

SICILY09

- CRUISE REPORT -

30 October – 23 November 2009

CNR IAMC - Istituto per l'Ambiente Marino e Costiero – Oristano

CNR ISMAR – Istituto di Scienze Marine - La Spezia



**Consiglio Nazionale
delle Ricerche**



Università di Genova



Università di Messina

EDITED BY A. RIBOTTI (IAMC-CNR ORISTANO)

M. BORGHINI (ISMAR-CNR LA SPEZIA)

SUMMARY

| | |
|--|----|
| SUMMARY | 3 |
| CRUISE DETAILS | 4 |
| SCIENTIFIC STAFF | 5 |
| <i>CNR-IAMC</i> | 5 |
| <i>CNR-ISMAR</i> | 5 |
| <i>GENOVA UNIVERSITY</i> | 5 |
| <i>MESSINA UNIVERSITY</i> | 5 |
| 1. SCIENTIFIC OBJECTIVES | 6 |
| 2. STATE OF THE ART | 7 |
| 2.1 <i>General description</i> | 7 |
| 2.1.1 Main hydrodynamic characteristics in the study areas..... | 10 |
| 3. CRUISE PLAN | 12 |
| 4. CRUISE MAPS | 13 |
| 5. ON BOARD OPERATIONS | 18 |
| 5.1 <i>CTD casts</i> | 18 |
| 5.3 <i>Nutrients</i> | 18 |
| 5.4 <i>LADCP</i> | 18 |
| 5.5 <i>Macrobenthos and sediment analysis</i> | 19 |
| 5.6 <i>Vessel-mounted ADCPs</i> | 19 |
| 5.7 <i>Turtles and other cetaceans sightings</i> | 20 |
| 5.8 <i>Marine midrobic microbiology</i> | 20 |
| 5.9 <i>Other operations on board</i> | 21 |
| 6. PRELIMINARY RESULTS | 22 |
| 6.1 <i>Meteo-marine conditions and problems on board</i> | 22 |
| 6.2 <i>Hydrology</i> | 22 |
| 6.2.1 <i>Corsica Channel</i> | 22 |
| 6.2.2 <i>Bonifacio Mouths and La Maddalena Archipelago</i> | 23 |
| 6.2.3 <i>Tyrrhenian Sea</i> | 24 |
| 6.2.4 <i>Central Mediterranean sea</i> | 24 |
| 6.2.5 <i>Sicily Strait</i> | 26 |
| 6.2.6 <i>Ionian Sea</i> | 28 |
| 6.3 <i>Moorings</i> | 29 |
| 6.3.1 <i>Corsica Channel</i> | 29 |
| 6.3.2 <i>Sicily Strait</i> | 31 |
| 6.4 <i>Chirp and Multibeam in the Bonifacio Mouth</i> | 33 |
| 6.5 <i>Characterization of bathyal macrofauna</i> | 33 |
| 6.6 <i>Marine midrobic microbiology</i> | 35 |
| ACKNOWLEDGEMENTS | 37 |

Cruise details

| | |
|-------------------------------|--|
| NAME | <i>SICILY09</i> |
| DATE | <i>30 OCTOBER – 23 NOVEMBER 2009</i> |
| STUDY AREA | <i>SICILY STRAIT TYRRHENIAN SEA SARDINIA CHANNEL BONIFACIO MOUTH</i> |
| PROJECT RESPONSIBLE | <i>A. PERILLI - CNR-IAMC - ORISTANO</i> |
| HEAD OF THE CRUISE | <i>MIRENO BORGHINI, CNR-ISMAR ALBERTO RIBOTTI CNR-IAMC</i> |
| PARTICIPANT INSTITUTES | <i>CNR – IAMC CNR – ISMAR MESSINA UNIVERSITY GENOVA UNIVERSITY</i> |
| RESEARCH VESSEL | <i>URANIA</i> |
| HARBOUR OF DEPARTURE | <i>OLBIA</i> |
| HARBOUR OF ARRIVAL | <i>MESSINA</i> |

SCIENTIFIC STAFF

CNR–I AMC

Località Sa Mardini
09072 Torregrande-Oristano
Italy
tel: +39.0783.22027
fax: +39.0783.22002

| | |
|--------------------|------------|
| Ribotti Alberto | Researcher |
| Antognarelli Fabio | Researcher |
| Matteo Sinerchia | Researcher |
| Palmieri Fabio | Technician |

CNR–I SMAR

Sezione La Spezia
c/o ENEA–Santa Teresa
I-19036 Pozzuolo di Lerici (SP)
tel: +39.0187.978300
fax: +39.0187.970585

| | |
|-----------------|------------|
| Borghini Mireno | Technician |
|-----------------|------------|

GENOVA UNI VERSI TY

Dip.Te.Ris.
Università degli Studi di Genova
Via Balbi, 5 - 16126 Genova
tel: +39.010.20991 +39.010.20991
fax +39 010 2099227

| | |
|------------------|------------|
| Misic Cristina | Researcher |
| Covazzi Anabella | Researcher |
| Roghi Fiorenza | Student |
| Parentini Silvia | Student |

MESSI NA UNI VERSI TY

Dip.to di Biologia Animale ed Ecologia Marina
Salita Sperone
98100 Sant'Agata, Messina, Italia
tel: +39.090.6765528
fax: +39.090.

| | |
|----------------------|------------|
| Ruggieri Gioacchino | Technician |
| Sciacca Virginia | Student |
| Papale Maria | Student |
| D'alessandro Michela | Student |
| Micari Cosimo | Student |
| Milici Mathias | Student |
| Denaro Giulia | Student |

1. Scientific objectives

In this report we present all activities realised during the oceanographic cruise named SICILY09, carried out from October 30th November 23rd 2009, on board the R/V URANIA in the central and western Mediterranean basins.

The cruise has been planned to reach the following objectives:

1. Water masses characteristics and biological structures

Several measurements along key sections localised inside and on the board of the basin in order to define the main paths of the circulation and the physical-chemical-biological properties (temperature, salinity, dissolved oxygen, nutrients, chlorophyll, phytoplankton, primary production, etc) of the water upper, intermediate and deep central (Sicily Strait) and western (Tyrrhenian sea, Sardinia Channel) Mediterranean water masses. Check of the diffusion of the new deep waters found during a cruise in 2005 in the same areas.

2. Validation of numerical models

Measurements will be used to validate four numerical circulation models implemented at IAMC-CNR in Oristano (SCRM32, SCRM48, WMRM, BONIFACIO/LA MADDALENA) and at ISMAR-CNR in La Spezia (box model). The three models at IAMC-CNR in Oristano are then operational models as they give daily forecasts for the following 5 days of the main oceanographic parameters (temperature, salinity, water and surface heat fluxes, currents, waves).

3. Methodological developments

- Measurements of velocity profiles by Lowered ADCP;
- Periodical maintenance of currentmeters moored in the Sicily Strait and Corsica Channel;
- Comparison of different methods for the quantification of Chlorophyll and calibration of the fluorometer coupled with the multiparametric probe through several photochemical techniques.

2. State of the art

2.1 General description

The Mediterranean sea is a semi-enclosed sea at medium latitudes. Some fundamental processes for the general circulation of the oceans (ex. deep water formation) happen or are given by such sea. The salty waters in the Atlantic, exiting from the Mediterranean, can influence the water formation processes, the variability and also the equilibrium state of the global thermohaline circulation, a mechanism by which large amounts of heat are exchanged inside and through the basins. The global thermohaline circulation has a fundamental role in contributing in the stabilization of the climatic system. The Mediterranean circulation, in the western basin, is forced by the wind stress, by the general floating forces generated by the heat and fresh water fluxes at the air-sea interface. The geography of the western Mediterranean is really complex with a really complex deep morphology and a distribution of its coasts, a variety of islands, straits, channels and openings. The exchanges through the different basins depend on the morphology of these straits, channels and openings. Due to a complex topography and geometry and of the high external forcing variability, the response time of the water masses and the spatial and temporal variability scales of the currents are really short than the oceanic ones. The recirculation time of the particles, inside the deep water formations areas, is around a hundreds years at Mediterranean scale, a really short climatic scale if compared with the Atlantic temporal scales of millenniums. The general view that grows up is that of a Mediterranean climatic system always interacting with the atmosphere that stores the information of the changes at the air-sea interface and modifies currents at the abyssal depths. This allows the Mediterranean, and then its western basin, to “react” really quickly to the changes of atmospheric forcing and then to be a “sensor” of the Earth climate. The study of the functioning of marine ecosystems and their response to external forcing is then controversial because really complex. The hydrological characteristics of the different water masses behave differently following depth and geographic position with different modifications in act. In the 30’s two different behaviours have been observed, a constant increase in temperature and salinity in the deep and intermediate levels of the western Mediterranean and a more complicated variability of the eastern basin, followed by the climatological transient. What is sure it is then the observation of a phenomenon in the yearly ‘90s that, due to its dimension and speed, is one of those events characterised by a strong discontinuity: the so called climatological transient. This transient shows as the

collapse of a system apparently stable can happen suddenly. In a few years the vertical structure of the basin has been completely modified. The possible reasons of the climatological phenomenon in the eastern basin have been widely described in the specialised literature (Malanotte-Rizzoli et al., 1999; Demirov and Pinardi 2002, Rupolo et al, 2003). This anomaly begun to propagate in the western basin (Schroeder et al., 2006; Schroeder et al., 2007, Schroeder et al., 2008). Actually it is difficult to forecast the effects of such an anomaly in the western Mediterranean even if the long times of run of the intermediate waters in the western basin probably will contribute to absorb it decreasing its effects. Vice versa the occurrence of such a phenomenon has underlined once more as the balances of a complex system can be strongly modified also by small variabilities of one of its components.

The temporal analysis of the analysed data does not permits to understand if these oscillations are characteristics of a natural state of the basin or, viceversa, if they represent an anomalous situation.

The cruise is part of a strategy for the periodic monitoring of this new hydrodynamic regime in order to evaluate the hydrodynamic and biogeochemical characteristic trends of the waters along the column and their interannual variabilities. For this reason the cruises have been repeated every year. Furthermore the biogeochemical anomalies N/P and the difference between the variables north and south of the basin, with two different hydrodynamic regimes, have been analysed.

Then in the area three regional hydrodynamic numerical models are operative giving a 5-days forecast of the sea state of the central and western Mediterranean updated daily. These cruises are also organised in order to calibrate and validate the circulation models at basin and coastal scales. Comparative studies with in-situ data, from satellite and models outputs will be used to evaluate the interannual variability of the dynamics at basin scale. Furthermore they will be used to study the mechanisms regulating and modulating the Chlorophyll distribution in mesoscale processes.

The coastal model, named BONIFACIO/LA MADDALENA, works in the Bonifacio Mouths, a strait between Sardinia (Cape Testa and Punta Falcone) and Corsica (Cape Pertusato) of high environmental value for the outstanding importance to the landscape and the wide variety of habitats.

For the legal status of International Strait, every year it is crossed by thousands of ships, particularly ships carrying dangerous or polluting materials such as oil tankers, chemical tankers and gas carriers, many of which are now obsolete or not with the double hull or equivalent technology.

The strong winds from the west and northwest, for the *Venturi* effect, increase their intensity when channeled through the Strait, greatly and influence the weather and sea conditions and therefore the shipping through the Strait.

Navigation is also complicated by the complex morphology of jagged coastline, from the existing shallow waters, the presence of islands of the Archipelago of La Maddalena (Sardinia) and of Lavezzi and Cavallo (Corsica) and the numerous shoals and reefs.

These factors make the Strait of Bonifacio Strait "highly vulnerable", with a high risk of marine pollution by oil and toxic-emissions.

The Strait is included in the plan area of international cooperation Franco-Italian-Monegasque RAMOGEPOL designating the competent authorities to coordinate the joint action of the three countries in the event of accidental pollution in the area RAMOGE (set up following the birth of the *RAMOGE Agreement*); as a function of their high vulnerability of the Strait of Bonifacio was chosen in 2007 as a scenario for the annual exercise and meetings between the authorities of the three countries.

