Consiglio Nazionale delle Ricerche - IAMC

Consiglio Nazionale delle Ricerche - ISMAR

ICHNUSSA13 Cruise Report

15 – 29 October 2013

Edited by D. Canesso and M. Borghini

Consiglio Nazionale delle Ricerche - ISMAR

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Institut Français de Recherche pour l'Exploitation de la Mer - IFREMER

Laboratoire d'Océanographie et du Climat - LOCEAN

Institut National des Sciences et Technologies de la Mer - INSTM

Università di Genova

Universitat de Barcelona

Consiglio Nazionale delle Ricerche

Contents

Cruise Details

NAME	*ICHNUSSA13*
DATE	*15 – 29 October 2013*
STUDY AREA	*WESTERN IONIAN SEA* *TYRRHENIAN SEA* *SARDINIAN SEA/CHANNEL* *SICILY CHANNEL* *CORSICA CHANNEL* *ALGERIAN BASIN*
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Scientific Objectives

This report presents the preliminary results obtained during the ICHNUSSA13 cruise, carried out from 15th to 29th October 2013, on board of the Italian R/V URANIA in the Southern Western Mediterranean Sea and in the Sardinian, Sicily and Corsica Channels.

The sampling plan of the ICHNUSSA2013 proposes the route already covered in previous cruises since 2000 like those MedGOOS, MedCO, MedOC, Bonifacio2011 and ICHNUSSA2012 to acquire data for the activities of Cal / Val of oceanographic forecasting numerical models at different scales. Then the aim is also to study the inter-annual variability of biogeochemical and physical properties of the water masses in crucial areas for understanding the circulation and exchange between basins, in particular the transport of heat and salt in the western Mediterranean. In particular, we want to study the exchange between the western and eastern Mediterranean and the waters recirculating or formed in the Algerian-Provençal basin (like the new deep water in the Gulf of Lions) and along the transect Sardinia-Balearic islands. Then we want to monitor characteristics and distribution of the new western Mediterranean deep water and its possible effects on the general circulation of the Mediterranean.

More in detail, the oceanographic cruise is planned in order to collect an oceanographic dataset in areas of interest (Algerian-Provencal sub-basin, the area between Sardinia-Sicily-Tunisia and along the western Sardinian platform) to:

i) monitor the physical characteristics of the new deep waters recently formed in the western Mediterranean;
ii) evaluate the transport of water, salt and heat in the western Mediterranean and analyze whether the inter-annual variability of water mass properties are due to climate change;
iii) ordinary maintenance of deep water currentmeters chains for the inclusion of the data in a 20 years old CNR dataset;
iv) initialize, calibrate and validate operational hydrodynamic models at different scales with in situ and satellite data;
v) quantify turbulence in the western Mediterranean Sea in various environments (flow through straits/constrictions/sills, internal waves, double diffusion, ...) through the VMP-6000 profiler.

Scientific Background

Oil pollution is a major cause of concern for the health of the marine ecosystem and has a strong impact on the economy. Many scientists and researchers (NRC, 1985; GESAMP, 1990, 1993) agree that the main anthropogenic flows of oil pollution in the marine environment come from land-based sources (refineries, municipal waste, rivers runoff, etc.) and transport activities (tankers). Even if the Mediterranean Sea represents less than 1% of global sea surface, the oil tanker traffic reaches 20% of the total traffic.

Despite a downward trend in the injection of oil spills in the marine environment (GESAMP , 1993) in some regions (including the Mediterranean Sea), some estimates indicate that the annual marine pollution can reach 7.3 million tons (Panov et al., 1988; GESAMP, 1994), without taking into account accidental spills that have already occurred several times in the past. We can remember at least four recent oil tankers incidents such as Exxon Valdez in Alaska in 1989 (40.000 tons), Haven in Liguria in 1991 (10.000 tons), Braer near the Shetland Islands in 1993 (85.000 tons) and Erika in 1999, which contaminated more than 400 km of French Atlantic coast.

The events of the Prestige oil tanker in 2002 and the BP Deepwater Horizon platform in 2010 have largely demonstrated the need of an efficient prediction system for the management of such emergency situations. In the context of European activities on ocean forecasting for oil spill emergency management, the European project **MEDESS - 4MS** (Mediterranean Decision Support System for Marine Safety), is dedicated to the prevention of maritime risks and to the safety enhancement in relation to oil spill pollution in the Mediterranean Sea. This project is financed by ERDF through the MED Programme for the period 2012-2015 and with the participation of the Italian Coast Guard. MEDESS - 4MS will deliver an operational forecast system based on integrated oil spills models for the Mediterranean Sea, connected to the existing monitoring platforms (CSN, AIS). This service will use well-known systems for oil spill modeling, data from the Marine Core Service (MCS) of GMES and oceanographic forecast from national systems. The CNR is participating in this project with two institutions: IAMC of Oristano for the numerical prediction and ISAC Roma for remote sensing.

In the areas affected by ICHNUSSA2013, oceanographic forecasting systems are currently operating at sub - basin and coastal scale for the western Mediterranean Sea and the Strait of Sicily (www.seaforecast.cnr.it). These predictions up to 3-5 days for the state of the sea and the main oceanographic parameters in 3D will be daily used in the different active projects of the section. Therefore one of the goals of ICHNUSSA2013 will be the acquisition of oceanographic data for the activities of calibration/validation (Cal/Val) of numerical prediction systems, as required also in **RITMARE** (SP3-WP4-A6, SP4-WP4-A1 , SP5-WP4-A1 , SP5-WP4-A2, SP5-WP4-A3, SP5-WP4-A4) as part of the project **PON TESSA** funded by MIUR and the European project FP7 **MyOcean2** (Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service). In particular, this latter project is specifically intended to develop, implement, validate and manage a robust and sustainable component of the Monitoring and Forecasting of the oceans within the GMES MCS.

The data acquired by ICHNUSSA2013 will also be used in combination with those of two experiments with Underwater Deep Glider (up to 1000 m) expected in 2012 and 2013 as an external application of the European project JERICO.

ICHNUSSA2013 will be used for studies on climatology, formation and circulation of new types of deep waters, and it's closely connected with the previous MedGOOS, MedOc, MedCO, MedBio and Ichnussa2012 campaigns in which it was analyzed the zonal trend of hydrodynamic and biogeochemical characteristics of mass of waters in the western and central basin.

This campaign will be conducted in the Algerian-Provencal basin (Sardinia Channel and Sea, Balearic Sea, south-west Tyrrhenian Sea) and in the Strait of Sicily, since previous studies have shown that such areas represent a crucial region for the understanding of exchanges between the various sub-Mediterranean basins (Olita et al., 2011a, 2011b; Menna and Poulain, 2010; Roether et al., 2007; Puillat et al., 2006; Ribotti et al., 2004; Schroeder et al., 2006a, 2006b, 2008). In particular, in the MedGOOS, MedOc, Bonifacio2011 and Ichnussa2012 campaigns, we followed the circulation of new deep waters (Schroeder et al., 2006a, 2006b, 2008) in the western Mediterranean Sea until their appearance into the Tyrrhenian basin during the campaigns Bonifacio2011 and Ichnussa2012.

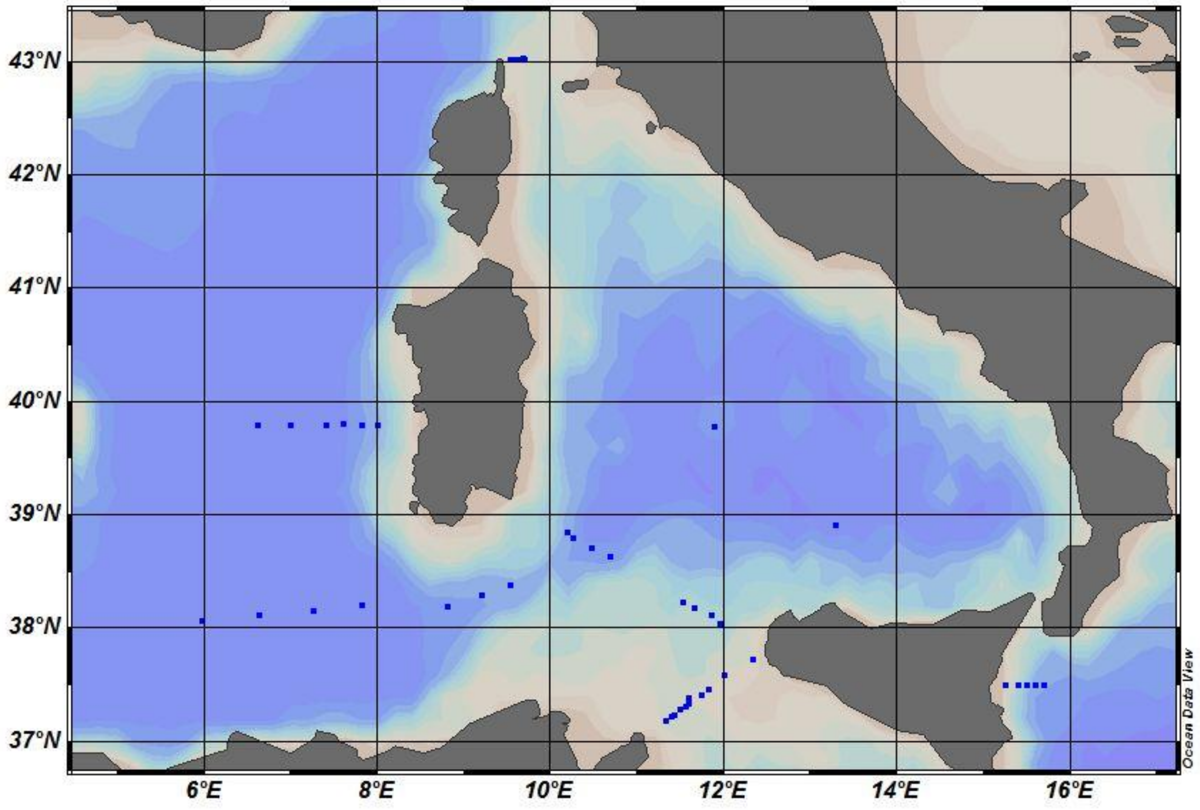


Figure 1. Study area

Cruise Plan

The following table 1 summarizes the parameters that have been measured and the groups involved in the sampling operations, while table 2 lists the sampling equipment and the methods of analysis.

Parameters	Working Group
CTD/O2/Fluorescence/Trasmissometer/Rosette	CNR-ISMAR-IAMC
Salinity	CNR-ISMAR-IAMC
Dissolved Oxygen	CNR-ISMAR-IAMC
Nutrients	CNR-ISMAR-IAMC
Lowered ADCP	CNR-ISMAR
Vessel Mounted ADCP	CNR-ISMAR
Visual surveys of floating object	CNR-ISMAR
Vertical Microprofiler (VMP)	IFREMER and LOCEAN
Autotrophic pigments – POM N-Inorganic nutrients	Università di Genova

Table 1. Measured parameters

Instruments	
Small-Volume Sampling	General Oceanics 24-place rosette with 12-liter bottles
CTD System	CTD SBE 911 plus
Salinometer	Portasal Guildline
Dissolved Oxygen	Winkler titration
Nutrients	Samples only, no on board analyses
Fluorimeter	AQU A^{traka} MK III
Vessel Mounted ADCP	RDI WH 300 kHz, RDI OS 75 kHz
Lowered ADCP	RDI WH 300 kHz
Autotrophic pigments – POM N-Inorganic nutrients	Spectrofluorometer Perkin Elmer LS50B, filtration devices, centrifuge
Microstructure Vertical Profiler	Rockland Scientific VMP-6000

Table 2. Sampling equipment and analysis methods

The cruise was planned to spend 15 days at sea. The geographic boundaries of the survey are 37.0 °N – 43.1 °N latitude and 5.5 °E – 16 °E longitude. The cruise track is shown in figure 4, the station list is shown in table 3.

