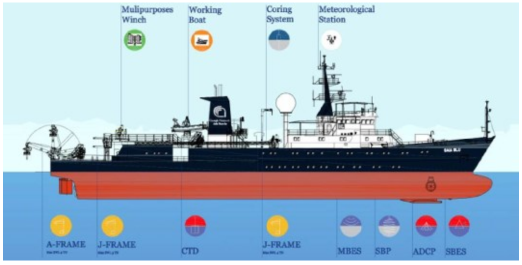
CNR ISMAR
ISTITUTO DI SCIENZE MARINE

PROJECT

INSIDE - Unravelling the lIthosphere-astheNosphere System of the Tyrrhenian back arc basin through geological, petrological and geophysical data Integration and geoDynamic modElling

Survey Report

N/R Gaia Blu, 8.08 – 27.08.2025



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1. INTRODUCTION

The Tyrrhenian basin (Fig. 1) is one of the few existing back-arc basins on Earth and the only one demonstrated to have experienced the process of mantle exhumation. Despite the various studies conducted in the Tyrrhenian basin in the last 50 years, the evolution from the first break-up to the opening of the central Vavilov basin, the internal structure, the relationship between thinned continental crust / exhumed mantle / intruded magma, and the thermal state with the related deep fluid circulation are not fully understood. The IODP-402 in 2024 has helped to advance on several of these questions strongly, but drilling data is limited in the spatial interpretation of this complex back-arc setting. With the present survey, we tried to fill part of these gaps by collecting new data represented by: heat flow, thermal conductivity, sub-bottom chirp profiles and very high resolution swath bathymetry. These data will help to image shallow tecto-sedimentary and magmatic features and help to constrain the deep thermal structure of the central part of the Tyrrhenian Basin.

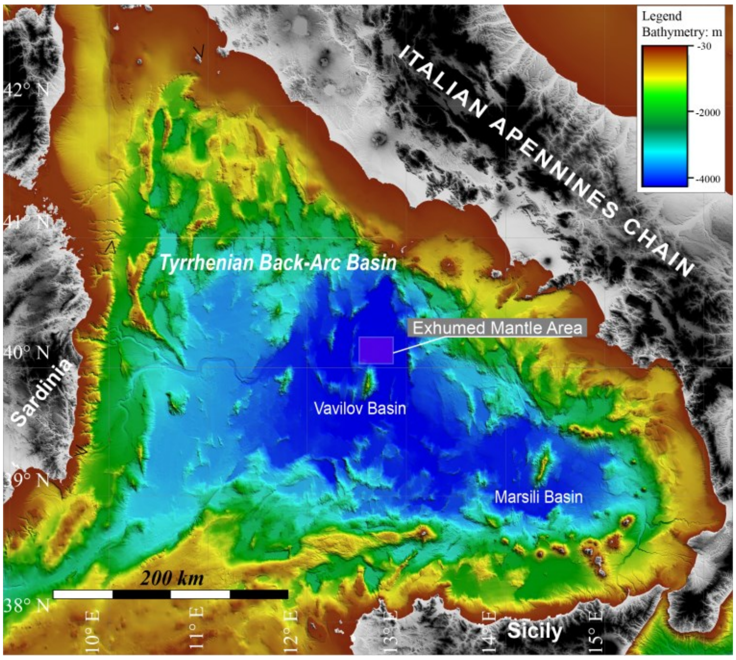

Figure 1 *– Morpho-bathymetric map of the Tyrrhenian Back-Arc basin, here the area of the exhumed mantle is underlined with a square. Bathymetry is from EMODnet portal, altimetry is from SRTM90 database.*

2. SCIENTIFIC CONTEXT

The Tyrrhenian back-arc basin (BAB) is a Neogene-Quaternary extensional basin that formed at the rear of the Neogene Apennine thrust belt. Its back arc evolution has mainly been attributed to the subduction and rollback toward the east, before, and south-east, later, of the Ionian plate (Malinverno & Ryan, 1986; Doglioni, 1991). The central abyssal plain of the Tyrrhenian Sea is characterized by a very thin and intensely faulted crust (Loreto et al., 2021), and mantle exhumed controlled by adiabatic decompression (e.g., Kastens & Mascle, 1990; Prada et al., 2014; Milia et al., 2016), high heat flow values (> 100 mWm^2; Pasquale et al., 1999; Della Vedova et al., 2001), and a large positive Bouguer gravity anomaly (Mongelli et al., 1975). Moreover, a series of volcanic edifices forms by magmatic fluid intruded along discontinuity and fractures affecting the lithosphere. During the last decades, numerous studies have been performed to disclose the dynamics and evolution of the Tyrrhenian basin using a multidisciplinary approach. The recent IODP Exp. 402 drilling survey conducted in the central Tyrrhenian (https://iodp.tamu.edu/scienceops/expeditions/tyrrhenian_continent_ocean_transition.html) highlighted the high heterogeneity of the mantle (Sanfilippo et al., 2025) and magmatism (Beccaluva et al., 1990; Trua et al., 2004), also reflected by physical properties variations (Filina et al., 2024, AGU abstract).

3. OBJECTIVES

- New high-density acquisition of heat flow data along several MCS profiles to identify (1) shallow thermal processes such as hydrothermal circulation, magmatic intrusions, sediment blanketing, etc. and (2) the structural thermal domains in areas of mantle exhumation and thinned continental crust.
- Integrate geophysical datasets already available from ISMAR and the IODP data repository.
- Integrated data will greatly improve the understanding of the opening and evolution of the Tyrrhenian BAB, allowing us to analyse in detail the interaction between shallow sedimentological/morphological and magma/mantle upwelling processes.
- Constrain the 3D structure of the lithosphere in the Back-arc basin by acquiring new geophysical data (heat flow, magnetic and gravity data) to implement geophysical models at crustal and upper mantle scales.
- Improve basin-scale 3D imaging of crustal compositional variations by integrated modeling based on magnetic, gravity, and seismic data.
- Where possible, quantify extensional rates in the central part of the Tyrrhenian back-arc basin.
- Define the role played by the upper mantle in thinning the Tyrrhenian back-arc basin and in generating magmas linked to the opening of the basin.
- Implement a set of advanced geodynamic models in order to validate hypotheses on the evolution of the Tyrrhenian BAB.

4. INVESTIGATION AREA

The investigation area is represented by the central-northern Tyrrhenian Sea, between Campania and Sardinia margins (Fig. 2), the area is included between the vertex reported in table 1.

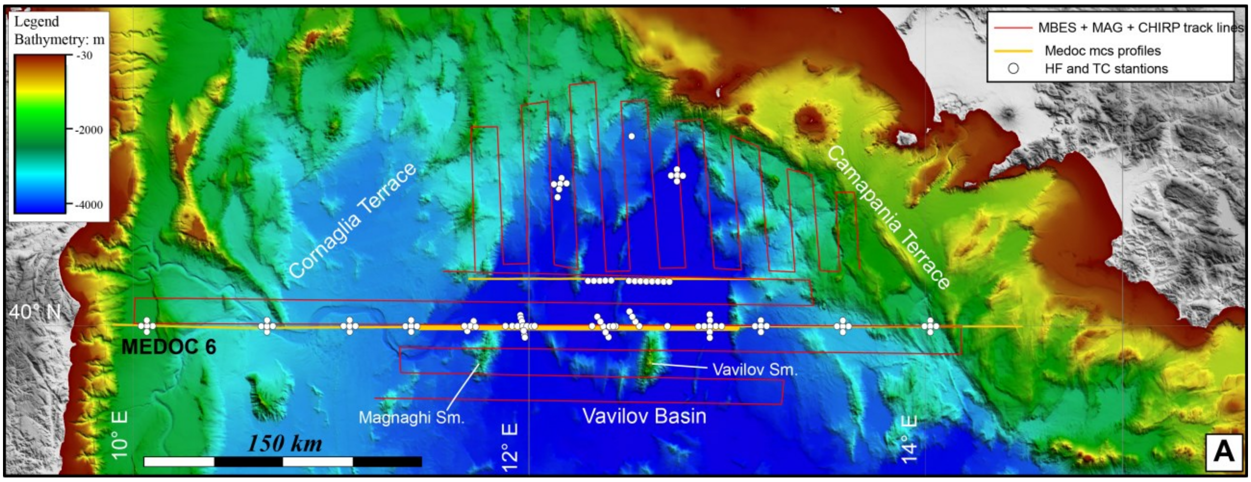

Figure 2 *– Morphobathymetric map of the central-northern Tyrrhenian Sea. The navigation track line along which the geophysical acquisition was planned are shown (red lines) together with the heat flow measurement points (white dots).*

Table 1 *– Vertex of the working area.*

	Degree	Degree
Vertex	**Latitude**	**Longitude**
V1	41,0036201	9,91378786
V2	41,0036201	13,8584554
V3	39,5453699	14,6207007
V4	39,55785	9,91282786

5. PERSONNEL

The INSIDE cruise aboard the R/V "Gaia Blu" was conducted through the collaboration between the CNR-ISMAR institutes and the University of Genova, the National Insitute of Geophysics and Volcanology (INGV), the Univeristy of Trieste and the Univeristé la Sorbonne. The Ship Gaia Blu is managed by ARGO S.r.l. society.

Given the workload (August) and personal needs, we decided to split the campaign into two legs. Below there are the tables 2 and 3 with the list of the people embarked on each leg and their role on board. While table 4 contains the list of the main people who are part of the crew managed by the shipowner Argo s.r.l.

Table 2 *– Scientific and technical personnel on board LEG 1*

Name	Duty	Role	Affiliation
M. Filomena Loreto	Party Chief	Researcher	CNR - ISMAR
Andrea Gallerani	Core Sampling Operator	Technician	CNR - ISMAR
Massimo Verdoya	Sample Surveyor	Professor	Univ. Genova
Stefania Romano	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Valentina Ferrante	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Camilla Palmiotto	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Linda Bonorino B.	Samp. Surveyor	PhD student	Univ. Genova
Luca Cocchi	Geophysical Operator	Researcher	INGV
Racine Abigail Basant	Passenger	Post-Doc	Univ. Trieste

Magdala Tesauro	Geophysical Operator	Professor	Univ. Trieste
Frederique Rolandone	Passenger	Professor	Univ. la Sorbonne

Table 3 *– Scientific and technical personnel on board LEG 2*

Name	Duty	Role	Affiliation
M. Filomena Loreto	Party Chief	Researcher	CNR - ISMAR
Andrea Gallerani	Core Sampling Operator	Technician	CNR - ISMAR
Massimo Verdoya	Sample Surveyor	Professor	Univ. Genova
Stefania Romano	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Valentina Ferrante	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Camilla Palmiotto	Samp. Surveyor/Geoph. Operator	Researcher	ISMAR-CNR
Linda Bonorino B.	Samp. Surveyor	PhD student	Univ. Genova
Paolo chiozzi	Passenger	Researcher	Univ. Genova
Joel Szrek	Passenger	PhD student	ENS - PSL
Lining Yang	Passenger	Research grant	ISMAR-CNR
Davide Vernazzani	Samp. Surveyor/Geoph. Operator	Technician	ISMAR-CNR
Marcello Felsani	Samp. Surveyor/Geoph. Operator	Technician	ISMAR-CNR

Table 4 *– Perosonel of crew on board during the INSIDE cruise*

Role	name
Mater	Pasquale Guida
First Officer	Lazzaro Festivo
Second Mate	Umberto Napolitano
Second Mate	Daniele Garofalo
first engineer officer	Vincenzo Schiano Lomoriello
Bosun	Srdan Ditarovic
Cooker	Pasquale Schiano Moriello
Cooker	Raffaele Del Vecchio
Argo Technichan	Daniele Gitto

Argo Tecnichan	Giuseppe Crudo

6. TECHNICAL NOTES

Problems, Anomalies, and Remedies

During the survey, two main problems occurred, one affecting the magnetometer and the other the gravity corer.

The magnetometer

The magnetometer on board, owned by CNR-ISMAR, is the Seaspy by Marine Magnetics. It is towed behind the ship's stern with a cable approximately 300 meters long, connecting the so-called fish (magnetic field sensor) to the PC on which the signal recording software is installed. When the instrument was deployed into the sea, it seemed to be working, but after 10 minutes, it stopped sending a significant signal. Acquisition was interrupted and it was recovered, where it was determined that water had entered (Fig. 3). The water created a series of short circuits that irreparably damaged the instrument. Technicians and the expert researcher worked for three days to try to repair it, but unfortunately without success. We have therefore decided to abandon the acquisition of magnetometry data.