For all the previous region a project named **SOS-Bocche di Bonifacio** (funded by the Italian Ministry for the Environment) wants to implement an innovative system of forecasting and monitoring of marine circulation for the management of environmental emergencies caused by spills into the sea of hydrocarbons (oil spills).

The oil spills are "leakages" of oil from vessels which may be accidental (collisions between ships, ground etc ...) or voluntary (discharge of bilge, ballast and tank waters).

The system provides for the integrated use of:

- analysis/forecast numerical models of the marine circulation "nested" on different spatial scales;
- analysis/forecast numerical models of the mesoscale atmospheric circulation;
- meteorological observations from remote station (weather station of Guardia Vecchia – La Maddalena island);
- Lagrangian measurements of the surface currents field by floating buoys (drifters);
- oil spill modules for the simulation of hydrocarbon spreading and weathering processes.

This system will facilitate the rapid planning and coordination of operations of the marine authorities to tackle pollution, through the knowledge of future estimates of displacement which suffers under the action of wind and sea currents, a patch of oil at sea and the main chemical and physical processes that interest hydrocarbons.

Moreover, the creation of "scenarios and risk maps" will quickly identify the most appropriate intervention strategies, given the high variability of possible events, to be taken during an environmental emergency.

The rapidity of action is essential to avoid a risk of pollution could become real, and if a pollution happens, it could develop into a serious threat to the coastal strip.

The main objective is therefore the prevention and / or limitation of damages, for the conservation of marine resources in coastal waters, especially the most vulnerable areas of high environmental value typical of this area.

This cruise is strictly linked with the previous ones Medgoos (2000-2006), MedOc (2005-2006), MedBio (2006), MedCO07 (2007), SESAME-IT4 and MedCO08 (2008) and Tyrrhmounts (2009) where zonal trends of the hydrodynamic and biogeochemical characteristics of the water masses in the western basin.

The work has been done with CNR-ISMAR in La Spezia to study the hydrodynamics and with the universities of Genova and Messina for the geological and biological aspects.

2.1.1 Main hydrodynamic characteristics in the study areas

The **central Mediterranean** (Sardinia and Sicily channels) is characterised by a really complicated bottom topography directly influencing on the water exchanges between the two Mediterranean basins (eastern and western). In the Sardinia channel the threshold depth is about 1900 m. This allows the Exchange of deep waters in the western Mediterranean. The Sicily Strait is instead characterised by two strict passages with the deepest one about 430 m depth giving strong limits to the exchanges with the eastern Mediterranean. Over these two thresholds, a wide and shallow area far off Tunisia (Skerki bank) is another obstacle to a direct link between the water masses in the two basins.

The **Tyrrhenian sea** is linked both with the western Mediterranean as the eastern and is an intermediate basin whose southern part is linked to the central Mediterranean through a shallow channel permitting the passage of the LIW (*Levantine Intermediate Water*) and of the tEMDW (*transitional Eastern Mediterranean Deep Water*) that, sinking at the entrance of the Tyrrhenian sea, .origns the TDW that will move over the WMDW. The Opening Sicily-Sardinia is mainly formed by two channels with a wide intermediate plain. The deepest, in its central part, directly links the Tyrrhenian sea to the Sardinia channel and to the rest of the western Mediterranean. All the water masses composing the water column from the surface to the bottom pass through it.

Resuming, the study area is a very complex system with an almost sub-tropical climate. Furthermore in the central Mediterranean area is present the widest community of marine mammals and fishes of the whole Mediterranean basin.

Other interesting aspects regards the hydrological properties (temperature and salinity) of the deep and intermediate layers, that show a positive trend for some decades. The reasons of this trend are still unknown.

An increase of the knowledge of all these aspects will contribute to a better comprehension of the role and functioning of the Mediterranean sea.

3. Cruise plan

The following table shows all the measured parameters and the working groups involved in the operations. Table 2 lists the instrumentation and analysis methods used.

| Parameters/Instruments | Working Groups |
|------------------------------|--------------------|
| CTD/O2/rosette | CNR-ISMAR/ IAMC |
| Dissolved oxygen | CNR-ISMAR |
| Marine midrobic microbiology | Messina University |
| | Genova University |

Table 1 Measured parameters

| | |
|-----------------------|---|
| Small sampling volume | Rosette General Oceanics 24-bottles of 10 l |
| CTD System | CTD SBE 911 plus |
| Oxygen | Winkler titration |
| Box Corer System | Box Corer & filter |

Table 2 Instrumentation for the sampling and analysis methods

The geographical limits of the study area are 32.00°N - 42.00°N of latitude and 8°E – 16°E of longitude. Due to bad sea conditions, the expected sampling plan has been partially reorganised (see pictures).

4. Cruise maps

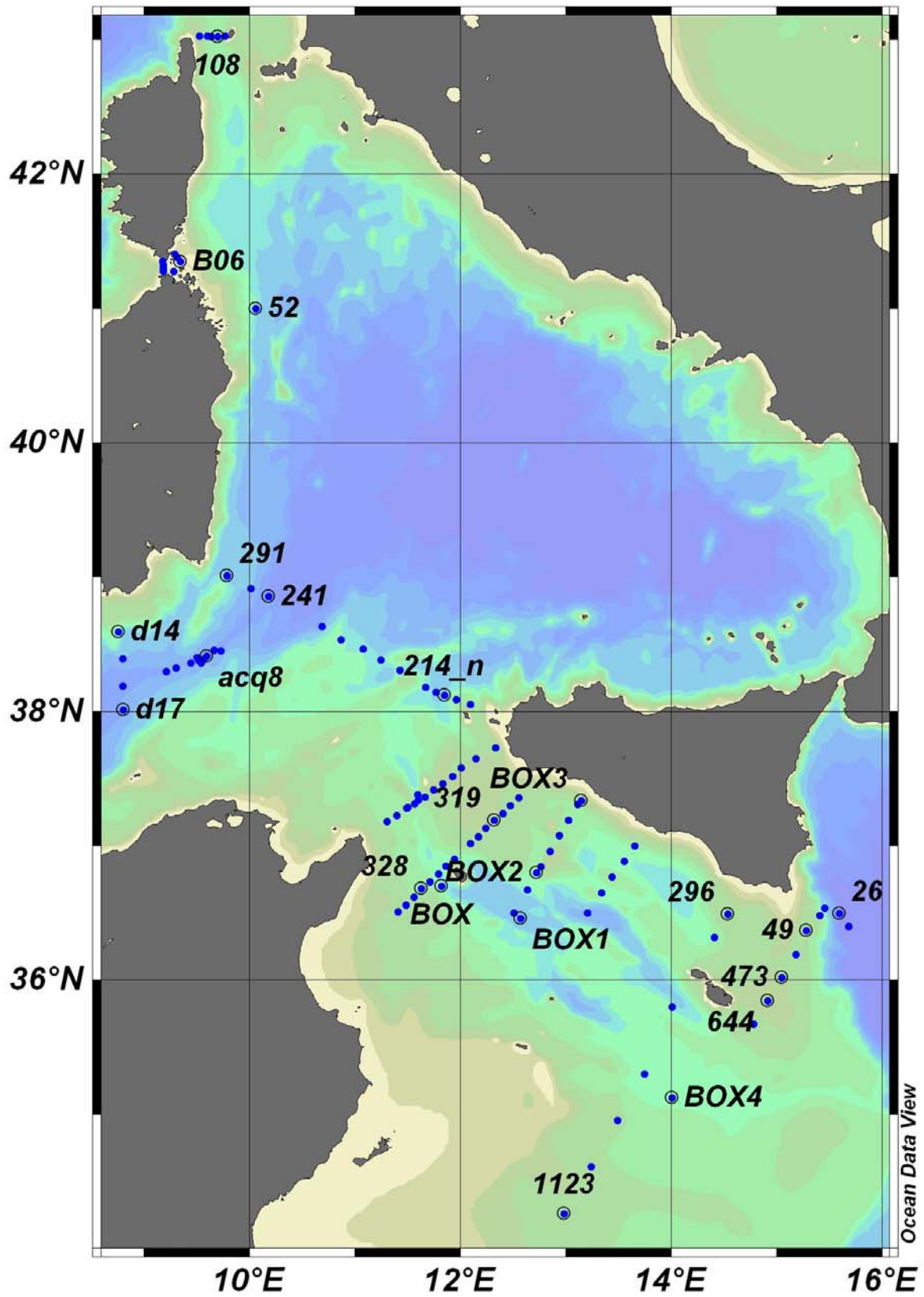


Figure. Maps of the CTD/Box Corer casts

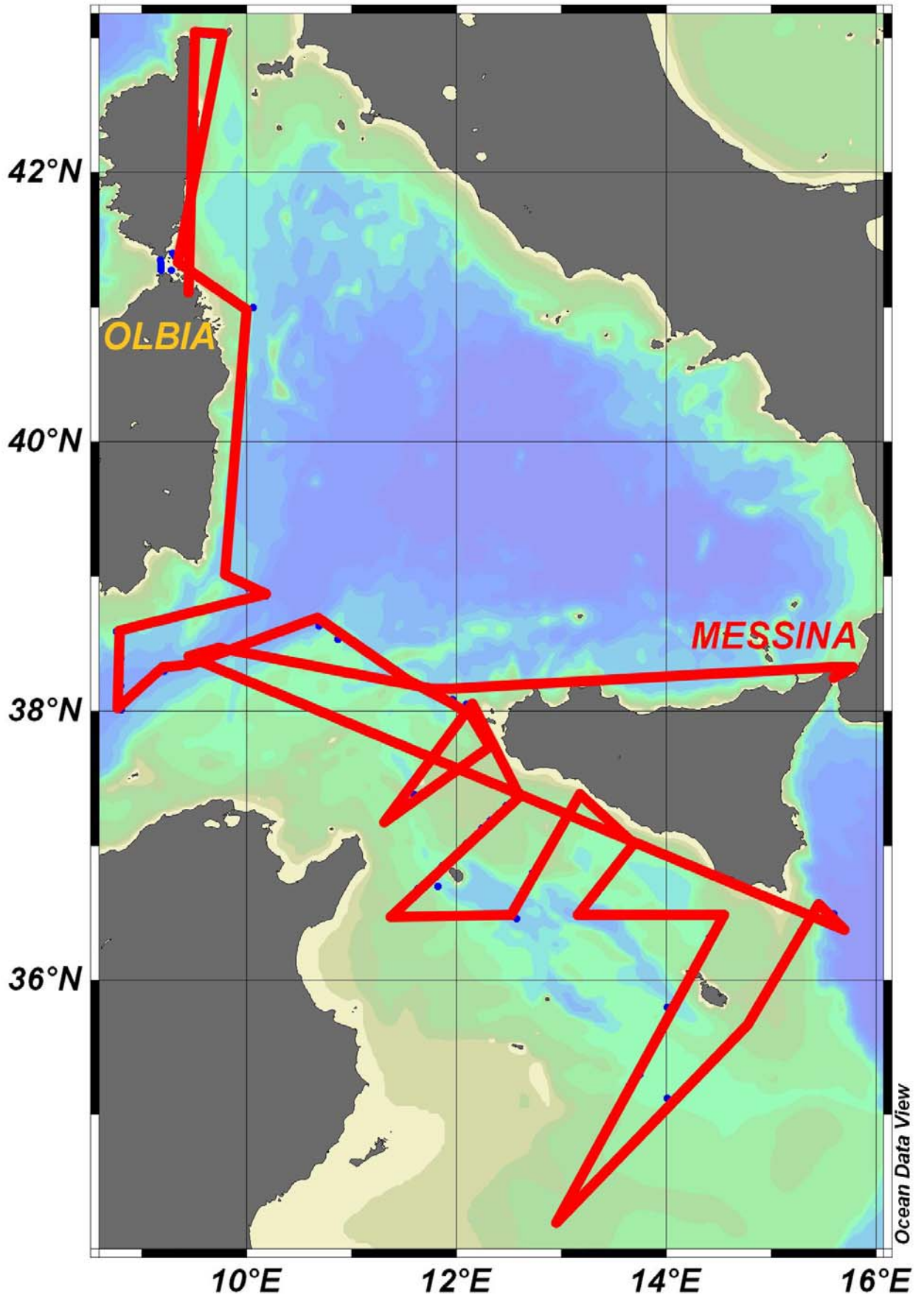


Figure. Map of the cruise path

Table CTD casts list

Sampling type and institute: N = Nutrients (Genova Univ); C = Box Corer (Genova Univ); O = dissolved oxygen (CNR); E = marine microbial ecology (Messina Univ).

