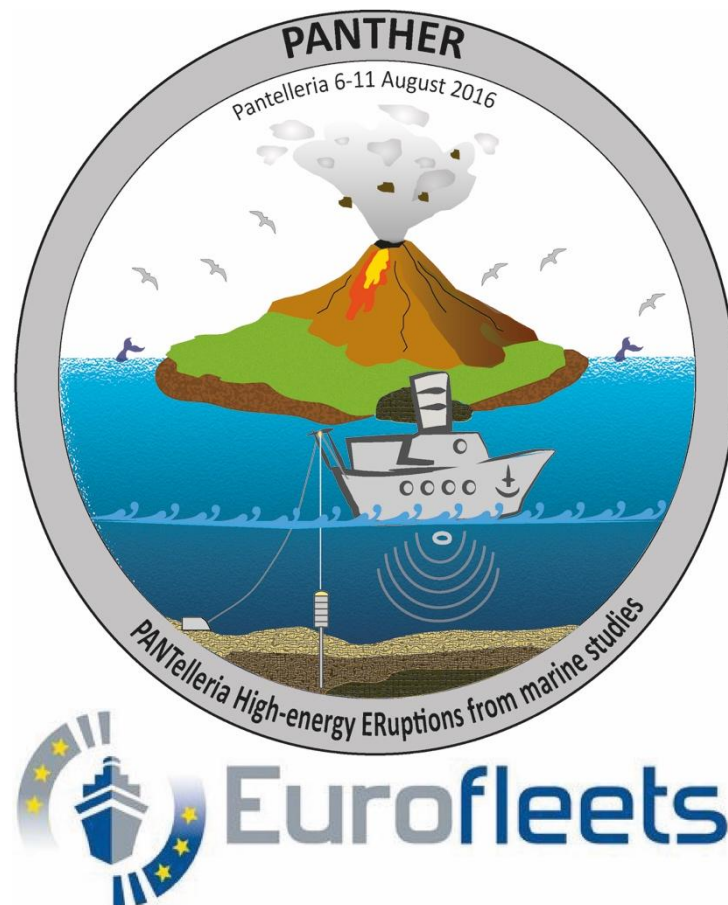


## EUROFLEETS2 Cruise Summary Report

### **PANTHER** ***PANTelleria High-energy ERuptions from marine studies***

R/V Minerva Uno  
Grant agreement no. 312762

06/08/2016 – 11/08/2016, Messina (Italy) – Messina (Italy)



**Dr. Sara Benetti & the PANTHER scientific party**

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## 1 Summary

The main aim of the PANTHER (PANTelleria High-Energy Eruptions from marine studies) project is to reconstruct the impacts of large high-energy eruptive events from the volcano of Pantelleria in the central Mediterranean Sea, as recorded in the seafloor surrounding the island. The Island of Pantelleria is the top of a large active composite Quaternary volcano, rising from a depth of 1300 m below sea level to a height of ca. 840 m above sea level. The volcano is below sea level for 72% of its areal extension. It has been active for the last 320 ka and characterized by mainly explosive eruptions, some of which of large-magnitude. The most recent eruption at Pantelleria was submarine and occurred in 1891, about 5 km offshore the NW coast. The potential hazard of this active volcano, from the explosive events themselves to their capability of generating submarine mass flows and tsunamis, must be better investigated because of possible adverse effects on human life and marine ecosystems. As most of the volcano is submerged, a lot about the volcano's history and related hazards can be learnt by exploring its submarine and offshore parts. Further objectives of the project deal with sedimentological and paleoenvironmental observations in relation to erosive, depositional, oceanographic and biological dynamics observed in the surrounding seafloor.

The EUROFLEETS2-funded research cruise for this project was scheduled from 6<sup>th</sup> to 11<sup>th</sup> August 2016 on board the CNR's Italian research vessel *Minerva Uno*. The onboard scientific participants of 13 people included experienced researchers, PhD and MSc students and two video-operators from the filming company Explorers Society. The project also includes another six onshore scientists. Overall the project brings together scientists from five different European countries (UK, Ireland, Italy, Spain and the Netherlands).

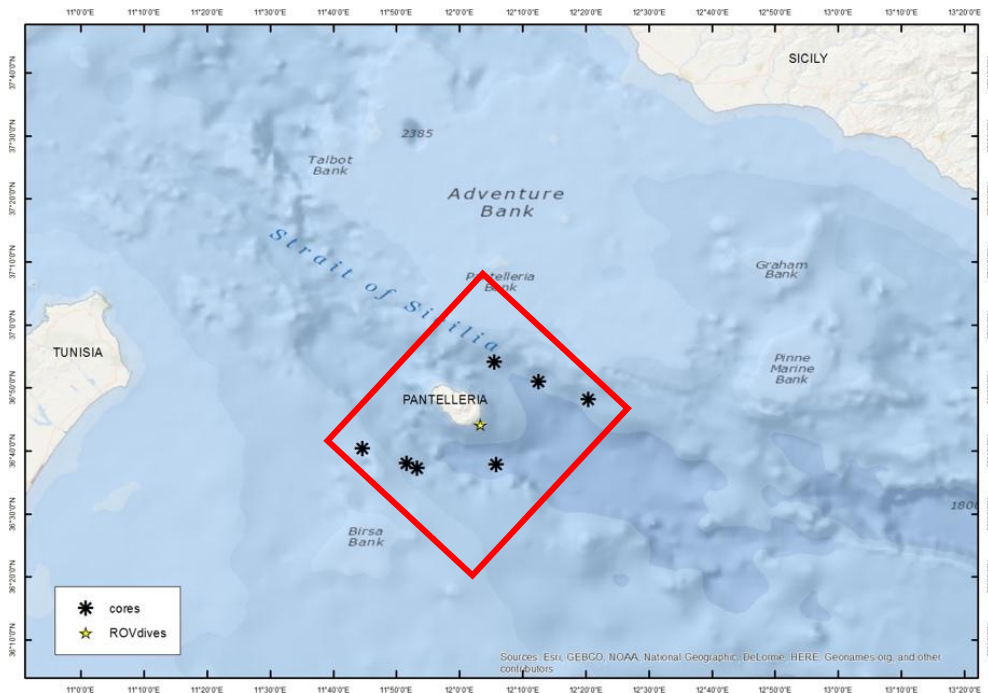
Activities onboard consisted in the surveying and sampling of deep-water areas surrounding the volcanic edifice. Due to the limited time ship available and to the difficulties caused by weather and sea conditions, we focused coring and geophysical surveying in areas to the east and south-east of the island. The choice of sampling sites in locations relatively distal to the volcanic source should, in fact, allow a better conservation potential for volcanic products related to explosive eruptions. Seven cores have been collected (for a total of about 34 m of recovered sediment) and will be split, described and analyzed at University College Dublin (Ireland) in December 2017. Specific sampling is also scheduled at that time for future analyses to be then carried out by the different participants to the project. From the first observations taken aboard during sampling activities, it is expected that primary volcanic materials derived from explosive eruptions of Pantelleria is present in the cores, interlayered in the marine sediments. This will provide a record of recent (i.e. thousands of years old) eruptions occurred on the island.