Figure 3 *– Magnetometer photo showing water infiltration.*

Gravity corer problems

During the recovery of the core barrel on board, tension was created in the winch cable caused by the lifting of the cradle and the failure of the winch supporting the core barrel to used release the cable. This strong tension caused the metal ring at the head of the core barrel to bend. Under these conditions, the core barrel was no longer usable, and sediment coring operations were interrupted.

The CNR Deck, having been duly informed, quickly contacted Carmacoring S.R.L., the manufacturer and supplier of the gravity core barrel installed on board the vessel, to rent a new one. The second core barrel was loaded on board two days after the accident and replaced the damaged one, which was then disinbarked and taken to the workshop to be repaired. Coring and heat flow measurements restarted as soon as we arrived in the working area.

During the second leg, the new Gravity Corer was also accidentally damaged due to the unpredictable occurrence of a layer of hard sand, which was not possibile to identify from the Chirp profile, and it became stuck in it. The force used to dislodge the corer caused the hook at the corer's head to bend. Although repaired by the onboard mechanic, the hook's effective hold was no longer guaranteed. The PI decided to permanently halt coring operations for safety reasons and to safeguard all the equipment. The final days of the investigation were dedicated to acquiring bathymetry and Chirp data only.

Another minor, but recurring, problem we encountered during coring and heat flow measurement was the winch cable becoming wrapped around the core barrel head's stabilizing wings (Fig. 4). This made it difficult to retrieve the corer inside the so-called "housing pot," generating a constant risk of sensor breakage due to impact with the cradle's truss. To overcome this problem, the sailors tied ropes between the wings and the support ring to prevent the cable from wrapping (Fig. 3).

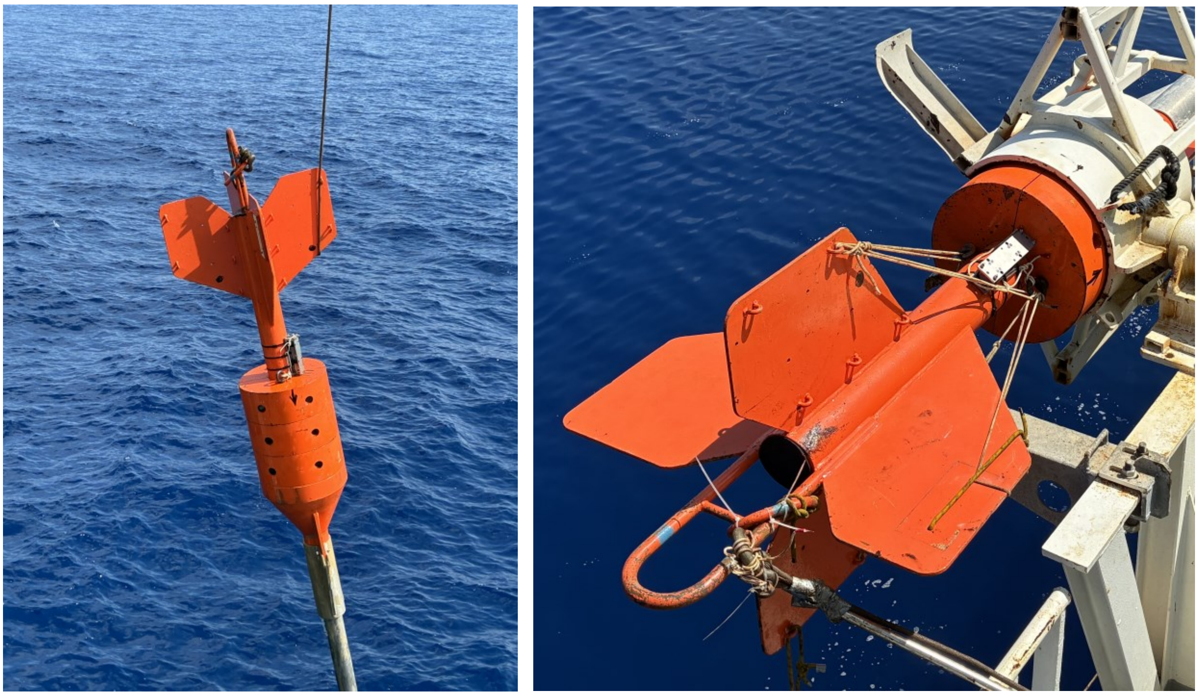

Figure 4 *– Photos of the gravity corer head with the cable wrapped around the stabilizing wings (on the left) and the ropes that create a sort of protection which prevents the cable from getting caught on the wings (on the rigth).*

Heat flow sensors failure

During a launching operation, due to some rough seas (wave height approximately 1.2 m), the corer has started to oscillate significantly hitting its mounting cradle. During the impact a heat flux sensor bent. Once the corer arrived on board, the sensor was recovered and we verified that it was no longer functioning (Fig. 5); it was not possible to download the recorded data. It was replaced with another spare sensor, fortunately brought on board.

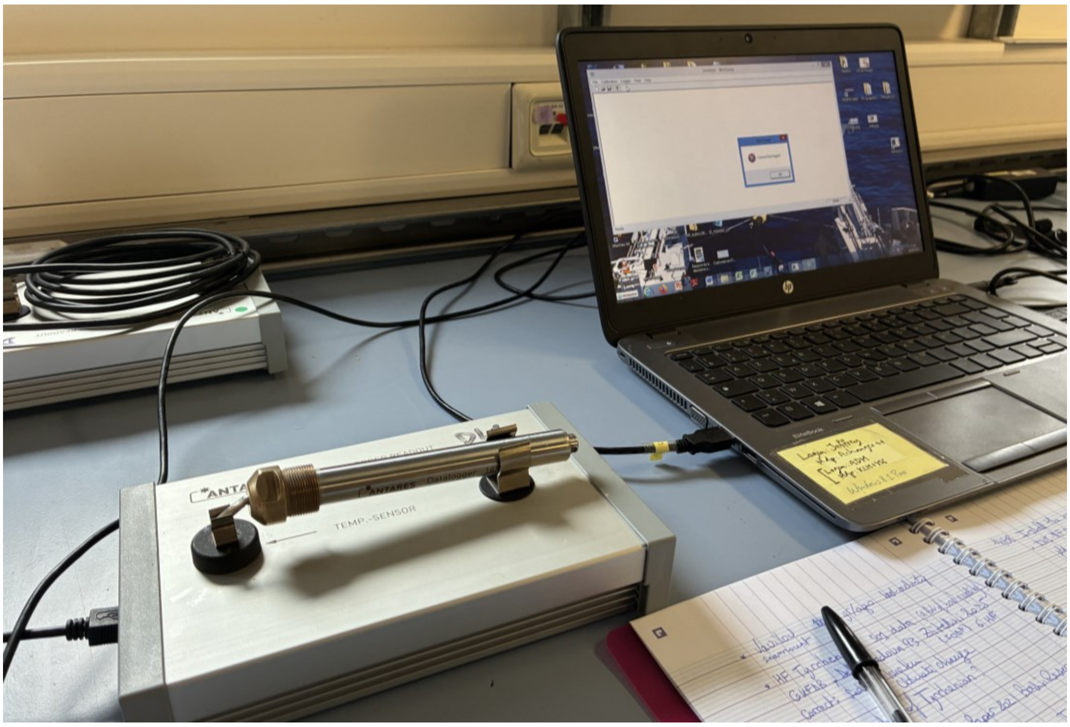

***Figure 5** – Check for damaged sensor.*

Standby meteo

During the first Leg (8 – 18 August) the weather was very good and allowed us to work well. We only had one day with a wave of about 1.2 m which did not prevent us from working. During the second Leg (18 – 27 August) there was a brief period of rough seas with waves higher than 2.5 meters which prevented us from both taking core samples and acquiring gephysical data. This is because a 2.5 meters wave and a sea wave against the bow of the ship creates a costant lift of the ship which leads to a poor coupling between the multibeam and the sea water. As a result, the signal is very poor, scattered and full of noise. We therefore decided to remain on weather standby for approximately 24 hours. Operations resumed only with geophysical acquisition until the sea calmed enough to have a wave height of less than 1 metre, so that we could place the corer overboard without risking breaking the sensors.

7. DATA ACQUISITION

We collected a series of data represented by: high-resolution multibeam data using the EM 712 and EM 304 system della konsberg; il sub bottom profiles chirp using the Knudsen 3260 system; CTD (Valeport probe) sensor to calibra the water velocity for the multibeam system; sediment sampling using; heat flow measurements at the seafloor; and thermal conductivity measurements for correction of the eath flow data. Below there is a detailed description of the single activity.

7.1 Navigation

The R/V "Gaia Blu" set sail from the port of Naples on the afternoon of August 8th, 2025, and docked back at the port of Trapani in Sicily on the afternoon of August 27rd, 2025. In total, the research vessel covered approximately 2,096 NM (white solid line in Figure 6). The ship's navigation and bridge communication systems were supported by QPS-Qinsy 9.5.6. The onboard Seapath 380 positioning system provided a Common Reference Point (CRP) for all integrated systems, including the Kongsberg Multibeam Echosounders and the Knudsen SubBottom Profiler (SBP) Chirp. The Kongsberg Multibeam software applied all necessary positioning and inertial corrections, as well as offset instrumental computations, in both pinging and recording modes. The Qinsy navigation system stored the offsets for all installed systems and transmitted the computed positioning data to the respective nodes

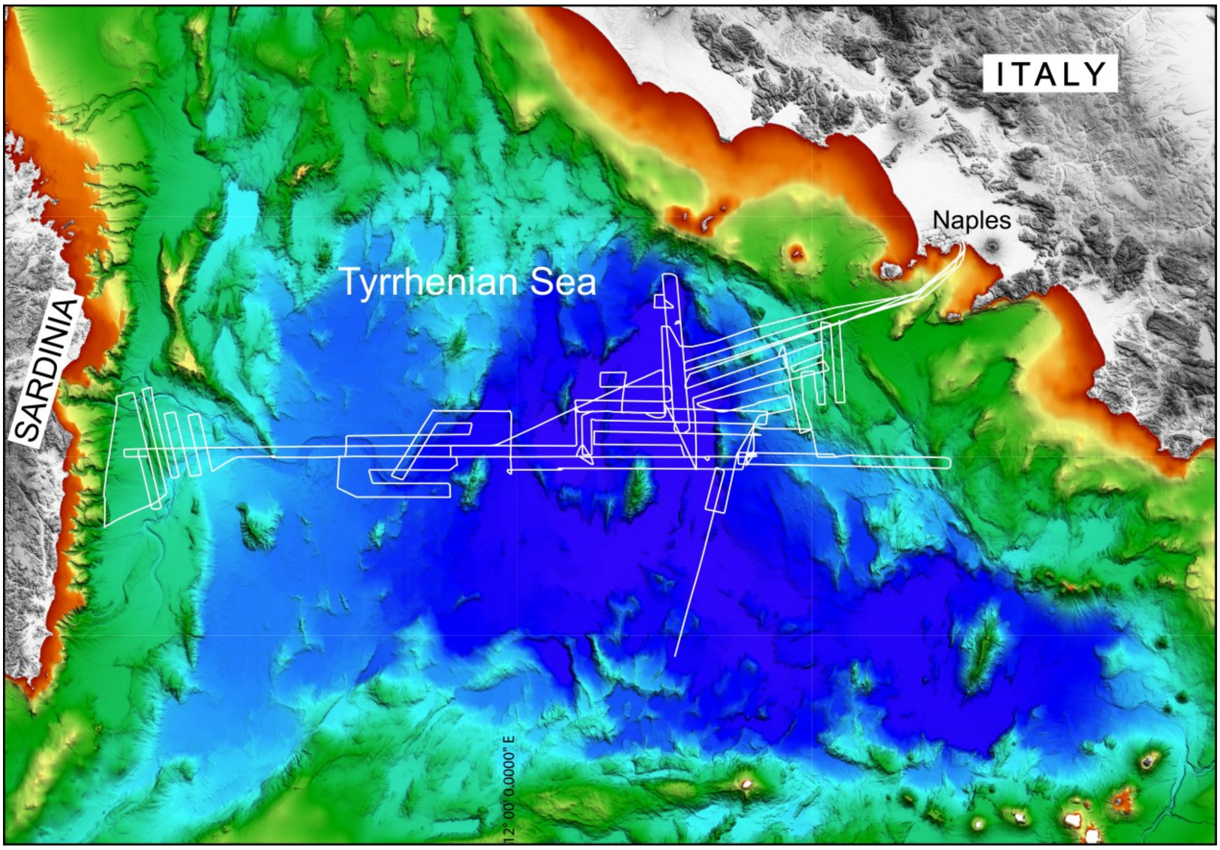

Figure 6 *– Navigation map of the INSIDE survey.*

7.2 Multibeam Echosounder data

Multibeam bathymetry, and backscatter data were acquired using the hull mounted Kongsberg EM304 system, designed for deep water acquisition (up to 8000 m), with a working frequency ranging from 20 to 32 kHz and a nominal frequency of 30 kHz. Ship positioning was provided by the Seapath 380 system, utilizing a Fugro HP differential Global Positioning System (DGPS) with Marinestar GNSS signal accuracy of better than 5 cm. Data were collected using a WGS84-UTM33 reference system. Corrections for pitch, roll, heave, and yaw movements were applied using the Kongsberg MRU (Motion Reference Unit) 5 and a dual antenna GPS integrated into the Seapath system.

