.32	383810.27	15	1A	12/02	123 150633.55 383822.87 12.2 1A 12/02
86	150636.93	383812.19	8	1A	12/02	124 150633.55 383822.87 12.2 1A 12/02
87	150636.88	383812.03	10.2	1A	12/02	125 150634.01 383823.06 12.5 1A 12/02
88	150636.88	383811.93	10.7	1A	12/02	126 150633.76 383823.29 12.9 1A 12/02
89	150636.97	383811.83	11.2	1A	12/02	127 150628.21 383822.48 15.8 1A 12/02
90	150636.97	383811.83	11.3	1A	12/02	128 150628.50 383821.51 13.5 1A 12/02
91	150636.97	383811.74	11.6	1A	12/02	129 150628.38 383821.45 13.7 1A 12/02
92	150637.71	383811.54	11.2	1A	12/02	130 150629.20 383821.05 13.4 1A 12/02
93	150636.88	383811.64	11.6	1A	12/02	131 150628.87 383820.37 13.9 1A 12/02
94	150636.80	383811.57	11.7	1A	12/02	132 150624.53 383823.72 21.1 1A 12/02
95	150636.93	383811.57	11.6	1A	12/02	133 150636.20 383823.77 13.2 1A 12/02
96	150637.75	383811.38	11.5	1A	12/02	134 150636.16 383823.77 13.8 1A 12/02
97	150639.08	383811.38	10.4	1A	12/02	135 150636.24 383823.87 13.6 1A 12/02
98	150637.63	383812.06	10.8	1A	12/02	136 150635.83 383824.00 15 1A 12/02
99	150637.30	383812.06	9.7	1A	12/02	137 150636.28 383824.03 14.2 1A 12/02
100	150636.21	383803.14	6.9	1A	12/02	138 150635.46 383824.13 15.9 1A 12/02
101	150636.09	383803.17	6.4	1A	12/02	139 150634.96 383824.20 15.7 1A 12/02
102	150636.17	383803.20	5.9	1A	12/02	140 150634.38 383824.23 13 1A 12/02
103	150636.21	383803.14	5.4	1A	12/02	141 150635.95 383824.33 14.5 1A 12/02
104	150636.13	383803.01	6	1A	12/02	142 150634.88 383824.33 16.6 1A 12/02
105	150636.08	383803.01	6.4	1A	12/02	143 150636.16 383824.33 15 1A 12/02
106	150636.08	383802.85	6.4	1A	12/02	144 150634.59 383824.42 15 1A 12/02
107	150636.13	383802.82	5.9	1A	12/02	145 150634.96 383824.49 16.2 1A 12/02
108	150635.92	383803.04	6.4	1A	12/02	146 150635.46 383824.49 15.5 1A 12/02
109	150631.68	383815.67	11.7	1A	12/02	147 150634.63 383824.52 15.2 1A 12/02
110	150631.64	383815.80	11.8	1A	12/02	148 150634.84 383824.55 15.3 1A 12/02
111	150628.99	383818.01	12.3	1A	12/02	149 150635.71 383825.33 17.5 1A 12/02
112	150629.12	383817.97	11.9	1A	12/02	150 150636.78 383825.40 15.6 1A 12/02
113	150629.08	383817.97	11.8	1A	12/02	151 150636.74 383825.53 16.5 1A 12/02
114	150634.36	383814.14	9.1	1A	12/02	152 150635.83 383825.98 15.9 1A 12/02
115	150633.70	383814.78	11.3	1A	12/02	153 150636.08 383826.08 16.1 1A 12/02
116	150633.70	383814.87	11.3	1A	12/02	154 150635.95 383826.14 16 1A 12/02
117	150633.71	383814.94	11.3	1A	12/02	155 150638.19 383826.50 17.8 1A 12/02
						156 150638.11 383826.59 18 1A 12/02
						157 150637.90 383826.72 18.4 1A 12/02
						158 150637.82 383827.21 19.9 1A 12/02
						159 150638.31 383827.60 21.4 1A 12/02
						160 150638.19 383827.57 21.2 1A 12/02
						161 150634.17 383821.73 10.7 1A 12/02
						162 150634.21 383821.83 10.7 1A 12/02
						163 150634.21 383821.89 10.8 1A 12/02
						164 150634.21 383821.99 10.7 1A 12/02