In addition, about 220 nautical miles of bathymetric and high-resolution seismic data have been collected in the area around the island and during transits, extending the available geophysical data set for the region. These will allow to study the distribution of main seismo-acoustic units in the areas surrounding the island, as well as the seafloor morphology and possible features related to gravity instability.

Overall, although the cruise was severely limited by weather downtime, during the ca. 35% of active working time (including acquisition of geophysical data including in transit and sampling activities), the scientific party achieved most of the cruise objectives. The only planned activity that was not carried out was dredging on the shallow platform around the island. This was due to interdiction communicated at the last minute from the Italian Navy to conduct any type of seafloor

sampling in a wide area around the island, including all of the planned dredging sites. This could have been due to military activities or other matter of national security for the specific time the research cruise took place and it was beyond the control of the scientific party.

**Fig. 1.1** General working area (inside red rectangle) in the context of the Sicilian Channel. Shaded relief bathymetric map of the region from GEBCO (General Bathymetric Chart of the Oceans) data. Position of collected sediment cores and ROV dives is also shown.



## 2 Research rationale and objectives

High-energy volcanic eruptions and ensuing mass transport of volcanoclastic debris pose a range of subaerial and submarine hazards, from the explosive events themselves to their capability of generating large tsunamis in the case of island or coastal volcanoes. In the case of volcanic islands, the links between the subaerial and submarine volcanic processes are still poorly understood. Marine research is particularly essential to constrain the geology and evolution of insular volcanoes that often represent the tip of very large volcanic edifices, mostly developed underwater. Insular volcanoes' growth and evolution is the result of interacting processes such as volcanic, tectonic, mass-wasting, eustatic and isostatic ones. In the last decades, high-resolution submarine mapping has greatly contributed to the knowledge of the submarine flanks of volcanic islands, with particular regards to mass-wasting processes (Moore et al., 1994; Bosman et al., 2008; Romagnoli et al., 2009; Le Friant et al., 2011; Mitchell et al., 2012; Quartau et al., 2012). A lot more can be learnt about eruptive events, the volcano's history and related hazards by exploring the submarine part of volcanoes as a more complete record is preserved compared to the subaerial counterpart, where later volcanism, erosive processes and anthropogenic effects may often obliterate the outcrops.

This project focuses on the island of Pantelleria in the Strait of Sicily in the central Mediterranean Sea (Fig.1.1). On the basis of recently acquired multibeam bathymetry (Bosman, 2008), we proposed a new targeted investigation on the submarine flanks of the volcanic edifice and in the deep water area around it, to ground-truth the available bathy-morphological data on specific volcanic features and to improve our understanding of the largest high-energy eruptive events. In particular, dredging was planned on the submarine flanks of the island, in order to verify

the nature and petrochemical composition of some volcanic features possibly witnessing ancient and unknown activity stages in the growth of the volcanic edifice, and coring and geophysical surveying was to focus at locations relatively distal to the volcanic source and therefore with a likely higher conservation potential for primary products related to high-energy explosive eruptions.

The **main aim** is reconstructing the impacts of large high-energy eruptive events in the submarine environment, in relation to the submarine morphology and sedimentology of the volcanic edifice and surrounding seafloor, with **4 specific objectives**:

(1) To characterize the submerged portions of the volcanic edifice (using seismic data and dredging informed by morphology from high-resolution multibeam bathymetry data);

(2) To investigate the deep water record of high-energy eruptive events (using cores and seismic data) and the evolution of the volcanoclastic flows into the ocean;

(3) To link the above to the eruptive history of Pantelleria (using geochemistry and core chronostratigraphy);

(4) To investigate the distribution of the associated mass flow deposits (e.g. turbidites) and relate them to respective eruptive events. This will enable to calculate the volume of mass flows in order to begin a tsunami risk assessment.

The achievement of these objectives will allow us (i) to better link the submarine morphology of the volcanic edifice with the subaerial volcanic history that represents a relatively short record within the evolution of the whole volcanic edifice; (ii) to enhance our knowledge of the eruptive history of Pantelleria, especially for the older activity, not fully documented on the island, and (iii) to assess/update the volume estimates of major high-energy events, including the Green Tuff offshore equivalent, which cannot be achieved by mapping of the subaerial deposits only.

The collected datasets will allow the research group to develop **additional and complementary objectives** and in particular:

(5) To investigate deep water sedimentary processes in the area and, in particular, the interaction between volcanically-derived sediments and bottom current reworking in distal areas;

(6) To assess the mechanical properties of ash layers in relation to their possible behaviour as weak layers in downslope mass transport;

(7) To further investigate the oceanographic history of the NW basin and its role as oceanographic gateway between the eastern and western Mediterranean;

(8) To better assess coral and other biogenic buildups distribution within the area.