During the acquisition, a sound velocity sensor (Valeport mini SVS), mounted near the multibeam transducers, continuously measured sound velocity in the surface to optimize beamforming. Additional punctual measurements were collected with CTD/rosette SBE 911plus to account for daily and local variations in sound velocity throughout the water column and ensure accurate seafloor depth calculations.

A preliminary data processing was conducted on board with the Qimera - QPS software licensed to CNR-ISMAR Bologna. Raw sonar files (KMALL format) were daily loaded and dynamic surfaces, with a grid cell size of 20 m, were generated to continuously updated to verify calibration parameters, assess data quality and facilitate real-time analysis. Using the Qimera-QPS tools “Swath editor” (port and starboard soundings editing along a single line) and “Slice Editor” (editing soundings into a selected area), a manual data cleaning was carried out and exported as an ascii grid file in order to obtain a new detailed bathymetric map. We collected in 16 full working days 14388 km2 of swath bathymetry in a narrow corridor between Campania and Sardinia margin (Fig. 7). The new data collected improved the image of the seafloor even in a very deep water (see the Fig. 8).

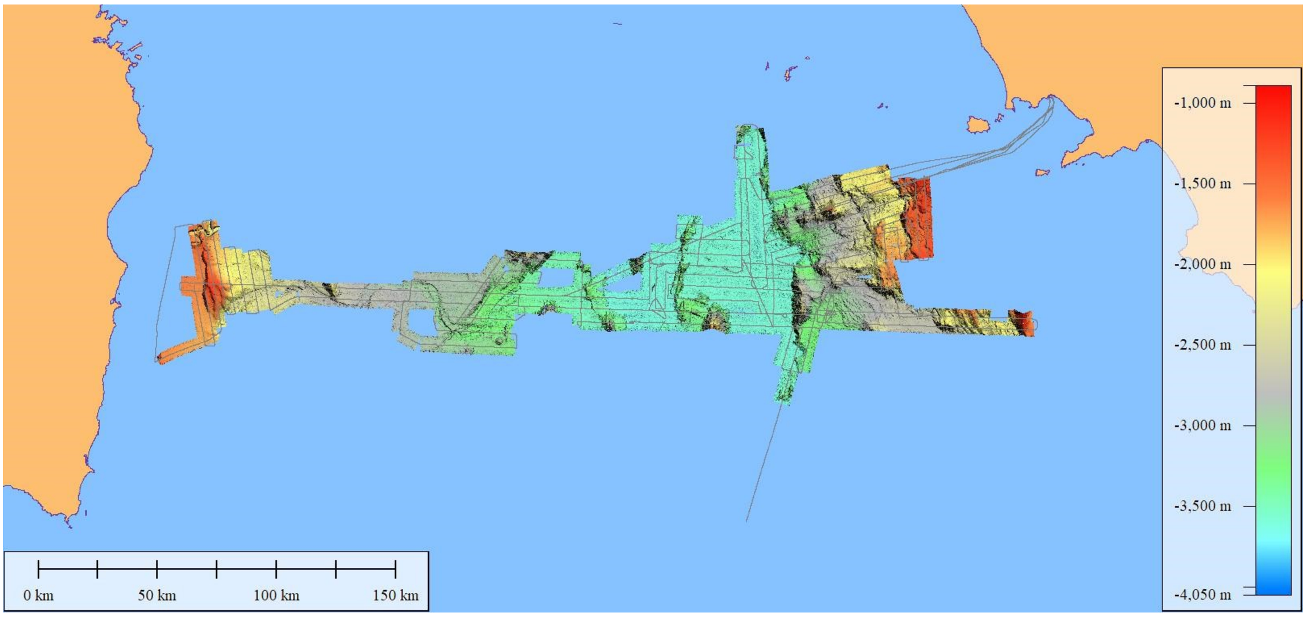

***Figure** 7 –Map of the high-resolution multibeam data collected during INSIDE survey*

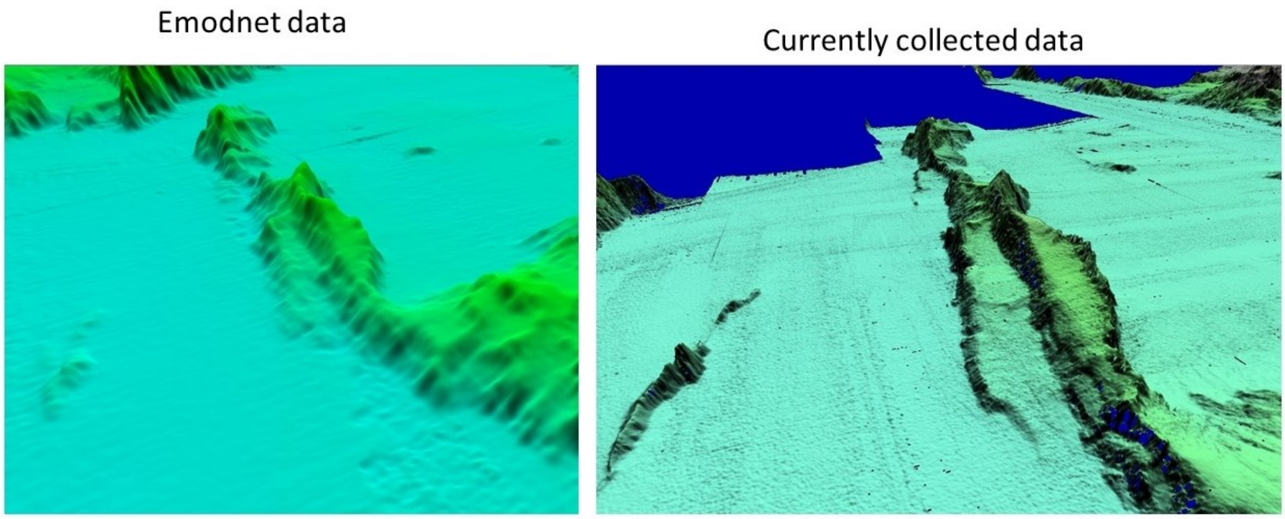

Figure 8 *- Detail of the Gortani Ridge, located in the Vavilov Basin Plain, approximately 3,600 m below sea level. On the right, the image obtained by gridding data downloaded from the EMOdnet portal; on the left, the image obtained by gridding data collected during INSIDE campaign.*

7.3 CTD Data

Vertical profiles of temperature, conductivity, and dissolved oxygen were obtained with the Sea-Bird SBE 911 CTD sensor (Fig. 9) installed beneath the Rosette system. These parameters , were collected to provide a precise and comprehensive chart of the distribution and variation of physical properties of water and for calibrating the sound velocity in the water during multibeam acquisition. The CTD sensor was placed in the water, along with the Rosette system, controlled via a dedicated winch, to a maximum depth of 2,000 m (Fig. 9). Measurements were stopped at this depth because we observed that the water temperature varied up to approximately 1,500 m and then showed a fairly constant decrease with depth. The measured parameters were used to determine the sound velocity in water, which for depths greater than 2,000 m was used an extrapolation function.

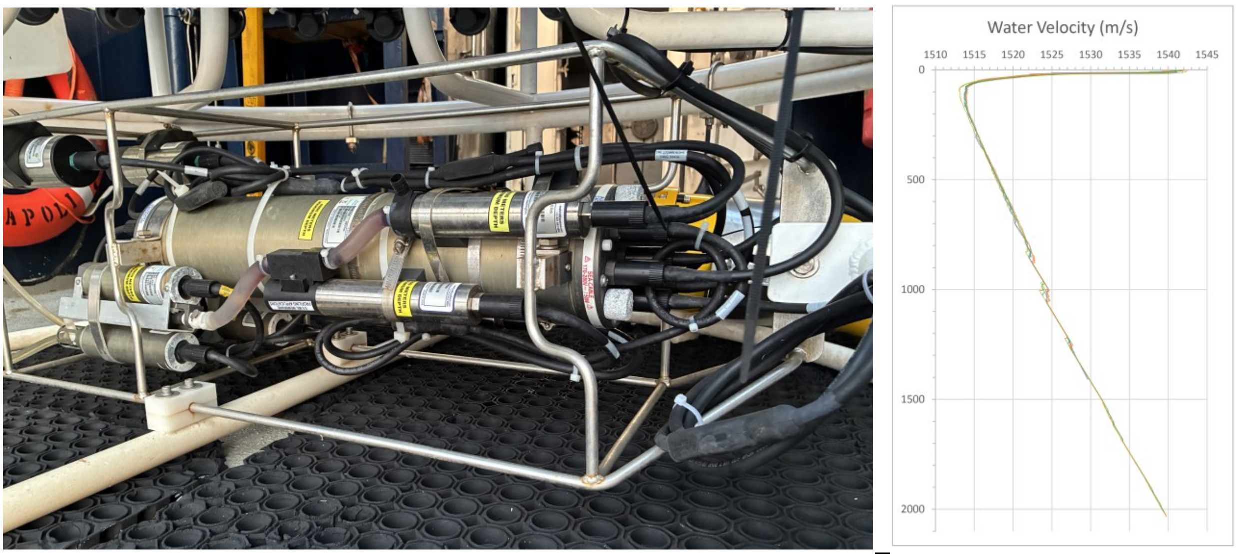

Figure 9 *– Photo of the Sea-Bird SBE 911 CTD sensor (on the left); plot of some sound water velocity profiles (on the right).*

7.4 Sub-bottom Profiler Data

Kunudsen’s Chirp Sub-Bottom Profiler (SBP), seismic profilometer, provides high-resolution seismic imaging and seismographic information of the first 40 m of sediment beneath the seafloor.

The very high-resolution SBP seismic data were collected using the hull mounted echosounder Knudsen Chirp 3260 working with franquency of 3.5 and 12 kHz. The chirp data is recorded simultaneously with the multibeam data, and since the two systems use similar frequencies, this generates strong interference, introducing noise into the multibeam data. We therefore decided to collect the geophysical data using the K-sync system, giving priority to the multibeam system. In total, approximately 1565 NM (corresponding to 2900 km) of chirp lines were collected, speed vessel was setted at 7 knots, and occasionally even 6.5 knots (Fig. 10). We decided to acquire at a slower speed than normal, which is 8 knots, in order to have good data quality/density at so great depth. The acquisition of Chirp profiles along the transects, where heat flux and sediment recovery measurements were planned, was performed at a speed reduced to 5 knots. This allowed for a higher-resolution image useful for assessing the lithology of the sediments to be drilled and thus deciding whether or not to proceed with coring without incurring the risk of bending the core barrel due to the presence of excessively hard sediment layers, such as hard sands or rocks.