Cruise Maps

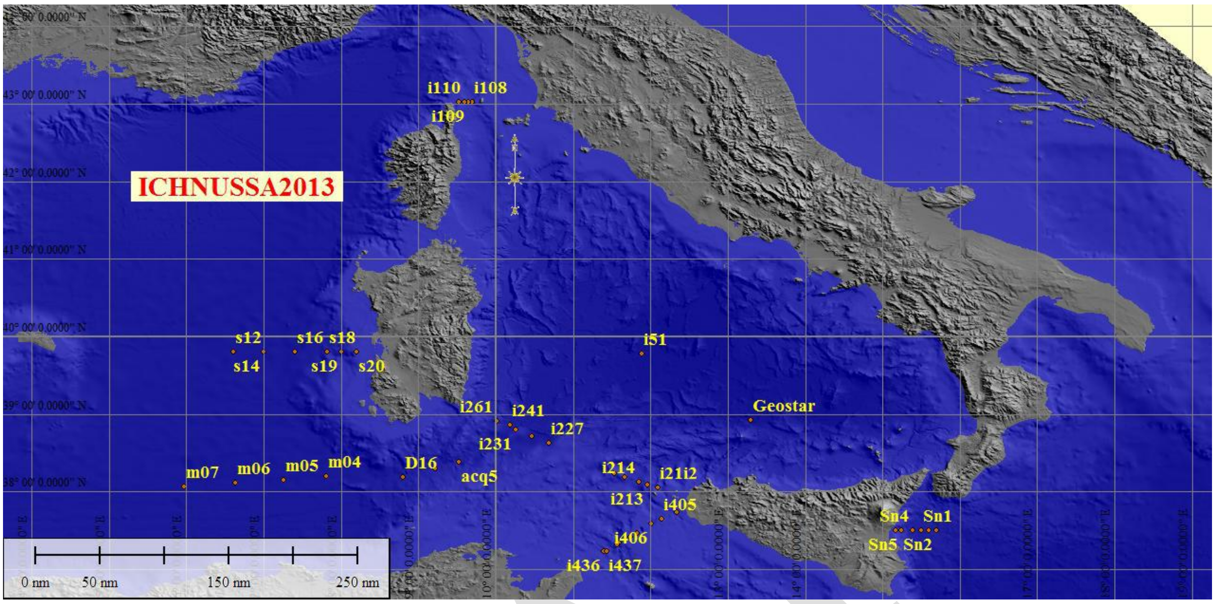


Figure 2. Stations map

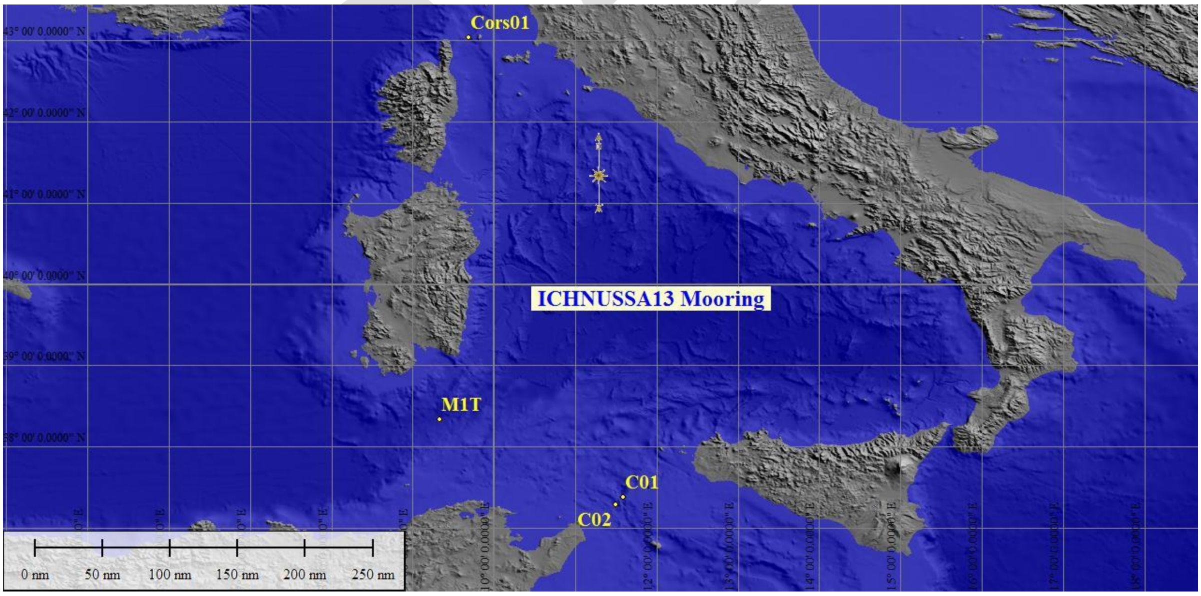


Figure 3. Moorings map

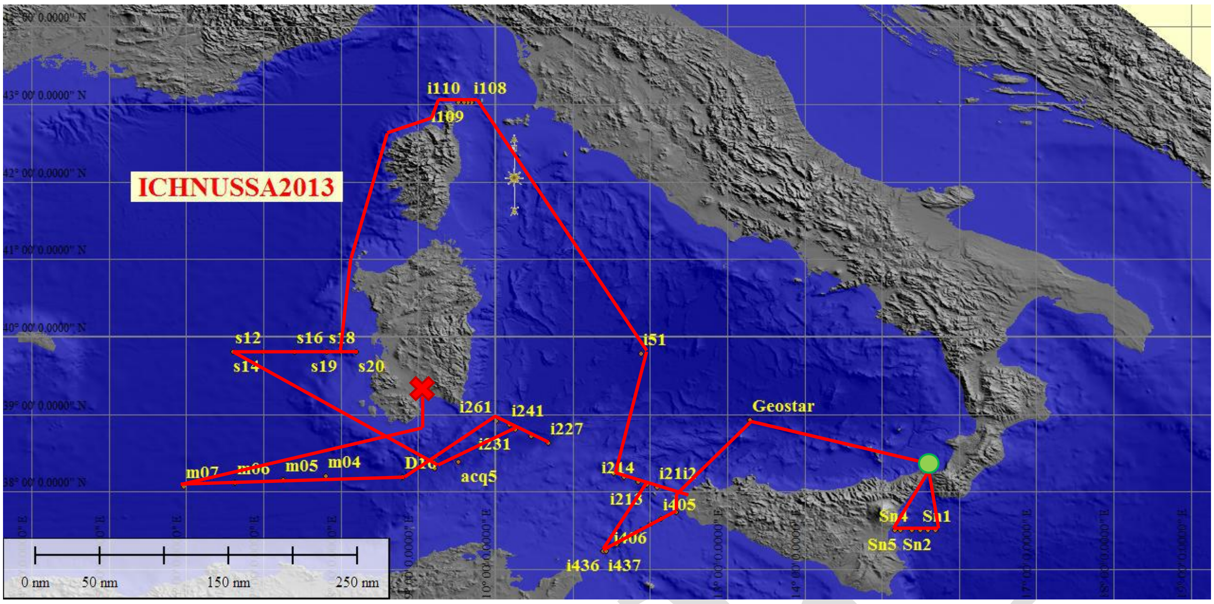


Figure 4. Cruise track

Cruise Stations

Station	Date	Latitude	Longitude	Bottom Depth	Activity
i108	22/10/2013	43.024167	9.698167	435	CTD – LADCP – Nutrients
i109	22/10/2013	43.024667	9.643	358	CTD – LADCP – Nutrients VMP
i110	22/10/2013	43.0265	9.598833	221	CTD – LADCP – Nutrients
i111	22/10/2013	43.026167	9.525167	54	CTD – LADCP – Nutrients
cors01	22/10/2013	43.029667	9.6865	440	CTD – LADCP – Nutrients VMP – Mooring recovery and deployment
i212	19/10/2013	38.049167	12.097833	142	CTD – LADCP – Nutrients
i213	19/10/2013	38.042667	11.962167	465	CTD – LADCP – Nutrients VMP
i214	19/10/2013	38.117167	11.851	1079	CTD – LADCP – Salinity Nutrients – Oxygen – VMP
i217	19/10/2013	38.181167	11.665833	761	CTD – LADCP – Nutrients
i218	20/10/2013	38.234667	11.531	222	CTD – LADCP – Nutrients
i227	25/10/2013	38.632833	10.684167	1563	CTD – LADCP – Salinity Nutrients – Oxygen – VMP

i231	26/10/2013	38.804833	10.258167	2350	CTD – LADCP – Nutrients VMP
i241	26/10/2013	38.856	10.18417	2541	CTD – LADCP – Salinity Chlo – POM/POC-PN – VMP
i296	26/10/2013	38.7135	10.472167	2493	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo POM/POC-PN – VMP
i406	19/10/2013	37.587333	12.005833	156	CTD – LADCP – Nutrients
i410	18/10/2013	37.19	11.330167	296	CTD – LADCP – Nutrients
i432	19/10/2013	37.729167	12.335667	161	CTD – LADCP – Nutrients
i434	18/10/2013	37.4155	11.741667	80	CTD – LADCP – Nutrients
i436	18/10/2013	37.226667	11.396333	408	CTD – LADCP – Nutrients
i437	18/10/2013	37.234	11.433167	436	CTD – LADCP – Nutrients
i438	19/10/2013	37.458833	11.829333	64	CTD – LADCP – Nutrients
i451	18/10/2013	37.34	11.598333	541	CTD – LADCP – Nutrients
i462	18/10/2013	37.314	11.563	85	CTD – LADCP – Nutrients
c01	18/10/2013	37.384667	11.597333	377	CTD – LADCP – Nutrients VMP – Mooring recovery and deployment
c02	18/10/2013	37.292667	11.495167	520	CTD – LADCP – Nutrients VMP – Mooring recovery and deployment
i51	20/10/2013	39.778333	11.889	3540	CTD – LADCP – Salinity Nutrients – Oxygen – VMP
m04	27/10/2013	38.201	7.812833	2793	CTD – LADCP Chlo – POM/POC-PN – VMP
m05	27/10/2013	38.15333	7.263	2846	CTD – LADCP – VMP
m06	27/10/2013	38.11617	6.6365	2849	CTD – LADCP Chlo – POM/POC-PN – VMP
m07	27/10/2013	38.06867	5.9685	2845	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo POM/POC-PN – VMP
s12	24/10/2013	39.799	6.610333	2891	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo POM/POC-PN – VMP
s14	24/10/2013	39.800667	7	2886	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo VMP
s16	24/10/2013	39.799833	7.399667	2808	CTD – LADCP – Nutrients Chlo – VMP
s17	24/10/2013	39.803	7.601333	2318	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo VMP

s18	24/10/2013	39.800667	7.8195	1638	CTD – LADCP – Nutrients Chlo – POM/POC-PN – VMP
s19	24/10/2013	39.799667	8	897	CTD – LADCP – Nutrients VMP
s20	23/10/2013	39.799167	8.200667	103	CTD – LADCP – Nutrients
d16	26/10/2013	38.19171	8.8	2247	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo POM/POC-PN – VMP
acq3	25/10/2013	38.2995	9.211167	2055	CTD – LADCP – Nutrients VMP
acq5	25/10/2013	38.379667	9.527833	2028	CTD – LADCP – Salinity Nutrients – Oxygen – Chlo POM/POC-PN – VMP
sn1	16/10/2013	37.498333	15.496667	2007	CTD – LADCP – Salinity Nutrients – Oxygen – VMP
sn2	15/10/2013	37.501167	15.7	2272	CTD – LADCP – Salinity Nutrients – Oxygen
sn3	16/10/2013	37.5	15.60033	2068	CTD – LADCP – Nutrients
sn4	16/10/2013	37.49917	15.38933	2076	CTD – LADCP – Nutrients
sn5	16/10/2013	37.5	15.248	1115	CTD – LADCP – Nutrients
geostar	17/10/2013	38.916167	13.296833	3511	CTD – LADCP – Salinity Nutrients – Oxygen – VMP
m1t	25/10/2013	38.33283	9.33383	1885	Mooring recovery

Table 3. Station list

Sampling Strategy

The stations have been chosen on historical basis and depending on the needs of the cruise. CTD, LADCP and fluorescence measurements were performed. The hydrological characteristics of the study area have been determined by CTD cast. Sample bottles have been taken in order to determine dissolved oxygen, carbon dioxide, salinity and nutrients, in stations shallower than 500 meters just nutrients were analyzed. In order to achieve information about the spatial variability of this parameters, a high-resolution sampling has been applied at standard depths as we can see in table 4. For a better sampling of the biological and chemical parameters, extra sampling depths were defined in the water column by analyzing the CTD profile during the acquisition.

Level	Standard depths (m)
1	0
2	25
3	50
4	75
5	100
6	200
7	300
8	400
9	500
10	750
11	1000
12	1250
13	1500
14	1750
15	2000
16	2500
17	3000
18	3250
19	3500

Table 4. Standard depths

Onboard Operations

CTD Casts

At every station, pressure (P), salinity (S), potential temperature (θ) dissolved oxygen concentration (DO) and fluorescence were measured with a CTD-rosette system consisting of a CTD SBE 911 plus, and a General Oceanics rosette with 24 Niskin Bottles (12 liters each).
Temperature measurements were performed with a SBE-3/F thermometer, with a resolution of 0.00015 °C/bit at -1 °C or 0.00018 °C/bit at 31 °C, and conductivity measurements were performed with a SBE-4C sensor, with a resolution of 3 x 10^{-4} S/m. Dissolved oxygen was measured with a SBE-43 sensor (resolution 4.3 µM). 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.
The rosette is equipped with a sonar altimeter which intercept the bottom 100-70 meters before getting to it. The altimeter is used just for safety, to avoid the rosette to touch the bottom.

Laboratory: CNR-ISMAR

Oxygen and salinity determination

Salinity samples were collected, stored and analyzed with a Guildline Portasal Salinometer. IAPSO standards were measured to standardize the salinometer.

Dissolved oxygen samples were collected and analyzed using a computer controlled potentiometric end-point titration procedure. Samples are first taken from the sampling bottle with the recommended precautions to prevent any biological activity and gas exchange with the atmosphere and "fixed" immediately after collection, adding manganese (II) and alkaline iodide with semi-automatic dispensers. The bottles are shaken vigorously for about 1 minute to bring each oxygen molecule in contact with the reagents. After fixation the precipitate is allowed to settle down. The samples are stored for a few hours in the dark, avoiding any change of temperature. Before titration the precipitated hydroxides are dissolved with sulfuric acid and the titration is carried out with a standardized thiosulfate solution using a Dosimat Methrom.

Laboratory: CNR-ISMAR

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 (version 10.16) software.

Laboratory: CNR-ISMAR

Inorganic Nutrients

Seawater samples for nutrient measurements were collected at different depths, when the system CTD/rosette was going up, according to the vertical profiles of salinity, potential temperature and dissolved oxygen, recorded in real time. No filtration was employed, nutrient samples were stored at −20°C and nitrate, orthosilicate and ortophosphate concentrations will be determined later in the laboratory, using a hybrid Brän–Luebbe AutoAnalyzer following classical methods (Grasshoff et al., 1983) with slight modifications.

Laboratory: CNR-ISMAR in collaboration with ENEA

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

Visual surveys of floating objects

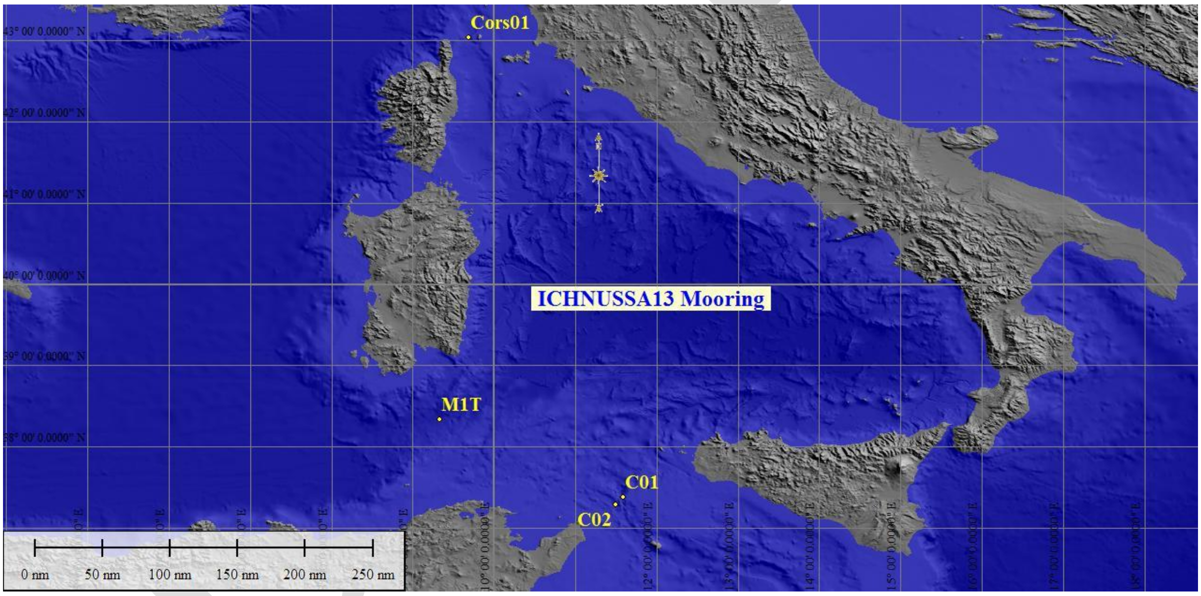
Visual surveys of floating objects have been conducted during regular navigation of the ship between stations in order to give an estimate of the abundance and distribution of floating marine litter on the surface of the Mediterranean sea.
An observer standing on the bearing deck of the vessel surveyed the sea surface from the starboard side of the track-line and recorded GPS position, distance, size and type of all floating objects sighted within a 50 m perpendicular distance from the ship. During the cruise 23 hours of visual observation have been conducted, covering an approximate survey length of 435,5 km. In total 132 floating objects have been sighted. Based on

the number of items counted and the area surveyed (transect width multiplied with transect length), counts of litter at sea will be subsequently used to provide estimates of abundance (numbers of floating items per km^2) following the standardized fixed-width strip transect method.

Laboratory: CNR-ISMAR

Recovery and deployment of moorings

During the cruise four moorings were recovered and three of them were deployed again in their original position. The 18th October we recovered the two moorings in the Sicily Channel: C01 (37.38282 °N, 11.49912 °E) and C02 (37.28600 °N, 11.49912 °E). After maintenance operations they were replaced on 19th October. In the C01 mooring we added a new sediment trap owned by the University of Barcelona.
The 22th October we recovered and replaced the Cors01 mooring in the Corsica Channel (43.02978 °N, 9.68525 °E). In this case we removed from the currentmeter chain the NGK WINCH deployed on 16th June 2013.
The 25th October a Tunisian mooring (M1T, 38.33283 °N, 9.33383 °E) was successfully recovered in the Sardinian Channel after more than two years from deployment.