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 31/10/2009 | 107 | 43.029 | 9.767667 | 86 | E |
| 31/10/2009 | 108 | 43.025 | 9.7 | 445 | |
| 31/10/2009 | 109 | 43.025167 | 9.641667 | 364 | E |
| 31/10/2009 | 110 | 43.026 | 9.599667 | 364 | |
| 31/10/2009 | 111 | 43.026167 | 9.525333 | 65 | E |
| 01/11/2009 | B01 | 41.354333 | 9.1785 | 72 | E |
| 01/11/2009 | B02 | 41.324167 | 9.1805 | 72 | E |
| 01/11/2009 | B03 | 41.301167 | 9.181 | 74 | E |
| 01/11/2009 | B04 | 41.275333 | 9.181167 | 72 | E |
| 01/11/2009 | B05 | 41.273667 | 9.279167 | 60 | E |
| 01/11/2009 | B06 | 41.346167 | 9.345333 | 86 | E |
| 01/11/2009 | B07 | 41.379167 | 9.313167 | 47 | E |
| 01/11/2009 | B08 | 41.402 | 9.289333 | 85 | E |
| 02/11/2009 | 52 | 41.000167 | 10.059833 | 987 | E |
| 04/11/2009 | 241 | 38.856667 | 10.1835 | 2521 | E |
| 04/11/2009 | 261 | 38.913333 | 10.014833 | 1466 | E |
| 04/11/2009 | 291 | 39.012333 | 9.788333 | 1006 | E |
| 05/11/2009 | acq3 | 38.299333 | 9.211 | 2030 | E |
| 05/11/2009 | acq3b | 38.324333 | 9.302667 | 1928 | |
| 05/11/2009 | acq4 | 38.361 | 9.441 | 1989 | |
| 05/11/2009 | acq5 | 38.3795 | 9.5215 | 2011 | E |
| 05/11/2009 | d14 | 38.5935 | 8.758667 | 633 | E |
| 05/11/2009 | d15 | 38.392833 | 8.800333 | 1392 | |
| 05/11/2009 | d16 | 38.1905 | 8.799667 | 2233 | E; O |
| 05/11/2009 | d17 | 38.009667 | 8.801667 | 1619 | E |
| 06/11/2009 | 212 | 38.051833 | 12.094 | 137 | |
| 06/11/2009 | 213 | 38.087333 | 11.957 | 410 | E |
| 06/11/2009 | 214 | 38.12 | 11.847667 | 1131 | |
| 06/11/2009 | 215 | 38.145333 | 11.765667 | 1199 | E |
| 06/11/2009 | 217 | 38.180333 | 11.667333 | 766 | |
| 06/11/2009 | 219 | 38.308 | 11.426333 | 857 | E |
| 06/11/2009 | 221 | 38.384333 | 11.244833 | 702 | E |
| 06/11/2009 | 223 | 38.467667 | 11.0765 | 848 | |
| 06/11/2009 | 225 | 38.535 | 10.868833 | 738 | E |
| 06/11/2009 | 227 | 38.632 | 10.683833 | 1506 | |
| 07/11/2009 | 405 | 37.647667 | 12.144333 | 96 | E |
| 07/11/2009 | 406 | 37.581 | 12.0045 | 146 | E |
| 07/11/2009 | 410 | 37.180333 | 11.305333 | 249 | E |
| 07/11/2009 | 432 | 37.730167 | 12.333333 | 137 | E |

Cruise report – SICILY09

| | | | | | |
|------------|-------|-----------|-----------|------|---------|
| 07/11/2009 | 433 | 37.514833 | 11.922 | 105 | E |
| 07/11/2009 | 434 | 37.415 | 11.742667 | 85 | E |
| 07/11/2009 | 436 | 37.2265 | 11.396833 | 413 | |
| 07/11/2009 | 438 | 37.460167 | 11.828833 | 74 | E |
| 07/11/2009 | 451 | 37.339 | 11.6 | 538 | |
| 07/11/2009 | 460 | 37.278833 | 11.486833 | 544 | E |
| 07/11/2009 | 462 | 37.314 | 11.563167 | 90 | |
| 07/11/2009 | 463 | 37.364 | 11.660833 | 93 | E |
| 12/11/2009 | BOX | 36.69988 | 11.8168 | 620 | B |
| 12/11/2009 | 328 | 36.680133 | 11.630067 | 350 | B |
| 12/11/2009 | 317 | 37.299833 | 12.4695 | 148 | E |
| 12/11/2009 | 318 | 37.239833 | 12.401 | 130 | E; N |
| 12/11/2009 | 319 | 37.19 | 12.319833 | 84 | E; N; B |
| 12/11/2009 | 320 | 37.13 | 12.24 | 89 | |
| 12/11/2009 | 321 | 37.0695 | 12.1695 | 93 | E; N |
| 12/11/2009 | 322 | 37.019333 | 12.091167 | 124 | |
| 12/11/2009 | 316 | 37.36 | 12.550667 | 163 | E; N |
| 13/11/2009 | 324 | 36.8995 | 11.939667 | 579 | E; N |
| 13/11/2009 | 325 | 36.849667 | 11.860667 | 482 | E; N |
| 13/11/2009 | 326 | 36.789833 | 11.789667 | 697 | E; N |
| 14/11/2009 | 167 | 37.306167 | 13.106833 | 287 | E |
| 14/11/2009 | 327 | 36.729833 | 11.710167 | 350 | E; N |
| 14/11/2009 | 328 | 36.679333 | 11.630333 | 355 | |
| 14/11/2009 | 329 | 36.619667 | 11.560833 | 297 | E; N |
| 14/11/2009 | 330 | 36.56 | 11.48 | 238 | |
| 14/11/2009 | 331 | 36.509833 | 11.409667 | 151 | E; N |
| 14/11/2009 | 614 | 36.844833 | 12.762 | 133 | |
| 14/11/2009 | 781 | 36.672167 | 12.634 | 739 | E |
| 14/11/2009 | 948 | 36.499833 | 12.506167 | 1310 | E |
| 14/11/2009 | BOX 1 | 36.458233 | 12.56665 | 1278 | B |
| 14/11/2009 | BOX 2 | 36.8 | 12.72 | 487 | B |
| 14/11/2009 | BOX 3 | 37.335933 | 13.144433 | 88 | B |
| 15/11/2009 | 275 | 37.191333 | 13.021 | 484 | E |
| 15/11/2009 | 296 | 36.4905 | 14.536167 | 157 | E; B |
| 15/11/2009 | 386 | 37.076333 | 12.934833 | 369 | |
| 15/11/2009 | 464 | 36.317 | 14.403 | 463 | E |
| 15/11/2009 | 500 | 36.959833 | 12.849 | 94 | E |
| 15/11/2009 | 601 | 36.999 | 13.648167 | 461 | E; N |
| 15/11/2009 | 602 | 36.883667 | 13.550833 | 739 | E |
| 15/11/2009 | 603 | 36.768167 | 13.435167 | 324 | E |
| 15/11/2009 | 604 | 36.649833 | 13.333833 | 606 | E |
| 15/11/2009 | 605 | 36.501833 | 13.2035 | 1711 | E |
| 16/11/2009 | 11105 | 35.3025 | 13.741 | 575 | E |
| 16/11/2009 | 11111 | 34.956167 | 13.487667 | 122 | E |

Cruise report – SICILY09

| | | | | | |
|---------------|--------|-----------|-----------|------|------|
| 16/11/2009 | 11117 | 34.609833 | 13.236333 | 252 | E |
| 16/11/2009 | 969 | 35.799 | 14.007333 | 1043 | E |
| 16/11/2009 | 1123 | 34.2641 | 12.984067 | 125 | E; B |
| 16/11/2009 | BOX 4 | 35.125633 | 14.002383 | 598 | B |
| 17/11/2009 | 809 | 35.67185 | 14.779933 | 134 | E |
| 17/11/2009 | 644 | 35.8448 | 14.912933 | 94 | E; B |
| 17/11/2009 | 473 | 36.01765 | 15.046633 | 96 | E; B |
| 17/11/2009 | 305 | 36.190583 | 15.181167 | 129 | E |
| 17/11/2009 | 49 | 36.369767 | 15.279817 | 143 | E; B |
| 17/11/2009 | 48 | 36.479833 | 15.405083 | 136 | E |
| 17/11/2009 | 25 | 36.536533 | 15.449867 | 1079 | E; B |
| 17/11/2009 | KC2 | 36.399467 | 15.678983 | 3384 | E; O |
| 18/11/2009 | 26 | 36.494433 | 15.588817 | 1909 | E |
| 18/11/2009 | KC2up | 36.400167 | 15.678333 | 3383 | E |
| 20/11/2009 | acq6_2 | 38.450667 | 9.726333 | 2056 | E |
| 20/11/2009 | acq7 | 38.455667 | 9.6625 | 2034 | |
| 20/11/2009 | acq8 | 38.411833 | 9.591667 | 2044 | |
| 20/11/2009 | acq9 | 38.3875 | 9.5585 | 2033 | |
| 20/11/2009 | acq10 | 38.359833 | 9.541833 | 2012 | |
| 20/11/2009 | acq11 | 38.403833 | 9.503 | 2013 | |
| 20-21/11/2009 | 214 n | 38.12 | 11.847667 | 1136 | |
| 20-21/11/2009 | 215 n | 38.145333 | 11.765667 | 1211 | O; N |

5. On board operations

5.1 CTD casts

At all the 114 hydrological stations, pressure (P), salinity (S), potential temperature (θ) and dissolved oxygen concentration (DO) were measured with a CTD-rosette system consisting of a CTD SBE 911 plus, and a General Oceanics rosette with 24 12-l Niskin Bottles. Temperature measurements were performed with a SBE-3/F thermometer, with a resolution of 10^{-3} °C, and conductivity measurements were performed with a SBE-4 sensor, with a resolution of 3×10^{-4} S/m. In addition, dissolved oxygen was measured with a SBE-13 sensor (resolution 4.3 μ M), and data were checked against Winkler titration. The vertical profiles of all parameters were obtained by sampling the signals at 24 Hz, with the CTD/rosette going down at a speed of 1 m/s. The data were processed on board, and the coarse errors were corrected.

Laboratory: ISMAR-CNR, IAMC-CNR

5.3 Nutrients

Seawater samples for nutrient measurements were collected at different depths at a few stations, when the system CTD /rosette was going up, according to the vertical profiles of salinity, potential temperature and dissolved oxygen, recorded in real time. Samples of 100 ml of seawater were collected at different depths and immediately filtered through a polycarbonate filter (0.47 μ m \varnothing and pore size 0.4 μ m) under slight vacuum. The filtered samples were transferred in 20 ml polyethylene vials and frozen at -20°C. The analysis of inorganic nutrients will be performed in the laboratory on land by the AutoAnalyser AAIII Bran+Luebbe (Grasshoff,1999).

Laboratory: Genova University

5.4 LADCP

Two Lowered Acoustic Doppler Current Profilers (LADCP) were used to measure velocity profiles. We used two RDI Workhorse 300 kHz ADCP. For data post-processing we used the LDEO LADCP (versione 8.1) software.