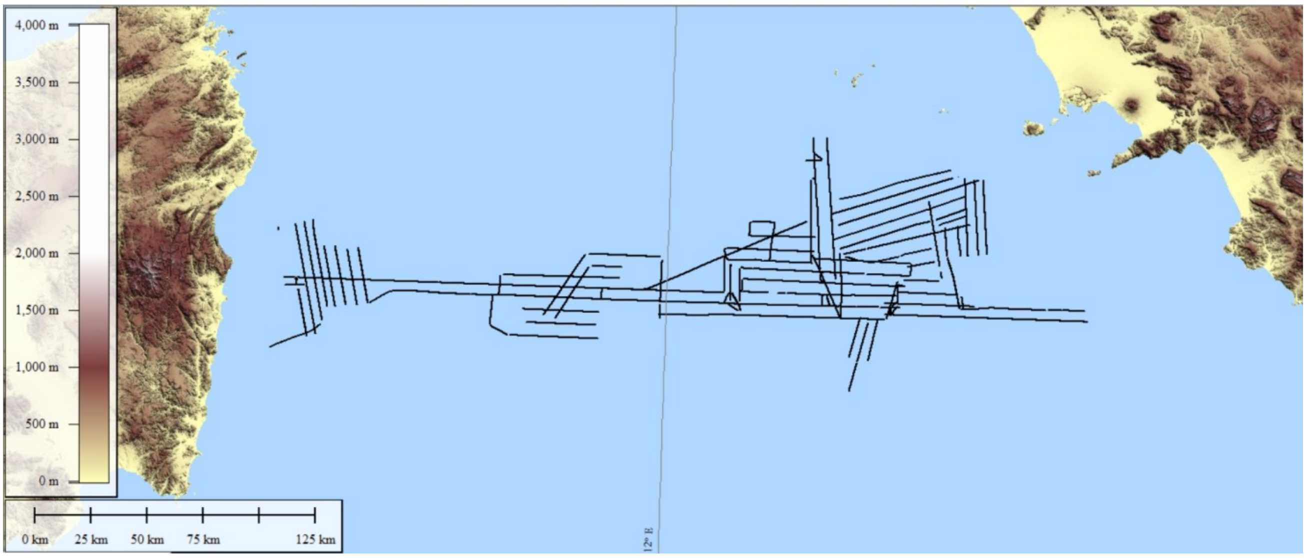

Figure 10 *– Map of Chirp profile navigations.*

Acquisition of Chirp data was done in raw format and parameters were setting accurately in order to obtain a good image of the sediments (Fig. 11). The maximum pulse length was kept at 4 ms, while the T-power was modified based on the hardness of the seabed; in the presence of soft sediments, it was increased to 4 ms. The gain in dB was also adapted to the reflectivity of the sediments and the seabed. To modify these parameters, the line being acquired was closed and then a new line started, to avoid visualization problems in the post-acquisition processing phase. During the acquisition of each individual line, these parameters remained fixed and only the recording window was varied. To obtain a good visualization of the sediments, we used windows ranging from 100 to 200 ms.

Data were automatically saved in SEG-Y format in order to be directly loaded in “Seisee software” for a rapid quality control of data and in “Kingdom (S&P Global)” for a georeferenced analysis and application of window shift correction, filters and gain obtaining so a good image of investigated sediments (Fig 11).

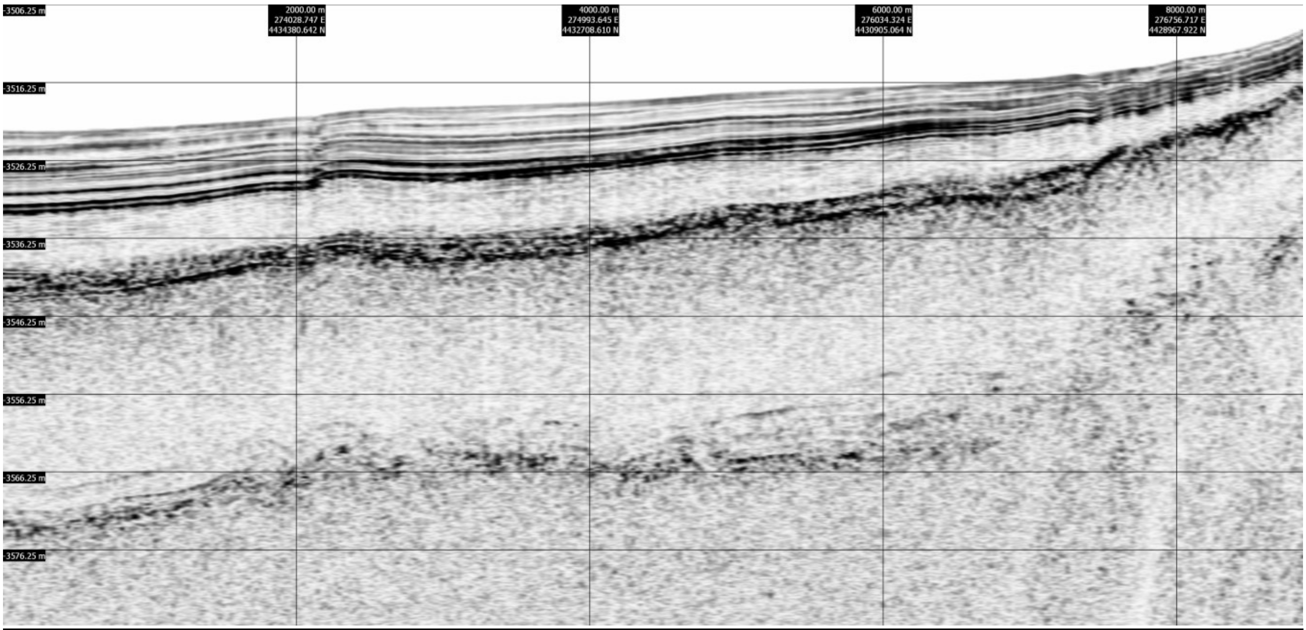

***Figure 11** – An example of sub-bottom chirp profile collected during the survey.*

7.5 Sediment Sampling

In order to perform heat flow determination and recover the sediments to define their physical properties and grain size, we sampled the uppermost 5 meters of sediment with the same gravity corer on which 5 temperature sensors were installed (Fig. 12). A piston coring system (650 - 1850 kg modular head) in gravity core setting was used.

During the campaign, 12 core samples were taken (Table 5), with sediment recovery and simultaneous temperature measurements. A 6 m-long core barrel was used, with a total mass of 1,5 Tons, providing sufficient force to penetrate the sediments. A PVC liner was inserted inside, trapping the sediments and allowing for their recovery. The core barrel was deployed into the sea using a winch with a cable approximately 6,000 m-long. The descent to the seabed was made at a constant speed of 80 m per minute until it reached approximately 30 m from the seabed. At this depth, the core barrel was stopped and left in position for approximately 5 minutes to stabilize and reach an optimal vertical position, after which it was released to the seabed. The pressure drop recorded by the system marked the end of the core barrel's travel and penetration into the sediments. The core barrel was left within the sediments for 10 minutes to allow temperature measurements to be recorded, and then recovered. The speed of descent and recovery was controlled by a dedicated system capable of constantly and in real time monitoring the position of the corer in the water via a sensor that sends a signal reflected by the corer. Finally, we also sampled very shallow sediments using the Oceanic Box Corer (Table 5) at the site where the second gravity corer was folded, to understand the lithology of the bottom sediments that prevented the penetration of the corer.

Figure 12 *– Photo of Piston Corer system with 5m-long tube, the system is housed in the cradle which allows for safe deployment and recovery of the core barrel.*

Table 5 *– List of sediment samples recovered. Latitude and Longitude are ported in degrees, datum WGS84.*

Date	Full name of the gravity core	Lat in deg	Long in deg	Recovered [m]	Seafloor depth [m]
10August2025	INS25_GC_01	39°59'59.57"	13°35'10.76"	1.36	2685 m
11August2025	INS25_GC_02	39°59'59.96"	13°10'20.96"	4.0	3230 m
14August2025	INS25_GC_03	40°00'02.85"	12°51'22.22"	4.56	3588 m
15August2025	INS25_GC_04	40°00'04.76"	12°19'09.35"	5.9	3616 m
16August2025	INS25_GC_05	40°10'39.63"	12°17'54.38"	5.45	3614 m
17August2025	INS25_GC_06	40°10'30.47"	12°32'06.18"	1.51	3580 m
17August2025	INS25_GC_07	40°10'30.69"	12°33'49.69"	1.45	3572 m
17August2025	INS25_GC_08	40°10'23.81"	12°39'13.10"	4.2	3578 m
19August2025	INS25_GC_09	39°57'19.90"	12°54'50.75"	4.61	3583 m
19August2025	INS25_GC_10	40°20'17.01"	12°44'32.66"	3.52	3602 m
20August2025	INS25_GC_11	40°01'25.14"	10°04'10.75"	5.49	1639 m
23August2025	INS25_GC_12	40°00'04.18"	11°05'40.25"	6.3	2824 m

Date	Full name of the box core	Lat in deg	Long in deg	Recovered [m]	Seafloor depth [m]
27August2025	INS25_BC_01	40°00'02.89"N	11°58'11.21"E	0,15 cm	3510 m

Once the core barrel was brought back on board, the liner was removed and placed on tripods to easily section it into 1 meter-long pieces (Fig. 13). Sectioning begins from the bottom of the core (maximum penetration depth) towards the top (seabed). The core's identifying information are printed on the caps placed at the top and bottom of the core, for example: INS_GC_1 IA or INS_GC_1 IB, where INS is the campaign acronims, GC = Gravity Core, 1 = first core, I corresponds to the first piece, A = Top, and B = Bottom. After the thermal conductivity measurements, the various pieces were stored in a refrigerated container at a constant temperature of 6°C (Fig. 13). We recovered a total of 48,35 m of sediments (see table 6 for more details).

Figure 13 *– Sub-sempling of core in 1 m-long section (on left); the core sections stored in refrigerated container.*

7.6 Heat flow measurements

We acquired several marine heat flow data using a typical probe technique that measures temperature at different intervals of the first 6 m of the seafloor sediments. Temperature gradients were thus determained in-situ using 5 autonomous high-precision temperature probes were welded on to a 5.84 m long core barrel (Figures 14 and 15). Thermal conductivities were measured onboard using a needle probe instrument on recovered sediment cores (Figure 16). Two modes of acquisitions were used (1) single penetrations with sediment recovery, and (2) a faster pogo-type acquisition without sediment coring.

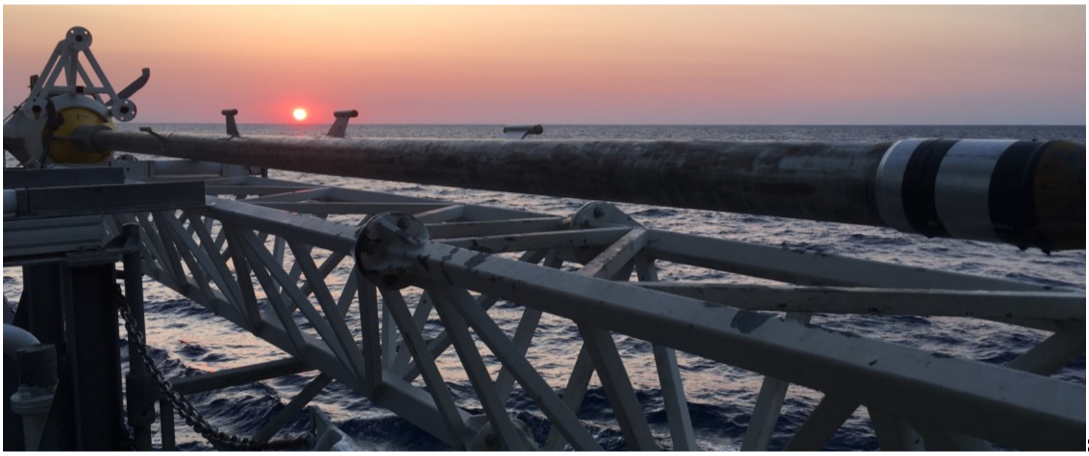
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Figure 14 - *Corel barrel with 5 MTL sensors.*