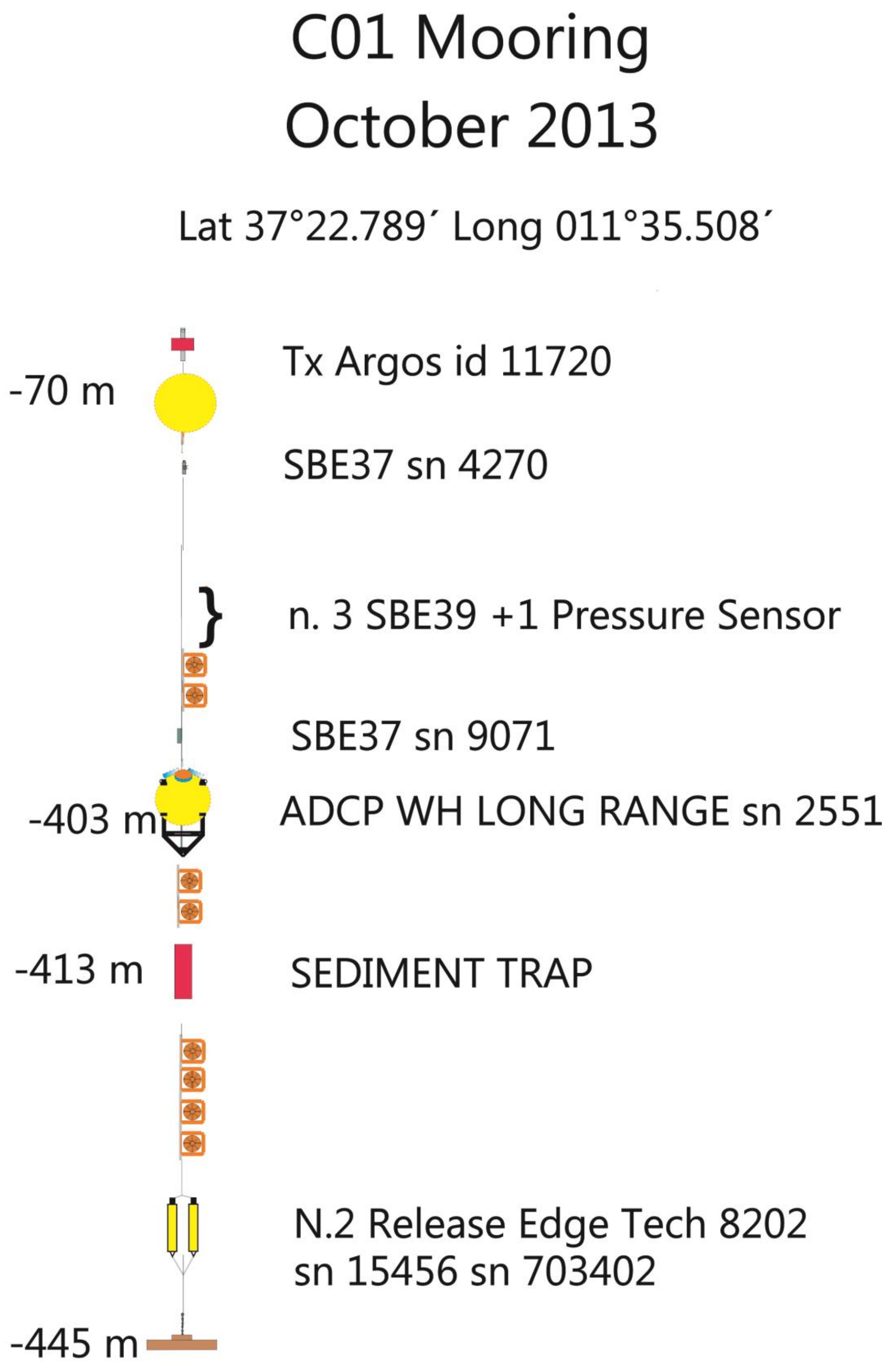


Figure 5. C01 mooring

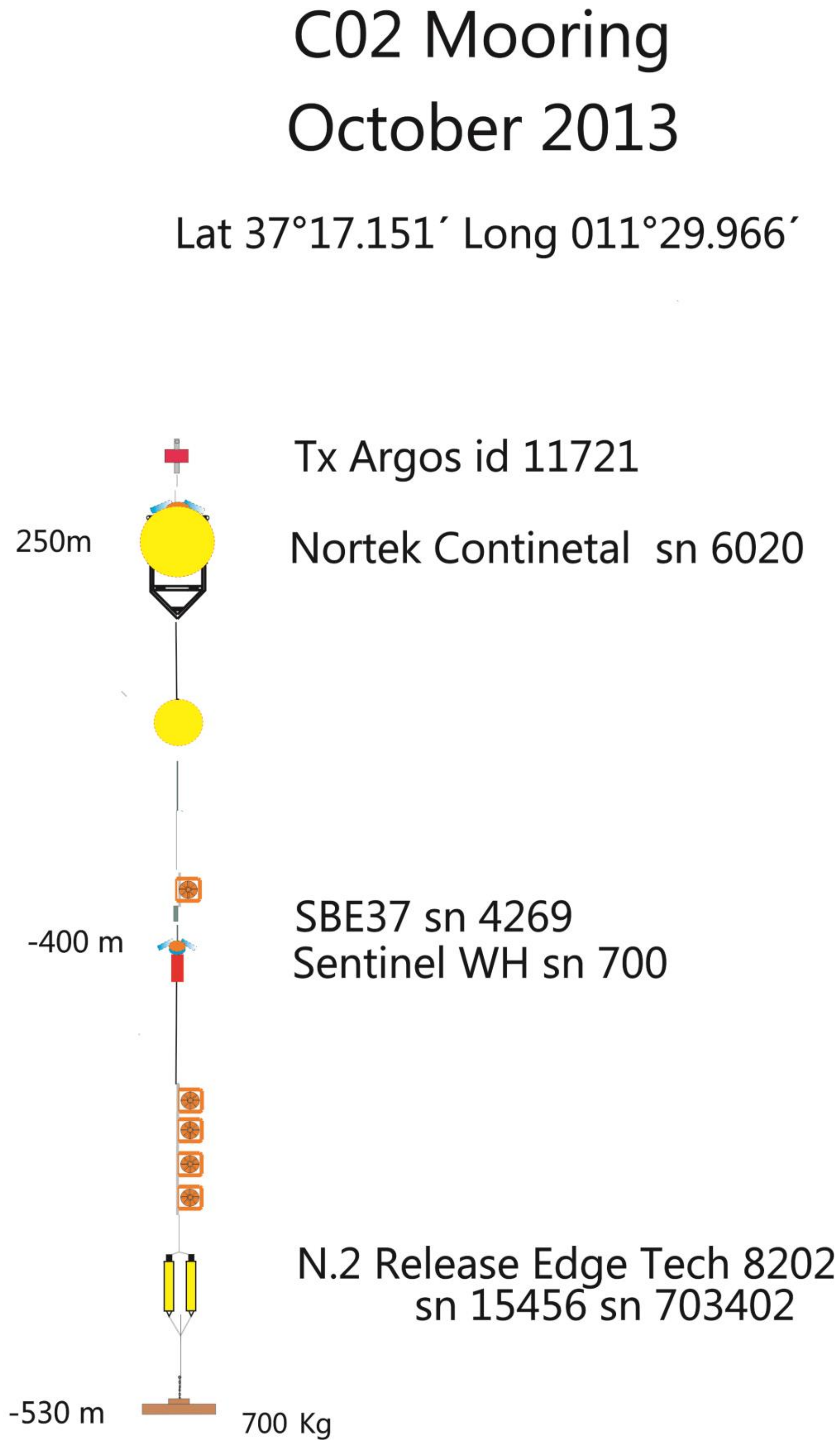


Figure 6. C02 mooring

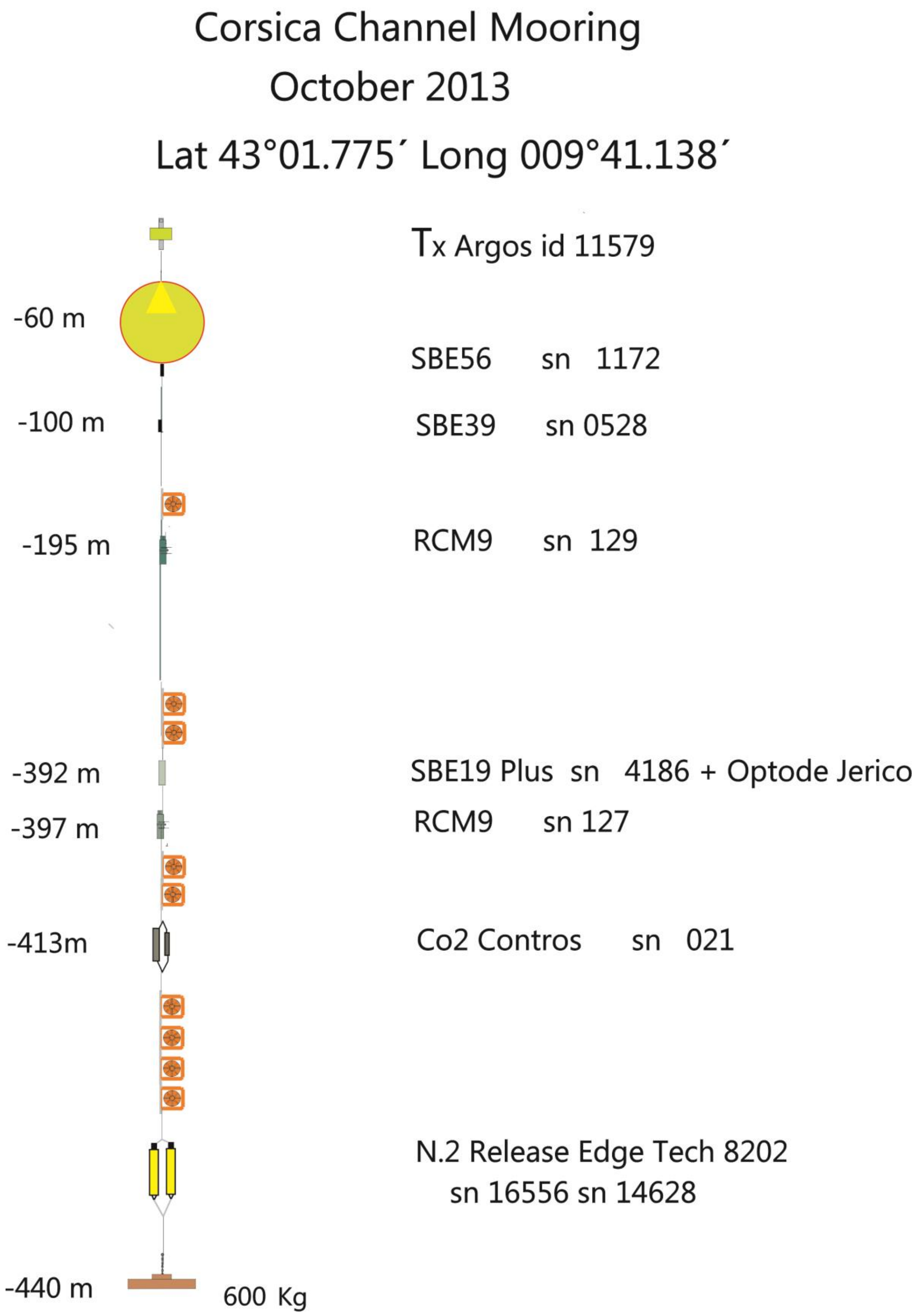


Figure 7. Corso1 mooring

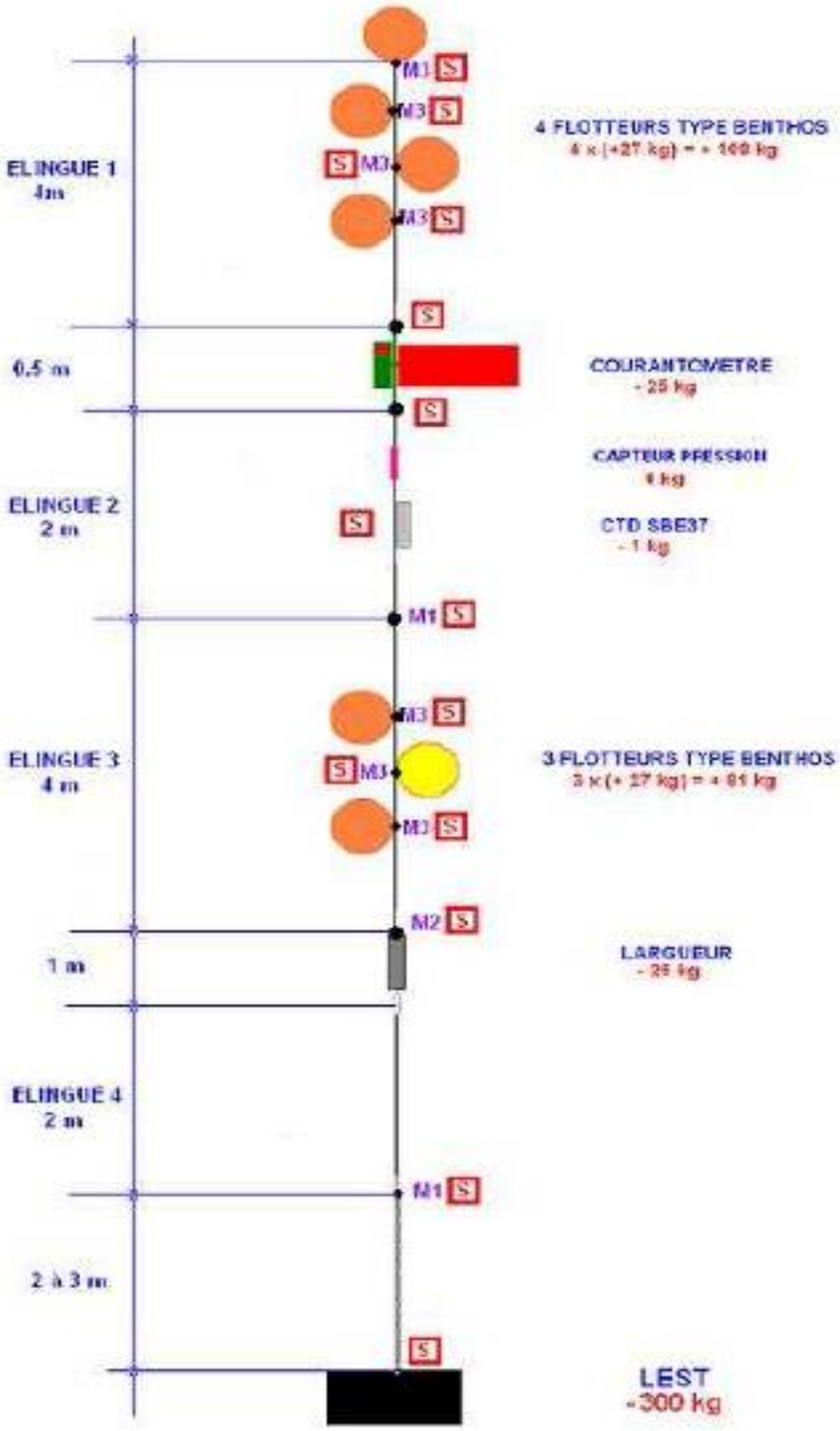
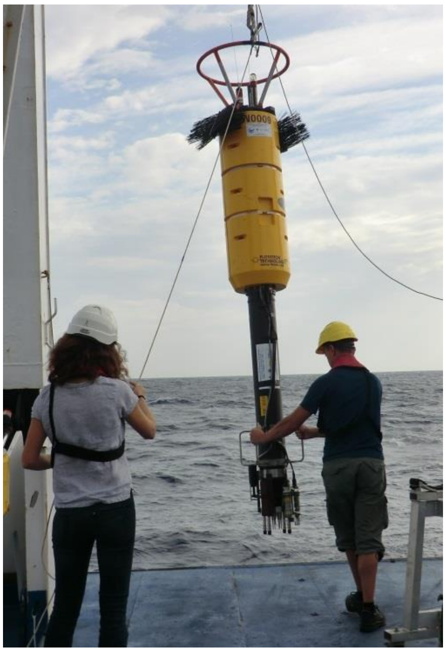


Figure 8. M1T mooring

Vertical microprofiler measurements (VMP)

The VMP-6000 by Rockland Scientific is a full ocean depth profiling system, for measurements of turbulence. This kind of measures are very important in this moment in the Mediterranean since in the 2004-2006 CTD records showed a stair case trend.



The Vertical Microstructure Profiler is an autonomous profiler that measures some parameters of the small scale turbulence during its downcast profile. It is equipped with two shear sensors (SPM-38), two micro-temperature sensor (FP07), one micro-conductivity sensor (SBE-7), three accelerometers, one compass, one Seabird CTD (SBE3F, SBE4C without pump). The high frequency sampling at 512 Hz gives access to centimeter scale fluctuations of the horizontal velocity, temperature and conductivity, thereby resolving partially scales at which dissipation is efficient. Two steel weights are added and are dropped at a prescribed pressure during the downcast. Once dropped, the VMP comes back to the surface thanks to its positive buoyancy. At the surface, the VMP is located with a radio beacon, an Argos beacon, and a strobe light at night.
A total of 26 VMP profiles were gathered during the cruise (see table 5 below). During this cruise, the VMP6000 worked nominally except for a failure of the release at station 3 in the Sicilian Strait.

From station 1 to 14, two brushes were used to slow the VMP down to 0.55 m/s (appropriate where staircases are present like in station d51 for instance). They were removed after VMP station 13 for ship time cost; VMP downcast velocity increased then to ~0.85 m/s. (VMP cast costs ~45 minutes more than CTD cast when depth is about 2800 m with two brushes but 0.55 m/s is OK for depth shallower than ~1000 m to be synchronous with the end of a CTD).

VMP 6000 station # position	**CTD station #**	**Depth (m)**	**Deployment Date Time (TU)**	**Comments**
1 37°30.000'N 15°29.933'E	Sn1	1980	16/10 08:01	In front of Catania Pb w/ sbt: no variation at sea. Cable cleaning.
2 38°54.800'N 13°18.460'E	Geostar	3450	17/10 15:54	Galvanic release broke. Last 800 m missing.
3 37°22.973'N 11°35.521'E	C01 mooring	456	18/10 08:18	Corsice channel mooring. Unexplained - mechanical failure of the release. Release mechanism changed. VMP grounded for 2.5'.
4 37°17.162'N 11°29.948'E	C02 mooring	530	18/10 16:32	µT2 noisy at high frequency but correct at low frequency

5 38°02.300'N 11°57.827'E	213	412	19/10 19:21	North of Marretimo
6 38°07.230'N 11°50.840'E	214	1150	19/10 20:40	North of Marretimo
7 39°46.850'N 11°53.010'E	d51	3485	21/10 20:40	Tyrrhenian Sea
8 43°01.804'N 09°41.072'E	Corso1 mooring	440	22/10 07:24	Middle of Corsica Channel 25 knots SE winds rough sea
9 43° 01.630'N 09°38.508'E	i109	364	22/10 09:18	West side of Corsica channel 25 knots SE winds rough sea
10 39°48.193'N 08°00.260'E	s19	850	23/10 23:42	West of Sardegna μT2 changed for this and coming profiles
11 39°48.294'N 07°49.502'E	s18	1570	24/10 02:04	West of Sardegna 12 knots winds
12 39°48.350'N 07°36.460'E	s17	2290	24/10 04:58	West of Sardegna
13 39°48.178'N 07°23.997'E	s16	2758	24/10 08:15	West of Sardegna
14 39°48.347'N 07°00.022'E	s14	2848	24/10 13:17	West of Sardegna No more brushes for this and coming profiles
15 39°48.029'N 06°36.984'E	s12	2851	24/10 17:09	West of Sardegna
16 38°18.104'N 09°12.874'E	acq3	2028	25/10 12:35	Sardegna passage μT1 changed for this and coming profiles
17 38°22.784'N 09°31.283'E	acq5	2010	25/10 16:00	Sardegna passage
18 38°37.984'N 10°40.791'E	227	1600	25/10 23:56	SE Sardegna transect
19 38°43.003'N 10°27.935'E	296	2460	26/10 02:44	SE Sardegna transect
20 38°48.477'N 10°15.805'E	231	2310	26/10 06:11	SE Sardegna transect

21 38°51.624'N 10°10.849'E	241	2522	26/10 08:26	SE Sardegna transect Exit of Sardegna passage
22 38°11.534'N 08°47.521'E	D16	2261	26/1017:46	Entrance of Sardegna passage
23 38°12.211'N 07°48.455'E	m04	2795	27/10 00:27	Toward Algerian Sea
24 38°09.246'N 07°15.334'E	m05	2845	27/10 5:37 TU	Toward Algerian Sea
25 38°07.096'N 06°38.104'E	m06	2850	27/10 10:33 TU	Toward Algerian Sea
26 38°04.130'N 05°58.160'E	m07	2850	27/10 15:50 TU	Toward Algerian Sea