165	150634.25	383822.19	11.1	1A	12/02	209	150627.26	383822.32	17.6	1B	12/02
166	150634.34	383822.22	11.3	1A	12/02	210	150627.01	383822.22	17.6	1B	12/02
167	150634.38	383822.35	11.4	1A	12/02	211	150627.18	383822.13	17.6	1B	12/02
168	150634.30	383822.90	12.6	1A	12/02	212	150625.86	383821.80	17.1	1B	12/02
169	150634.42	383822.83	12.7	1A	12/02	213	150626.10	383820.57	16.1	1B	12/02
170	150634.50	383822.80	12.6	1A	12/02	214	150626.31	383819.66	17.6	1B	12/02
171	150634.67	383822.80	12.5	1A	12/02	215	150628.75	383820.44	14.1	1B	12/02
172	150635.08	383823.19	14.3	1A	12/02	216	150628.83	383820.37	13.7	1B	12/02
173	150637.39	383819.36	7.1	1A	12/02	217	150627.88	383819.24	14.3	1B	12/02
174	150637.56	383819.36	7	1A	12/02	218	150628.08	383819.30	14.4	1B	12/02
175	150637.89	383819.36	4.4	1A	12/02	219	150632.31	383824.10	14.3	1B	12/02
176	150637.68	383819.39	7.5	1A	12/02	220	150632.15	383824.10	14.3	1B	12/02
177	150637.43	383819.81	8	1A	12/02	221	150636.41	383823.71	12.7	1B	12/02
178	150637.81	383820.27	7.9	1A	12/02	222	150635.54	383823.74	16.3	1B	12/02
179	150638.06	383820.27	7.1	1A	12/02	223	150635.17	383824.94	16.1	1B	12/02
180	150638.23	383827.50	21.1	1A	12/02	224	150635.75	383824.88	16.4	1B	12/02
181	150641.96	383830.91	31.7	1A	12/02	225	150637.98	383827.31	20	1B	12/02
182	150641.92	383830.91	31.7	1A	12/02	226	150638.19	383827.50	20.7	1B	12/02
183	150638.43	383831.80	31	1A	12/02	227	150638.56	383827.70	21.4	1B	12/02
184	150641.75	383831.26	30	1A	12/02	228	150638.44	383827.70	21.7	1B	12/02
185	150621.14	383825.02	26.3	1A	12/02	229	150634.71	383822.57	12.2	1B	12/02
186	150621.70	383811.33	13.7	1A	12/02	230	150635.87	383822.61	10.3	1B	12/02
187	150613.64	383809.91	14.8	1A	12/02	231	150636.03	383823.55	14.6	1B	12/02
188	150612.51	383804.07	19.1	1A	12/02	232	150635.50	383823.22	14.2	1B	12/02
189	150626.61	383803.73	8.1	1A	12/02	233	150637.48	383819.98	8.5	1B	12/02
190	150620.38	383809.45	12.8	1A	12/02	234	150638.40	383827.05	20	1B	12/02
EC 1B 12/02						235	150638.60	383827.73	21.9	1B	12/02
No.	Long	Lat	Depth	Class	Date	236	150649.07	383826.32	15.2	1B	12/02
191	150637.55	383812.00	11	1B	12/02	237	150649.07	383826.45	15.3	1B	12/02
192	150637.59	383811.90	11.2	1B	12/02	238	150649.40	383826.45	15.4	1B	12/02
193	150637.13	383811.90	11.3	1B	12/02	239	150649.28	383826.49	15.2	1B	12/02
194	150636.84	383811.83	11.3	1B	12/02	240	150625.72	383813.30	12.2	1B	12/02
195	150636.55	383811.64	11.8	1B	12/02	241	150614.38	383809.49	14.7	1B	12/02
196	150636.76	383811.57	11.2	1B	12/02	242	150617.36	383808.87	13.3	1B	12/02
197	150638.62	383810.63	12.7	1B	12/02	EC 1C 12/02					
198	150635.71	383801.03	19.7	1B	12/02	No.	Long	Lat	Depth	Class	Date
199	150635.67	383801.26	18.4	1B	12/02	243	150644.70	383809.85	26.8	1C	12/02
200	150636.00	383802.85	6.5	1B	12/02	244	150639.36	383810.21	15.2	1C	12/02
201	150635.96	383803.24	6.5	1B	12/02	245	150642.80	383812.96	12.8	1C	12/02
202	150633.70	383814.89	11.4	1B	12/02	246	150639.36	383810.27	14.8	1C	12/02
203	150632.63	383815.24	11.1	1B	12/02	247	150636.80	383812.32	7.4	1C	12/02
204	150632.88	383818.03	11.4	1B	12/02	248	150636.68	383812.29	7.5	1C	12/02
205	150633.09	383817.61	8.1	1B	12/02	249	150637.01	383812.22	7.7	1C	12/02
206	150624.24	383818.14	17.6	1B	12/02	250	150636.76	383812.19	8.1	1C	12/02
207	150623.08	383817.82	16.3	1B	12/02	251	150636.76	383812.29	7.3	1C	12/02
208	150627.55	383822.39	17.8	1B	12/02	252	150636.76	383812.13	8	1C	12/02