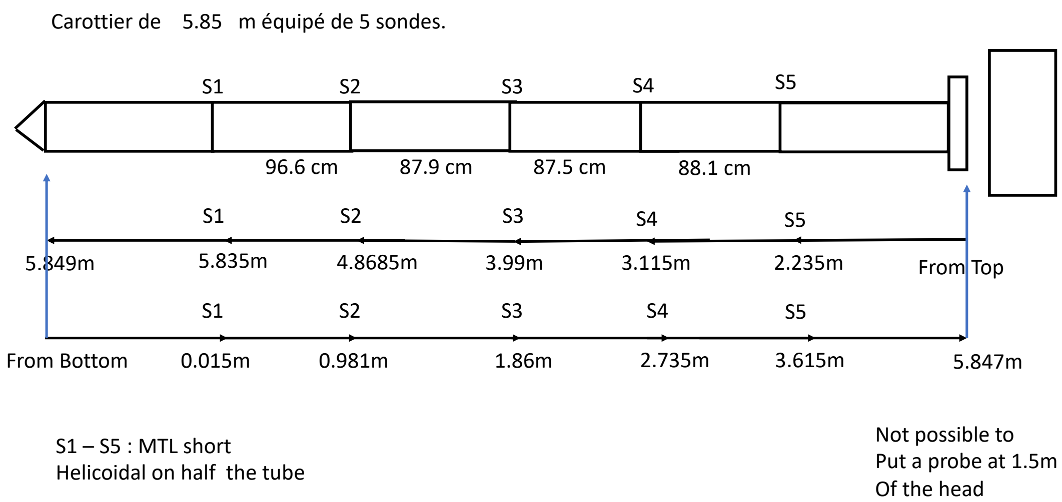

Figure 15 - *Position of the 5 MLT sensors*

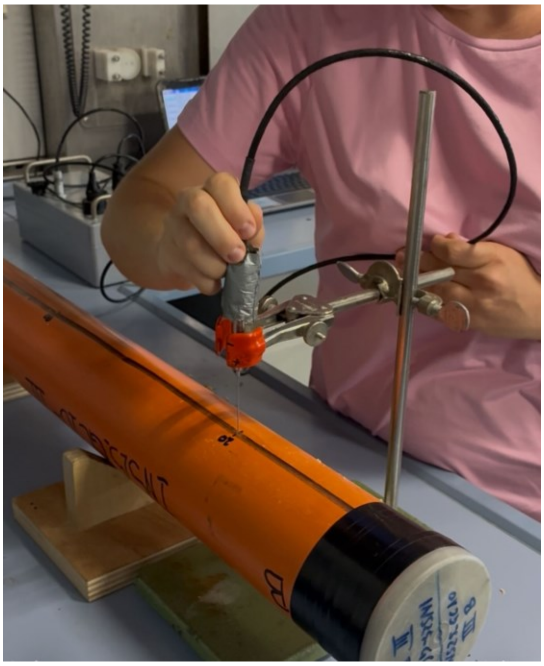

Figure 16 *- Thermal conductivity measurements*

7.7 Thermal conductivity (whole core sections)

The thermal conductivity was measured on recoverd cores (Table 6) using the needle-probe technique developed by Von Herzen and Maxwell (1959) for deep-sea sediments.

Table 6 *– Thermal conductivity determinations performed on core sections of 12 coring sites and 1 box corer site.*

Core number	Number of measurements	Max core depth (m)	Corresponding Heat Flow station (Table 2)
INS25_GC01	4	1.36	HF_02
INS25_GC02	12	4.0	HF_04
INS25_GC03	15	4.56	HF_05
INS25_GC04	18	5.9	HF_09
INS25_GC05	17	5.45	HF_13
INS25_GC06	5	1.51	HF_17
INS25_GC07	5	1.45	HF_18
INS25_GC08	12	4.2	HF_20
INS25_GC09	14	4.61	HF_21
INS25_GC10	10	3.52	HF_24
INS25_GC11	16	5.49	HF_25
INS25_GC12	18	6.3	HF_26
INS25_BC01	2	0.24	

The needle, which includes a heating wire and a temperature sensor was inserted perpendicular to the core axis (this provides the vertical component of thermal conductivity) and heated at a constant power Q. The temperature increase of the probe with the logarithm of time is proportional after some time delay to the inverse of thermal conductivity. We used the commercial device Hukseflux with a TP08 needle-probe (Figure 16). The heating time was 150 seconds for all measurements. We started the measurement after the probe insertion only when the temperature drift was less than 0.2°C/5min. Thermal conductivity measurements were generally obtained with high accuracy (standard deviation of <1%), but unknown uncertainty can be associated to changes in sediment structure during the coring processes and core handling. The measurements were performed at depth of 20, 50 and 80 cm along each 1-meter section of the cores. All the cores are coded as INS25_GC being obtained with gravity corer. One thermal conductivity determination, named INS25_BC, was performed on the uppermost sediments sampled using the box corer (Table 1).

In situ temperatures and thermal gradients (at 27 sites)

Temperature measurements were obtained by autonomous high precision temperature loggers (~ 0.001 K) disposed at regular distance and in a half-spiral way along a core barrel (Figures 14 and 15). We used 5 MTL (Miniaturized Temperature Loggers) loggers (by Antares) named S1 to S5. The logger interval is approximately 0.9 meter, with the lowest logger S1 at 15 cm from the corers head. On the head top a Starmon tilt logger (by Star-Oddi) was mounted to check the verticality of the penetration. The corer operation on the seafloor is only controlled by the tension on the corer cable and the cable length. At 10 stations we also collected sediment cores with the same operation in gravity mode, while all other stations surveyed with a closed corer for a multi-penetration mode, the pogo mode (Figure 16).

Figure 16 - *Heat flow measurements in Pogo style*

An example of a temperature acquisition sequence is given in Figure 18, where temperature for the five probes is shown as a function of time. Data are downloaded after each return of the corer on-board and analyzed with a specific software (THPread, Lucazeau unpublished 2014) and with python codes. The penetration of the core barrel into the sediment yields frictional heating and a temperature peak. It is therefore necessary to wait for some time (usually 10 minutes) in order to extrapolate the temperature at thermal equilibrium according to the theory developed by Bullard (1954). The equilibrium temperature can be obtained from the intercept of a regression line made on (T,1/t) couples with the time axis for infinite time, i.e. when 1/t tends to 0.

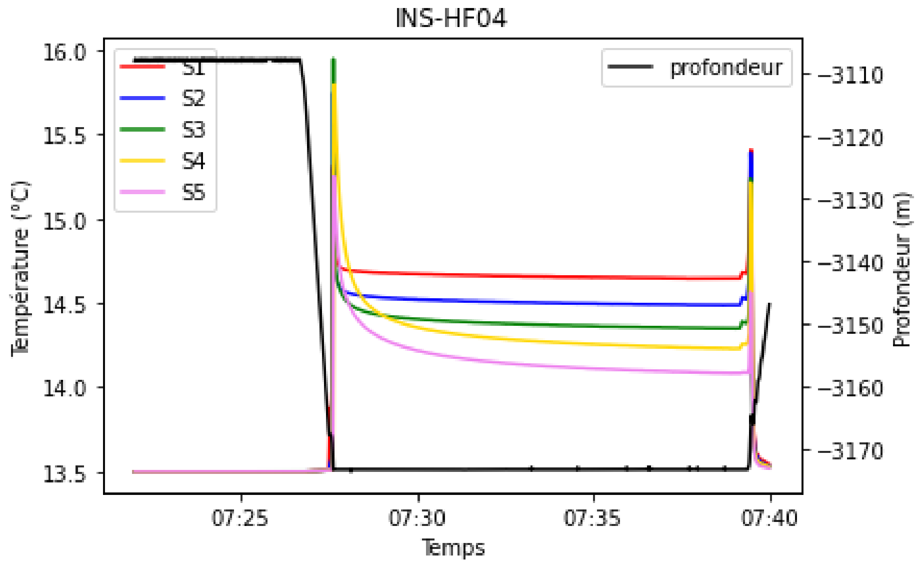

Figure 18 - *Example of a temperature acquisition sequence for the 5 thermal sensors.*

Multiple temperature records were performed in 27 stations (Table 7). Most stations resulted in full penetration of all 5 sensors in the sediments. Preliminary analyses show average thermal gradients as low as 1 mK/m and up to more than 200 mK/m.

Combining these thermal gradients with the thermal conductivity data from the same site or nearby cores will allow us to obtain the conductive heat flow values. A detailed analysis of non-linearity of the temperature-depth datacan further give information of possible advection processes.

Table 7 - *The 27 stations where we acquired high-precision temperature data in the upper 6 meters of the sediments in order to obtain thermal gradient and heat flow values.*

Heat Flow Stations	Longitude	Latitude	Coring / Pogo
HF_01	13,6156	39,9999	pogo
HF_02	13,5863	39,9998	coring
HF_03	13,5567	40,0001	pogo
HF_04	13,1725	40,0000	coring
HF_05	12,8562	40,0008	coring
HF_06	12,8855	40,0005	pogo
HF_07	12,9442	40,0002	pogo

HF_08	12,9736	40,0014	pogo
HF_09	12,3193	40,0013	coring
HF_10	12,3480	40,0008	pogo
HF_11	12,3760	40,0001	pogo
HF_12	12,4071	39,9996	pogo
HF_13	12,2984	40,1777	coring
HF_14	12,3283	40,1764	pogo
HF_15	12,3582	40,1774	pogo
HF_16	12,3876	40,1785	pogo
HF_17	12,5350	40,1751	coring
HF_18	12,5638	40,1752	coring
HF_19	12,6233	40,1736	pogo
HF_20	12,6536	40,1733	coring
HF_21	12,9141	39,9555	coring
HF_22	12,7514	40,2080	pogo
HF_23	12,7461	40,2913	pogo
HF_24	12,7424	40,3381	coring
HF_25	10,0697	40,0237	pogo
HF_26	11,0945	40,0012	pogo
HF_27	11,1236	40,0018	pogo

All information regarding the acquisition and all operations performed are reported in the on-board log included in Appendix A.

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Appendix A

TIME (UTC)	ACTIVITY	FILE NAME	LATITUDE	LONGITUDE
15:00	Departure from Naples port			
19:02	CTD off deck			
19:26	CTD at bottom	INSIDE_CTD_01	40°31'04.37"N	13°38'42.04"E
19:45	CTD on board			
20:25	Magnetometer off deck			
20:42	SOL Qinsy + MB304 + Kundsen	0001_220_2042_000		
20:49	Magnetometer on board			
21:31	Magnetometer off deck			
22:07	Magnetometer on board			
23:41	EOL Qinsy + MB304 + Kundsen			
00:05	SOL Qinsy + MB304 + Kundsen	0002_221_0005_000		
02:39	EOL Qinsy			
02:40	EOL MB304 + Kundsen			
02:59	SOL Qinsy + MB304 + Kundsen	0003_221_0300_000		

03:35	EOL Kundsen			
03:37	SOL Kundsen	0004_221_0337_000		
04:16	EOL Kundsen			
04:16	SOL Kundsen	0005_221_0416_000		
05:38	SOL Qinsy + MB304 + Kundsen			
05:47	CTD off deck			
06:17	CTD at bottom	INSIDE_CTD_02	40°12'32.29"N	13°34'16.24"E
06:43	CTD on board			
07:04	SOL Qinsy + MB304 + Kundsen	0006_221_0704_000		
08:07	EOL Qinsy + MB304 + Kundsen			
08:34	SOL Qinsy + MB304 + Kundsen	0007_221_0834_000		
09:34	EOL Qinsy + MB304 + Kundsen			
09:39	SOL Qinsy + MB304 + Kundsen	0008_221_0834_000		
10:19	EOL Qinsy			
10:20	SOL Qinsy			
11:25	EOL Qinsy + MB304 + Kundsen			
11:28	SOL Kundsen	0009_221_1129_000		
12:36	EOL Kundsen			
12:42	SOL Qinsy + MB304			
12:56	EOL Qinsy + MB304			
13:55	Gravity corer off deck			
14:30	Gravity corer at bottom	INSIDE_GC_TEST	39°59'59.71"N	13°36'56.19"E
15:21	Gravity corer on board			
15:43	CTD off deck			
16:20	CTD at bottom	INSIDE_CTD_03	40°00'02.25"N	13°36'53.40"E
16:54	CTD on board			
17:10	SOL Qinsy + Kundsen	0010_221_1711_000		
17:11	SOL MB304			
18:52	Magnetometer off deck			
19:15	Magnetometer on board			
20:41	EOL Qinsy + MB304 + Kundsen			
21:07	SOL Qinsy + MB304 + Kundsen	0011_221_2107_000		
04:18	EOL Qinsy + MB304 + Kundsen			
04:41	SOL Qinsy + MB304 + Kundsen	0012_221_2107_000		
05:24	EOL Qinsy			
05:29	EOL Kundsen			
05:31	EOL MB304			
05:32	SOL Kundsen	0013_222_0531_000		
05:55	SOL Kundsen	0014_222_0557_000		
06:33	SOL MB304 + Kundsen	0015_222_0633_000		
06:43	SOL Qinsy			
09:02	EOL Qinsy + MB304 + Kundsen			
09:52	Gravity corer off deck			
10:27	Gravity corer at bottom	INS_HF_01	39°59'59.66"N	13°36'56.23"E
11:15	Gravity corer on board			