### 3 Narrative of the Cruise

#### Friday 5th August

Scientific crew arrived on RV *Minerva Uno* docked in Messina Harbour on the evening of Friday 5<sup>th</sup>. Lead scientist Dr. Sara Benetti outlined the goals of the cruise to the ship crew and discussed shifts and responsibilities with the Captain.

#### Saturday 6<sup>th</sup> August

Final preparations by crew were made for departure, which occurred at 1:30pm. During the morning, several presentations were made by Dr. Sara Benetti, Prof. Claudia Romagnoli and PhD/MSc students who are on board (full list of presentations in Sect. 3.2). We were made aware of a storm front within the Straits and were advised that this would delay the scientific operations. This was updated throughout the day and the decision was made to stay closer to the coast of Sicily, while moving south very slowly, and to wait out the storm ahead. The sea conditions did not allow the ship to head towards the study area but instead we are waiting close to the southern tip of Sicily (Capo Passero) for the weather to improve.

#### *Sunday 7<sup>th</sup> August*

Two storm fronts that were continuing to cause high winds and increasing wave swells made it impossible to move from our current sheltered position. Discussions between the scientific party and the ship captain continued in order to maximize what could be done when we reach our destinations. Seminars by Dr. Aggeliki Georgiopoulou, Dr. Marga Garcia and Dr. Lorenzo Angeletti were completed during the day (See Sect. 3.2) and were recorded by the documentary crew that has accompanied the cruise on behalf of Eurofleets. The waiting out of the high swells continued throughout the night once again.

#### *Monday 8<sup>th</sup> August*

Moving along the sheltered southern coast of Sicily for the morning, it was decided that the weather had calmed enough to make our way to our first location. Arriving on site at 14:30 UTC, we started out first multibeam line traveling from shallow water towards the island and deeper water. Travelling at a speed of 10kts, the multibeam was used to map the sea floor and after some adjustments with the range and filters we started receiving some good data. The chirp sub-bottom profiler was also used in conjunction with the multibeam to acquire sub-bottom data along with seafloor bathymetry. Throughout the day some changes were made to the waypoints depending on weather and the information we were receiving. The CTD device (conductivity, temperature & depth) was deployed at 18:22 UTC and returned to ship at 18:37 UTC. The Chirp and multibeam systems started returning poor quality data due to worsening sea conditions around 18:45-19:00 UTC. Data quality kept deteriorating due to weather conditions. It was decided at 19:49 UTC that all instruments be stopped and the ship to move to shelter behind the island of Pantelleria to wait out for better sea conditions. Plan for the coming day was discussed with the Captain and coring stations selected so that sampling can start as soon as the weather and sea state improve again. For the following 36 hours before having to start our transit back, the priority is coring and achieving one or two ROV dives with geophysical acquisition continuously on in transit.

#### *Tuesday 9<sup>th</sup> August*

This morning we made a start at 05:27 UTC towards the site where we will be taking our first gravity core. Chirp recording was started en route. At 06:03 UTC the acquisition of navigation began and shortly afterwards at 06:15 UTC, it was decided stop chirp acquisition after passing the coring site 01 and we turned back towards the core site 01. Arrived at location at 06:28 UTC and proceeded to take first core. Recovery 5.30m. We then proceeded to core site 02, we arrived at this location at 09:16 and a second gravity core was completed. Recovery 5.54m. The third

core of the day was taken at location 3 at 10:42, again over 5 m of sediment was recovered. Throughout the day the chirp was utilized throughout the transit between each core location and over each core site in order to have sub-bottom information at each core site. A 4<sup>th</sup> core was planned to be taken but these plans had to be abandoned due to the high winds that were picking up again. Chirp acquisition continued as we moved towards Pantelleria island for shelter and for deployment of the ROV. ROV deployed at 13:07. Seafloor reached at 14:10 UTC and image acquisition from the ROV started. ROV transect from 522 m to 280 m water depth. Notes were taken in real time by Dr. Angeletti about key species for flora and fauna visible in the live streaming from the ROV. Unfortunately, along with marine life, a large amount of man-made objects (including ropes, glass bottles, plastic glasses and plates) were also observed. ROV recovered at 17:52 UTC. The night crew then continued geophysical acquisition along the transects by Pantelleria Island. Chirp and multibeam bathymetry data were acquired throughout the night. The sparker was tried between 19:10 and 22:57 UTC but quality of data was poor with very little penetration and its acquisition was abandoned for the rest of the night shift.

#### Wednesday 10<sup>th</sup> August.

Thanks to improving weather and sea conditions overnight, we were able to take core 04, on the bathymetric high SW of Pantelleria. Core on deck at 05:35 UTC. Recovery 85 cm with sediment of very coarse sands. Chirp and multibeam acquisition continued on our way to the second core location of the day on the other side (NE) of the island. Really steep changes in water depth along this transect meant we had to make several changes to the chirp settings in order to get some clean data. Core 05 on deck at 8:50 UTC; recovery 5.44 m. Chirp acquisition continued on transit towards the east, to the third core location of the day. Core 06 on deck at 10:24; recovery 5.59 m. When taking this core on deck the head of the core went down and the nose of the core rose, some sediment was washed out. Finally, we transited to the final core location of the day, again further to the east. Core on deck at 11:53 UTC; recovery 5.295 m. In the core catcher some angular volcanic pumice and scoria was found with average size <1 cm. As we finished at this location, chirp and multibeam acquisition was started again to collect data in transit to port in a region where there is currently limited high-resolution data available. We followed the slope of the Pantelleria and Malta graben systems and identified interesting features related to alongslope sediment transport and mass failures. End of data acquisition at 22:54 UTC. In transit.