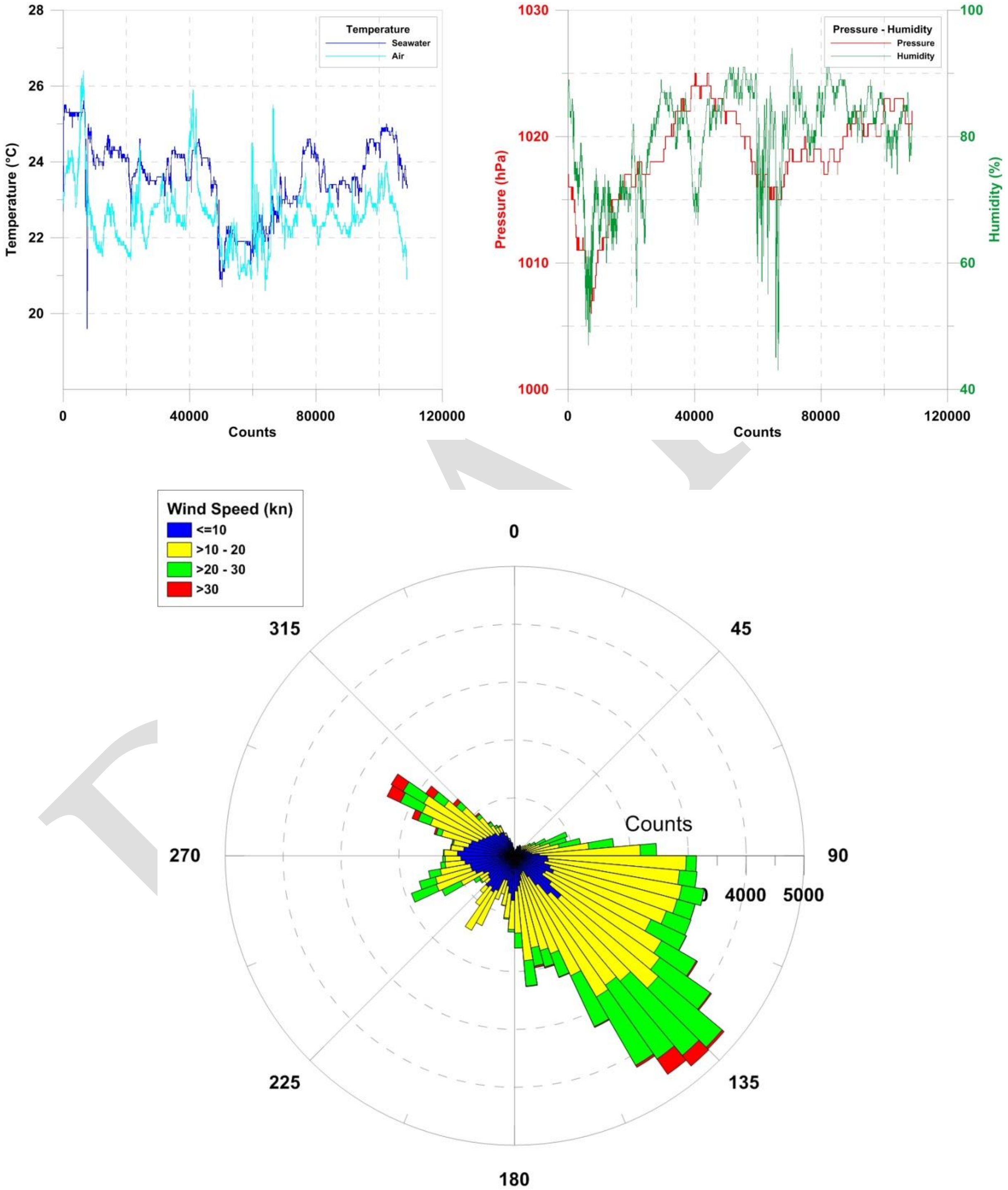
Chlorophyll-a, phaeopigments, POC-PN

The organic matter recycling processes, their quantitative features as well as the functional aspects, may give clues on the open-sea ecological properties and pathways. In order to investigate some aspects of the western Mediterranean, also related to the presence of new hydrological features, 12 stations were sampled.

- In the stations s18, s12, Acq5, 296, 241, D16, m4 and m6 seawater was collected at 6 to 7 depths: oxygen maximum, deep chlorophyll maximum, the lower limit of the surface water layer (ca. 200 m) where the fluorescence signal disappears, the LIW core (ca. 400 m), the bottom water layer and 1 to 2 intermediate depths, depending on the station depth and on the presence of peculiar hydrological features. These samples were pre-processed for the determination of the autotrophic pigments (chlorophyll-a and phaeopigments, the analysis was carried out entirely on board) , for the particulate organic matter (POC) and particulate nitrogen (PN), for the total and hydrolysable protein concentrations. Samples for hetrotrophic bacterial counts and, hopefully, for the dissolved chromophoric organic matter and proteolytic activity were also collected. Samples for the measurement of the nitrite+nitrate concentrations were collected at every depth, in order to focus the study on the nitrogen cycle features.
- At station m7 seawater was collected at 14 depths, sampling for the autotrophic pigments and the POC-PN evaluation.
- At stations s17, s16 and s14 only the pigments were considered, in the 0-200 m depth water layer (6 depths), in order to provide a picture of the chlorophyll-a distribution in the whole s-transect .

Preliminary Results

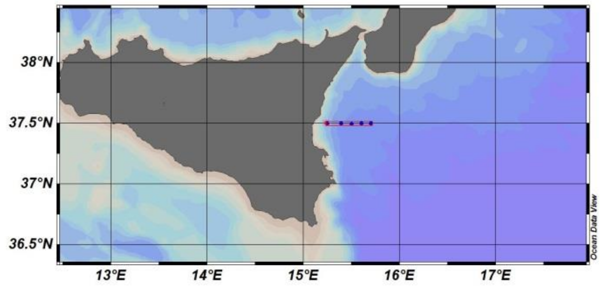
Weather conditions

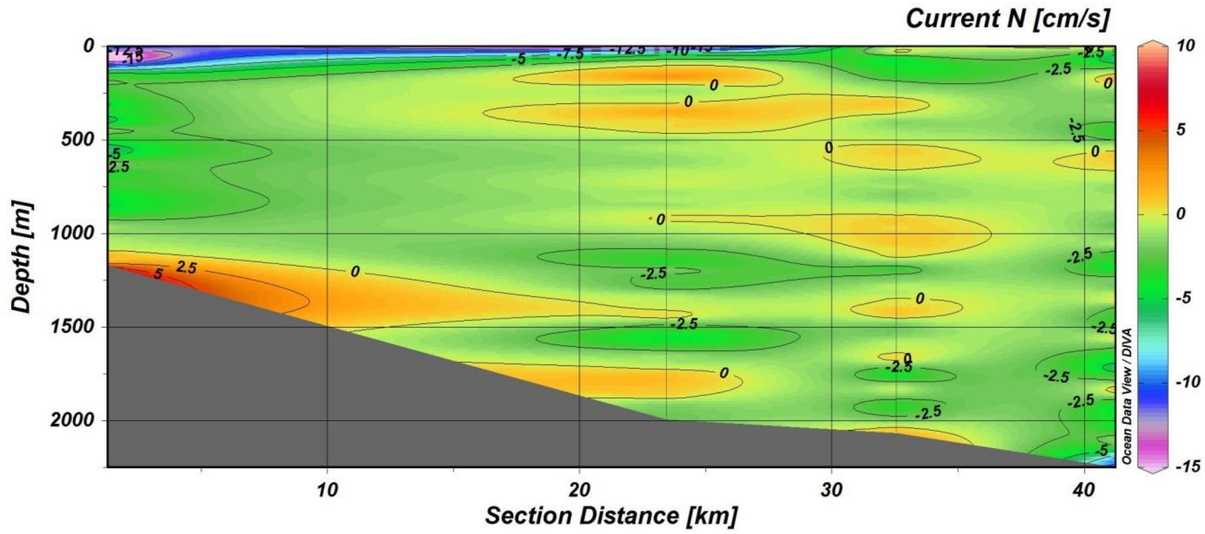


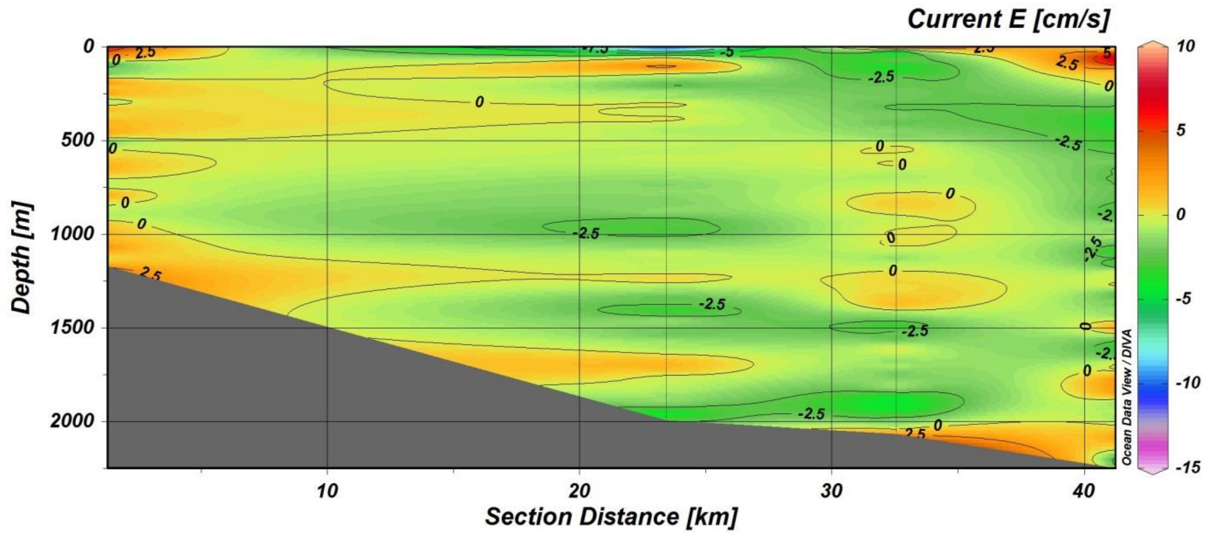
Evolution of the weather conditions between 15th and 28th October 2013 (air temperature, seawater temperature, relative humidity, air pressure, wind rose)