11:25	SOL Qinsy + MB304			
11:26	EOL Qinsy + MB304			
11:37	SOL Qinsy + MB304			
12:02	EOL Qinsy + MB304			
12:39	Gravity corer off deck			
13:14	Gravity corer at bottom	INS25_GC_01-INS_HF_02	39°59'59.57"N	13°35'10.76"E
14:00	Gravity corer on board			
14:04	SOL MB304			
14:12	SOL Qinsy			
14:15	EOL MB304			
14:24	EOL Qinsy			
14:30	Gravity corer off deck			
15:06	Gravity corer at bottom	INS_HF_03	40°00'00.66"N	13°33'23.91"E
15:46	Gravity corer on board			
16:08	CTD off deck			
16:46	CTD at bottom	INSIDE_CTD_04	40°00'00.58"N	13°33'22.41"E
17:18	CTD on board			
17:23	SOL Qinsy			
17:25	SOL Kundsen	0016_222_1725_000		
17:30	SOL MB304	Line 61		
17:44	EOL Qinsy + MB304 + Kundsen	0016_222_1725_000		
17:53	SOL Qinsy + MB304 + Kundsen	0017_222_1753_000		
19:54	EOL Qinsy + MB304 + Kundsen	0017_222_1753_000		
20:20	SOL Qinsy + MB304 + Kundsen	0018_222_2020_000		
22:45	EOL Qinsy + MB304 + Kundsen	0018_222_2020_000		
22:51	SOL Kundsen	0019_222_2251_000		
23:12	EOL Kundsen	0019_222_2251_000		
23:15	SOL Qinsy + MB304 + Kundsen	0020_222_2315_000		
23:40	Fix at station HF_04-7ALT	0020_222_2315_000		
00:20	Fix at station HF_04ALT	0020_222_2315_000		
00:42	Fix at station HF_04-1ALT	0020_222_2315_000		
01:03	Fix at station HF_04-5ALT	0020_222_2315_000		
01:15	EOL Kundsen	0020_222_2315_000		
01:16	SOL Kundsen	0021_223_0116_000		
02:02	EOL Kundsen	0021_223_0116_000		
02:17	SOL Kundsen	0023_223_0217_000		
02:24	EOL MB304			
02:25	Fix at station HF_03.3ALT	0023_223_0217_000		
02:49	Fix at station HF_03	0023_223_0217_000		
03:11	Fix at station HF_03.4ALT	0023_223_0217_000		
03:24	EOL Kundsen	0023_223_0217_000		
03:53	SOL Kundsen	0024_223_0353_000		
03:54	Fix at station HF_03ALT	0024_223_0353_000		
04:28	EOL Kundsen	0024_223_0353_000		

04:28	SOL Qinsy + Kundsen	0025_223_0433_000		
04:59	Fix at station HF_03.4ALT	0025_223_0433_000		
06:05	EOL & SOL Kundsen	0026_223_0605_000		
06:35	EOL Kundsen			
06:44	Gravity corer off deck			
07:27	Gravity corer at bottom	INS25_GC_02-INS_HF_04	39°59'59.96"N	13°10'20.96"E
08:15	Gravity corer on board			
09:23	SOL & EOL Kundsen	0027_223_0923_000		
09:24	SOL Kundsen	0028_223_0924_000		
09:25	SOL Qinsy			
09:46	SOL MB304			
09:57	EOL Kundsen	0028_223_0924_000		
09:58	SOL Kundsen	0029_223_0958_000		
10:15	EOL MB304			
10:37	EOL Kundsen	0029_223_0958_000		
10:41	CTD off deck			
11:20	CTD at bottom	INSIDE_CTD_05	40°05'08.64"N	13°14'33.49"E
11:23	EOL Qinsy			
11:52	CTD on board			
12:03	SOL Qinsy + MB304 + Kundsen	0030_223_1203_000		
13:38	EOL Kundsen	0030_223_1203_000		
13:39	SOL Kundsen	0031_223_1339_000		
14:48	EOL Qinsy + MB304			
14:49	EOL Kundsen + SOL Kundsen	0032_223_1449_000		
15:16	EOL Kundsen + SOL Kundsen	0033_223_1516_000		
15:19	SOL MB304			
16:50	EOL Kundsen	0033_223_1516_000		
16:55	SOL Kundsen	0034_223_1655_000		
17:33	EOL Kundsen	0034_223_1655_000		
17:34	SOL Kundsen	0035_223_1734_000		
18:22	EOL Qinsy + MB304 + Kundsen	0035_223_1734_000		
18:26	SOL Kundsen	0036_223_1826_000		
18:48	EOL Kundsen	0036_223_1826_000		
18:51	SOL Qinsy + MB304 + Kundsen	0037_223_1851_000		
20:40	EOL Kundsen	0037_223_1851_000		
20:41	SOL Kundsen	0038_223_2041_000		
21:40	Water Column ON			
22:06	Water Column OFF			
22:13	EOL Qinsy + MB304 + Kundsen	0038_223_2041_000		
22:23	SOL Qinsy + MB304 + Kundsen	0039_223_2223_000		
22:53	Fix at station HF_37ALT	0039_223_2223_000		
23:34	Fix at station HF_35ALT	0039_223_2223_000		
23:55	Fix at station HF_34ALT	0039_223_2223_000		
00:16	Fix at station HF_33ALT	0039_223_2223_000		

00:18	EOL Qinsy + MB304 + Kundsen	0039_223_2223_000		
00:18	SOL Qinsy + MB304 + Kundsen	0040_224_0018_000		
00:39	Fix at station HF_32ALT	0040_224_0018_000		
01:19	Fix at station HF_30ALT	0040_224_0018_000		
01:23	EOL Qinsy + Kundsen	0040_224_0018_000		
01:24	SOL Qinsy + Kundsen	0041_224_0124_000		
01:52	EOL Qinsy + Kundsen	0041_224_0124_000		
01:53	SOL Qinsy + Kundsen	0042_224_0153_000		
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02:28	Fix at station HF_28ALT	0042_224_0153_000		
02:48	Fix at station HF_27ALT	0042_224_0153_000		
03:09	Fix at station HF_26ALT	0042_224_0153_000		
03:10	EOL Qinsy + MB304 + Kundsen	0042_224_0153_000		
03:12	SOL Kundsen	0043_224_0312_000		
03:40	EOL Kundsen	0043_224_0312_000		
03:41	SOL Qinsy + MB304 + Kundsen	0044_224_0341_000		
06:46	EOL Qinsy + MB304 + Kundsen	0044_224_0341_000		
07:37	CTD off deck			
08:14	CTD at bottom	INSIDE_CTD_06	40°13'01.14"N	12°45'47.05"E
09:30	CTD on board			
09:37	SOL Qinsy + MB304 + Kundsen	0045_224_0937_000		
12:27	Fix at station HF_16.1ALT	0045_224_0937_000		
12:39	Fix at station HF_16	0045_224_0937_000		
12:51	Fix at station HF_16.2ALT	0045_224_0937_000		
13:02	SOL Qinsy + MB304 + Kundsen	0045_224_0937_000		
13:48	SOL Qinsy + Kundsen	0046_224_1348_000		
13:58	Fix at station HF_16.3ALT	0046_224_1348_000		
14:19	Fix at station HF_16	0046_224_1348_000		
14:38	Fix at station HF_16.4ALT	0046_224_1348_000		
14:38	EOL Qinsy + Kundsen	0046_224_1348_000		
14:52	SOL Qinsy + MB304 + Kundsen	0047_224_1452_000		
15:26	SOL MB304			
15:44	EOL Kundsen			
15:59	EOL Qinsy + MB304			
16:33	SOL Qinsy + MB304			
16:44	SOL Kundsen	0048_224_1644_000		
16:44	Fix at station HF_16.4ALT	0048_224_1644_000		
18:02	SOL Qinsy + MB304 + Kundsen	0048_224_1644_000		
18:20	CTD off deck			
19:26	CTD at bottom	INSIDE_CTD_07	40°31'08.75"N	12°48'26.09"E
20:22	CTD on board			
20:59	SOL Qinsy + MB304 + Kundsen	0049_224_2059_000		
21:04	EOL Kundsen	0049_224_2059_000		
21:05	SOL Kundsen	0050_224_2105_000		
21:46	EOL Kundsen	0050_224_2105_000		

21:47	SOL Kundsen	0051_224_2147_000		
22:32	EOL Qinsy + MB304 + Kundsen	0051_224_2147_000		
06:30				
09:17				
15:55	SOL MB304			
16:00	SOL Kundsen	0052_225_1600_000		
16:01	EOL MB304 + Kundsen	0052_225_1600_000		
16:13	SOL Qinsy + MB304 + Kundsen	0053_225_1613_000		
18:48	SOL Qinsy			
18:49	EOL Qinsy			
19:24	EOL Qinsy + MB304 + Kundsen			
19:29	SOL Qinsy			
19:31	SOL MB304 + Kundsen	0054_225_1931_000		
20:19	Fix on Kundsen	0054_225_1931_000		
21:38	EOL Qinsy + MB304 + Kundsen	0054_225_1931_000		
21:54	SOL Qinsy + MB304 + Kundsen	0055_225_2154_000		
00:19	EOL Kundsen	0055_225_2154_000		
00:19	SOL Kundsen	0056_226_0019_000		
00:52	EOL Qinsy + MB304 + Kundsen	0056_226_0019_000		
00:55	SOL Kundsen	0057_226_0055_000		
01:20	EOL Kundsen	0057_226_0055_000		
01:22	SOL Qinsy + MB304 + Kundsen	0058_226_0122_000		
02:15	EOL Kundsen	0058_226_0122_000		
02:35	SOL Kundsen	0059_226_0235_000		
02:53	EOL Kundsen	0059_226_0235_000		
02:54	SOL Kundsen	0060_226_0254_000		
04:16	EOL Qinsy			
04:18	EOL MB304 + Kundsen	0060_226_0254_000		
04:20	SOL Kundsen	0061_226_0420_000		
04:46	EOL Kundsen	0061_226_0420_000		
05:29	SOL Kundsen	0062_226_0529_000		
05:38	EOL Kundsen	0062_226_0529_000		
05:39	SOL Kundsen	0063_226_0539_000		
05:57	EOL Kundsen	0063_226_0539_000		
06:22	Gravity corer off deck			
07:05	Gravity corer at bottom	INS25_GC_03-INS_HF_05	40°00'02.85"N	12°51'22.22"E
08:58	Gravity corer on board			
11:01	Gravity corer off deck			
11:45	Gravity corer at bottom	INS_HF_06	40°00'01.67"N	12°53'07.79"E
12:35	Gravity corer on board			
13:22	Gravity corer off deck			
14:05	Gravity corer at bottom	INS_HF_07	40°00'00.53"N	12°56'39.34"E
15:01	Gravity corer on board			
15:41	Gravity corer off deck			

16:26	Gravity corer at bottom	INS_HF_08	40°00'04.92"N	12°58'25.02"E
17:20	Gravity corer on board			
23:04	SOL Qinsy + MB304 + Kundsen	0001_226_2304_000		
23:50	EOL + SOL Kundsen	0002_226_2350_000		
00:01	Fix at station HF_05	0002_226_2350_000		
00:02	EOL Kundsen	0002_226_2350_000		
00:03	SOL Kundsen	0003_227_0003_000		
01:40	EOL Qinsy			
01:40	SOL Qinsy			
01:47	SOL Kundsen	0004_227_0147_000		
01:52	Fix at station HF_06-9	0004_227_0147_000		
02:03	Fix at station HF_06-1	0004_227_0147_000		
02:20	Fix at station HF_06	0004_227_0147_000		
02:36	Fix at station HF_06-3	0004_227_0147_000		
02:40	Fix at station HF_06-4	0004_227_0147_000		
02:52	EOL Qinsy + MB304 + Kundsen			
02:58	SOL Kundsen	0005_227_0258_000		
03:30	EOL Kundsen	0005_227_0258_000		
03:32	SOL Qinsy + MB304 + Kundsen	0006_227_0333_000		
03:39	Fix at station HF_06-8	0006_227_0333_000		
03:54	Fix at station HF_06-7	0006_227_0333_000		
04:07	Fix at station HF_06	0006_227_0333_000		
04:22	Fix at station HF_06-5	0006_227_0333_000		
04:25	EOL Qinsy + MB304 + Kundsen	0006_227_0333_000		
04:30	SOL Kundsen	0007_227_0430_000		
05:09	EOL Kundsen	0007_227_0430_000		
05:43	Gravity corer off deck			
06:35	Gravity corer at bottom	INS25_GC_04- INS_HF_09	40°00'04.76"N	12°19'09.35"E
07:30	Gravity corer on board			
08:20	Gravity corer off deck			
09:03	Gravity corer at bottom	INS_HF_10	40°00'02.71"N	12°20'52.90"E
09:55	Gravity corer on board			
11:42	Gravity corer off deck			
12:27	Gravity corer at bottom	INS_HF_11	40°00'00.19"N	12°22'33.42"E
13:17	Gravity corer on board			
14:07	Gravity corer off deck			
14:50	Gravity corer at bottom	INS_HF_12	39°59'58.63"N	12°24'25.38"E
15:39	Gravity corer on board			
15:56	CTD off deck			
16:41	CTD at bottom	INSIDE_CTD_08	39°59'58.89"N	12°24'24.80"E
17:19	CTD on board			
17:37	SOL Kundsen	0001_227_1737_000		
17:39	SOL Qinsy + MB304			
19:38	Fix at station HF_07	0001_227_1737_000		