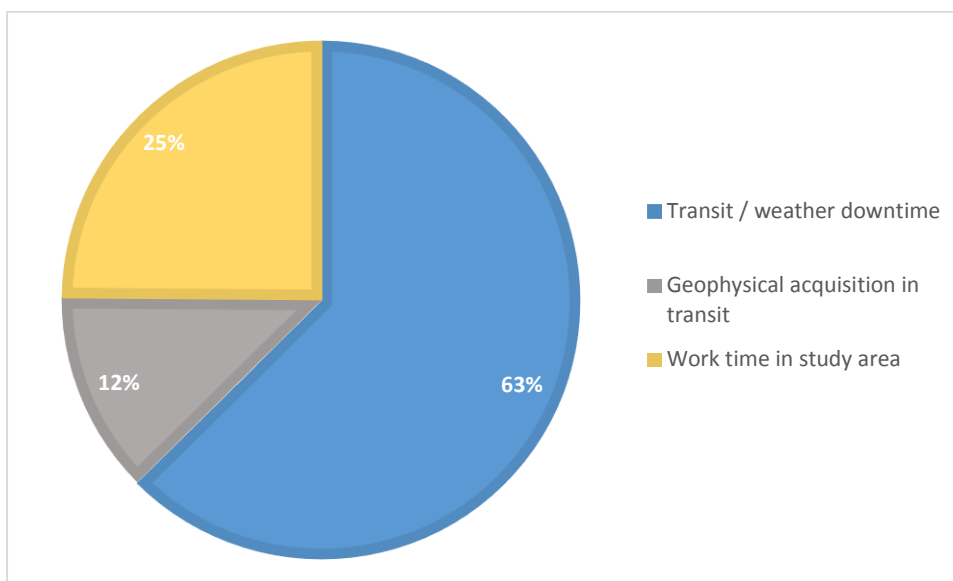
#### Thursday 11<sup>th</sup> August

Final day on board *Minerva Uno* during transit consisted of ensuring all documentation and reports were correct and put together for final reporting. Geophysical data were backed up on several hard-drives and a copy will be retained on the ship's server for six months after the cruise. No new data was acquired and it was full steam ahead back to Messina. Arrived in port at 14:30 UTC. Most cruise participants disembarked the following morning and the sediment cores were packed and collected by DHL for shipment and storage at UCD in Ireland.

### 3.1 Breakdown of cruise activities

The diagram below shows the distribution of the various activities during the research cruise.

Unfortunately weather downtime and transit from port to the study area and back took 62% of the total time we had available for the cruise. A total of around 52 hours (over two days) was due to adverse weather conditions in the period August 6th to 9th. Only 25% of the time was spent working in the actual study area. This includes coring at 7 separate sites on both sides of the island, one ROV dive and geophysical acquisition within the study area. The remainder 13% of the time, although in transit to the study area, was at least dedicated to geophysical acquisition that resulted in additional datasets for the investigation of seafloor processes.



**Fig. 3.1** Breakdown of cruise activities.

### 3.2 List of presentations

#### Scientific staff:

- Dr. Sara Benetti (UU): *PANTHER*: rationale, plan of activities and life on board.
- Prof. Claudia Romagnoli (UBol): The record of volcanic activity in the marine environment.

The eruptive history of Pantelleria and related marine record.

- Dr. Aggeliki Georgiopoulou (UCD): Preliminary results from cruise MSM47: the 1929 Grand Banks slide.
- Dr. Marga Garcia (CSIC): Morphological depressions at the Diego Cao channel (Guadalquivir Bank, Gulf of Cadiz). Oceanographic and sedimentary implications.
- Dr. Lorenzo Angeletti (CNR-ISMAR): The deep water corals of the Mediterranean Sea.

#### PhD/MSc students:

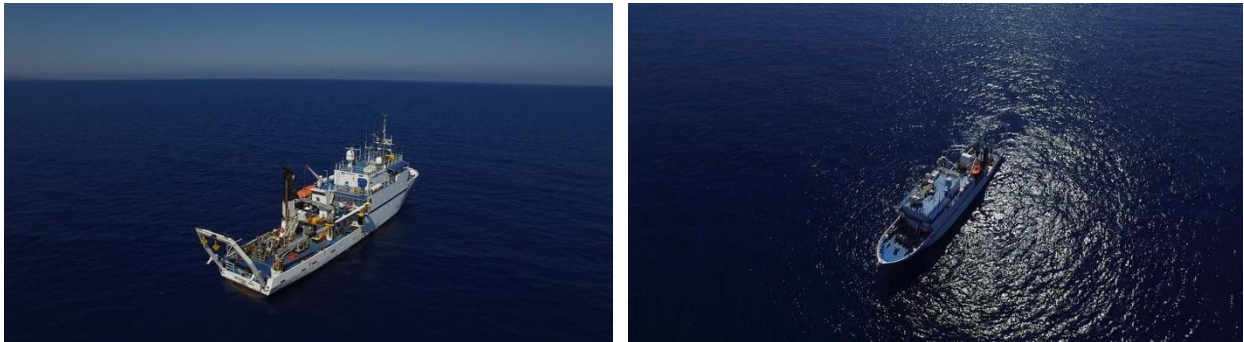
- Mr. Michael Owens (UCD): The Cenozoic depositional evolution of the NE Rockall Trough.
- Ms. Cristiana Giglio (UBol): My studies and thesis plan.
- Mr. Darren Barry (UL): Does size matter: paleoenvironmental reconstruction during sapropel deposition along the Mediterranean ridge.



- Ms. Denise McCullagh (UU): Paleoenvironments of Galway Bay (Ireland).
- Mr. Antoine Thieblemont (RHUL): The Contourites depositional and erosional system along the east African margin and southeast American margin with their onset, evolution and implication on hydrocarbon exploration.
- Mr. Alessandro Ricchi (UBol): My seagoing experience and my PhD project on insular shelf development of volcanic islands.

*Explorers Society:*

Drone flight over ship *Minerva UNO* and the life of a National Geographic video-operator/photographer.



**Fig. 3.2** Photos of the *RV Minerva Uno* taken by drone during the filming of activities by Explorers Society (copyright of Explorers Society).