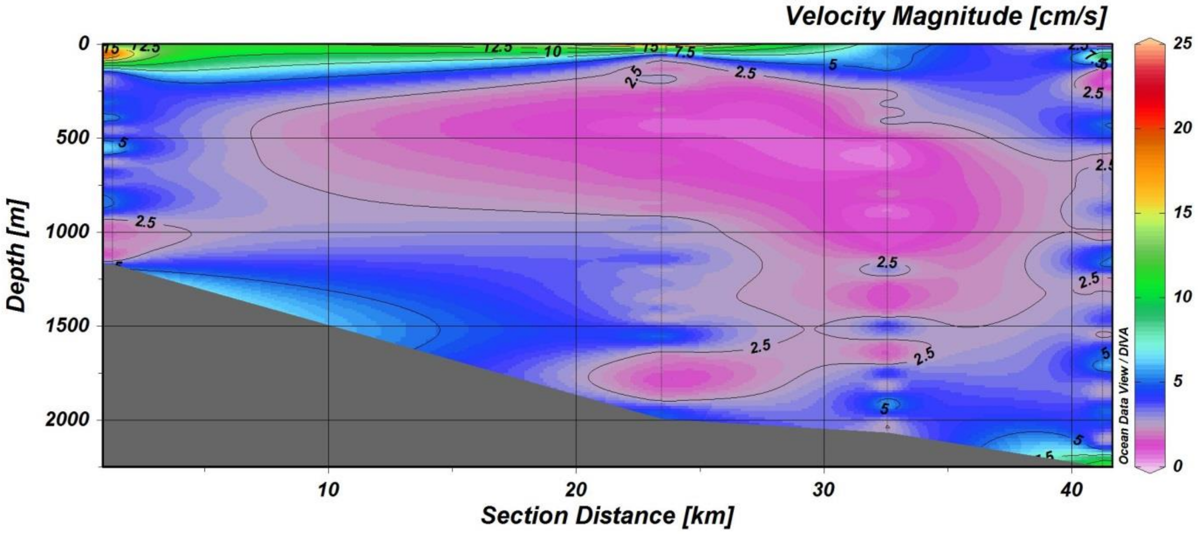
Currents from LADCP

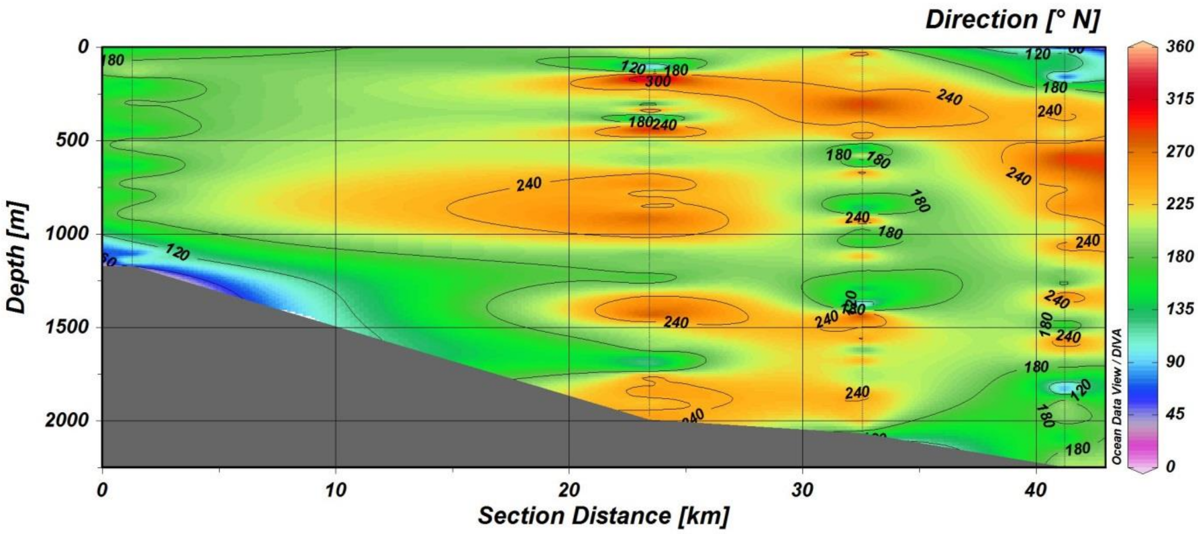
South-Est Sicily transect





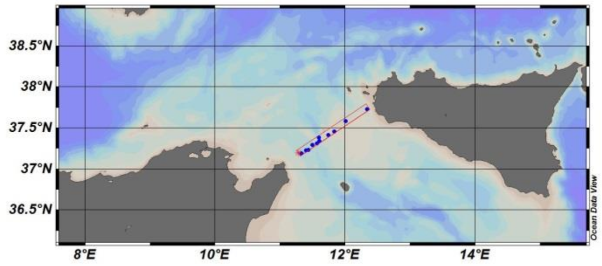


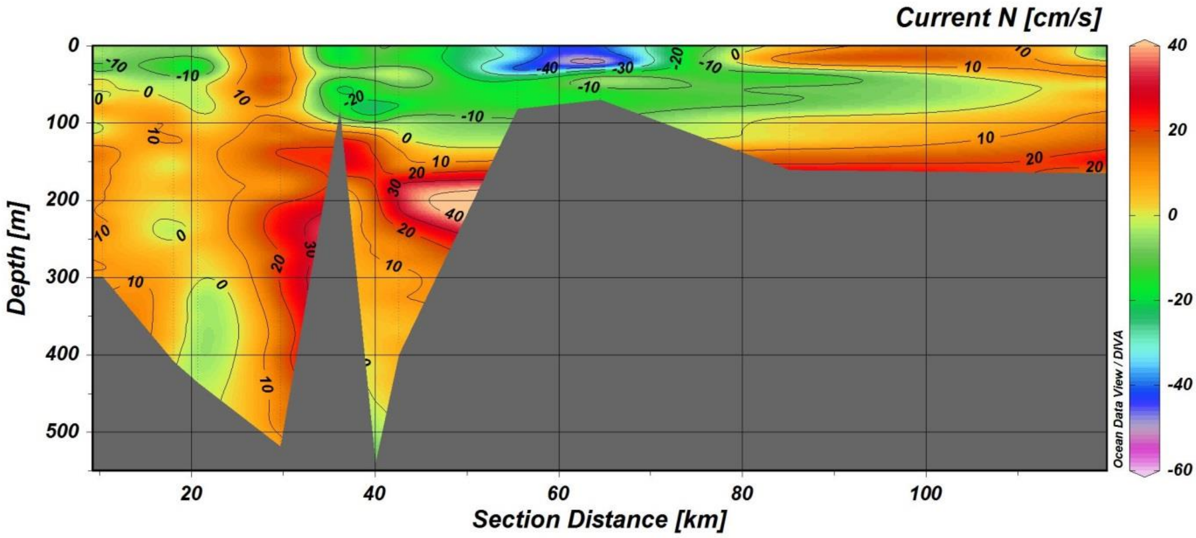


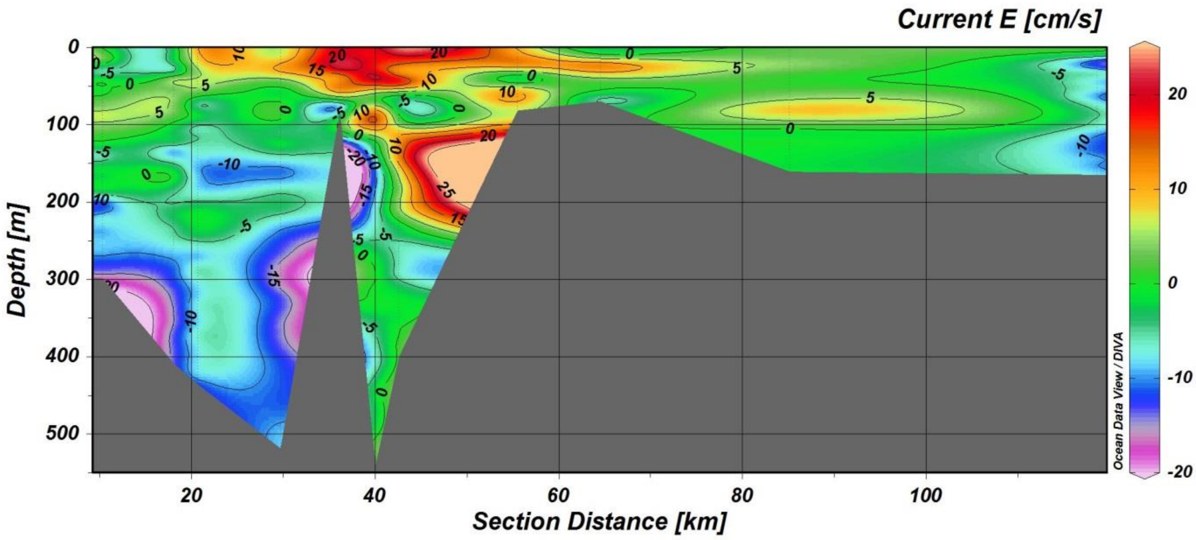


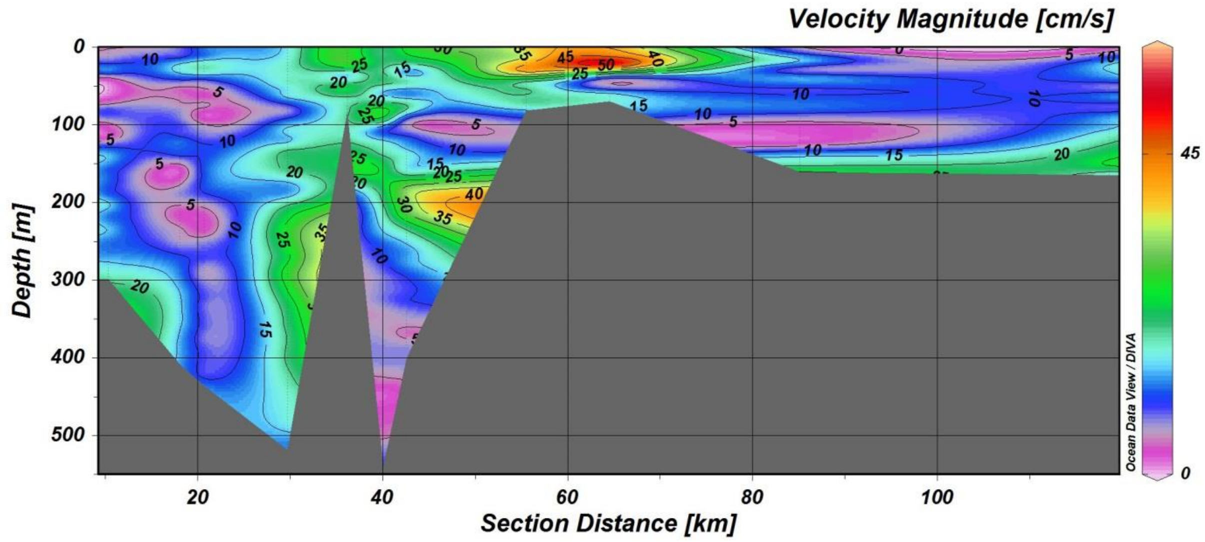
Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

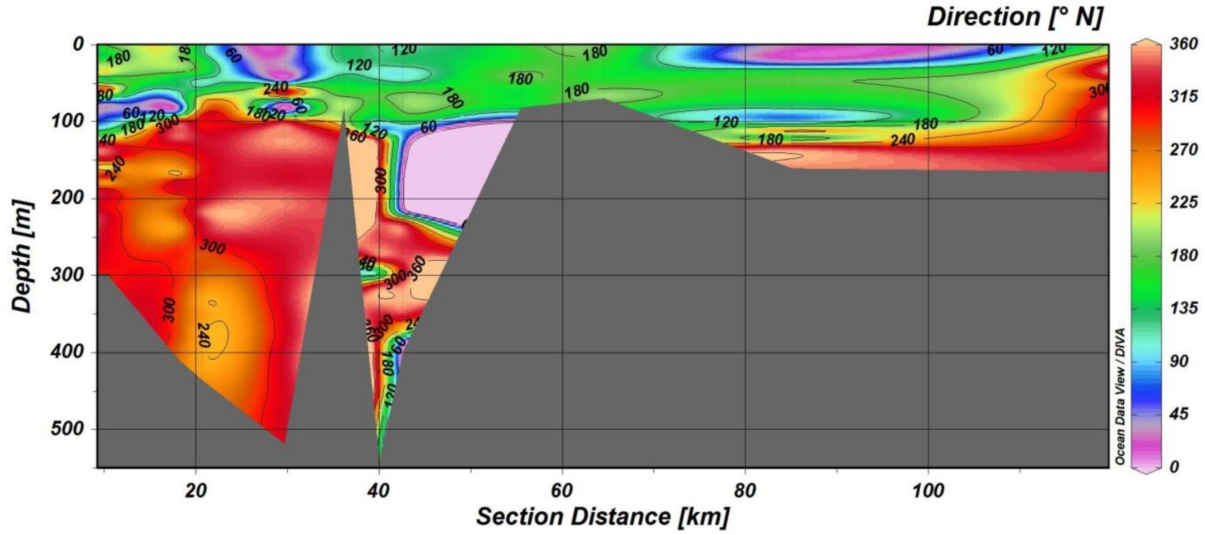
Sicily Strait transect





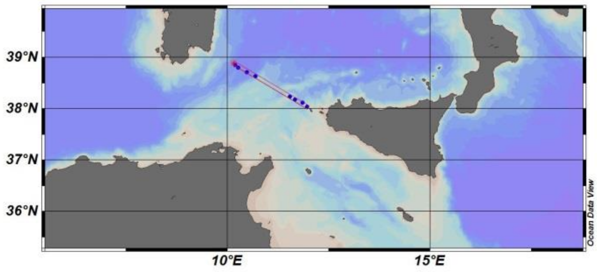


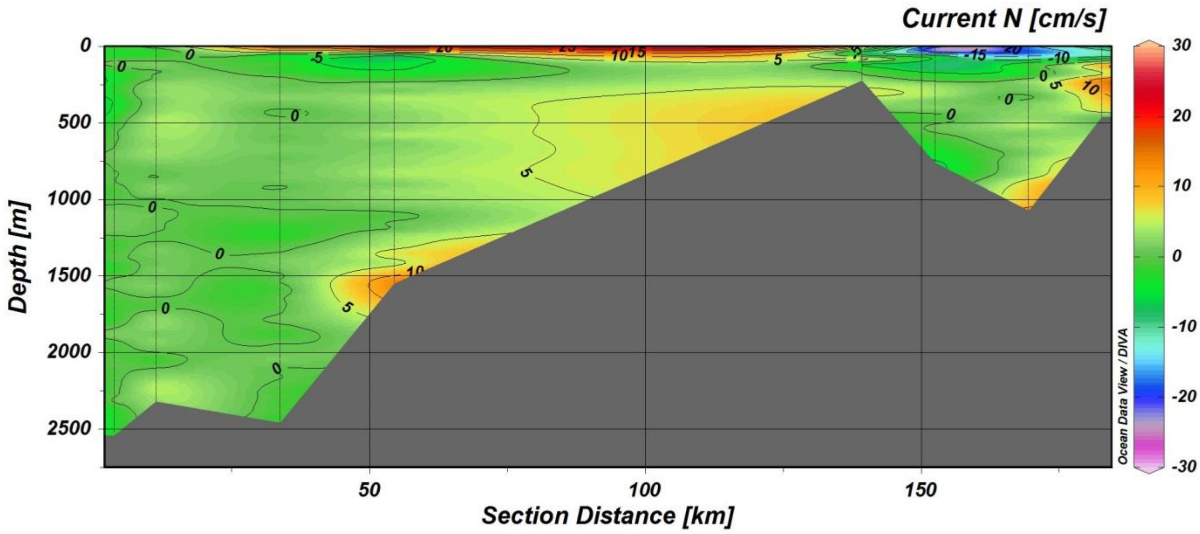


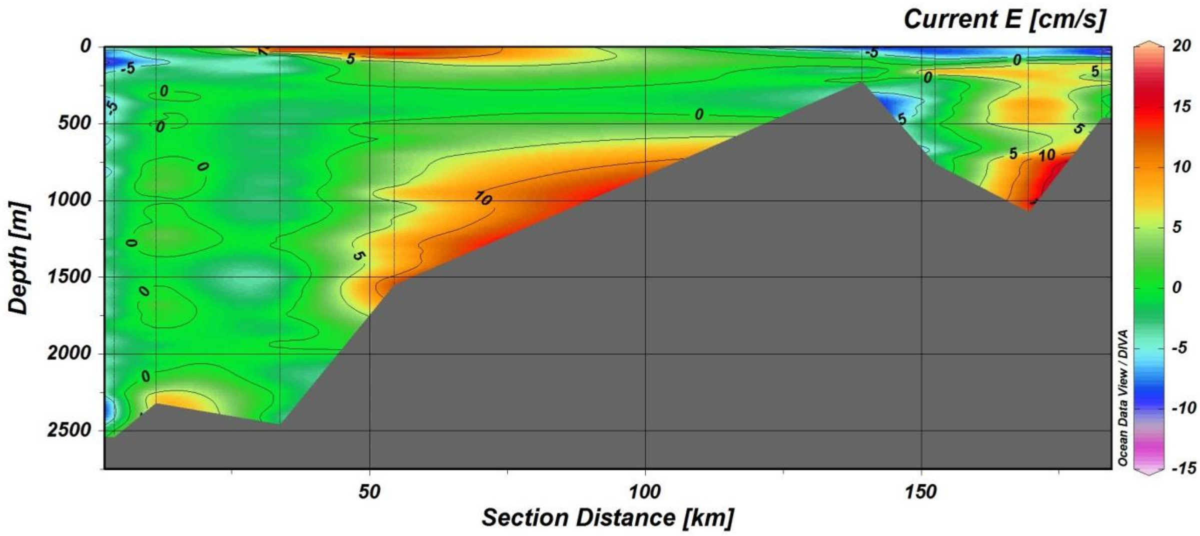


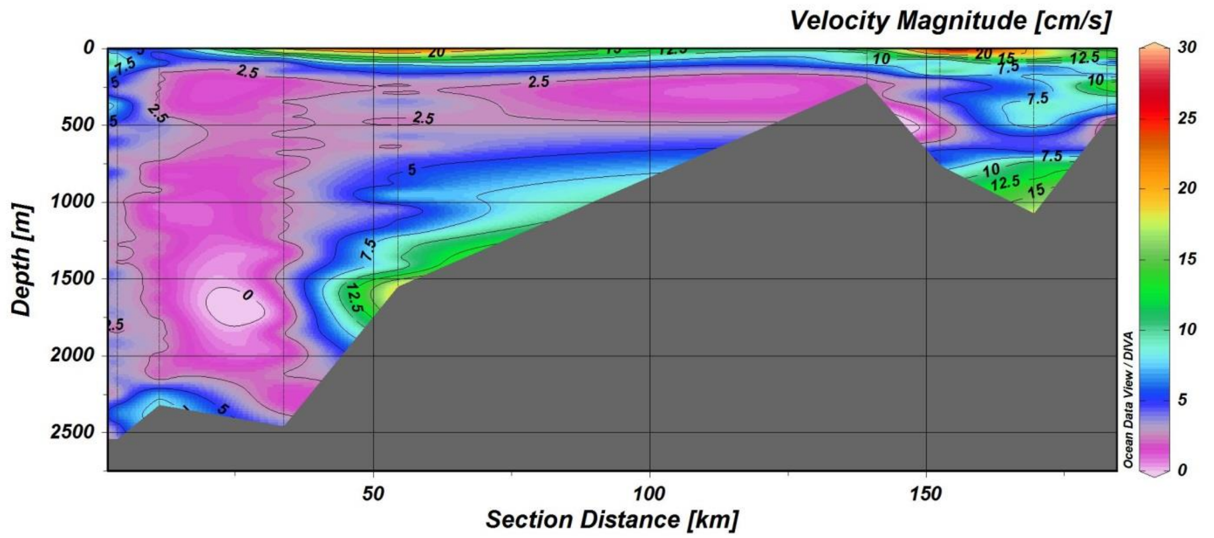
Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