253	150636.76	383812.00	9.3	1C	12/02	290	150641.06	383808.46	27.4	0B	07/03
254	150637.21	383811.74	11.5	1C	12/02	291	150641.10	383808.39	27.5	0B	07/03
255	150636.55	383811.54	11.8	1C	12/02	292	150631.68	383815.83	11.7	0B	07/03
256	150639.16	383811.18	10.9	1C	12/02	293	150631.80	383815.80	11.8	0B	07/03
257	150638.66	383811.38	10.5	1C	12/02	294	150631.93	383815.83	11.9	0B	07/03
258	150626.23	383821.74	16.1	1C	12/02	295	150631.68	383815.76	11.8	0B	07/03
259	150626.43	383819.47	17	1C	12/02	296	150631.72	383815.70	11.7	0B	07/03
260	150632.73	383824.85	15	1C	12/02	297	150631.84	383815.70	11.6	0B	07/03
261	150632.23	383824.26	14.7	1C	12/02	298	150631.84	383815.67	11.5	0B	07/03
262	150634.05	383823.84	13	1C	12/02	299	150632.71	383815.54	11	0B	07/03
263	150637.86	383827.24	20.2	1C	12/02	300	150632.71	383815.50	11	0B	07/03
264	150614.83	383810.13	15.5	1C	12/02	301	150632.55	383815.47	11.5	0B	07/03
EC 2A 12/02						302	150632.67	383815.44	11	0B	07/03
No.	Long	Lat	Depth	Class	Date	303	150632.67	383815.34	11.1	0B	07/03
265	150636.67	383806.64	19.2	2A	12/02	EC 0C 07/03					
266	150639.16	383811.48	9.8	2A	12/02	No.	Long	Lat	Depth	Class	Date
267	150635.91	383821.02	8	2A	12/02	304	150641.18	383808.39	27.4	0C	07/03
268	150635.53	383821.21	8	2A	12/02	EC 1A 07/03					
269	150638.65	383827.24	21	2A	12/02	No.	Long	Lat	Depth	Class	Date
270	150638.36	383827.24	21	2A	12/02	305	150639.03	383806.15	30.9	1A	07/03
271	150619.20	383825.05	26.2	2A	12/02	306	150638.78	383805.96	28.1	1A	07/03
272	150619.61	383825.22	26.1	2A	12/02	307	150638.90	383805.99	29.5	1A	07/03
273	150621.37	383808.64	12	2A	12/02	308	150638.82	383805.90	29.2	1A	07/03
274	150621.33	383808.64	12	2A	12/02	309	150638.82	383805.83	29.1	1A	07/03
275	150612.51	383803.03	19.8	2A	12/02	310	150636.08	383802.88	5.9	1A	07/03
276	150612.63	383803.13	19.8	2A	12/02	311	150641.10	383808.78	27.2	1A	07/03
277	150626.12	383802.86	10.6	2A	12/02	312	150636.97	383811.80	11.5	1A	07/03
EC 2B 12/02						313	150636.84	383811.80	11.5	1A	07/03
No.	Long	Lat	Depth	Class	Date	314	150636.76	383811.77	11.5	1A	07/03
278	150638.74	383810.57	13	2B	12/02	315	150636.84	383811.80	11.4	1A	07/03
279	150638.56	383827.47	21.8	2B	12/02	316	150636.84	383811.87	11.4	1A	07/03
280	150620.44	383824.92	26.2	2B	12/02	317	150637.01	383811.77	11.6	1A	07/03
281	150617.60	383809.09	13.6	2B	12/02	318	150636.80	383811.77	11.6	1A	07/03
282	150617.36	383809.09	13.6	2B	12/02	319	150641.77	383814.07	8.6	1A	07/03
283	150612.80	383803.32	18.7	2B	12/02	320	150641.81	383814.10	9	1A	07/03
284	150612.76	383803.26	18.9	2B	12/02	321	150631.68	383815.67	11.6	1A	07/03
285	150620.50	383809.51	12.5	2B	12/02	322	150632.67	383815.31	11	1A	07/03
286	150606.81	383811.70	18.2	2B	12/02	323	150627.92	383822.94	16.6	1A	07/03
EC 0A 07/03						324	150626.77	383823.17	18.5	1A	07/03
No.	Long	Lat	Depth	Class	Date	325	150626.10	383820.51	16.3	1A	07/03
287	150632.63	383815.41	11.2	0A	07/03	326	150626.10	383820.60	16.1	1A	07/03
288	150634.39	383814.30	13.1	0A	07/03	327	150626.10	383820.64	16.4	1A	07/03
EC 0B 07/03						328	150623.78	383817.72	17.1	1A	07/03
No.	Long	Lat	Depth	Class	Date	329	150623.57	383817.78	16.3	1A	07/03
289	150641.06	383808.59	27.4	0B	07/03	330	150624.77	383818.01	17.3	1A	07/03