## 4 Preliminary Results

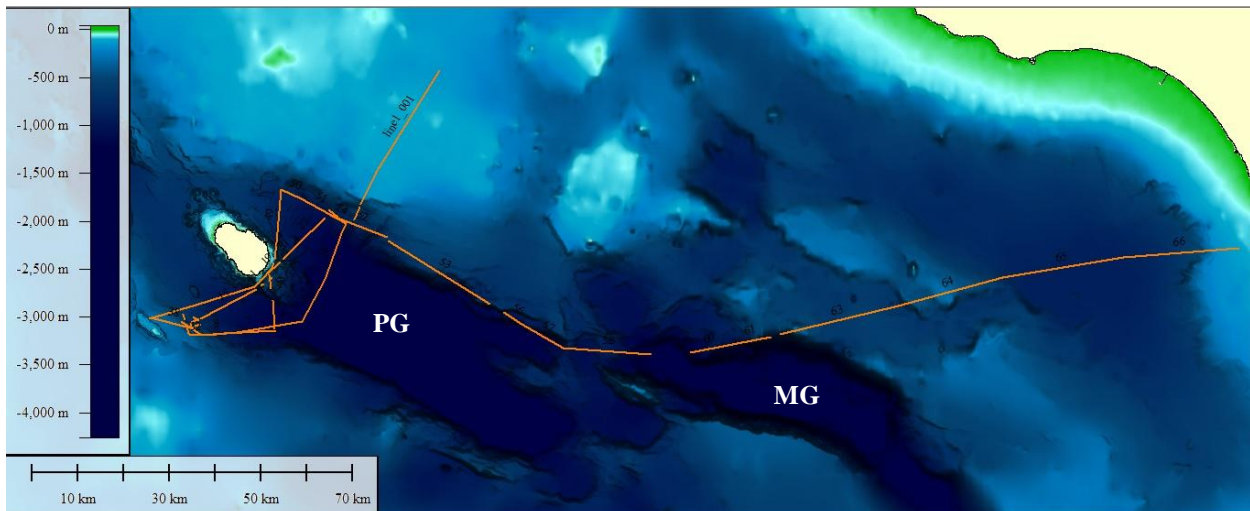
### 4.1 Geophysical acquisition (*M. Garcia*)

Overall 220 nautical miles (ca. 400 km) of geophysical data were acquired during the cruise, including multibeam bathymetric and high-resolution seismic data (CHIRP and sparker) in the area around the island and during transits, extending the available geophysical data set for the region. Due to poor data quality only about 14 nm (26 km) of sparker data was acquired.

Acquisition of MB and chirp data took place at varying speed, between 4 and 10 knots, depending on sea conditions and use of sparker, which needs slower ship speeds (4 to 4.5 knots).

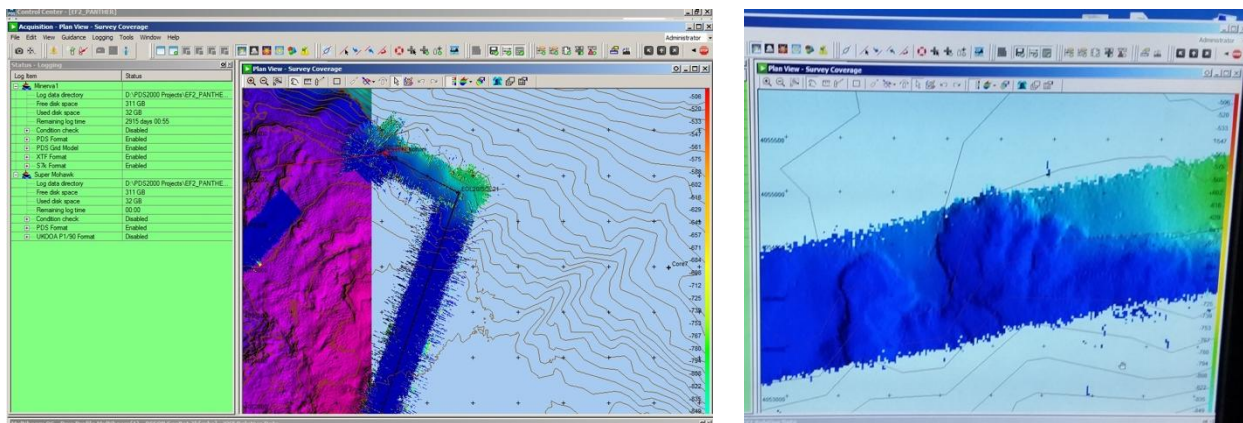
#### 4.1.1 *Swath bathymetry*

The multibeam echosounder RESON8125 (hull mounted) was used to acquire bathymetric data in transit and in the study area. Calibration of the sound velocity through the water column was done by one CTD profile prior to the start of acquisition (CTD01, Sect. 7). The system includes roll and pitch stabilization and was operated at variable depths between ca 150 m and 2000 m. The navigation software was PDS2000.



**Fig. 4.1** Overview of geophysical acquisition lines for both multibeam bathymetric and chirp sub-bottom data. The low-resolution bathymetric data in the image clearly show some geological structures of the Sicilian channel, including the Pantelleria Graben (PG) and the Malta Graben (MG) (cf. Civile et al., 2008).

Although data already exist for a good portion of the study area, the objective was to have high-resolution data at all sampling stations and to expand the existing datasets when possible. For example, we obtained new MB data over the coring sites further to the east.



**Fig. 4.2** Example of MB data during acquisition over core site 06 (left panel). The image shows the raw data as they are acquired. They will then be processed and cleaned using the hydrographic software Caris. The right panel shows an example of data acquired during the return transit along the northern edge of the Pantelleria graben.

#### 4.1.2 High-resolution seismic (CHIRP)

High-resolution sub-bottom data were acquired using a Chirp Swan Pro 2.02 system (Fig. 4.3). It worked with a pulse length of 10 ms and a trigger rate and recording length between 0.25 and 2 s varying with depth. Maximum signal penetration was around 80 m with resolutions in the order of 1 m. Chirp operated simultaneously with the multibeam (extent of coverage in Fig. 4.1) and sparker systems and the information was used to allocate the best location for coring sites. 75 files were recorded in XTF format and converted into SEG files for interpretation using the SeisPhro LCL 2.0 software (Gasperini and Stanghellini, 2009).