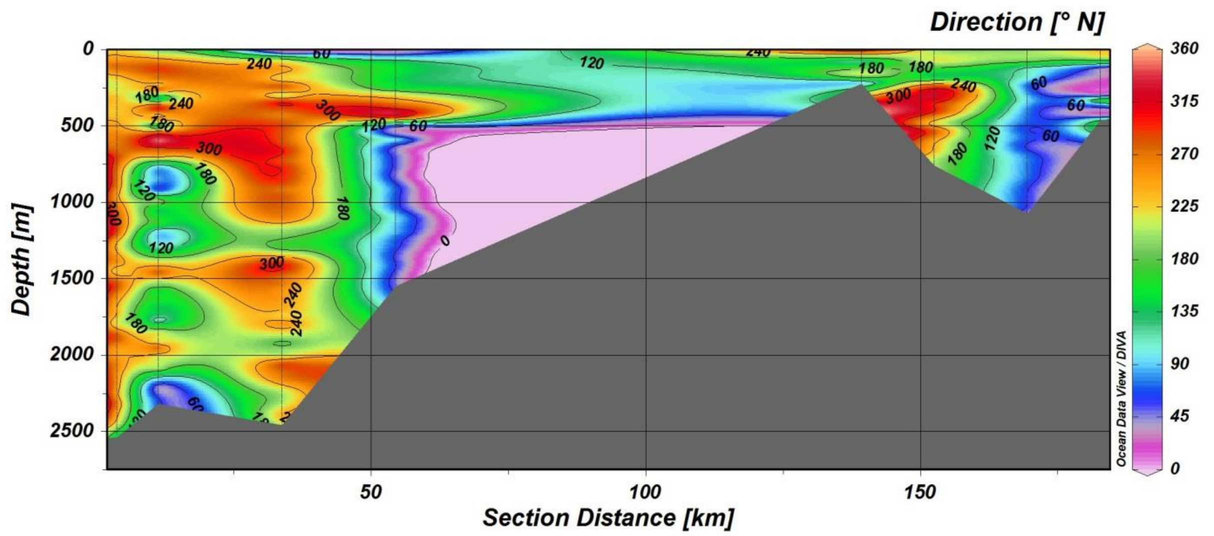
Sicily-Sardinia transect





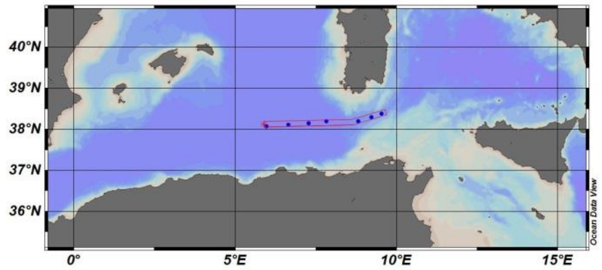


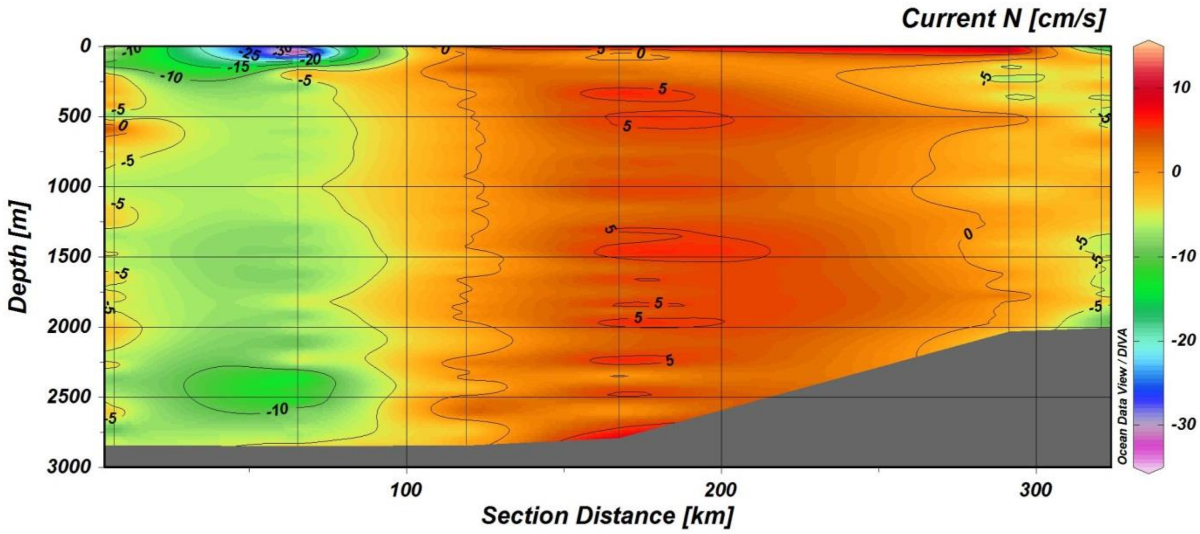


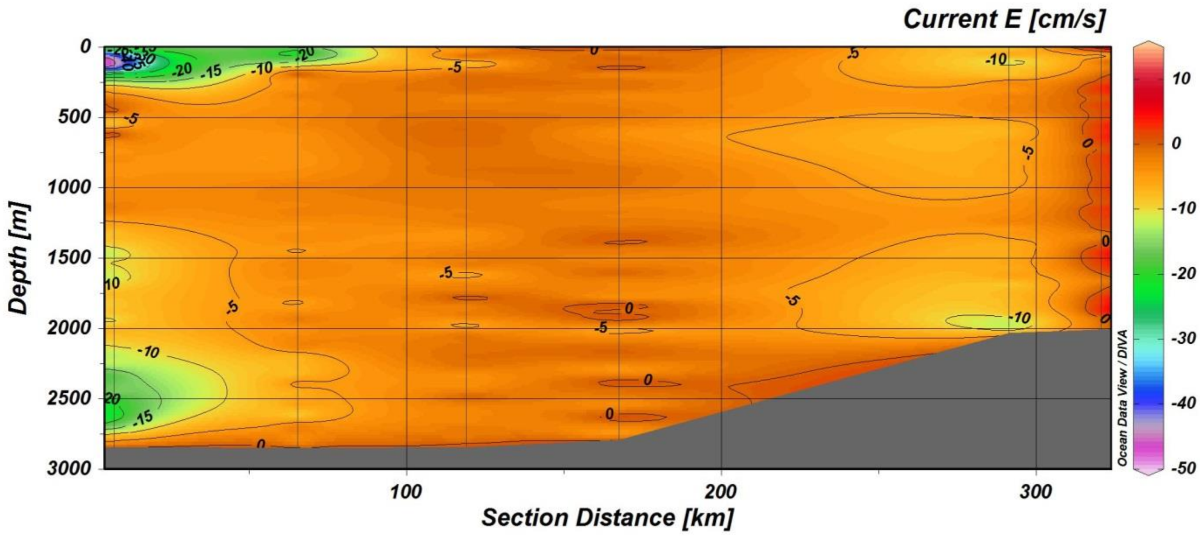


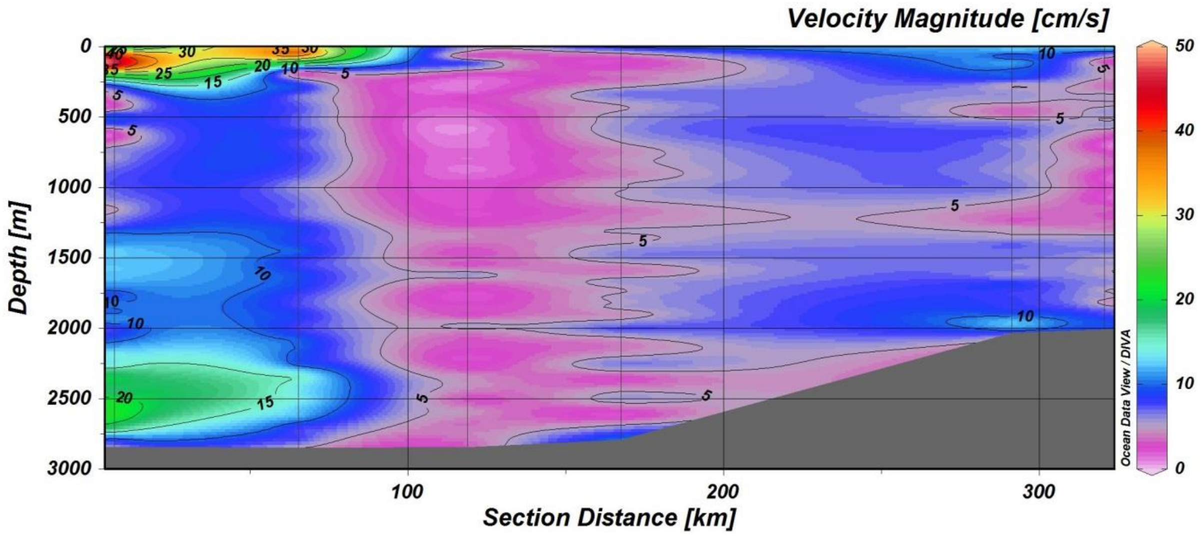
Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

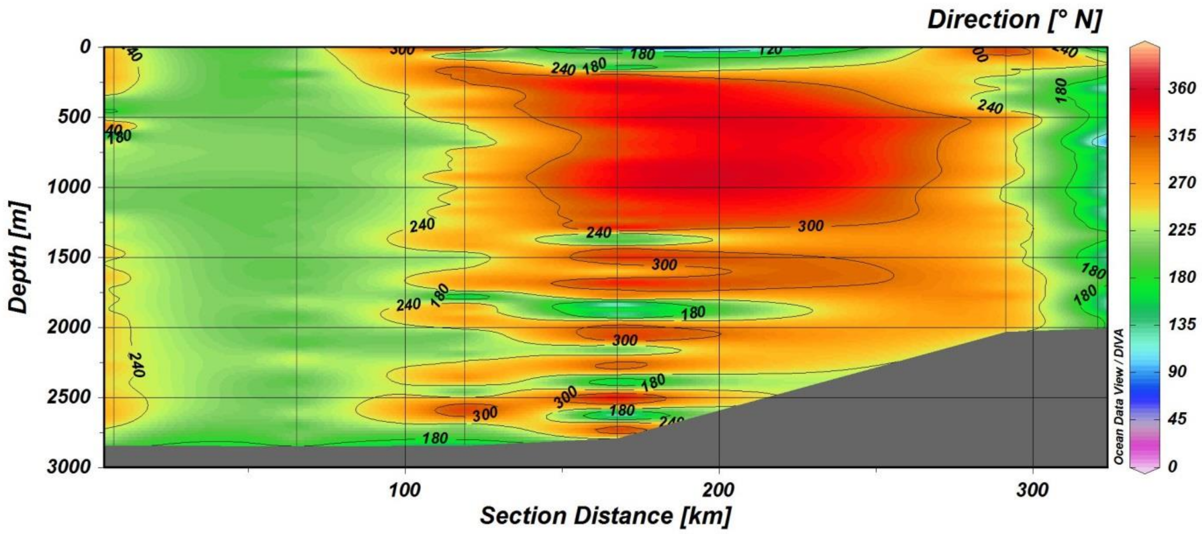
Sardinian Channel transect





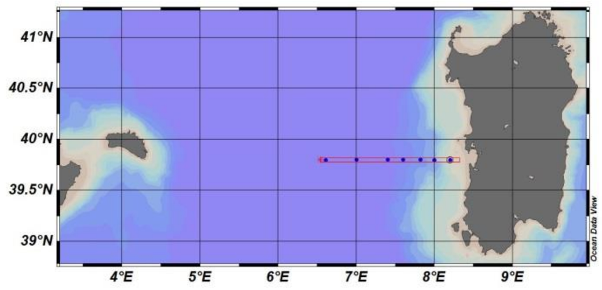


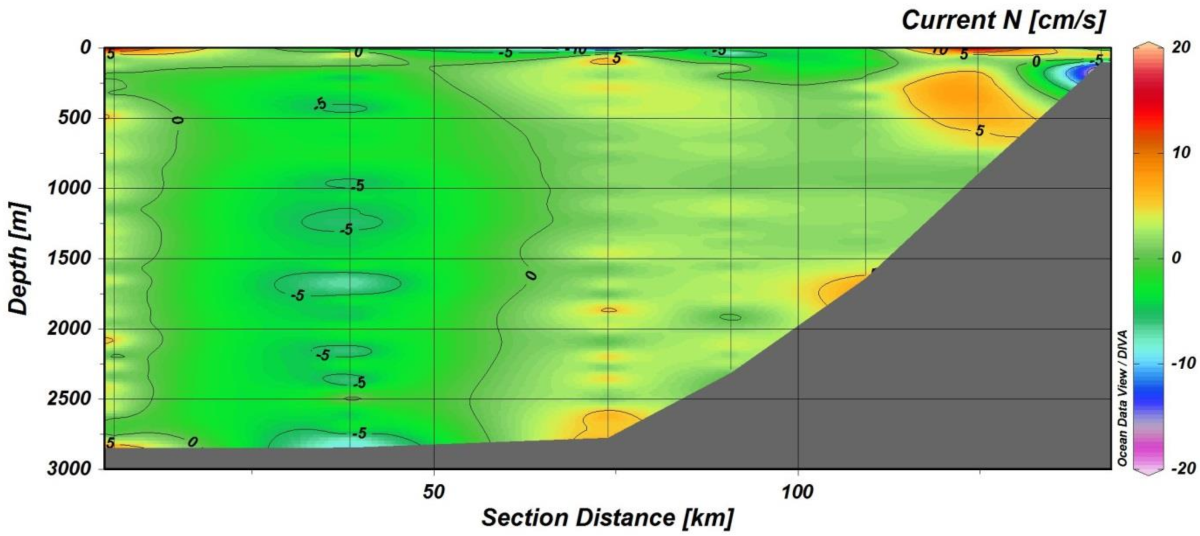


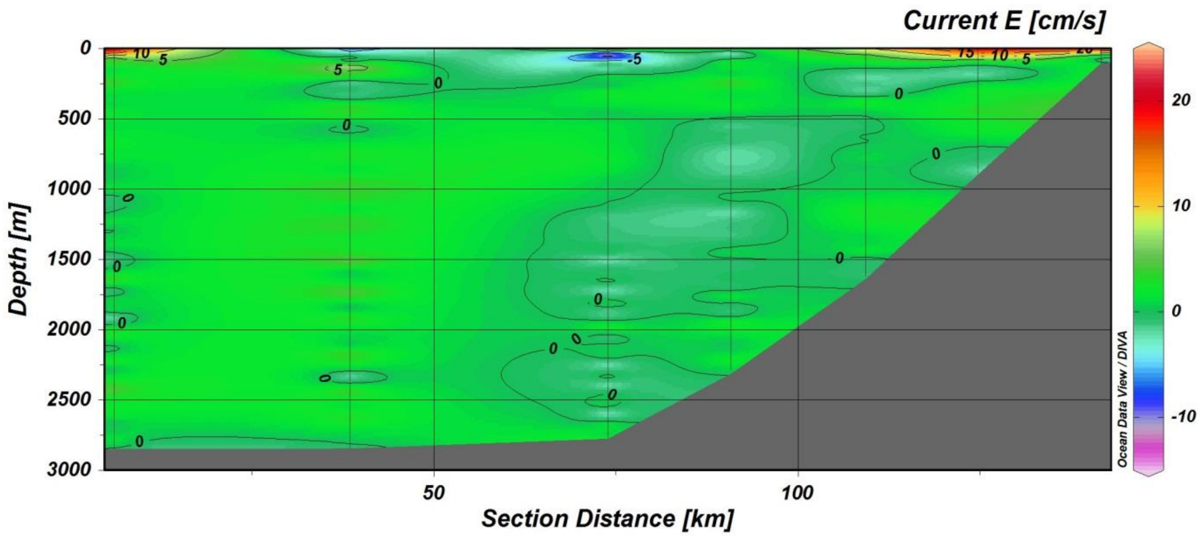


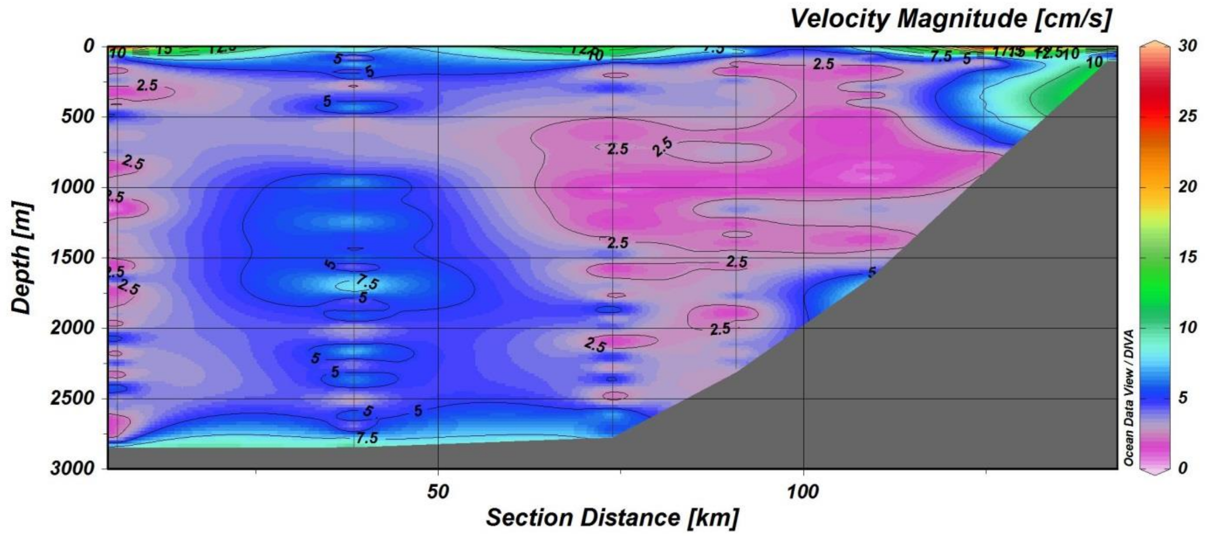
Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