Laboratory: CNR-ISMAR

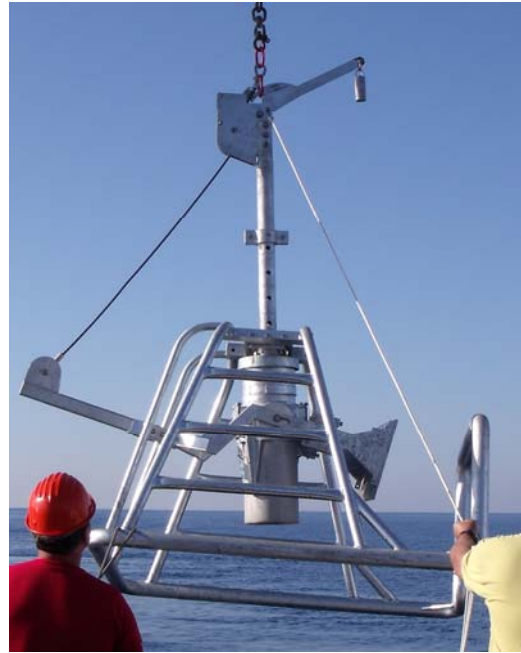


5.5 Macrobenthos and sediment analysis

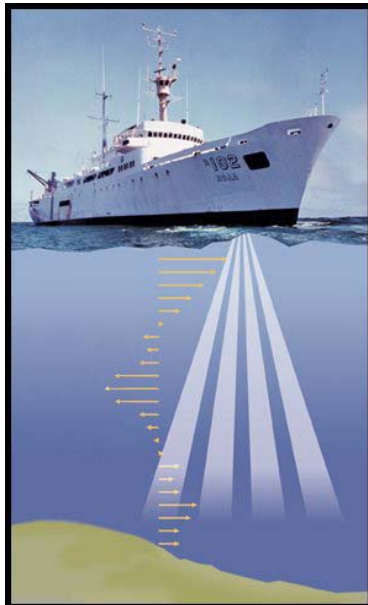
The primary goal was to investigate the deep macrobenthic communities (in terms of abundance, biomass, distribution and diversity) in the Ionian sea, along the Maltese continental slope. Sediment samples were taken for biological and biochemical analyses, in order to characterize the deep macrofauna associations in relation to the main environmental characteristics of the area.

Three different depths along the slope were selected: 1200 m, 1700 m and 2000 m, performing three deployments in each station. Sediment samples were collected with a box-corer (size: 32 cm diameter, 52 cm height) and subsamples were collected using Plexiglass liners of 5,5 cm and 3,6 cm internal diameter. Sediment subsamples were collected to analyze the biochemical composition of organic matter (chlorophyll a, phaeopigments, carbohydrates, lipids and proteins), heterotrophic prokaryote production, protozoa abundance, meiofaunal abundance, biomass and diversity, granulometry. All the sediment in the box corer have been collected for macrofauna.

Laboratory: Genova University



5.6 Vessel -mounted ADCPs



The hydrographic data set has been integrated with direct current measurements. During the whole campaign two VM-ADCPs (RDI Ocean Surveyor, 75 KHz, and RDI Workhorse, 300 KHz) which operated during the whole campaign, along the whole ship track. The depth range of the two current profilers is about 700 m (OS75) and 150 m (WH300). Data acquisition is carried out using the RDI VMDAS software vers. 1.44. The ADCP data will be submitted to a post-processing with the CODAS3 Software System, which allows to extract data, assign coordinates, edit and correct velocity data. Data will be corrected for errors in the value of sound velocity in water, and misalignment of the instrument with respect to the

axis of the ship.

Laboratory: CNR-ISMAR

5.7 Turtles and other cetaceans sightings

A table to be filled by the ship crew with all sightings of turtles and other cetaceans (dolphins, wales, etc.) has been left on the bridge of the ship. In the following table type of sighting, date, time and number of animals are resumed.

| | | | | |
|--------------------------|----------------------|---------------------|----------------|-----------------------------------|
| date (dd/mm/yyyy) | | | | |
| time (GMT+1) | latitude | 38° 11.06' N | Turtle | n°1 |
| 21/11/09 | longitude | 012° 12.8' E | Wale | n°/ |
| 14:20 | Dist. stimata | 20 m | Dolphin | n°20 (stenelle), 1 delfino |
| | latitude | 38° 15.10'N | Turtle | n°/ |
| | longitude | 012° 37.0' E | Wale | n°/ |
| | Dist. stimata | 10 m | Dolphin | n° 3 stenelle, 2 delfini |

Laboratory: CNR-IAMC

5.8 Marine microbiology

Almost all stations, at depths along the water column, have been filtered with different sea water volumes to study microbial biodiversity using CARD-FISH technique. Then the sea water samples from Niskin bottles have been processed on board to perform viable counts and isolation of Heterotrophic Bacteria on Marine Agar medium (MA) and Luminescent Bacteria on SWC (Sea Water Complete) medium (figure belowey will be characterized in laboratory using morpho-physiological and tassonomic approaches.

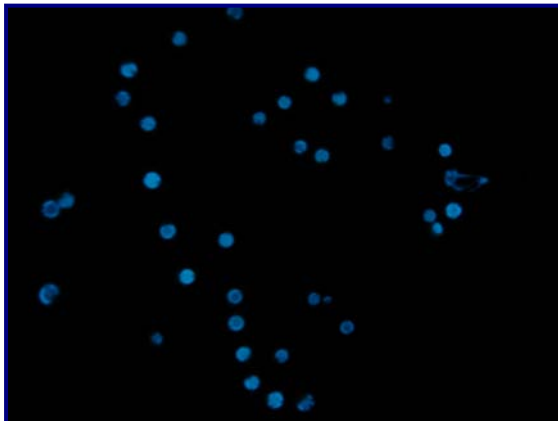


Figure 5.10.1. Luminous Bacteria Strains

Some samples are filtered on Millipore filters 0,22 μm and stored in “RNAlater” for a taxonomic study by molecular approach. As a consequence, DNA-RNA extraction was carried out to compare active and inactive microbial communities, coming from different water masses. Filters are stored at -20 °C after incubation in “RNAlater” storage solution.

Laboratory: Messina University

5.9 Other operations on board

DATASONIC DSP-661 Chirp 2 Profiler 4SBP at 3.5 kHz, with positions recorded on the XTF trace headers as lat/long of the DGPS antenna

Laboratory: CNR-IAMC

RESON Seabat 8160 (50 kHz, 3X, 126 beams at 0.5° covering at 150° installed on the keel through bulb protruding of about 1.5m)

Laboratory: CNR-IAMC

Recovering and maintenance of moorings

Three moorings, deployed in the first half of 2009 in the COR (Cosica Channel), C01 and C02 (Sicily Strait) were recovered and redeployed.

Laboratory: CNR-ISMAR

Chlorophylls

Laboratory: Genova University

6. Preliminary Results

6.1 Meteo-marine conditions and problems on board

The meteo-marine conditions during the cruise have been characterised by a strong variability but, usually, by a medium-high atmospheric pressure and very low pressure at the end of the first half of the cruise. This has permitted to do all planned activities, with only 4 days of inactivity in Favignana island (TP).

6.2 Hydrology

In the following pages the maps with the stations for the different areas are presented (Corsica Channel, Bonifacio Mouths, Tyrrhenian Sea, Sicily Strait, Sardinia Channel, Ionian Sea).

6.2.1 Corsica Channel

In the Corsica Channel the mooring has been recovered and then re-deployed (COR, see in the following section). Then four CTD stations have been done. Map and table follow.

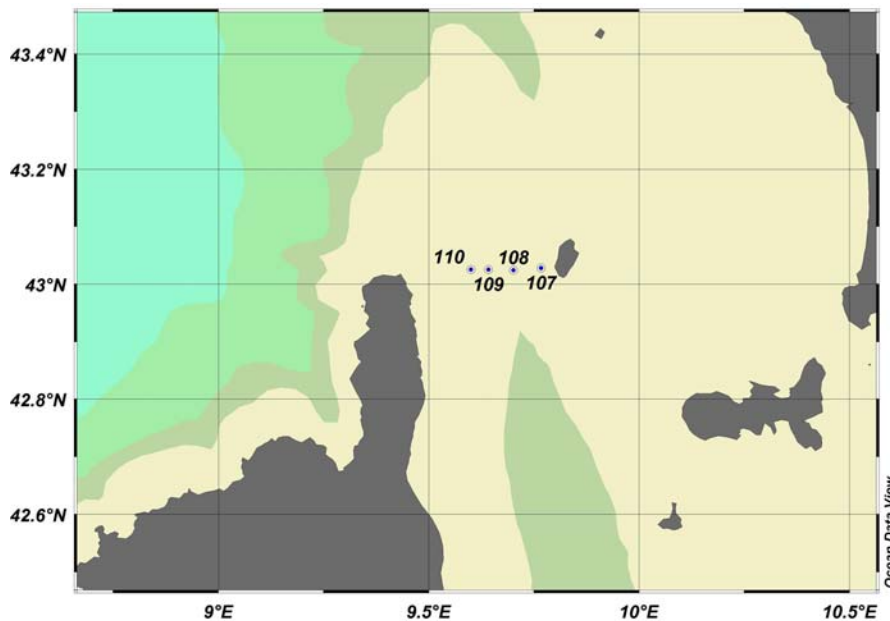


Figure. The CTD casts in the Corsica Channel

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 31/10/2009 | 107 | 43.029 | 9.767667 | 86 | E |
| 31/10/2009 | 108 | 43.025 | 9.7 | 445 | |
| 31/10/2009 | 109 | 43.025167 | 9.641667 | 364 | E |
| 31/10/2009 | 110 | 43.026 | 9.599667 | 364 | |
| 31/10/2009 | 111 | 43.026167 | 9.525333 | 65 | E |

6.2.2 Bonifacio Mouths and La Maddalena Archipelago

In the Bonifacio Mouths and La Maddalena Archipelago some CTDs casts have been done and, furthermore ADCP, CHIRP and Multibeam.

The data have been acquired in the framework of the “SOS-Bonifacio” project, to improve local bathymetry (Chrip and Multibeam) and the knowledge on current in the area of the Bonifacio area and La Maddalena Archipelago. Furthermore data will be used to validate local numerical circulation models.

In the following maps and tables the ADCP, Chrip and Multibeam route and the CTD casts.