The high resolution bathymetric map of the exhalative area of Panarea (Aeolian Islands, Italy)

331	150624.82	383818.01	18	1A	07/03	378	150636.66	383824.65	13.8	1A	07/03
332	150624.28	383818.14	17.4	1A	07/03	379	150635.58	383825.20	17.4	1A	07/03
333	150623.45	383818.40	21.1	1A	07/03	380	150635.33	383825.49	16.6	1A	07/03
334	150624.58	383823.72	21.3	1A	07/03	381	150638.23	383826.56	17.8	1A	07/03
335	150624.04	383823.72	21.8	1A	07/03	382	150638.07	383826.85	19.2	1A	07/03
336	150624.37	383823.88	22.5	1A	07/03	383	150635.41	383823.58	15	1A	07/03
337	150634.63	383823.58	16.2	1A	07/03	384	150635.25	383823.55	15.1	1A	07/03
338	150634.63	383823.55	16	1A	07/03	385	150634.96	383823.58	15.5	1A	07/03
339	150634.21	383823.45	14.6	1A	07/03	386	150635.21	383823.48	15.1	1A	07/03
340	150633.80	383823.32	13.2	1A	07/03	387	150638.11	383826.89	19.1	1A	07/03
341	150633.80	383823.32	13	1A	07/03	388	150637.90	383827.24	20	1A	07/03
342	150634.25	383823.16	13.7	1A	07/03	398	150617.37	383821.58	25.2	1A	07/03
343	150634.21	383823.00	13.1	1A	07/03	399	150616.34	383821.39	25	1A	07/03
344	150634.38	383822.93	12.6	1A	07/03	400	150615.43	383820.87	24	1A	07/03
345	150634.38	383822.93	12.7	1A	07/03	401	150636.58	383824.50	13.7	1A	07/03
346	150634.83	383822.87	12.5	1A	07/03	402	150634.93	383833.83	33.5	1A	07/03
347	150634.87	383822.83	12.4	1A	07/03	403	150634.85	383833.90	33.6	1A	07/03
348	150634.58	383822.80	12.4	1A	07/03	404	150620.75	383809.51	12.5	1A	07/03
349	150634.67	383822.80	12.5	1A	07/03	405	150620.71	383809.51	12.5	1A	07/03
350	150634.58	383822.80	12.4	1A	07/03	EC 1B 07/03					
351	150634.25	383822.12	11.1	1A	07/03	No.	Long	Lat	Depth	Class	Date
352	150634.54	383823.68	16	1A	07/03	406	150638.99	383806.25	29.6	1B	07/03
353	150634.88	383823.71	16.1	1A	07/03	407	150638.98	383806.09	30.4	1B	07/03