20:01	Fix at station HF_08-3	0001_227_1737_000		
20:04	Fix at station HF_08-2	0001_227_1737_000		
20:17	Fix at station HF_08-1	0001_227_1737_000		
20:29	Fix at station HF_08	0001_227_1737_000		
20:42	Fix at station HF_08-4	0001_227_1737_000		
20:58	Fix at station HF_08-5	0001_227_1737_000		
21:16	Fix at station HF_09	0001_227_1737_000		
21:17	EOL Kundsen	0001_227_1737_000		
21:17	SOL Kundsen	0002_227_2112_000		
21:XX	Fix at station HF_09	0002_227_2112_000		
21:51	EOL MB304			
21:52	SOL MB304			
22:08	EOL Kundsen	0002_227_2112_000		
22:09	SOL Kundsen	0003_227_2209_000		
22:18	Fix at station HF_10-3	0003_227_2209_000		
22:35	Fix at station HF_10	0003_227_2209_000		
22:52	Fix at station HF_10-4	0003_227_2209_000		
22:55	EOL Qinsy + MB304 + Kundsen	0003_227_2209_000		
22:58	SOL Kundsen	0004_227_2258_000		
23:20	EOL Kundsen	0004_227_2258_000		
23:20	SOL Qinsy + MB304 + Kundsen	0005_227_2320_000		
01:16	Fix at station HF_08-12	0005_227_2320_000		
03:29	EOL Qinsy + MB304 + Kundsen	0005_227_2320_000		
03:35	SOL Qinsy +Kundsen	0006_228_0335_000		
03:36	SOL MB304			
04:42	Fix at station HF_25ALT	0006_228_0335_000		
04:50	EOL Qinsy + MB304 + Kundsen	0006_228_0335_000		
05:47	Gravity corer off deck			
06:42	Gravity corer at bottom	INS25_GC_05- INS_HF_13	40°10'39.63"N	12°17'54.38"E
07:34	Gravity corer on board			
08:20	Gravity corer off deck			
09:13	Gravity corer at bottom	INS_HF_14	40°10'34.96"N	12°19'42.07"E
10:03	Gravity corer on board			
11:13	Gravity corer off deck			
11:59	Gravity corer at bottom	INS_HF_15	40°00'00.19"N	12°22'33.42"E
12:52	Gravity corer on board			
13:26	Gravity corer off deck			
14:10	Gravity corer at bottom	INS_HF_16	40°10'42.53"N	12°23'15.48"E
14:30	Gravity corer on board			
15:19	CTD off deck			
16:06	CTD at bottom	INSIDE_CTD_09	40°10'42.09"N	12°23'15.12"E
16:52	CTD on board			
17:27	SOL Qinsy +Kundsen	0007_228_1727_000		
17:30	SOL MB304			

18:40	EOL Qinsy + MB304 + Kundsen	0007_228_1727_000		
19:02	SOL Qinsy + MB304 + Kundsen	0008_228_1902_000		
20:08	EOL Qinsy + Kundsen	0008_228_1902_000		
20:09	EOL MB304			
20:12	SOL Qinsy + MB304			
20:13	SOL Kundsen	0009_228_2013_000		
20:28	EOL Qinsy			
20:29	SOL Qinsy			
20:36	EOL Qinsy + Kundsen	0009_228_2013_000		
20:37	SOL Kundsen	0010_228_2037_000		
20:52	EOL Kundsen	0010_228_2037_000		
20:53	SOL Kundsen	0011_228_2053_000		
23:05	EOL Qinsy + MB304 + Kundsen	0011_228_2053_000		
23:26	SOL Qinsy + MB304 + Kundsen	0012_228_2326_000		
00:19	EOL Qinsy + MB304 + Kundsen	0012_228_2326_000		
00:33	SOL Qinsy + MB304 + Kundsen	0013_229_0033_000		
02:48	EOL Qinsy + MB304 + Kundsen	0013_229_0033_000		
02:49	SOL Kundsen	0014_229_0229_000		
03:19	EOL Kundsen	0014_229_0229_000		
03:19	SOL Qinsy +Kundsen	0015_229_0319_000		
03:20	SOL MB304			
04:08	EOL Qinsy + MB304 + Kundsen	0015_229_0319_000		
04:09	SOL Qinsy + MB304 + Kundsen	0016_229_0409_000		
05:21	EOL Qinsy + MB304			
05:22	EOL Kundsen	0016_229_0409_000		
05:22	SOL Kundsen	0017_229_0522_000		
05:33	EOL Kundsen	0017_229_0522_000		
05:47	Gravity corer off deck			
06:32	Gravity corer at bottom	INS25_GC_06-INS_HF_17	40°10'30.47"N	12°32'06.18"E
07:26	Gravity corer on board			
08:13	Gravity corer off deck			
09:01	Gravity corer at bottom	INS25_GC_07-INS_HF_18	40°10'30.69"N	12°33'49.69"E
09:53	Gravity corer on board			
10:48	Gravity corer off deck			
11:31	Gravity corer at bottom	INS_HF_19	40°10'25.12"N	12°37'23.66"E
12:19	Gravity corer on board			
13:01	Gravity corer off deck			
13:44	Gravity corer at bottom	INS25_GC_08-INS_HF_20	40°10'23.81"N	12°39'13.10"E
14:03	Gravity corer on board			
14:51	CTD off deck			
15:37	CTD at bottom	INSIDE_CTD_10	40°10'24.36"N	12°39'12.64"E
16:30	CTD on board			
17:12	SOL Qinsy + MB304 + Kundsen	0018_229_1712_000		

17:31	Fix at station HF_42ALT	0018_229_1712_000		
17:40	Fix at station HF_43ALT	0018_229_1712_000		
17:58	Fix at station HF_44ALT	0018_229_1712_000		
18:13	Fix at station HF_45ALT	0018_229_1712_000		
18:40	Fix at station HF_46ALT	0018_229_1712_000		
18:57	Fix at station HF_47ALT	0018_229_1712_000		
19:47	Fix at station HF_49ALT	0018_229_1712_000		
20:04	Fix at station HF_50ALT	0018_229_1712_000		
20:21	Fix at station HF_51ALT	0018_229_1712_000		
20:49	Fix at station HF_52ALT	0018_229_1712_000		
21:17	EOL Qinsy + MB304 + Kundsen	0018_229_1712_000		
21:19	SOL Qinsy + Kundsen	0019_229_2119_000		
21:25	EOL Kundsen	0019_229_2119_000		
21:27	EOL Qinsy			
22:26	SOL Qinsy + MB304 + Kundsen	0020_229_2226_000		
01:24	EOL Qinsy + MB304 + Kundsen	0020_229_2226_000		
12:34	CTD off deck			
12:56	CTD at bottom	INSIDE_CTD_11	40°31'04.36"N	13°37'33.36"E
13:14	CTD on board			
13:19	SOL Qinsy +Kundsen	0001_230_1319_000		
13:28	SOL MB304			
18:39	EOL Qinsy + MB304 + Kundsen	0001_230_1319_000		
19:12	SOL Qinsy + MB304 + Kundsen	0002_230_1912_000		
22:34	EOL Qinsy + MB304 + Kundsen	0002_230_1912_000		
23:04	SOL Qinsy + MB304 + Kundsen	0003_230_2304_000		
02:20	EOL Qinsy + MB304 + Kundsen	0003_230_2304_000		
02:28	SOL Qinsy + MB304 + Kundsen	0004_231_0228_000		
03:34	EOL Qinsy + MB304 + Kundsen	0004_231_0228_000		
03:34	SOL Kundsen	0005_231_0334_000		
03:38	SOL MB304			
03:41	Fix at station HF_04_8			
03:59	Fix at station HF_04_4			
04:13	Fix at station HF_04			
04:30	Fix at station HF_04_3			
04:26	Fix at station HF_04_6			
04:49	EOL MB304 + Kundsen	0005_231_0334_000		
05:15	SOL Qinsy			
05:31	Gravity corer off deck			
06:20	Gravity corer at bottom	INS25_GC_09- INS_HF_21	39°57'19.90"N	12°54'50.75"E
07:09	Gravity corer on board			
07:10	EOL Qinsy			
07:38	SOL Qinsy + Kundsen	0006_231_0738_000		
09:18	EOL Qinsy + Kundsen	0006_231_0738_000		
09:38	SOL Qinsy			

09:38	Gravity corer off deck			
10:23	Gravity corer at bottom	INS_HF_22	40°12'28.63"N	12°45'04.97"E
11:15	Gravity corer on board			
11:16	EOL Qinsy			
12:15	Gravity corer off deck			
12:16	SOL Qinsy			
13:01	Gravity corer at bottom	INS_HF_23	40°17'28.55"N	12°44'46.08"E
13:54	Gravity corer on board			
13:54	EOL Qinsy			
14:43	SOL Qinsy			
14:43	Gravity corer off deck			
15:28	Gravity corer at bottom	INS25_GC_10- INS_HF_24	40°20'17.01"N	12°44'32.66"E
16:25	Gravity corer on board			
16:25	EOL Qinsy			
16:30	SOL Qinsy + MB304 + Kundsen	0007_231_1636_000		
20:48	EOL Qinsy + MB304 + Kundsen	0007_231_1636_000		
20:49	SOL Qinsy + MB304 + Kundsen	0008_231_2049_000		
22:01	EOL Kundsen	0008_231_2049_000		
22:02	SOL Kundsen	0009_231_2202_000		
01:36	EOL Kundsen	0009_231_2202_000		
01:36	SOL Kundsen	0010_232_0136_000		
03:23	EOL Kundsen	0010_232_0136_000		
03:24	SOL Kundsen	0011_232_0324_000		
05:25	EOL Qinsy			
05:27	EOL MB304 + Kundsen	0011_232_0324_000		
05:40	SOL MB304 + Kundsen	0012_232_0540_000		
05:58	Fix at station HF_14.2ALT			
06:15	Fix at station HF_14			
06:31	Fix at station HF_14.1ALT			
06:37	EOL Qinsy + MB304 + Kundsen	0012_232_0540_000		
06:45	SOL Qinsy + MB304 + Kundsen	0013_232_0645_000		
06:48	Fix at station HF_14.1ALT			
07:05	Fix at station HF_14			
07:05	EOL Qinsy + MB304 + Kundsen	0013_232_0645_000		
07:05	SOL Qinsy			
07:16	EOL Qinsy			
07:23	SOL Qinsy + MB304 + Kundsen	0014_232_0723_000		
07:34	EOL Qinsy			
07:37	SOL Qinsy			
07:38	EOL MB304 + Kundsen	0014_232_0723_000		
08:05	Gravity corer off deck			
08:29	Gravity corer at bottom	INS25_GC_11	40°01'25.14"N	10°04'10.75"E
08:50	Gravity corer on board			
09:05	EOL Qinsy			