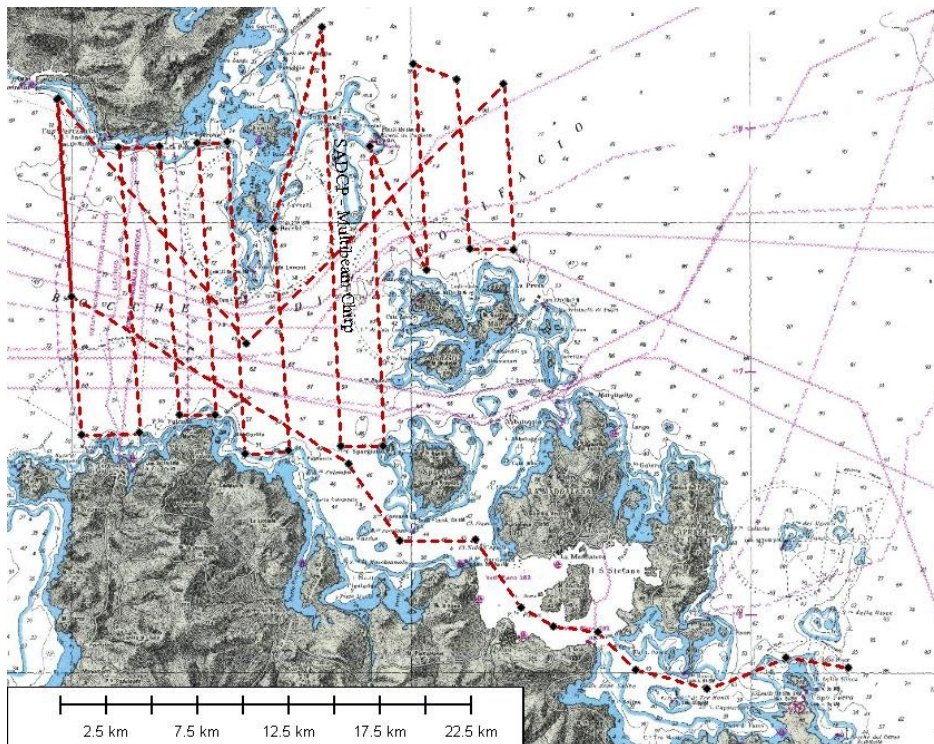


Figure. The tracks for ADCP, Chirp & Multibeam

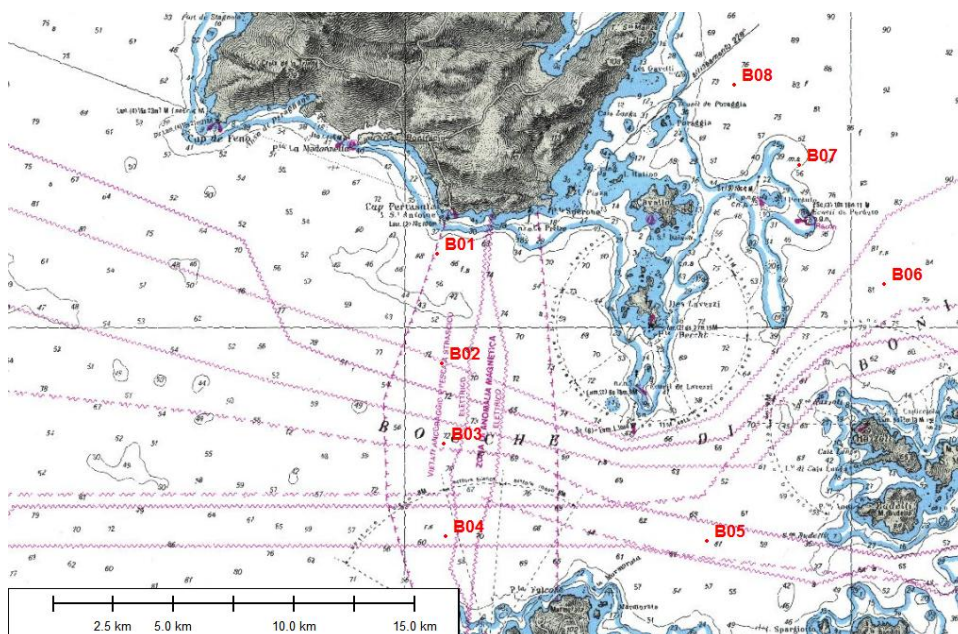


Figure. The CTD casts in the Bonifacio Mouths

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 01/11/2009 | B01 | 41.354333 | 9.1785 | 72 | E |
| 01/11/2009 | B02 | 41.324167 | 9.1805 | 72 | E |
| 01/11/2009 | B03 | 41.301167 | 9.181 | 74 | E |
| 01/11/2009 | B04 | 41.275333 | 9.181167 | 72 | E |
| 01/11/2009 | B05 | 41.273667 | 9.279167 | 60 | E |
| 01/11/2009 | B06 | 41.346167 | 9.345333 | 86 | E |
| 01/11/2009 | B07 | 41.379167 | 9.313167 | 47 | E |
| 01/11/2009 | B08 | 41.402 | 9.289333 | 85 | E |

6.2.3 Tyrrhenian Sea

In Figure below the unique CTD station realised in the Tyrrhenian Sea.

Two transects were planned in the area, but bad weather conditions obliged the vessel to move southward along Sardinia.

Below figure and table:.

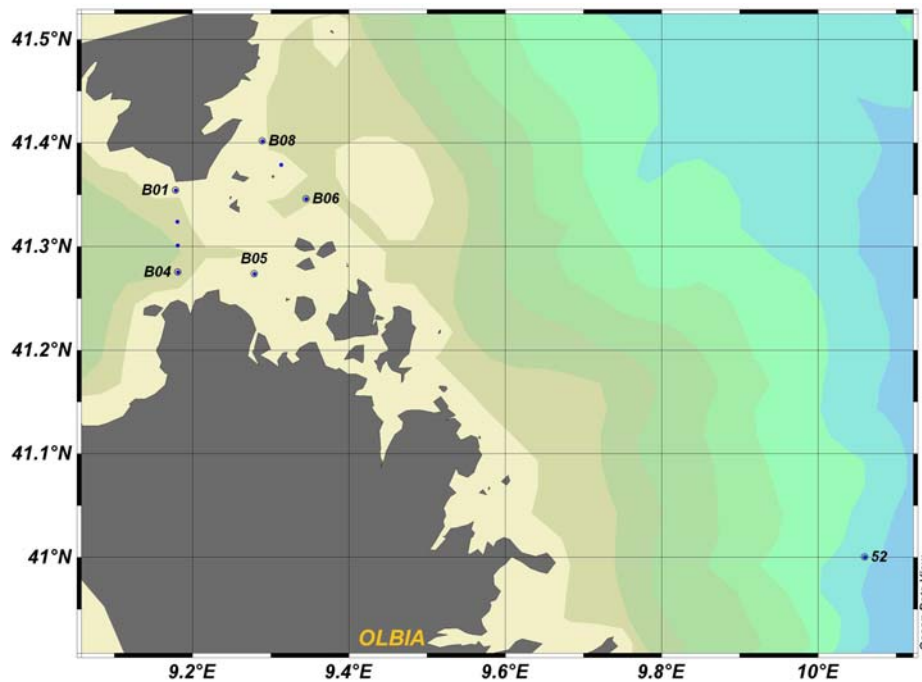


Figure. The CTD cast in the Tyrrhenian Sea

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 02/11/2009 | 52 | 41.000167 | 10.059833 | 987 | E |

6.2.4 Central Mediterranean sea

In the figure below three transects between Sardinia and Sicily, across the Sardinia Channel and transversal to the Sardinia Channel are visible.

The importance of these three transects is given by their central position in the whole Mediterranean basin and obliged passage for the waters coming from west to east and vice versa. Here the diffusion of the nWMDW from the Algerian to the Tyrrhenian Sea has been verified.

The station ACQ6 has been stopped on November 5th due to bad weather conditions and re-made on November 20th followed by other stations in the area in order to define the limit of the nWMDW over the sill dividing the Algerian Basin from the Tyrrhenian Sea.

On November 20th -21st stations 214 and 215 have been repeated 6 times in order to verify fluctuations in the water masses from the Eastern Mediterranean.

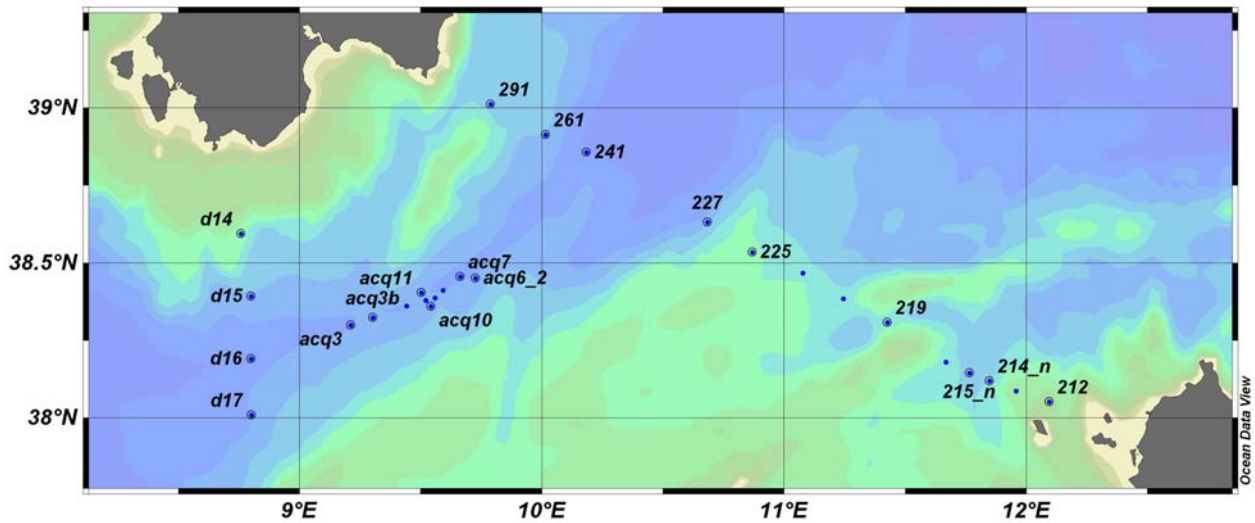


Figure The three CTD transects in the Sardinia channel and Sicily-Sardinia passage

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|------------|
| 04/11/2009 | 241 | 38.856667 | 10.1835 | 2521 | E |
| 04/11/2009 | 261 | 38.913333 | 10.014833 | 1466 | E |
| 04/11/2009 | 291 | 39.012333 | 9.788333 | 1006 | E |
| 05/11/2009 | acq3 | 38.299333 | 9.211 | 2030 | E |
| 05/11/2009 | acq3b | 38.324333 | 9.302667 | 1928 | |
| 05/11/2009 | acq4 | 38.361 | 9.441 | 1989 | |
| 05/11/2009 | acq5 | 38.3795 | 9.5215 | 2011 | E |
| 05/11/2009 | acq6 | 38.450667 | 9.726333 | 2056 | interrotta |
| 05/11/2009 | d14 | 38.5935 | 8.758667 | 633 | E |
| 05/11/2009 | d15 | 38.392833 | 8.800333 | 1392 | |
| 05/11/2009 | d16 | 38.1905 | 8.799667 | 2233 | E; O |
| 05/11/2009 | d17 | 38.009667 | 8.801667 | 1619 | E |
| 06/11/2009 | 212 | 38.051833 | 12.094 | 137 | |
| 06/11/2009 | 213 | 38.087333 | 11.957 | 410 | E |
| 06/11/2009 | 214 | 38.12 | 11.847667 | 1131 | |
| 06/11/2009 | 215 | 38.145333 | 11.765667 | 1199 | E |

| | | | | | |
|---------------|--------|-----------|-----------|------|------|
| 06/11/2009 | 217 | 38.180333 | 11.667333 | 766 | |
| 06/11/2009 | 219 | 38.308 | 11.426333 | 857 | E |
| 06/11/2009 | 221 | 38.384333 | 11.244833 | 702 | E |
| 06/11/2009 | 223 | 38.467667 | 11.0765 | 848 | |
| 06/11/2009 | 225 | 38.535 | 10.868833 | 738 | E |
| 06/11/2009 | 227 | 38.632 | 10.683833 | 1506 | |
| 20/11/2009 | acq6_2 | 38.450667 | 9.726333 | 2056 | E |
| 20/11/2009 | acq7 | 38.455667 | 9.6625 | 2034 | |
| 20/11/2009 | acq8 | 38.411833 | 9.591667 | 2044 | |
| 20/11/2009 | acq9 | 38.3875 | 9.5585 | 2033 | |
| 20/11/2009 | acq10 | 38.359833 | 9.541833 | 2012 | |
| 20/11/2009 | acq11 | 38.403833 | 9.503 | 2013 | |
| 20-21/11/2009 | 214_n | 38.12 | 11.847667 | 1136 | |
| 20-21/11/2009 | 215_n | 38.145333 | 11.765667 | 1211 | O; N |

6.2.5 Sicily Strait

CTD casts, ADCP routes and box corer casts have been acquired in the area of the Sicily Strait and two moorings recovered and re-deployed (C01 and C02, see the following section). The data have been used to verify the forecast circulation numerical model in the Sicily Strait in the framework of several projects and for climatological studies.

Unfortunately the planned Lybia transects have been cancelled as the expected permissions from Lybia were not available in time.