354	150634.92	383823.77	16.2	1A	07/03	408	150638.78	383806.06	26.8	1B	07/03
355	150634.09	383823.87	13.7	1A	07/03	409	150638.86	383806.02	29.2	1B	07/03
356	150634.09	383823.87	13.6	1A	07/03	410	150638.82	383805.93	28	1B	07/03
357	150634.88	383823.90	16.7	1A	07/03	411	150638.82	383805.93	29.2	1B	07/03
358	150634.88	383823.94	16.8	1A	07/03	412	150638.90	383805.80	29	1B	07/03
359	150634.79	383823.97	17.2	1A	07/03	413	150636.13	383802.85	6.2	1B	07/03
360	150634.13	383823.97	12.9	1A	07/03	414	150636.00	383802.82	6.6	1B	07/03
361	150634.63	383824.42	15.4	1A	07/03	415	150636.04	383802.36	6.2	1B	07/03
362	150634.59	383824.42	15.4	1A	07/03	416	150635.92	383802.43	6.3	1B	07/03
363	150636.45	383823.74	12.9	1A	07/03	417	150641.14	383808.59	27.2	1B	07/03
364	150636.32	383823.87	13.6	1A	07/03	418	150636.84	383811.87	11.3	1B	07/03
365	150636.32	383823.90	13.6	1A	07/03	419	150642.10	383814.46	10.5	1B	07/03
366	150636.32	383823.90	14.4	1A	07/03	420	150642.31	383814.07	11.3	1B	07/03
367	150636.20	383824.00	12.5	1A	07/03	421	150641.81	383814.13	8.9	1B	07/03
368	150636.32	383824.07	14.3	1A	07/03	422	150631.72	383815.83	11.6	1B	07/03
369	150636.32	383824.13	14.8	1A	07/03	423	150631.93	383815.83	11.9	1B	07/03
370	150636.65	383824.16	12.7	1A	07/03	424	150632.17	383815.50	11.6	1B	07/03
371	150636.32	383824.13	14.6	1A	07/03	425	150632.67	383815.28	11	1B	07/03
372	150636.28	383824.20	15	1A	07/03	426	150627.34	383822.26	17.6	1B	07/03
373	150636.57	383824.32	13.3	1A	07/03	427	150627.59	383822.39	17.5	1B	07/03
374	150636.20	383824.33	14.9	1A	07/03	428	150627.43	383822.52	15.7	1B	07/03
375	150636.57	383824.42	13.6	1A	07/03	429	150626.10	383820.44	16.6	1B	07/03
376	150636.20	383824.33	15.1	1A	07/03	430	150626.56	383821.32	16.6	1B	07/03
377	150636.57	383824.49	13.7	1A	07/03						