**Fig. 4.3** Seismic acquisition station. The centre screen shows the CHIRP data being acquired. The scientific staff on geophysical watch would take care of data quality, changes in delay and of initial interpretation of data in order to select the optimal locations for coring.

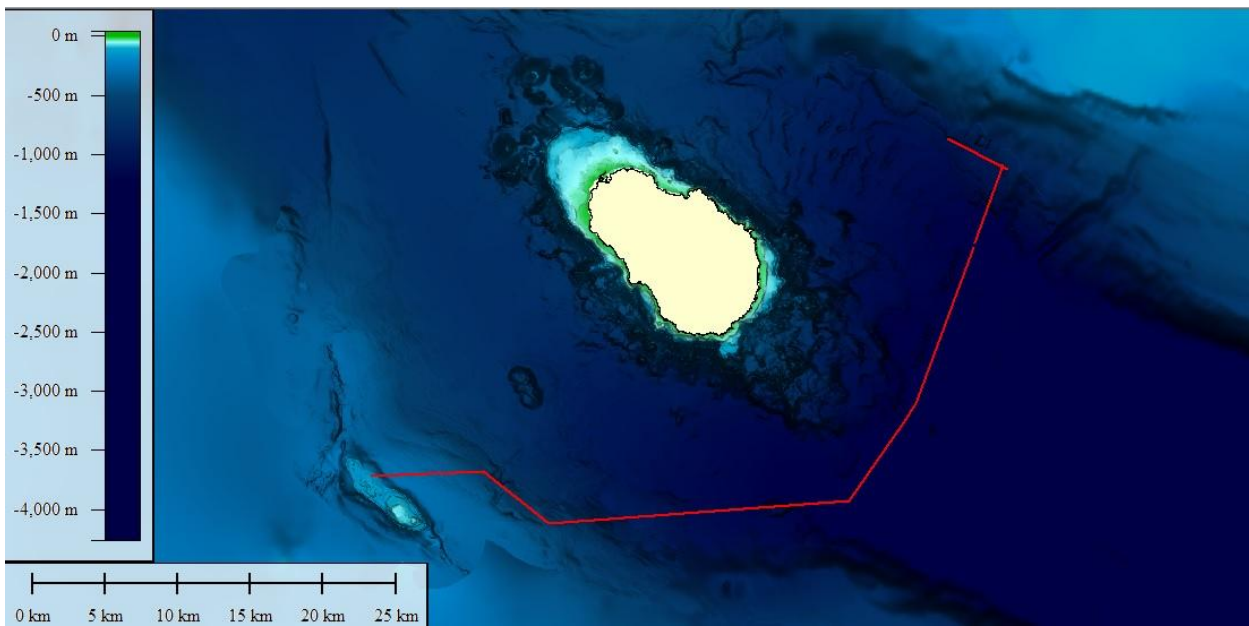
#### 4.1.3 Sparker System



The sparker system was used to obtain mid-resolution seismic profiles, operating simultaneously with the Chirp and multibeam systems. The seismic source is a Geo-Source 1500 equipment (Fig. 4.4), operated at trigger rates between 1 and 2 seconds, and towed behind the ship. The signal was received in a single channel streamer, with an active length of 5 m and acquired in a Triton SB Logger system that provided files in SEG Y format. During sparker operations, ship speed was reduced to 4 to 4.5 knots to achieve the best possible quality of the signal. Often however the sparker system did not return data of comparable quality of the CHIRP system. This was probably due to the weather and marine conditions, the type of seafloor sediment and the variable water depth along the transect (Fig. 4.5). As a result, only about 14 nm (26 km) of line data was acquired in total along the transect shown in Fig. 4.5.

**Fig. 4.4** The ship technicians getting the Geo-Source 1500 sparker ready for deployment.





**Fig. 4.5** Sparker lines collected in the study area. The data quality for sparker was often poor and in several occasions it was decided to turn the instrumentation off. As a result, only about 26 km of line data were acquired along this transect.

The sub-bottom geophysical data will be used to investigate the distribution of seismo-acoustic units around the volcanic edifice, in particular in relation to the areal distribution of volcanic deposits below the seafloor.

## 4.2 Seafloor sampling (*S. Benetti*)

Two activities were planned as part of the research cruise: dredging in the shallow platform around the island and coring in deeper water.

By Italian law, all marine research activities are required to apply for permit to conduct offshore work. These requests go to several different government bodies, including port authorities, the Navy, the Ministry for the Environment and so on. Each government body then issues a separate permit. When the permits came in few days before the cruise, we found out about the interdiction from the Italian Navy to conduct any type of seafloor sampling in specific areas around the island, including the shallow platform around it. This could have been due to military activities or other matter of national security for the specific time the research cruise took place and it was beyond the control of the scientific party. This meant that all dredging activities planned in shallow water had to be dismissed and only coring in a distal location took place during the cruise.

A 6-m barrel gravity corer with a trigger system was used (Figs. 4.6 & 4.7). The performance was excellent with full penetration and almost complete recovery at most sites (see Table 1). Shortest core was on the bathymetric high to the SW of the island (core PAN04) at 85 cm. This short recovery was due to the type of sediment that included very coarse shell hash. All of the other cores are over 5 m long and include both mud and sand.