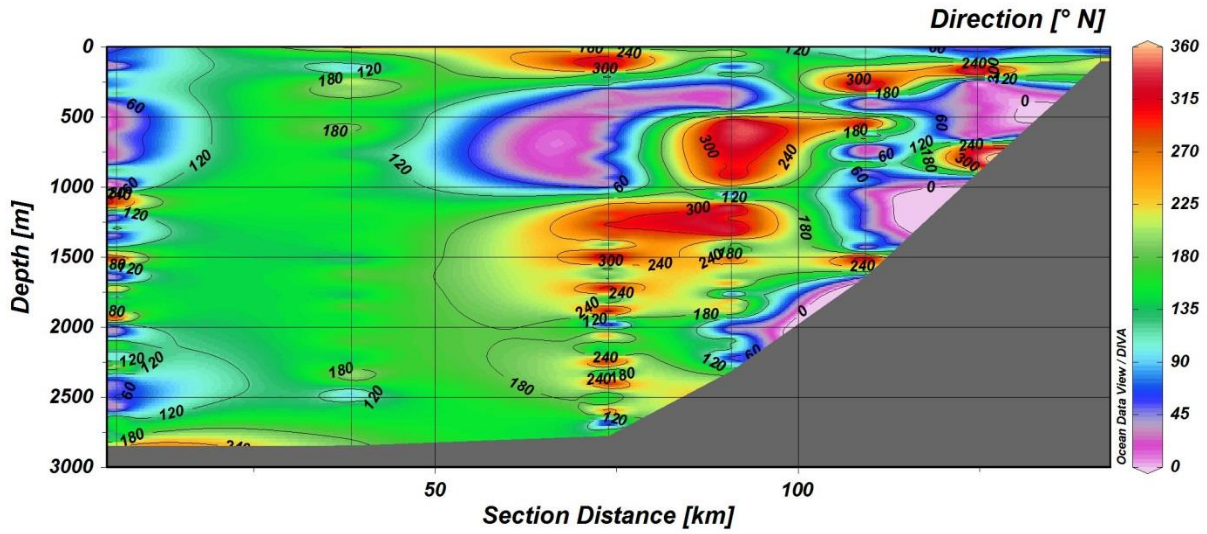
Sardinian Sea transect





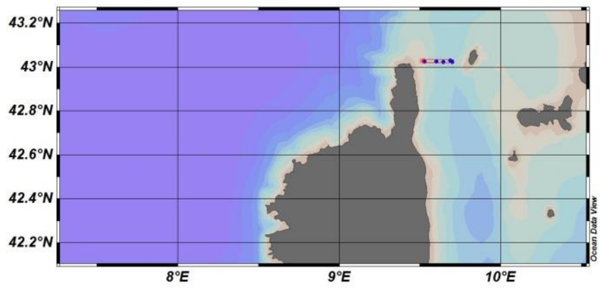


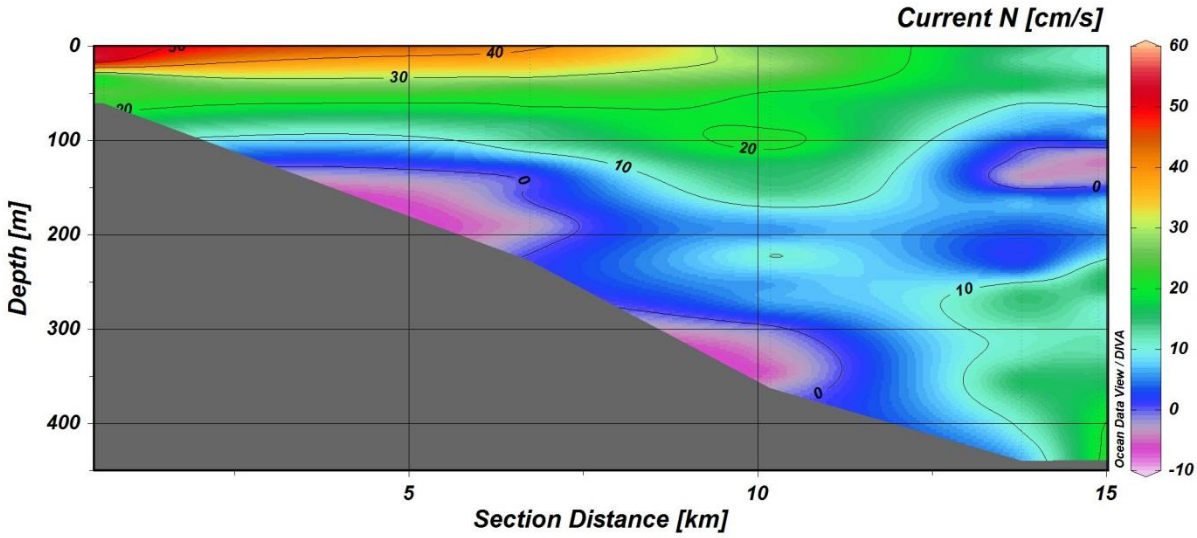


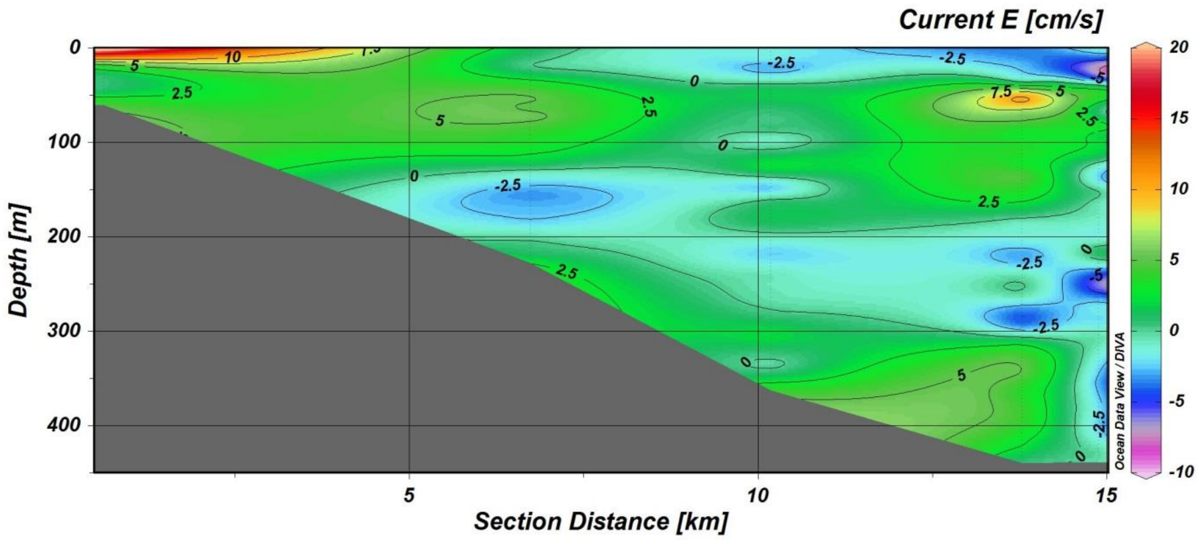


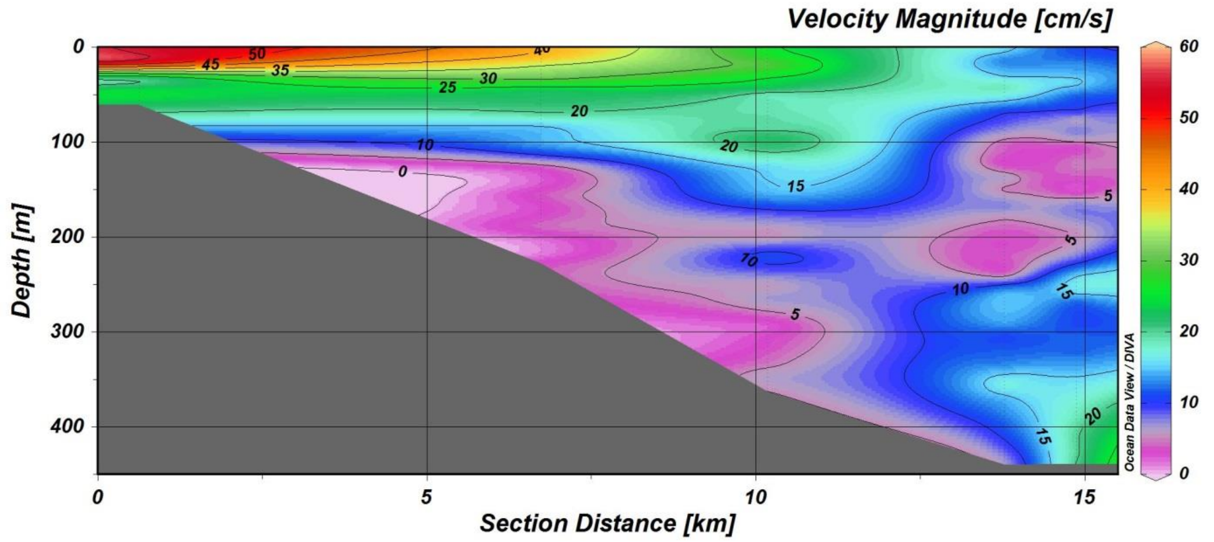
Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

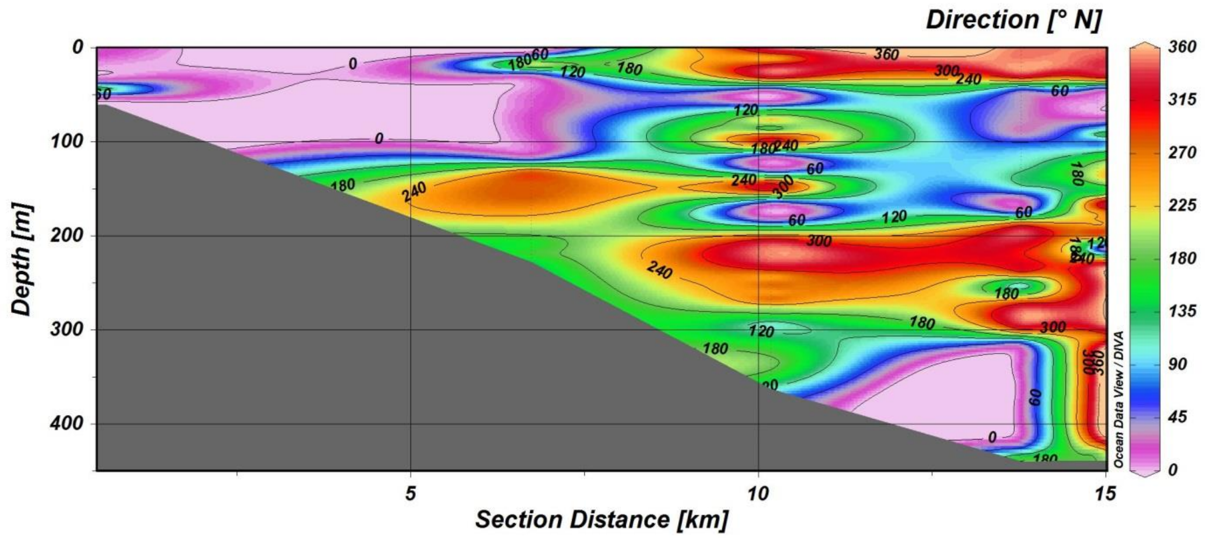
Corsica Channel transect





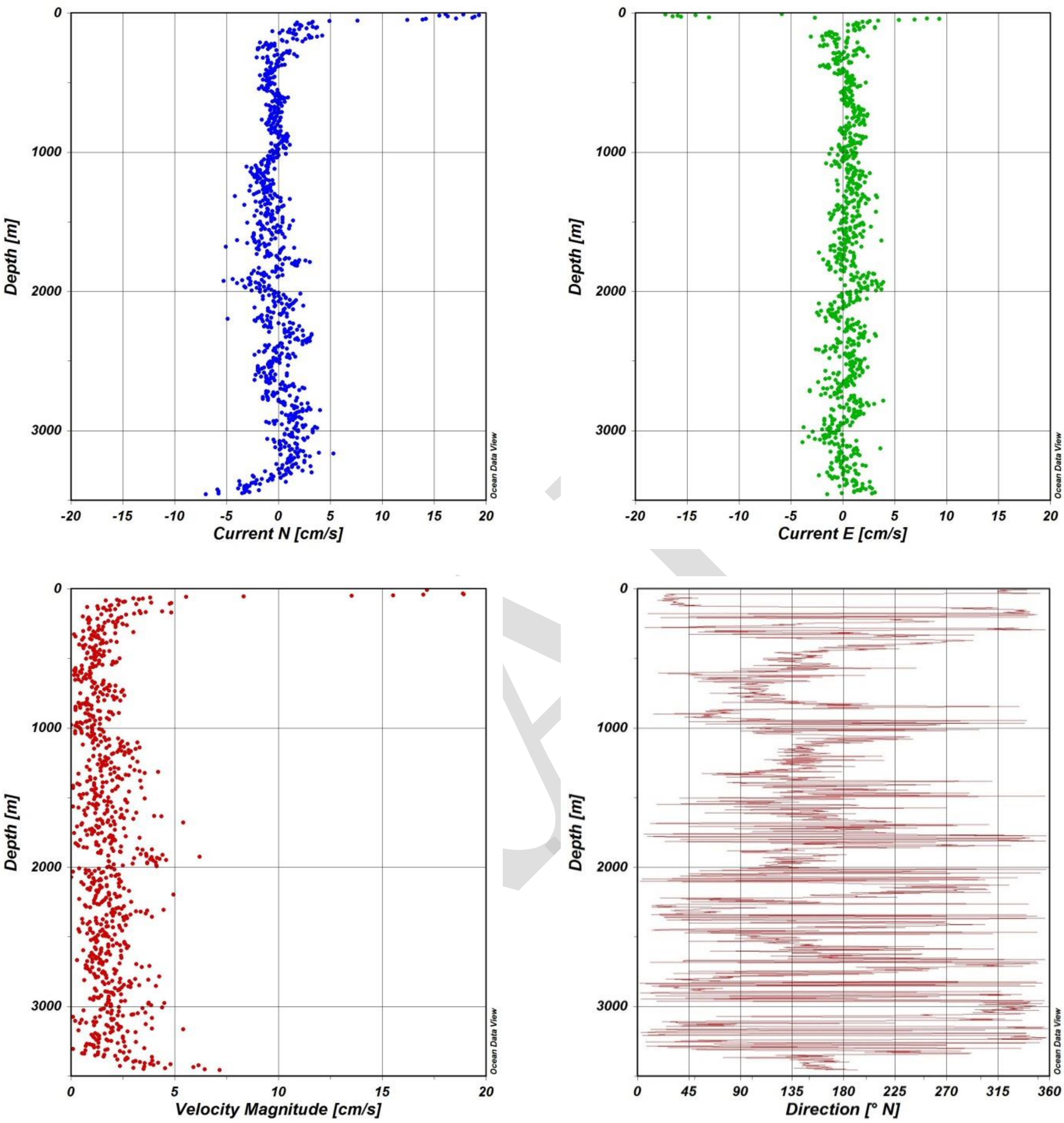


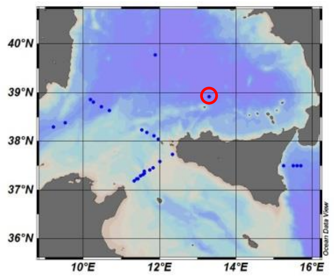




Distribution of the measured velocity in cm/s along the transect: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

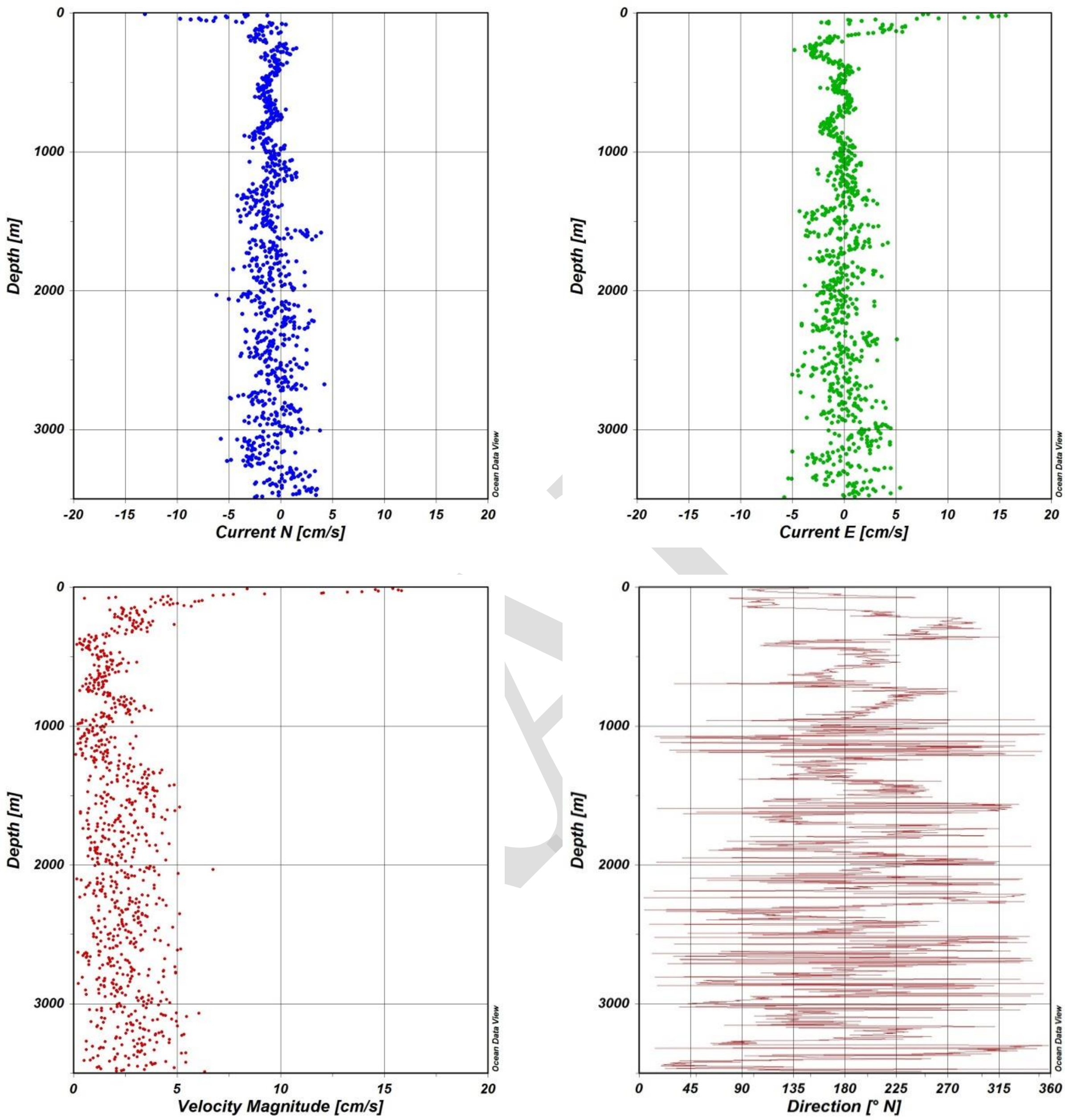
Geostar station

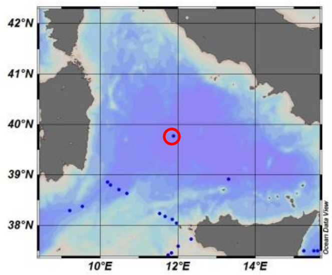




Distribution of the measured velocity in cm/s at Geostar station: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