431	150626.27	383821.77	16.4	1B	07/03	475	150627.14	383822.39	18.2	1C	07/03
432	150623.08	383817.85	16.3	1B	07/03	476	150628.71	383822.42	14.5	1C	07/03
433	150623.37	383818.17	17.1	1B	07/03	477	150627.59	383822.42	17.4	1C	07/03
434	150623.45	383818.17	17.5	1B	07/03	478	150628.71	383822.42	14.4	1C	07/03
435	150623.41	383818.40	21	1B	07/03	479	150627.97	383822.52	16.5	1C	07/03
436	150624.58	383823.72	21.2	1B	07/03	480	150627.47	383822.65	16.7	1C	07/03
437	150634.63	383823.45	15.5	1B	07/03	481	150626.06	383820.86	17.2	1C	07/03
438	150634.09	383823.42	14	1B	07/03	482	150626.02	383821.97	17.2	1C	07/03
439	150634.25	383823.35	14	1B	07/03	483	150623.08	383817.98	16.5	1C	07/03
440	150634.25	383823.29	13.6	1B	07/03	484	150624.11	383818.14	17.6	1C	07/03
441	150634.38	383823.06	13.6	1B	07/03	485	150624.08	383823.72	22.2	1C	07/03
442	150634.92	383823.81	16.2	1B	07/03	486	150624.12	383823.88	21.8	1C	07/03
443	150634.88	383823.87	16.2	1B	07/03	487	150634.88	383823.58	15.7	1C	07/03
444	150634.59	383823.81	17.2	1B	07/03	488	150634.09	383823.35	13.8	1C	07/03
445	150634.92	383823.87	16.2	1B	07/03	489	150632.77	383823.26	12.6	1C	07/03
446	150634.88	383823.90	16.5	1B	07/03	490	150634.83	383823.13	13.8	1C	07/03
447	150636.32	383823.77	13.1	1B	07/03	491	150634.75	383823.09	13.5	1C	07/03
448	150636.61	383823.94	12.2	1B	07/03	492	150634.75	383823.06	13	1C	07/03
449	150636.57	383824.23	12.2	1B	07/03	493	150634.21	383823.00	13	1C	07/03
450	150635.99	383824.33	14.5	1B	07/03	494	150634.21	383821.83	10.9	1C	07/03
451	150635.50	383823.29	14.2	1B	07/03	495	150634.63	383823.74	16.7	1C	07/03
452	150638.44	383827.08	20.3	1B	07/03	496	150632.52	383823.84	13.9	1C	07/03
453	150637.08	383832.66	31.6	1B	07/03	497	150632.68	383824.00	14.3	1C	07/03
454	150637.08	383832.63	31.7	1B	07/03	498	150635.58	383823.68	14.9	1C	07/03
455	150617.78	383814.06	22.6	1B	07/03	499	150636.20	383823.94	14.2	1C	07/03
456	150618.19	383814.32	23	1B	07/03	500	150635.83	383824.00	15.3	1C	07/03
457	150617.03	383814.22	20.1	1B	07/03	501	150635.83	383824.00	15.3	1C	07/03
458	150636.61	383823.90	18.8	1B	07/03	502	150635.79	383824.07	15	1C	07/03
459	150620.91	383809.45	12.4	1B	07/03	503	150635.70	383824.13	15.1	1C	07/03
460	150620.83	383809.61	12.4	1B	07/03	504	150636.03	383824.26	13.8	1C	07/03
461	150614.83	383810.13	15.2	1B	07/03	505	150635.95	383824.46	14.7	1C	07/03
C 1C 07/03						506	150635.71	383825.33	17.9	1C	07/03
No.	Long	Lat	Depth	Class	Date	507	150635.42	383825.36	16.9	1C	07/03
462	150638.74	383806.06	26.9	1C	07/03	508	150635.62	383825.49	17.9	1C	07/03
463	150638.94	383805.77	29	1C	07/03	509	150634.96	383823.45	15.2	1C	07/03
464	150636.00	383802.82	6.6	1C	07/03	510	150638.44	383827.11	20.2	1C	07/03
465	150636.00	383802.78	6	1C	07/03	511	150638.56	383827.28	21	1C	07/03
466	150641.18	383808.36	27.4	1C	07/03	512	150638.36	383827.24	20.5	1C	07/03
467	150641.18	383808.85	27.4	1C	07/03	513	150638.11	383827.02	19.2	1C	07/03
468	150642.18	383814.23	11	1C	07/03	514	150639.69	383832.40	32.7	1C	07/03
469	150642.31	383814.36	11.2	1C	07/03	515	150616.91	383814.32	20.1	1C	07/03
470	150642.89	383814.36	11.2	1C	07/03	516	150621.00	383809.42	12.3	1C	07/03
471	150631.72	383815.76	11.7	1C	07/03	C 2C 07/03					
472	150632.09	383815.57	11.9	1C	07/03	No.	Long	Lat	Depth	Class	Date
473	150632.26	383815.41	11.2	1C	07/03	517	150638.78	383805.73	29	2B	07/03
474	150627.34	383822.29	17.5	1C	07/03	518	150636.08	383802.72	5.9	2B	07/03