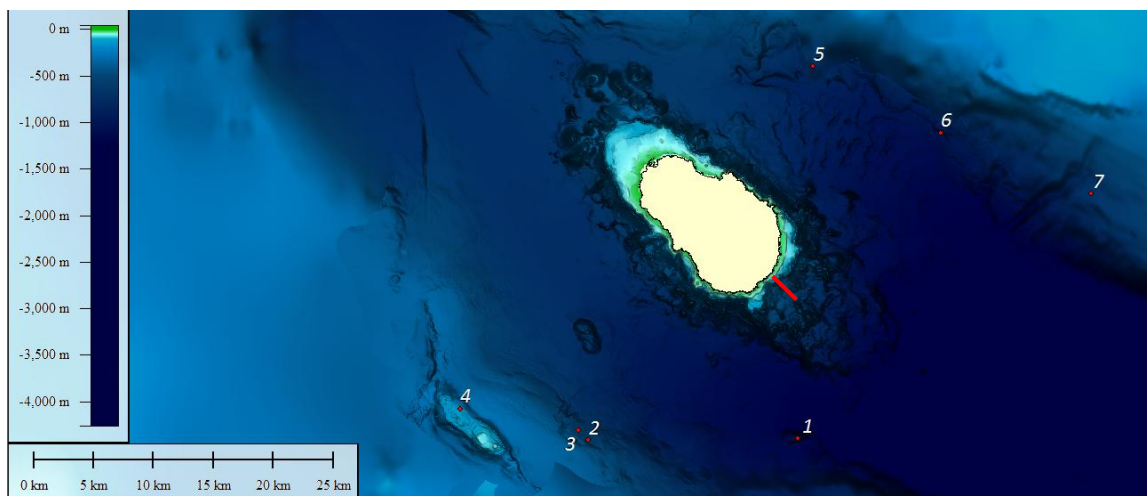
**Fig. 4.6** (top) Particular of the trigger system for gravity corer.



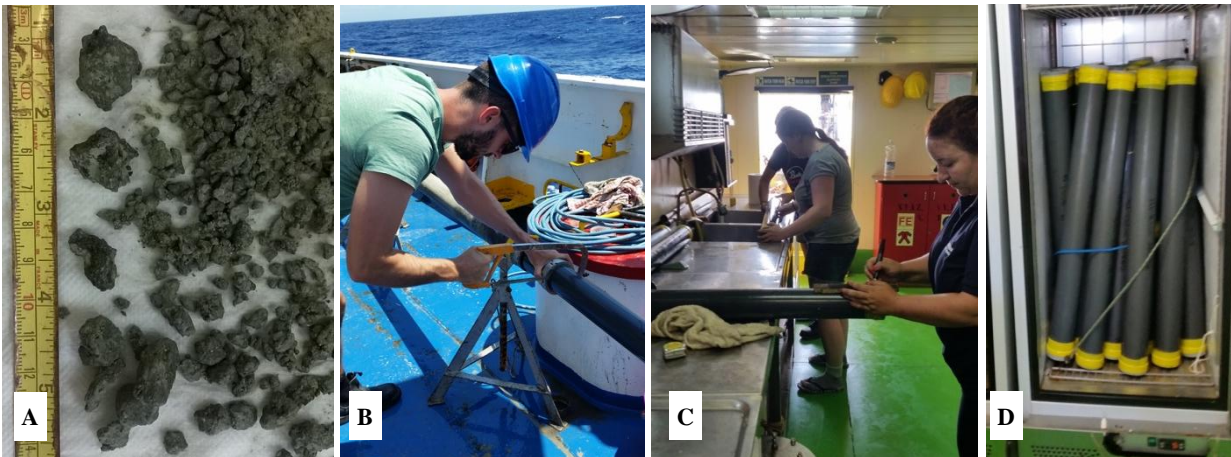
**Fig. 4.7** (right) Recovery of gravity corer. The mud all over the barrel and weight of the corer is an indication of complete penetration.

Seven cores were collected, for a total of about 34 m of recovered sediment (Table 1 for specific details). Coring sites were selected at locations distal from the volcanic source (see map in Fig. 4.8) to allow for a better conservation potential for volcanic products related to explosive eruptions. From the first observations taken aboard during sampling activities, it is expected that primary volcanic materials derived from explosive eruptions of Pantelleria are present in the cores, interlayered in the marine sediments (Fig. 4.9). This will provide a record of recent (i.e. thousands of years old) eruptions occurred on the island.

After recovery, cores were cut into 1 m sections, carefully labelled and stored in the fridge at 4°C (Fig. 4.9). Cores will be split, described and analyzed at University College Dublin (Ireland) in December 2017. Specific sampling is also scheduled at that time for future analyses to be then carried out by the different participants to the project.



**Fig. 4.8** Locations of core sites and ROV dive (red transect).



**Fig. 4.9** A: example of volcanic pumice and scoria recovered in one of the cores. B to D: Processing of sediment cores. (B) Cores were cut on deck in 1m sections on deck, capped and taped, and (C) then brought into the wet lab for labelling and (D) stored in the fridge at 4°C.

**Table 1.** Locations of core sites.

N.	Date	Arrival Time UTC	Dep. Time UTC	Lat (deg N)	Long (deg E)	winch tension (kg)	Num. sections	WD (m)	recovery (m)	Comment
PAN01	09/08/16	06:30	07:17	36.6245	12.0664	2432	6	1086	5.305	Silty grey mud at core bottom, continued grey mud throughout the core with a disturbed core top.
PAN02	09/08/16	09:16	09:48	36.6275	11.8714	2301	6	507	5.54	Grey sandy coarse volcanic clasts, changing into black sand in middle sections and grey sandy mud on top. Disturbed core top.
PAN03	09/08/16	10:27	11:04	36.6355	11.8622	2432	6	520	5.46	Grey clay at core bottom changing into coarse sand in middle sections with grey mud on top. Disturbed core top.
PAN04	10/08/16	05:25	05:34	36.6541	11.7532	1532	1	147	0.85	Light grey mud with shelly material at bottom and brown shelly mud at top.
PAN05	10/08/16	08:23	09:05	36.9023	12.0921	2432	6	746	5.44	Grey sandy mud at top and bottom of each section, the core top is disturbed. On outside of core barrel some volcanic shards
PAN06	10/08/16	09:44	10:32	36.8495	12.2095	2414	6	993	5.59	Grey mud throughout, disturbed core top and stuffed. Some sediment lost when taking core out of water.
PAN07	10/08/16	11:22	12:25	36.8003	12.3472	2229	6	763	5.295	Volcanic material at core bottom in core catcher (bagged). Grey mud throughout. Core top disturbed.