Maps and table follow:

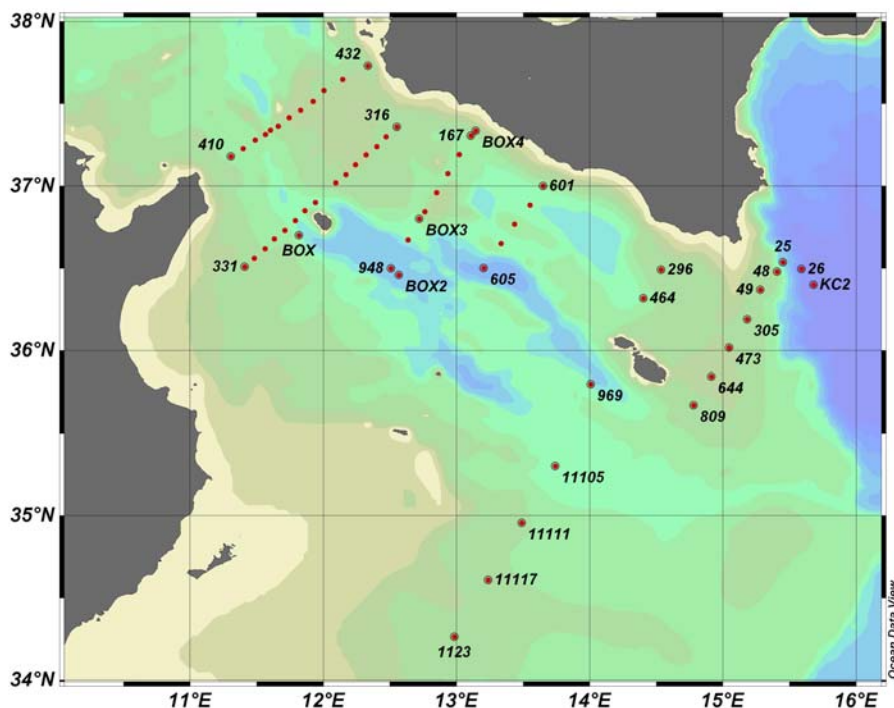


Figure. The CTD and BOX stations in the Sicily Channel

Cruise report – SICILY09

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 07/11/2009 | 405 | 37.647667 | 12.144333 | 96 | E |
| 07/11/2009 | 406 | 37.581 | 12.0045 | 146 | E |
| 07/11/2009 | 410 | 37.180333 | 11.305333 | 249 | E |
| 07/11/2009 | 432 | 37.730167 | 12.333333 | 137 | E |
| 07/11/2009 | 433 | 37.514833 | 11.922 | 105 | E |
| 07/11/2009 | 434 | 37.415 | 11.742667 | 85 | E |
| 07/11/2009 | 436 | 37.2265 | 11.396833 | 413 | |
| 07/11/2009 | 438 | 37.460167 | 11.828833 | 74 | E |
| 07/11/2009 | 451 | 37.339 | 11.6 | 538 | |
| 07/11/2009 | 460 | 37.278833 | 11.486833 | 544 | E |
| 07/11/2009 | 462 | 37.314 | 11.563167 | 90 | |
| 07/11/2009 | 463 | 37.364 | 11.660833 | 93 | E |
| 12/11/2009 | BOX | 36.69988 | 11.8168 | 620 | B |
| 12/11/2009 | 328 | 36.680133 | 11.630067 | 350 | B |
| 12/11/2009 | 317 | 37.299833 | 12.4695 | 148 | E |
| 12/11/2009 | 318 | 37.239833 | 12.401 | 130 | E; N |
| 12/11/2009 | 319 | 37.19 | 12.319833 | 84 | E; N; B |
| 12/11/2009 | 320 | 37.13 | 12.24 | 89 | |
| 12/11/2009 | 321 | 37.0695 | 12.1695 | 93 | E; N |
| 12/11/2009 | 322 | 37.019333 | 12.091167 | 124 | |
| 12/11/2009 | 316 | 37.36 | 12.550667 | 163 | E; N |
| 13/11/2009 | 324 | 36.8995 | 11.939667 | 579 | E; N |
| 13/11/2009 | 325 | 36.849667 | 11.860667 | 482 | E; N |
| 13/11/2009 | 326 | 36.789833 | 11.789667 | 697 | E; N |
| 14/11/2009 | 167 | 37.306167 | 13.106833 | 287 | E |
| 14/11/2009 | 327 | 36.729833 | 11.710167 | 350 | E; N |
| 14/11/2009 | 328 | 36.679333 | 11.630333 | 355 | |
| 14/11/2009 | 329 | 36.619667 | 11.560833 | 297 | E; N |
| 14/11/2009 | 330 | 36.56 | 11.48 | 238 | |
| 14/11/2009 | 331 | 36.509833 | 11.409667 | 151 | E; N |
| 14/11/2009 | 614 | 36.844833 | 12.762 | 133 | |
| 14/11/2009 | 781 | 36.672167 | 12.634 | 739 | E |
| 14/11/2009 | 948 | 36.499833 | 12.506167 | 1310 | E |
| 14/11/2009 | BOX 1 | 36.458233 | 12.56665 | 1278 | B |
| 14/11/2009 | BOX 2 | 36.8 | 12.72 | 487 | B |
| 14/11/2009 | BOX 3 | 37.335933 | 13.144433 | 88 | B |
| 15/11/2009 | 275 | 37.191333 | 13.021 | 484 | E |
| 15/11/2009 | 296 | 36.4905 | 14.536167 | 157 | E; B |
| 15/11/2009 | 386 | 37.076333 | 12.934833 | 369 | |
| 15/11/2009 | 464 | 36.317 | 14.403 | 463 | E |
| 15/11/2009 | 500 | 36.959833 | 12.849 | 94 | E |
| 15/11/2009 | 601 | 36.999 | 13.648167 | 461 | E; N |

| | | | | | |
|------------|-------|-----------|-----------|------|------|
| 15/11/2009 | 602 | 36.883667 | 13.550833 | 739 | E |
| 15/11/2009 | 603 | 36.768167 | 13.435167 | 324 | E |
| 15/11/2009 | 604 | 36.649833 | 13.333833 | 606 | E |
| 15/11/2009 | 605 | 36.501833 | 13.2035 | 1711 | E |
| 16/11/2009 | 11105 | 35.3025 | 13.741 | 575 | E |
| 16/11/2009 | 11111 | 34.956167 | 13.487667 | 122 | E |
| 16/11/2009 | 11117 | 34.609833 | 13.236333 | 252 | E |
| 16/11/2009 | 969 | 35.799 | 14.007333 | 1043 | E |
| 16/11/2009 | 1123 | 34.2641 | 12.984067 | 125 | E; B |
| 16/11/2009 | BOX 4 | 35.125633 | 14.002383 | 598 | B |
| 17/11/2009 | 809 | 35.67185 | 14.779933 | 134 | E |
| 17/11/2009 | 644 | 35.8448 | 14.912933 | 94 | E; B |
| 17/11/2009 | 473 | 36.01765 | 15.046633 | 96 | E; B |
| 17/11/2009 | 305 | 36.190583 | 15.181167 | 129 | E |
| 17/11/2009 | 49 | 36.369767 | 15.279817 | 143 | E; B |
| 17/11/2009 | 48 | 36.479833 | 15.405083 | 136 | E |

6.2.6 Ionian Sea

Three CTD casts (KC” have been repeated twice), ADCP routes and the attempt to recover some instruments from the station KC2 have been realised.

The three CTD casts have been realised as extension in the Ionian Sea of the transect 809-48 in order to verify the numerical model response at the across a front.

The instruments were moored in a previous cruise at the point named KC2, but problems incurred and have been never recovered. Now the attempt have failed.

Maps and table follow:

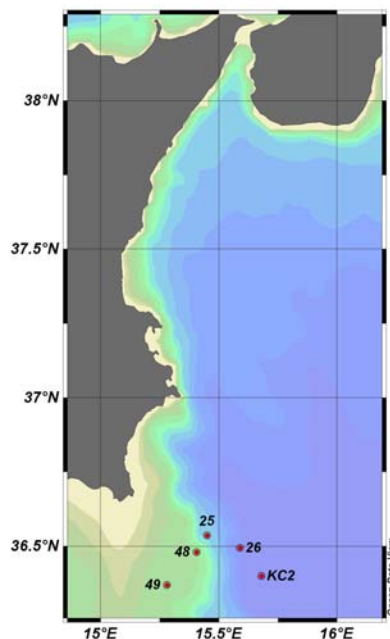


Figure. The CTD and BOX stations in the Sicily Channel

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 17/11/2009 | 25 | 36.536533 | 15.449867 | 1079 | E; B |
| 17/11/2009 | KC2 | 36.399467 | 15.678983 | 3384 | E; O |
| 18/11/2009 | KC2up | 36.400167 | 15.678333 | 3383 | E |
| 18/11/2009 | 26 | 36.494433 | 15.588817 | 1909 | E |

6.3 Moorings

6.3.1 Corsica Channel

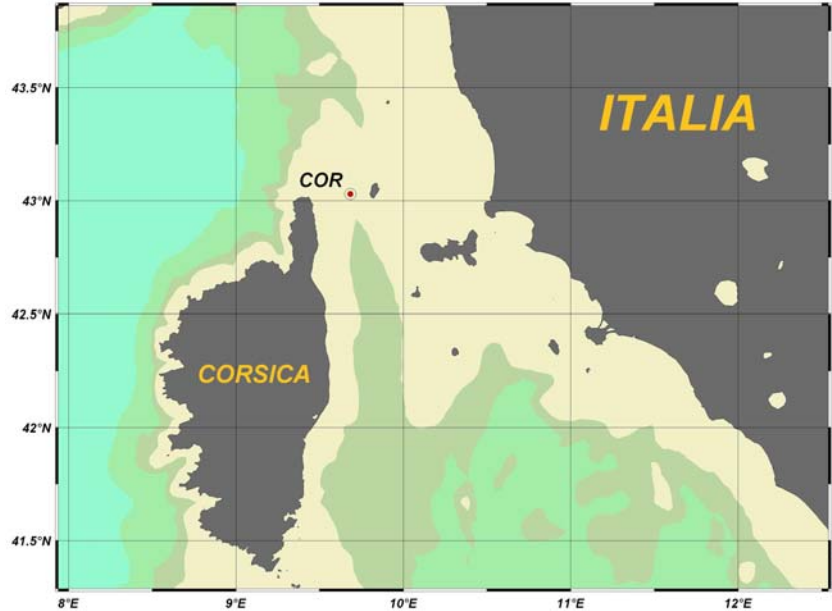


Figure. Location of the COR mooring in the Corsica Channel

In the following table the coordinates of the mooring are shown:

| mooring | Longitude [° 'E] | Latitude [° 'N] | Bottom [m] | Date [dd/mm/yy] | Mooring length [m] |
|---------|------------------|-----------------|------------|-----------------|--------------------|
| COR | 009 41.123 | 43 01.766 | 447 | 31/10/2009 | 378 |

The mooring was structured (see figure), from the top to the bottom, with a buoy with satellite Argos SMM 2000X ID transmitter.

Then these instruments follow (figure below): a floating buoy Billing <37 inches in diameter, two mechanical correntmeters RCM7, two acoustics currentmeters RCM9, one CTD SBE37, 7 floating buoys of 17 inches in diameter, one double underwater acoustic release Edge Tech 8202. Instruments and floats are then kept together by a 10 mm Kevlar or a 14 mm poliester cable, by a 14 mm chain moored to the bottom through two 300 kg train wheels.

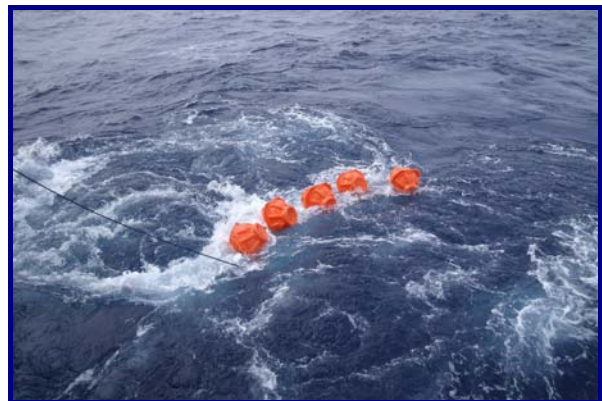
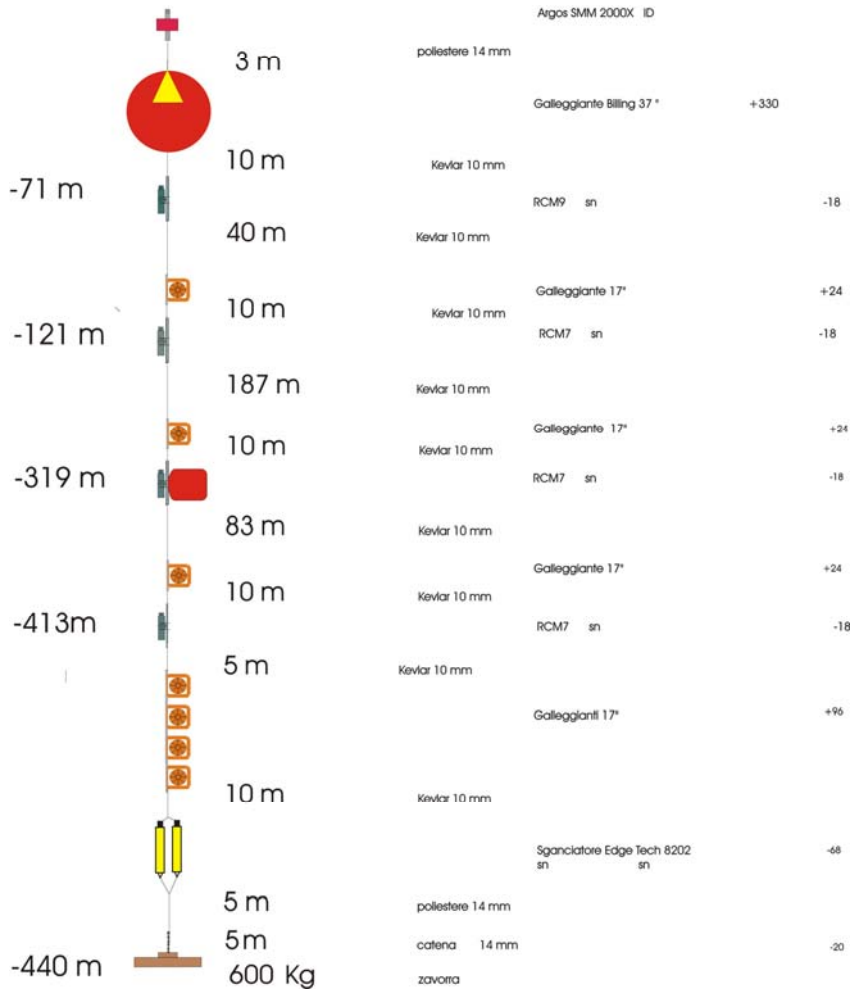


Figure. Two images of the mooring: acoustic releases (left), five orange underwater floats (right).