519	150636.04	383800.41	24.6	2B	07/03
520	150636.41	383802.33	7	2B	07/03
521	150619.61	383825.22	27	2B	07/03
522	150620.81	383823.98	25.9	2B	07/03
523	150636.04	383800.41	24.6	2B	07/03
524	150636.41	383802.33	7	2B	07/03
525	150619.61	383825.22	27	2B	07/03
526	150620.81	383823.98	25.9	2B	07/03

EC 1A 12/03

No.	Long	Lat	Depth	Class	Date
528	150634.58	383822.83	12.4	1A	12/03
529	150634.67	383822.80	12.4	1A	12/03
530	150634.79	383822.87	12.5	1A	12/03
531	150634.34	383822.90	12.2	1A	12/03
532	150634.83	383822.87	12.1	1A	12/03
533	150634.38	383823.06	13.1	1A	12/03
534	150633.80	383823.32	13	1A	12/03
535	150634.63	383823.52	15.7	1A	12/03
536	150634.13	383824.00	13.1	1A	12/03
537	150636.66	383824.68	14	1A	12/03
538	150636.53	383824.45	14.1	1A	12/03
539	150636.49	383824.42	13.6	1A	12/03
540	150636.53	383824.36	13.6	1A	12/03
541	150636.16	383824.33	15.1	1A	12/03
542	150636.53	383824.29	13.3	1A	12/03
543	150636.16	383824.33	15.1	1A	12/03
544	150636.24	383824.07	14.2	1A	12/03
545	150636.28	383823.90	14.1	1A	12/03
546	150636.24	383823.94	14.1	1A	12/03
547	150634.88	383823.81	16.2	1A	12/03
548	150634.88	383823.78	16	1A	12/03
549	150634.96	383823.61	15.6	1A	12/03
550	150635.29	383823.55	14.9	1A	12/03
551	150635.24	383823.54	14.8	1A	12/03
552	150635.26	383823.52	14.7	1A	12/03
553	150634.83	383822.87	12.7	1A	12/03
554	150635.16	383822.90	12.2	1A	12/03
555	150638.23	383826.53	17.7	1A	12/03
556	150637.94	383826.63	18.6	1A	12/03
557	150640.80	383826.66	19.3	1A	12/03
558	150639.64	383826.72	19.6	1A	12/03

1B 12/03

No.	Long	Lat	Depth	Class	Date
559	150634.75	383822.74	12.6	1B	12/03
560	150634.17	383823.00	12.7	1B	12/03

561	150634.09	383823.35	13.8	1B	12/03
562	150634.09	383823.45	13.9	1B	12/03
563	150634.59	383823.81	16.8	1B	12/03
564	150634.09	383824.00	11.7	1B	12/03
565	150634.88	383825.27	14.9	1B	12/03
566	150636.70	383824.71	14	1B	12/03
567	150636.70	383824.68	13.9	1B	12/03
568	150636.57	383824.49	13.7	1B	12/03
569	150636.28	383824.10	14.4	1B	12/03
570	150635.04	383824.00	16.5	1B	12/03
571	150636.16	383823.94	14.4	1B	12/03
572	150636.16	383823.94	14.4	1B	12/03
573	150635.04	383823.16	13.5	1B	12/03
574	150634.96	383822.83	12.8	1B	12/03
575	150638.23	383826.53	17.9	1B	12/03
576	150638.07	383826.85	19.2	1B	12/03
577	150639.80	383827.66	22.8	1B	12/03

1C 12/03

No.	Long	Lat	Depth	Class	Date
578	150634.71	383823.09	12.7	1C	12/03
579	150635.58	383825.27	17.3	1C	12/03
580	150635.99	383824.33	15.1	1C	12/03
581	150635.99	383824.33	14.8	1C	12/03
582	150636.61	383824.16	12.9	1C	12/03
583	150635.83	383824.00	15	1C	12/03
584	150636.28	383823.81	13.7	1C	12/03
585	150639.64	383826.76	19.4	1C	12/03
586	150638.07	383826.85	19.2	1C	12/03
587	150638.11	383826.95	19.3	1C	12/03
588	150638.11	383827.02	19.4	1C	12/03
589	150638.48	383827.11	20	1C	12/03
590	150637.98	383827.24	20.1	1C	12/03
591	150638.44	383827.28	20.5	1C	12/03
592	150640.01	383827.53	21.9	1C	12/03
593	150634.92	383825.27	14.5	1C	12/03

A 12/03

No.	Long	Lat	Depth	Class	Date
594	150634.25	383823.29	13.3	2A	12/03
595	150634.09	383823.87	13.6	2A	12/03
596	150634.63	383824.46	15.2	2A	12/03
597	150635.22	383823.81	15.4	2A	12/03
598	150635.29	383823.85	15.5	2A	12/03
599	150635.37	383823.71	15.2	2A	12/03
600	150635.08	383823.71	15.6	2A	12/03
601	150636.98	383821.53	8.8	2A	12/03

12/03						
No.	Long	Lat	Depth	Class	Date	
602	150631.65	383823.84	14.8	2B	12/03	
603	150632.48	383823.84	13.9	2B	12/03	
604	150632.68	383824.00	13.8	2B	12/03	
605	150636.78	383825.56	16	2B	12/03	
606	150635.12	383823.74	15.7	2B	12/03	

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