### 4.3 ROV (*L. Angeletti*)

One ROV dive was conducted with ROV Pollux III (Fig. 4.10) along the SE flank of Pantelleria island between -520 and -288 m water depth (Fig. 4.8 for location). Objective of the dive was to explore the seafloor around the island to verify and eventually map the presence of deep-water scleractinians (i.e. white corals, also called Cold Water Corals – CWC).

The data streaming during the dive showed a seafloor dominated by muddy sediments throughout most of the transect, except for the last ca. 310 to 288m water depth, where outcrops of volcanic rocks were seen. To be noted, the presence of abundant man-made objects (mainly



rubbish, including ropes, tyres, plastic plates and glasses, Fig. 4.11), possibly transported to the site from bottom currents.



**Fig. 4.10** Left: The ROV Pollux III being prepared for the dive. Right: ROV going into the water for the beginning of the dive.

**Fig. 4.11 (below)** Views of the seafloor during the ROV dive. Muddy seafloor and many anthropogenic remains.



#### 4.4 Report from Explorers Society Srls (*Flavio Oliva*)

Two operators (Flavio Oliva and Elisabetta Carfagna) from the company Explorers Society Srls participated to the Eurofleets research cruise Panther 2016. The objective was to record ship and research activities to document and disseminate both the funded project and the Eurofleets contribution to European Research. During the cruise, both crew and scientific staff were interviewed. Filming was carried out with different multi-media techniques and a short film about the research cruise will be produced in the following months.

The final product will be delivered to Eurofleets according the signed agreement at the end of the post-production.

## 5 Data and Sample Storage / Availability

As for agreement, the data collected during the cruise are stored with the project partners as for their contribution and in multiple copies to avoid loss of data.

The metadata will be delivered to EMODnet Central Portal (European Marine Observation and Data Network) for inclusion after the post-cruise QA process.

## 6 Participants

No	Name	Gender	Affiliation		On-board tasks
1	Sara Benetti	F	UU		Chief scientist
2	Claudia Romagnoli	F	UniBO		Co-chief scientist
3	Marga Garcia	F	IACT-CSIC		Geophysical acquisition lead
4	Aggie Georgiopoulou	F	UCD		Coring lead
5	Lorenzo Angeletti	M	ISMAR-CNR		ROV
6	Denise McCullagh	F	UU	PhD student	Coring / seismic watch
7	Darren Barry	M	MIC - UL	PhD student	Coring / seismic watch
8	Michael Owens	M	UCD	MSc student	Coring / seismic watch
9	Cristiana Giglio	F	UniBO	BSc student	Coring / seismic watch Navigation / multibeam acquisition
10	Alessandro Ricchi	M	UniBO	PhD student	Navigation / multibeam acquisition
11	Antoine Thieblemont	M	RHUL	PhD student	Coring / seismic watch
12	Flavio Oliva	M	ES	*	Video-operator
13	Elisabetta Carfagna*	F	ES	*	Video-operator

UU	Ulster University, Coleraine, Northern Ireland (UK)
UniBO	University of Bologna, Bologna, Italy
IACT-CSIC	Andalusian Institute of Earth Sciences, Granada, Spain
UCD	University College Dublin, Dublin, Ireland
ISMAR-CNR	Istituto Scienze Marine, Consiglio Nazionale delle Ricerche, Bologna, Italy
MIC - UL	Mary Immaculate College, University of Limerick, Limerick, Ireland
RHUL	Royal Holloway University of London, Egham, UK
ES	Explorers Society Srls, Roma, Italy; * Funded separately



**Fig. 6.1**  
PANTHER  
scientific  
participants.



## 7 Station List

Station No.	Date	Time	Latitude	Longitude	Water Depth	Gear	Remarks/Recovery
	2016	[UTC]	[°N]	[°E]	[m]		
CTD 01	08.08	18:31	38.8249	12.2608	400	CTD	Multibeam calibration
PAN01	09.08	6:51	36.6245	12.0664	1086	Gravity corer	Recovery 5.305m
PAN02	09.08	9:16	36.6275	11.8714	507	Gravity corer	Recovery 5.54m
PAN03	09.08	10:42	36.6355	11.8622	520	Gravity corer	Recovery 5.46m
ROV01 start	09.08	14:10	36.7298	12.0638	520	ROV PolluxIII	ROV transect start
ROV01 end	09.08	17:52	36.7393	12.0518	288	ROV PolluxIII	ROV transect end
PAN04	10.08	5:30	36.6541	11.7532	147	Gravity corer	Recovery 0.85m
PAN05	10.08	8:39	36.9023	12.0921	746	Gravity corer	Recovery 5.44m
PAN06	10.08	10:07	36.8495	12.2095	993	Gravity corer	Recovery 5.59m
PAN07	10.08	11:38	36.8003	12.3472	763	Gravity corer	Recovery 5.295m

## 8 Acknowledgements

We thank the Eurofleets2 Trans-national access programme for funding this research project that brought together new collaborations across Europe. We would like to acknowledge the help received during the cruise activities by the captain and all of the crew of the Italian R/V *Minerva Uno*. In particular, we would like to thank the ship technicians, Andrei and Nando, for their continuous support during all research activities. Additionally, the ship operator So.Pro.Mar, and Mauro Del Sette in particular, provided logistic support before, during and after the cruise. Giuseppe Magnifico, Giovanni Proietti, Anna Vetrano and Laura Barbieri of the Italian CNR (Consiglio Nazionale delle Ricerche) also provided logistical support and helped sorting out all other aspects related to the cruise, from financial management of funds to acquisition of permits for offshore work. We finally thank our onshore colleagues (Francesca Sangiorgi, Angela Cloke-Hayes, Alessandro Bosman, Francisco J. Hernandez-Molina, Giorgio Gasparotto, Marco Taviani) who contributed to the original proposal and will collaborate to the post-cruise research.

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