C. DI CORSICA

Latit.:
 Long.:
 Data :
 Prof. : 440
 Pos : Canale Corsica

Figure 6.3.2.2. Structure of the mooring COR in the Corsica Channel



6.3.2 Sicily Strait

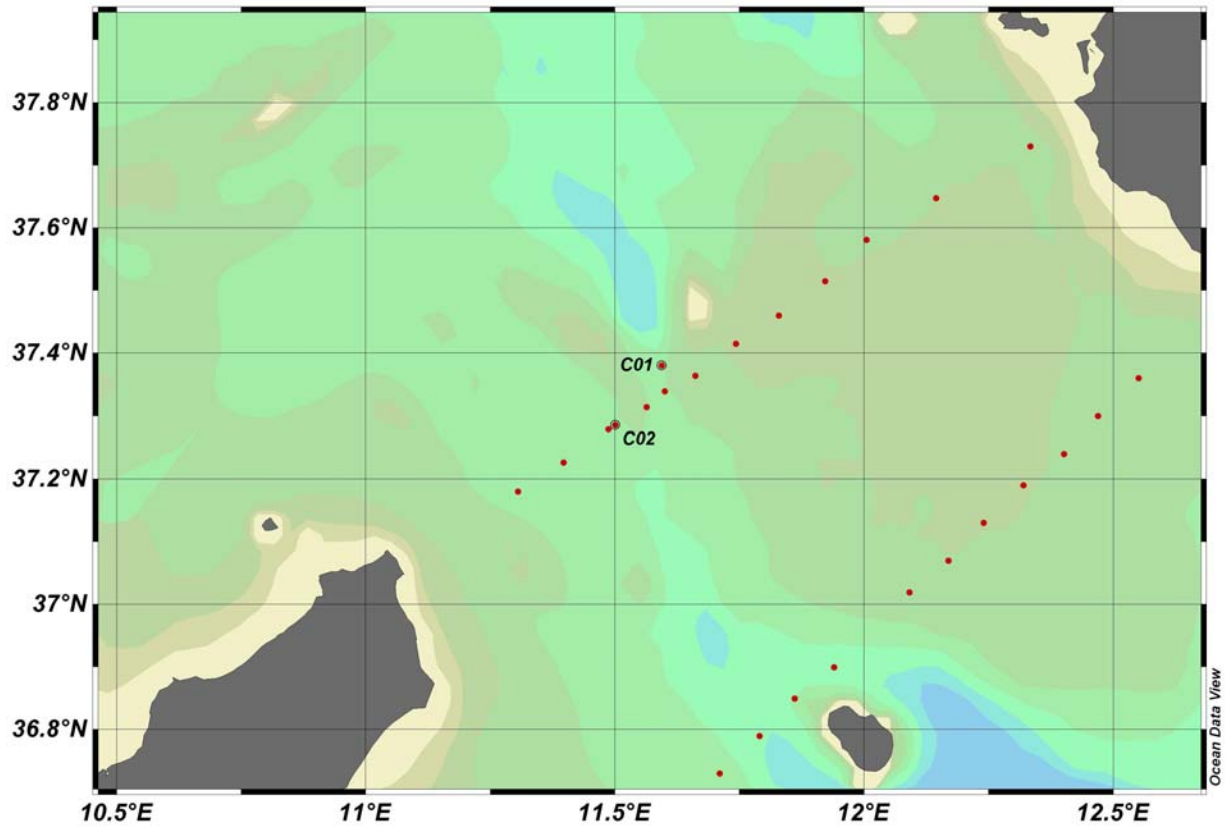


Figure. Location of the C01 and C02 moorings in the Sicily Strait

In the following table the coordinates of the moorings are shown:

| mooring | Longitude [° 'E] | Latitude [° 'N] | Bottom [m] | Date [dd/mm/yy] | Mooring length [m] |
|---------|------------------|-----------------|------------|-----------------|--------------------|
| C01 | 011 35.636 | 37 22.836 | 457 | 13/11/2009 | 383 |
| C02 | 011 30.019 | 37 17.120 | 536 | 13/11/2009 | 287 |

The two moorings were structured (see figure 6.3.2.) with:

- C01: a buoy with satellite Argos SMM 2000X ID transmitter, a syntathic floating buoy with RDI ADCP Workhorse Long Ranger 75kHz, a syntathic floating buoy, a mechanical correntmeters RCM7, one CTD SBE19 plus and one SBE37 MicroCat, 6 floating buoys of 17 inches in diameter, two underwater acoustic releases Edge Tech 8202.

- C02: a syntathic floating buoy with ADCP Nortek 6020, a syntathic floating buoy, a buoy with satellite Argos SMM 2000X ID transmitter, a mechanical correntmeters RCM7, a Nortek Aquadop 20409 currentmeter, one CTD SBE37, 5 floating buoys of 17 inches in diameter, one underwater acoustic release Edge Tech 8202.

Instruments and floats are then kept together by a 10 mm Kevlar or a 14 mm poliester cable, by a 14 mm chain moored to the bottom through two 350 kg train wheels.

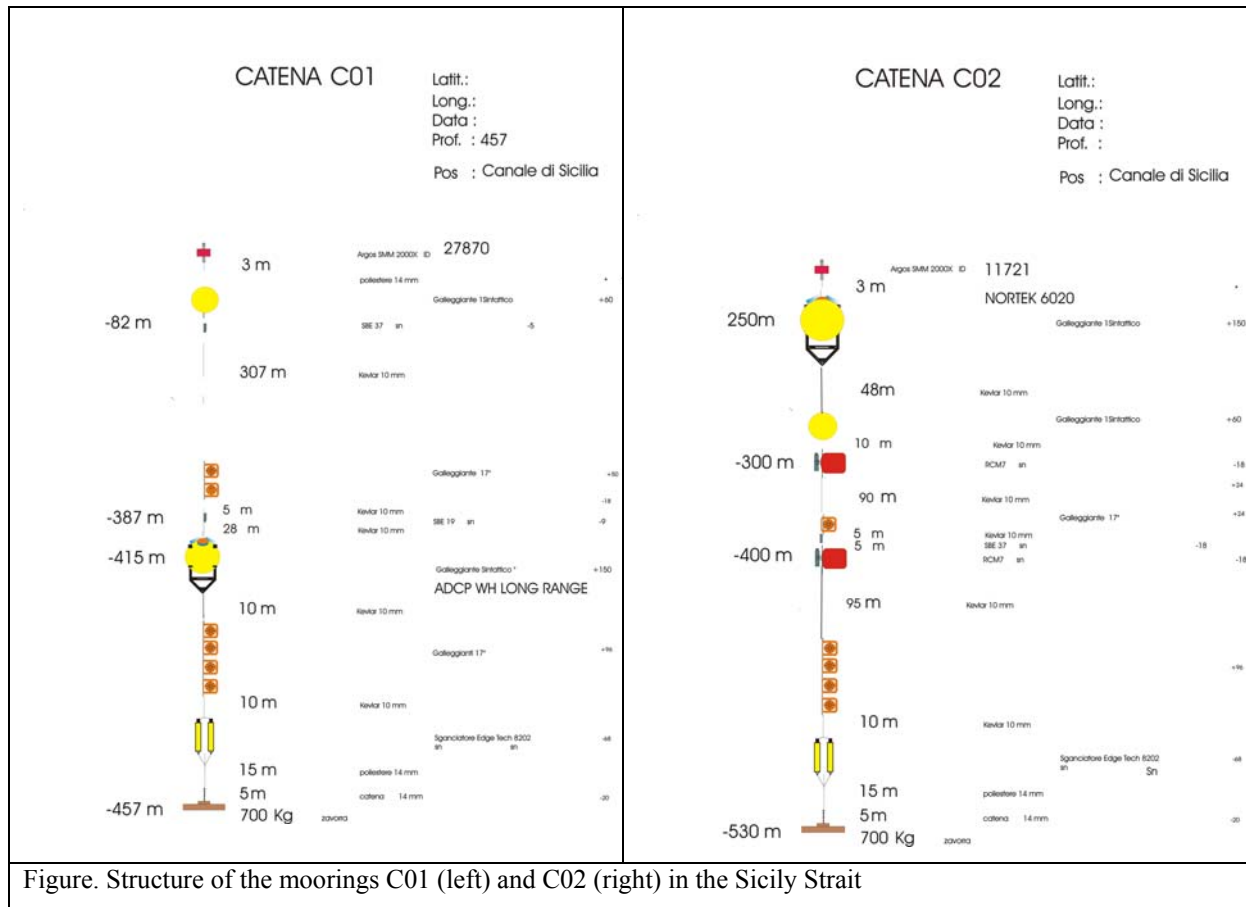
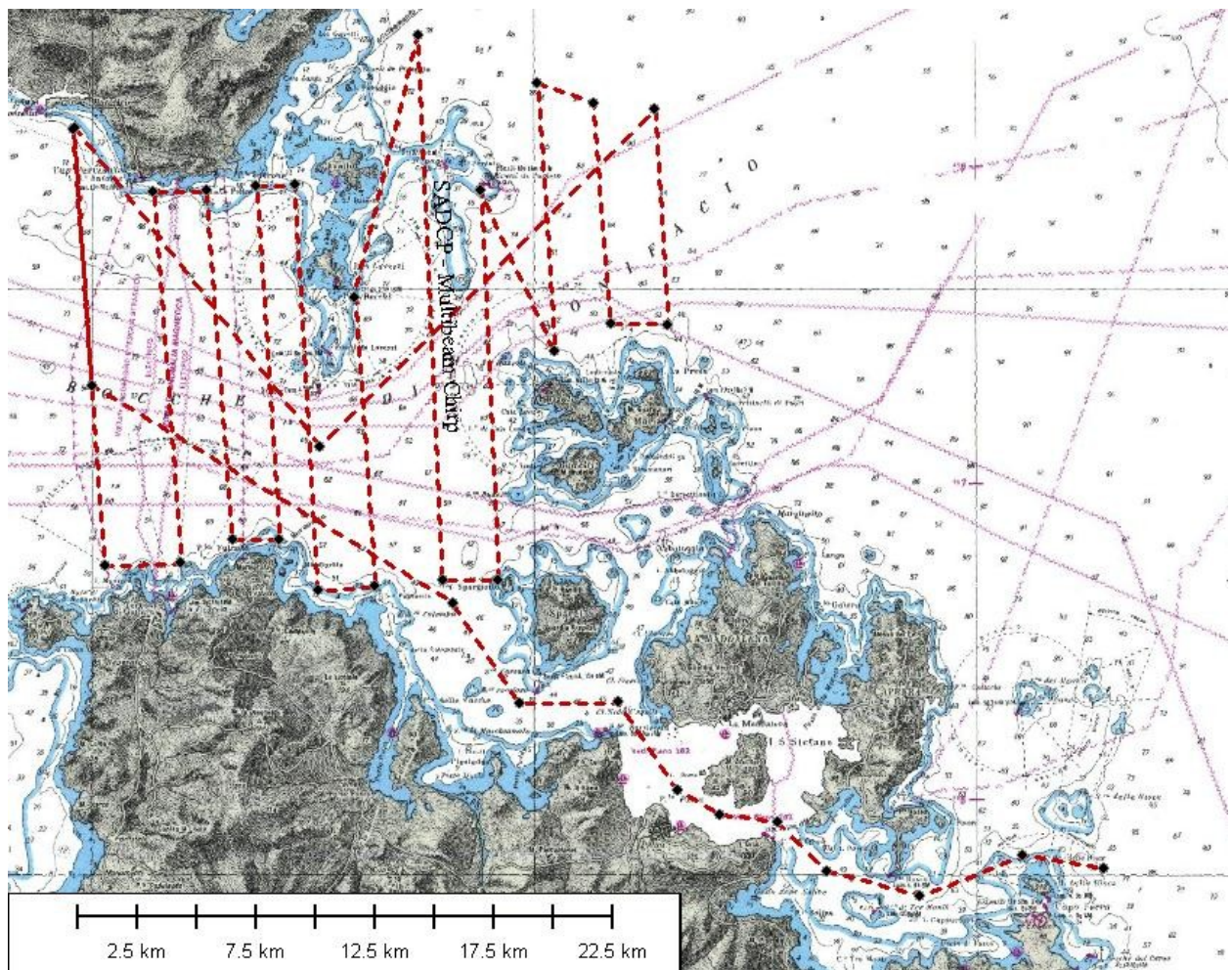