09:30	SOL Qinsy			
09:30	Gravity corer off deck			
09:54	Gravity corer at bottom	INS_HF_25	40°01'25.16"N	10°04'10.80"E
10:28	Gravity corer on board			
10:28	EOL Qinsy			
10:32	SOL + EOL Kundsen	0015_232_1032_000		
10:38	SOL Kundsen	0016_232_1038_000		
10:39	SOL Qinsy			
10:59	EOL Qinsy			
11:00	EOL Kundsen	0016_232_1038_000		
11:04	CTD off deck			
11:35	CTD at bottom	INSIDE_CTD_12	40°00'05.78"N	10°04'12.66"E
12:10	CTD on board			
12:40	SOL Qinsy + MB304 + Kundsen	0017_232_1240_000		
14:29	EOL Qinsy + MB304 + Kundsen	0017_232_1240_000		
14:55	SOL Qinsy + MB304			
14:56	SOL Kundsen	0018_232_1456_000		
19:21	EOL Qinsy + MB304 + Kundsen	0018_232_1456_000		
19:55	SOL Qinsy + MB304 + Kundsen	0019_232_1955_000		
20:01	EOL Qinsy + MB304 + Kundsen	0019_232_1955_000		
06:08	SOL MB304			
06:19	SOL Kundsen	0020_233_0619_000		
06:20	SOL Qinsy			
07:10	EOL + SOL MB304			
07:40	EOL Qinsy + MB304 + Kundsen	0020_233_0619_000		
07:42	SOL Qinsy + MB304 + Kundsen	0021_233_0742_000		
07:43	EOL Qinsy + MB304 + Kundsen	0021_233_0742_000		
07:56	CTD off deck			
08:32	CTD at bottom	INSIDE_CTD_13	39°50'52.98"N	10°12'14.41"E
09:02	CTD on board			
09:25	SOL Qinsy + MB304 + Kundsen	0022_233_0925_000		
12:53	EOL Qinsy + MB304 + Kundsen	0022_233_0925_000		
13:17	SOL Qinsy + MB304 + Kundsen	0023_233_1317_000		
16:26	EOL Qinsy + MB304 + Kundsen	0023_233_1317_000		
16:56	CTD off deck			
17:33	CTD at bottom	INSIDE_CTD_14	39°55'25.97"N	10°16'40.73"E
18:04	CTD on board			
18:16	SOL Qinsy + MB304 + Kundsen	0024_233_1816_000		
20:38	EOL Qinsy + MB304 + Kundsen	0024_233_1816_000		
21:07	SOL Qinsy + MB304 + Kundsen	0025_233_2107_000		
23:10	EOL Qinsy + MB304 + Kundsen	0025_233_2107_000		
23:42	SOL Qinsy + MB304 + Kundsen	0026_233_2342_000		
01:48	EOL Qinsy + MB304 + Kundsen	0026_233_2342_000		
02:14	SOL Qinsy + MB304 + Kundsen	0027_234_0214_000		
04:16	EOL Qinsy			

04:18	EOL MB304 + Kundsen	0027_234_0214_000		
04:22	SOL Qinsy + MB304 + Kundsen	0028_234_0422_000		
05:15	EOL MB304 + Kundsen	0028_234_0422_000		
05:16	SOL MB304 + Kundsen	0029_234_0516_000		
05:57	Fix at station HF_13.3ALT	0029_234_0516_000		
06:15	Fix at station HF_13	0029_234_0516_000		
06:32	Fix at station HF_13.4ALT	0029_234_0516_000		
07:04	EOL Qinsy + MB304 + Kundsen	0029_234_0516_000		
07:22	CTD off deck			
07:57	CTD at bottom	INSIDE_CTD_15	40°00'10.84"N	10°45'51.64"E
08:28	CTD on board			
08:50	SOL Qinsy + MB304 + Kundsen	0030_234_0850_000		
10:16	EOL Qinsy + MB304 + Kundsen	0030_234_0850_000		
10:17	SOL Qinsy + MB304 + Kundsen	0031_234_1017_000		
10:31	EOL Kundsen	0031_234_1017_000		
10:32	SOL Kundsen	0032_234_1032_000		
10:38	Fix at station HF_12.1ALTnew	0032_234_1032_000		
11:21	Fix at station HF_12	0032_234_1032_000		
11:36	Fix at station HF_12.2ALT	0032_234_1032_000		
11:59	EOL Qinsy + MB304 + Kundsen	0032_234_1032_000		
12:01	SOL Qinsy + MB304 + Kundsen	0033_234_1201_000		
13:06	EOL Qinsy + Kundsen	0033_234_1201_000		
13:07	SOL Qinsy + Kundsen	0034_234_1307_000		
13:24	Fix at station HF_12.1ALTnew	0034_234_1307_000		
13:41	Fix at station HF_12	0034_234_1307_000		
13:55	Fix at station HF_12.2ALT	0034_234_1307_000		
15:46	EOL Qinsy + MB304 + Kundsen	0034_234_1307_000		
16:25	CTD off deck			
17:01	CTD at bottom	INSIDE_CTD_16	39°58'03.85"N	11°41'39.12"E
17:32	CTD on board			
17:57	SOL Qinsy + Kundsen	0035_234_1757_000		
17:59	SOL MB304			
20:36	EOL Qinsy + MB304 + Kundsen	0035_234_1757_000		
21:09	SOL Qinsy + MB304 + Kundsen	0036_234_2109_000		
23:34	EOL Qinsy + MB304 + Kundsen	0036_234_2109_000		
00:14	SOL Qinsy + MB304 + Kundsen	0037_235_0014_000		
03:29	EOL Qinsy + MB304 + Kundsen	0037_235_0014_000		
03:34	SOL Qinsy + MB304 + Kundsen	0038_235_0334_000		
04:15	EOL Qinsy + MB304 + Kundsen	0038_235_0334_000		
04:19	SOL Qinsy + MB304 + Kundsen	0039_235_0419_000		
05:03	EOL Kundsen	0039_235_0419_000		
05:04	SOL Kundsen	0040_235_0504_000		
05:09	Fix at station HF_12.3ALT	0040_235_0504_000		
05:20	EOL MB304			
05:27	EOL Kundsen	0040_235_0504_000		

05:57	Gravity corer off deck			
06:07	SOL Qinsy			
06:34	Gravity corer at bottom	INS25_GC_12	40°00'04.18"N	11°05'40.25"E
06:36	EOL Qinsy			
07:06	Gravity corer on board			
07:59	Gravity corer off deck			
07:59	SOL Qinsy			
08:37	Gravity corer at bottom	INS_HF_26	40°00'04.15"N	11°05'40.27"E
08:39	EOL Qinsy			
09:18	Gravity corer on board			
09:56	Gravity corer off deck			
09:56	SOL Qinsy			
10:30	Gravity corer at bottom	INS_HF_27	40°00'06.05"N	11°07'25.50"E
11:16	EOL Qinsy			
11:16	Gravity corer on board			
15:08	CTD off deck			
15:45	CTD at bottom	INSIDE_CTD_17	40°00'05.48"N	11°07'25.27"E
16:21	CTD on board			
16:25	SOL Qinsy + MB304 + Kundsen	0041_235_1625_000		
17:02	EOL MB304 + Kundsen	0041_235_1625_000		
17:06	SOL MB304 + Kundsen	0042_235_1706_000		
21:08	EOL Qinsy + MB304 + Kundsen	0042_235_1706_000		
21:36	SOL Qinsy + MB304 + Kundsen	0043_235_2136_000		
22:39	EOL Qinsy + MB304 + Kundsen	0043_235_2136_000		
22:47	SOL Qinsy + MB304 + Kundsen	0044_235_2247_000		
00:57	EOL Qinsy + MB304 + Kundsen	0044_235_2247_000		
01:30	SOL Qinsy + MB304 + Kundsen	0045_236_0130_000		
04:19	EOL Qinsy + MB304 + Kundsen	0045_236_0130_000		
04:22	SOL Qinsy + MB304 + Kundsen	0046_236_0422_000		
05:25	EOL Kundsen	0046_236_0422_000		
05:25	SOL Kundsen	0047_236_0525_000		
05:34	EOL Kundsen	0047_236_0525_000		
05:34	SOL Kundsen	0048_236_0534_000		
06:56	EOL Qinsy + MB304 + Kundsen	0048_236_0534_000		
07:24	SOL MB304 + Kundsen	0049_236_0723_000		
07:27	SOL Qinsy			
08:27	Fix at station HF_08-12	0049_236_0723_000		
08:32	Fix at station HF_08-11	0049_236_0723_000		
08:41	Fix at station HF_08-10	0049_236_0723_000		
08:49	EOL Qinsy + MB304 + Kundsen	0049_236_0723_000		
09:29	Box corer off deck			
10:32	Box corer at bottom	INS25_BC_01	40°00'02.89"N	11°58'11.21"E
11:20	Box corer on board			
11:45	SOL Qinsy + MB304 + Kundsen	0050_236_1145_000		
12:13	EOL Qinsy + MB304 + Kundsen	0050_236_1145_000		

12:31	SOL Qinsy + MB304 + Kundsen	0051_236_1231_000		
14:11	EOL Qinsy + MB304 + Kundsen	0051_236_1231_000		
14:37	CTD off deck			
15:38	CTD at bottom	INSIDE_CTD_18	39°57'07.00"N	12°13'49.97"E
16:12	CTD on board			
16:28	SOL Qinsy + MB304 + Kundsen	0052_236_1628_000		
21:47	EOL Kundsen	0052_236_1628_000		
21:47	SOL Kundsen	0053_236_2147_000		
22:43	EOL Qinsy + MB304 + Kundsen	0053_236_2147_000		
22:49	SOL Qinsy + MB304 + Kundsen	0054_236_2249_000		
00:01	EOL Kundsen	0054_236_2249_000		
00:07	EOL Qinsy + MB304			
00:10	SOL Qinsy + MB304			
00:22	EOL Qinsy + MB304			
00:22	SOL Qinsy + MB304 + Kundsen	0055_237_0022_000		
01:36	EOL Kundsen	0055_237_0022_000		
02:04	EOL Qinsy + MB304			
02:33	EOL Qinsy + MB304			
02:34	SOL Qinsy			
02:34	SOL MB304			
02:47	SOL Kundsen	0056_237_0247_000		
03:00	EOL Kundsen	0056_237_0247_000		
03:13	SOL Kundsen	0057_237_0313_000		
05:35	EOL Qinsy + Kundsen	0057_237_0313_000		
05:36	EOL MB304			
05:54	CTD off deck			
06:32	CTD at bottom	INSIDE_CTD_19	40°25'10.20"N	13°20'46.46"E
07:03	CTD on board			
07:29	SOL Qinsy + MB304 + Kundsen	0058_237_0729_000		
08:51	EOL Qinsy + MB304 + Kundsen	0058_237_0729_000		
09:18	SOL Qinsy + MB304 + Kundsen	0059_237_0918_000		
10:21	EOL Qinsy + MB304 + Kundsen	0059_237_0918_000		
10:38	SOL Qinsy + MB304 + Kundsen	0060_237_1038_000		
11:12	EOL Qinsy			
11:16	SOL Qinsy			
11:34	EOL Qinsy + MB304 + Kundsen	0060_237_1038_000		
12:02	SOL Qinsy + MB304 + Kundsen	0061_237_1202_000		
13:10	EOL Kundsen	0061_237_1202_000		
13:12	SOL Kundsen	0062_237_1312_000		
15:50	EOL Kundsen	0062_237_1312_000		
15:53	SOL Kundsen	0063_237_1553_000		
16:37	EOL Qinsy + Kundsen	0063_237_1553_000		
16:40	EOL MB304			
16:48	SOL MB304 + Kundsen	0064_237_1648_000		
17:16	EOL Kundsen	0064_237_1648_000		

17:33	SOL Kundsen	0065_237_1733_000		
17:37	EOL MB304			
17:38	SOL MB304			
18:14	EOL Kundsen	0065_237_1733_000		
18:15	SOL Kundsen	0066_237_1815_000		
18:40	EOL Qinsy + MB304 + Kundsen	0066_237_1815_000		
18:44	SOL Qinsy + MB304 + Kundsen	0067_237_1844_000		
19:49	EOL Qinsy + MB304 + Kundsen	0067_237_1844_000		
20:25	SOL Qinsy + MB304 + Kundsen	0068_237_2025_000		
21:54	EOL Qinsy + MB304 + Kundsen	0068_237_2025_000		
22:55	SOL Qinsy + MB304 + Kundsen	0069_237_2255_000		
00:22	EOL Qinsy + MB304 + Kundsen	0069_237_2255_000		
01:03	SOL Qinsy + MB304 + Kundsen	0070_238_0103_000		
02:24	EOL Qinsy + MB304 + Kundsen	0070_238_0103_000		
02:46	SOL Qinsy + MB304 + Kundsen	0071_238_0247_000		
04:11	EOL Kundsen	0071_238_0247_000		
04:14	SOL Kundsen	0072_238_0414_000		
05:15	EOL Qinsy + MB304 + Kundsen	0072_238_0414_000		