Figure. Structure of the moorings C01 (left) and C02 (right) in the Sicily Strait

6.4 Chirp and Multibeam in the Bonifacio Mouth

During the whole cruise SADC data have been recorded by using an RDI Workhorse 300 kilohertz and an RDI Ocean Surveyor 75 kilohertz. Inside the Bonifacio Mouths and La Maddalena Archipelago multibeam and chirp data have been recorded as visible in the picture below.

The vessel speed was about 5-6 knots. The acquisition started in the Tyrrhenian Sea to the Corsica Sea.



Figure– SADC (RDI Workhorse 300 kilohertz), multibeam and chirp lines of acquisition

6.5 Characterization of bathyal macrofauna

On 12 stations (see table and figure below), each repeated at least 5 times, box corer operations have been realized in order to acquire the superficial sediment to be analysed for bathyal macrofauna. The first 20-30 centimeters of the sediment in the box-corer were sieved using a 0,5 mm and 0,3 mm sieving in order to collect all macrobenthic organisms. Before sieving a visual observations of the surface cores was regularly performed and the organisms

were immediately picked. All the macrofauna was preserved in 10% buffered formalin with Bengal Rose and then transferred to 80% alcohol. After a preliminary and quick sorting, all macrofauna found seemed to be mainly polychaetes, scaphopods and foraminifera; few molluscs and pteropodes shells.

| Data inizio calata | Stazione | Lat (°N) | Long (°E) | Fondale | Attività |
|--------------------|----------|-----------|-----------|---------|----------|
| 12/11/2009 | BOX | 36.69988 | 11.8168 | 620 | B |
| 12/11/2009 | 328 | 36.680133 | 11.630067 | 350 | B |
| 12/11/2009 | 319 | 37.19 | 12.319833 | 84 | E; N; B |
| 14/11/2009 | BOX 1 | 36.458233 | 12.56665 | 1278 | B |
| 14/11/2009 | BOX 2 | 36.8 | 12.72 | 487 | B |
| 14/11/2009 | BOX 3 | 37.335933 | 13.144433 | 88 | B |
| 15/11/2009 | 296 | 36.4905 | 14.536167 | 157 | E; B |
| 16/11/2009 | 1123 | 34.2641 | 12.984067 | 125 | E; B |
| 16/11/2009 | BOX 4 | 35.125633 | 14.002383 | 598 | B |
| 17/11/2009 | 644 | 35.8448 | 14.912933 | 94 | E; B |
| 17/11/2009 | 473 | 36.01765 | 15.046633 | 96 | E; B |
| 17/11/2009 | 49 | 36.369767 | 15.279817 | 143 | E; B |

A huge quantity of white filter feeding polychaetes characterised the superficial sediment in station 2 and in station 3. A detailed sorting and identification of the organisms will be subsequently made in the laboratory, to estimate the abundance and diversity of the macrobenthic communities.

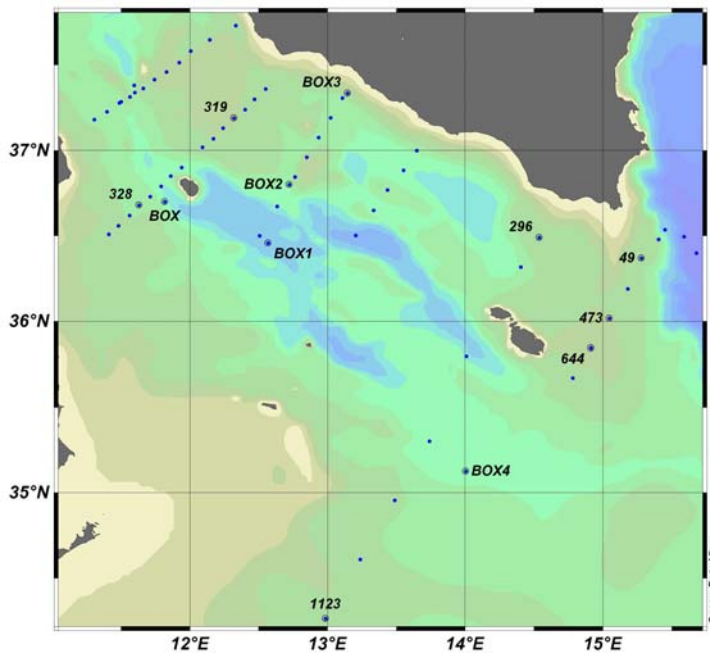


Figure. The Box Corer stations in the Sicily Strait

Each box-corer was sub-sampled using two Plexiglas liners of 5.5 cm for organic matter, prokaryote production and meiofauna and one Plexiglas liners of 3.6 cm for granulometry. Chemical and biological analyses were carried out on three replicates (from independent deployments) at each sampling station. For the heterotrophic prokaryote production the 0-1, 3-5 and 10-15 cm of three liners were immediately used to perform these analyses on board. For the organic matter and prokaryote diversity, sediment corers were sliced into different layers: 0-1, 1-3, 3-5, 5-10 and 10-15 cm and were immediately frozen at -20°C and stored until the analysis. For meiofauna three corers were immediately frozen at -20°C and stored until the analysis. For granulometry three small liners were sliced into different layers: 0-1, 1-3, 3-5, 5-10 and 10-15 cm and stored in plastic jars until the analysis.



6.6 Marine microbiology

In almost all CTD casts water samples (see CTD casts list above) have been realised in order to obtain a water for microbic analyses. Microbes are believed to play a large role in marine environments. Microbial community in deep-sea and along water column has poorly been studied. Exactly there are insufficient information about a possible correlation among water mass, depth, and bacterial community composition (Giovannoni, et al. 2000). This approach is essential to study the role of bacteria in marine ecology and their contribution in nutrient and element cycles.

The aim of this research is the quantitative and qualitative analysis of heterotrophic bacteria distribution in western Mediterranean pelagic waters. Heterotrophic bacteria utilize organic compounds. Most of marine bacteria belongs to this kind of bacteria, such as luminous bacteria.

One of the most important factor in heterotrophic microbial distribution in different sea water is organic compounds concentration, particularly sugars and proteins concentration (Rheinheimer, 1977). Therefore, higher values of microbial density are characteristic of the photic layer.

Another important objective of this study was to characterize microbial communities diversity focusing on the metabolically active fraction of the bacterial populations that occurs in some representative layers of the water column (Surface, 200 m, 500 m, 700 m, 800 m, 1000 m,

1500, 2000 m, Bottom) in the same areas. Pure-culture approach to study microbial world, seriously constrained microbial diversity view because most microbes defy cultivation by standard methods. Numerous studies, based on culture-independent methodology, have been carried out to investigate microbes as key player in many environmental processes in the biosphere (Head et al., 1998; Moeseneder et al., 2005). At the moment, molecular phylogenetic studies applied to microbial ecology are based on the analysis of either DNA or RNA, whereas, simultaneous studies on both types of nucleic acids extracted from the same environment are still scarce (Nogales et al., 1999; 2001; Mills et al., 2005; Moeseneder et al., 2005). To detect bacterial community composition without DNA amplification using 16S rRNA probes we have used CARD-FISH technique, a recently developed catalyzed reporter deposition FISH method that allows the use of oligonucleotide probes (Pernthaler et al., 2002). This approach permits the detection of small marine bacteria with low ribosome content. Eco BIOLOG GN plates were used to characterize the ability of the microbial communities to oxidize various carbon sources. Finally, some enrichments with Crude Oil, PCB and Mercuric Chloride were effected in 5 stations.

In many stations (see table list above) sea water samples at different depth have been collected, according to the physical and chemical survey by Niskin bottles.

Acknowledgements

The scientific/technical personnel embarked for the SICILY09 cruise wishes to thank the Consiglio Nazionale delle Ricerche (CNR) for the availability of the R/V URANIA and the Captain Lubrano Lavadera Vincenzo, the Officers and the Crew of the vessel for their help on board.

A large amount of graphs and data analysis in this report has been done by the freeware software ODV – Ocean Data View realised and updated by Dr R. Schlitzer (<http://www.awi-bremerhaven.de/GEO/ODV/2006>).

The MedCO08 cruise is organised in the framework of international strategies:

- ⇒ **GOOS** (*Global Ocean Observing System*) facing three moments of the operational oceanography: measurements, monitoring and modelling. GOOS is sponsored by: IOC, WMO, UNEP and ICSU.
- ⇒ **MOON** (*Mediterranean Operational Observing Network*) part of the coordinating group of the EuroGOOS Mediterranean Task Team and is responsible of Mediterranean operational oceanography, sea forecast and observation.
- ⇒ **GNOO** (*Gruppo Nazionanle di Oceanografia Operativa*) created to consolidate and coordinate the activities in operational oceanography in Italy.
- ⇒ **MedGOOS** (*Mediterranean Global Ocean Observing System*) an association fundede under the auspices of UNESCO/IOC to give support the the Mediterranean GOOS.
- ⇒ **EuroGOOS** (*European Global Ocean Observing System*) part of the European GOOS. It is a programme between nations to exchanges of data and information at European level.
- ⇒ **MFS** (*Mediterranean Forecasting System*). International project inside GOOS with the objective to give an operational product in the Mediterranean area. Several forecast numerical circulation models have been developed for the western Mediterranean. XBT probes have been furnished as part of the collaboration through the institutes participating at MFS in the frame work of the VOS component (Volunteer Observing Ships) of MFS.

The cruise is also part of the strategy of some CNR institutes in order to analyse hydrological and biogeochemical variabilities as part of the climatic changes. The cruise has been organised in the framework of the following projects:

- ⇒ **ECOOP - European COastal-shelf sea OPerational observing and forecasting system** (European IP);
- ⇒ **MyOcean**, (European IP);

- ⇒ **SESAME - Southern European Seas: Assessing and Modelling Ecosystem changes** (European IP);
- ⇒ **PRIMI - Progetto Pilota Inquinamento Marino da Idrocarburi**, financing ASI;
- ⇒ **VECTOR: VulnErabilità delle Coste e degli ecosistemi marini italiani ai cambiamenti climaTici e loro ruolo nei cicli del caRbonio mediterraneo** subproject DIVCOST;
- ⇒ **MaGIC: Marine geohazard along the Italian coast.**