51 station

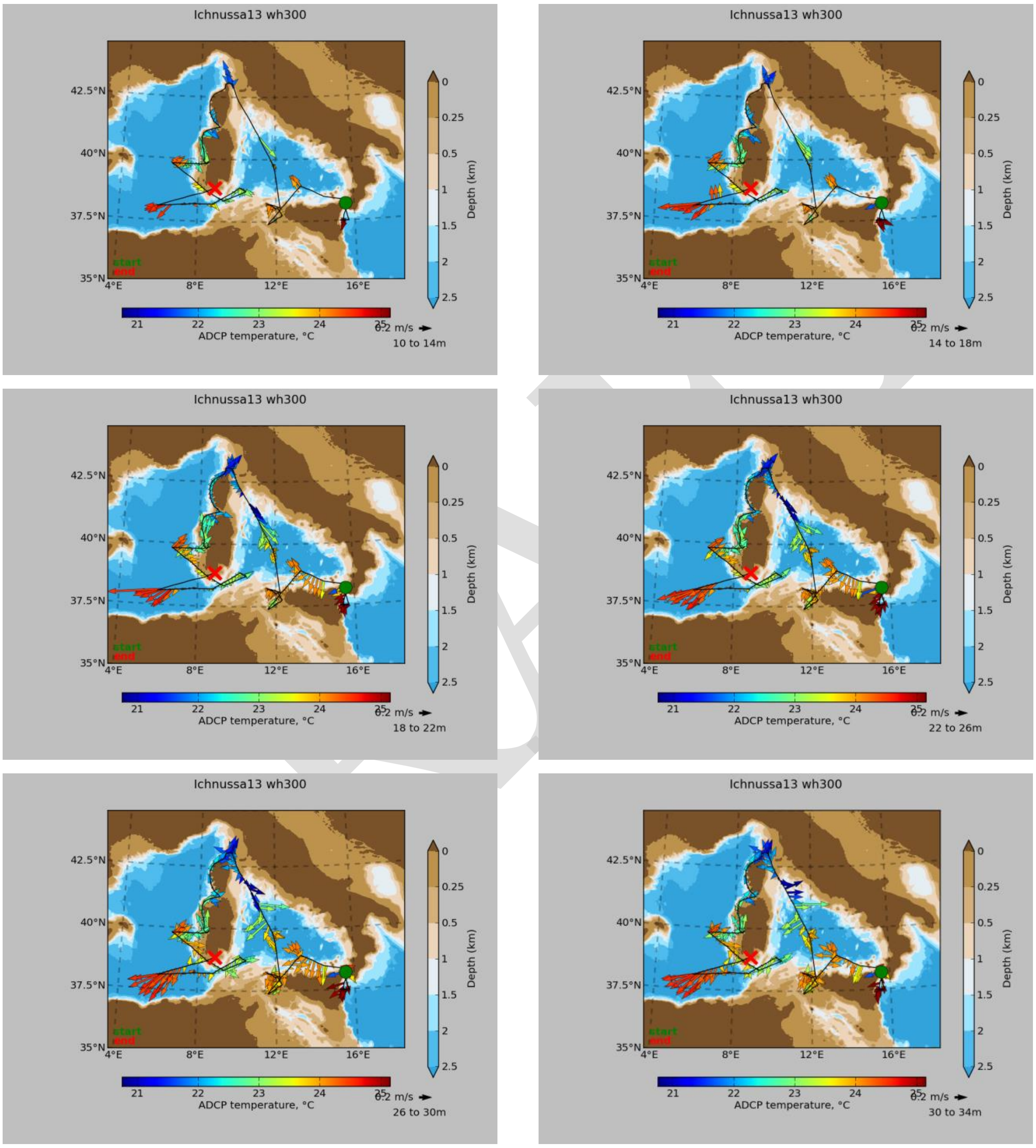


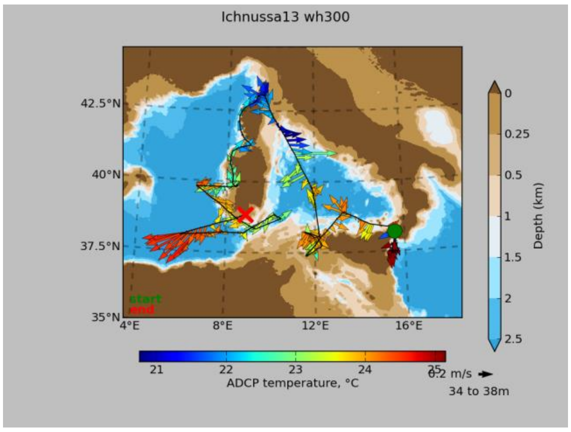


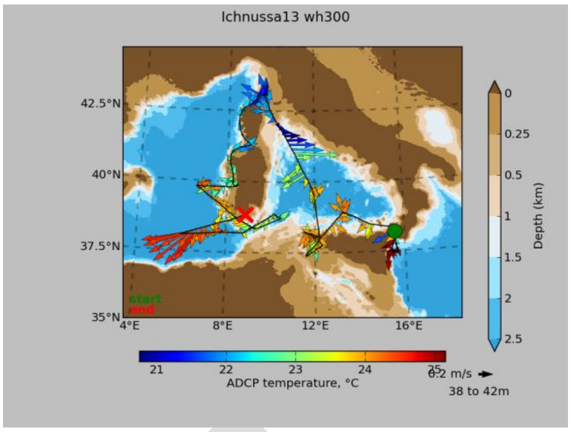
Distribution of the measured velocity in cm/s at 51 station: N component (positive values are northward), E component (positive values are eastward), velocity magnitude, direction (clockwise from the north).

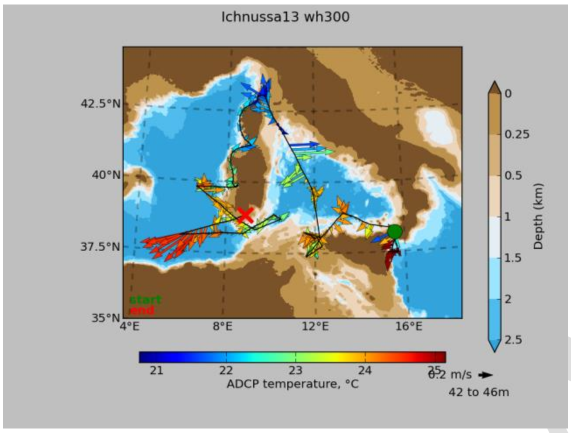
Currents from VMADCP

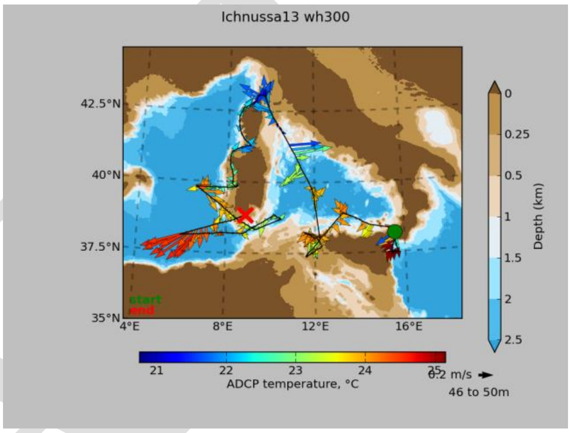
Instrument type: WH 300 kHz

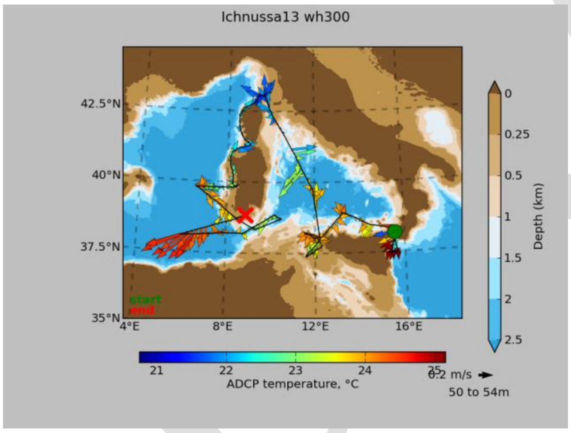


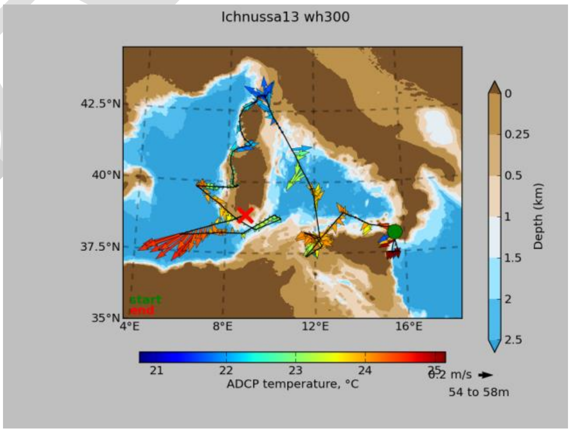

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
34 to 38m

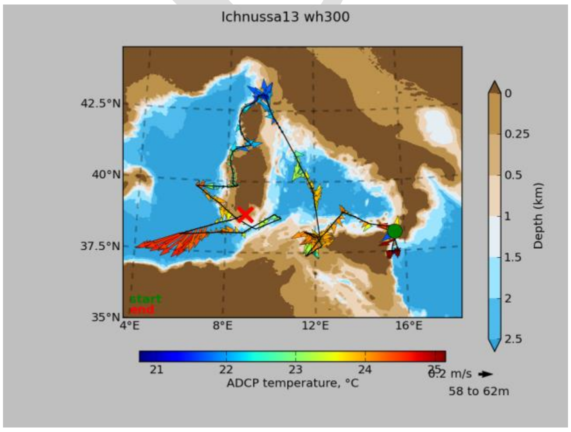

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
38 to 42m

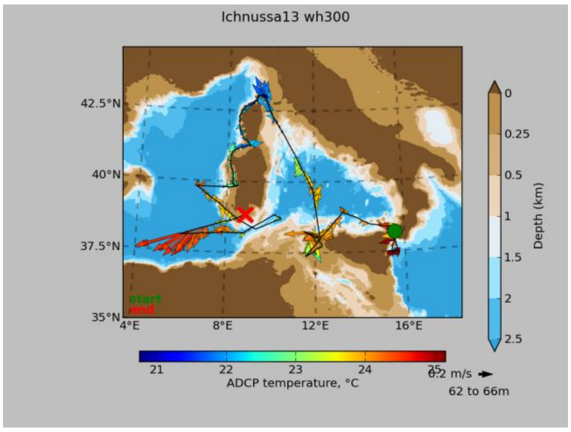

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
42 to 46m

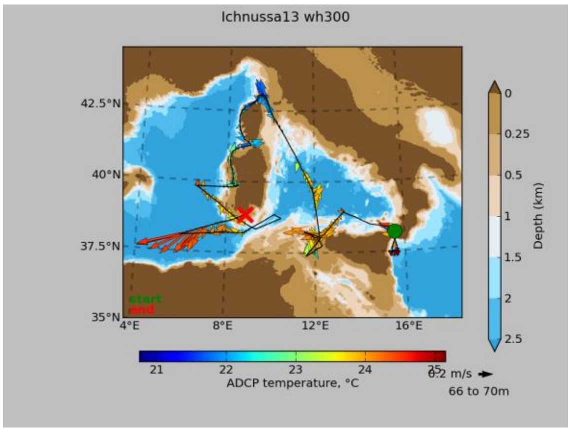

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
46 to 50m

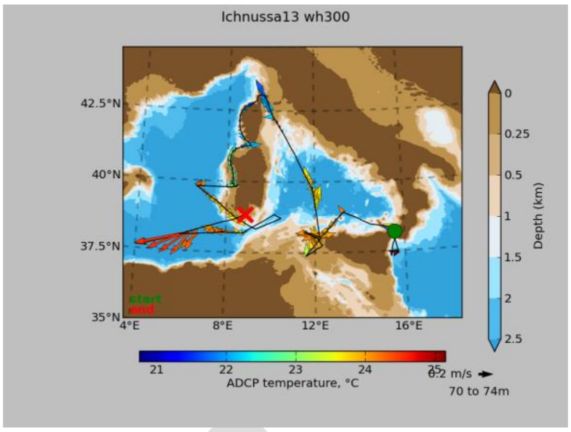

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
50 to 54m

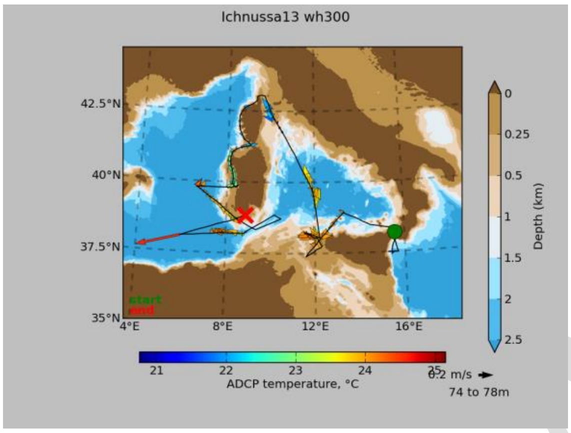

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
54 to 58m

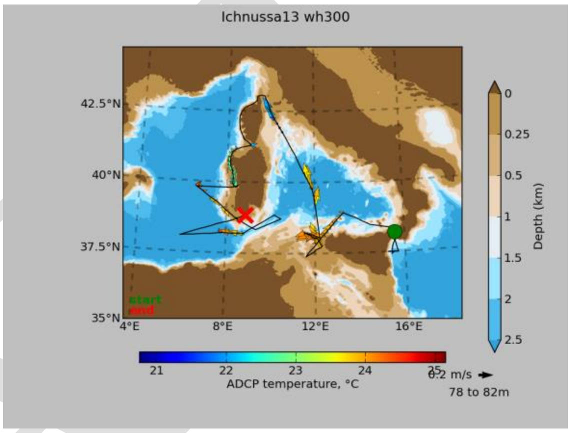

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
58 to 62m

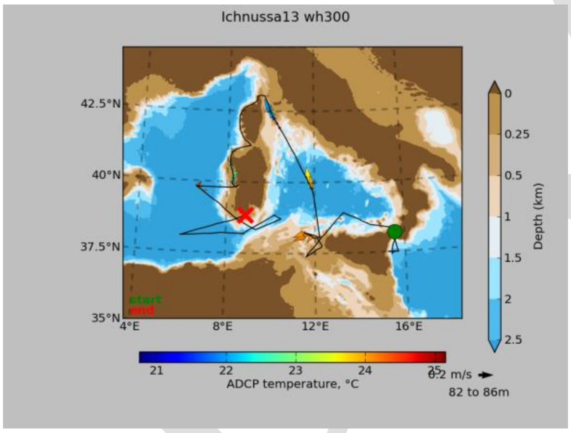

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
62 to 66m

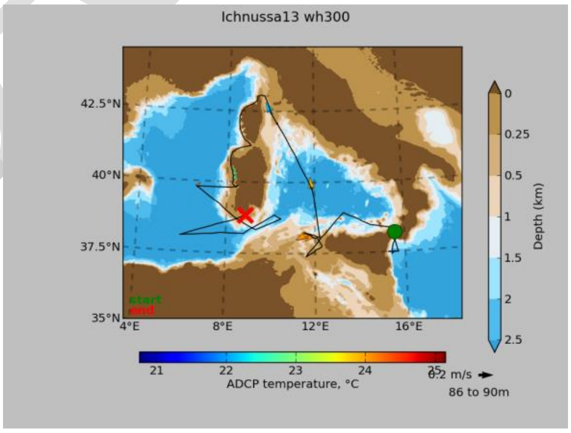

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
66 to 70m


Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
70 to 74m

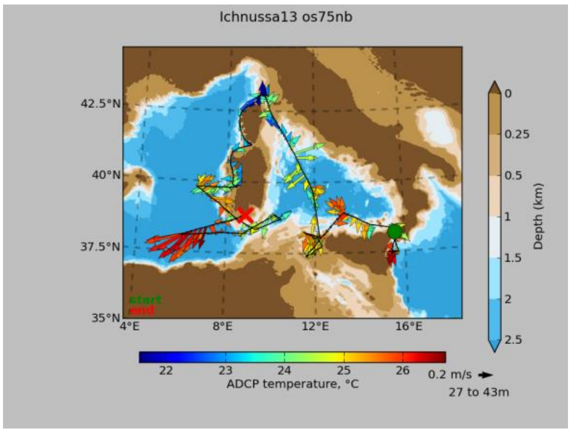

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
74 to 78m

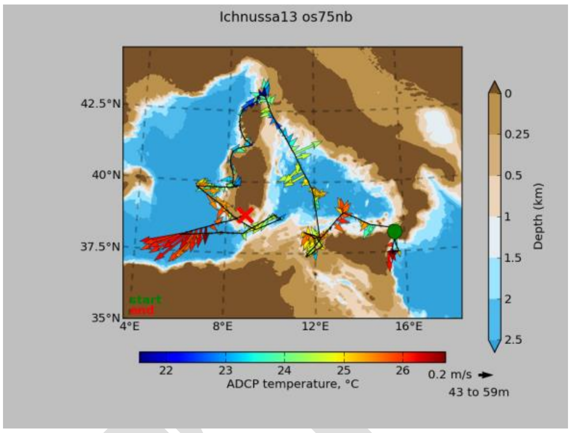

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
78 to 82m

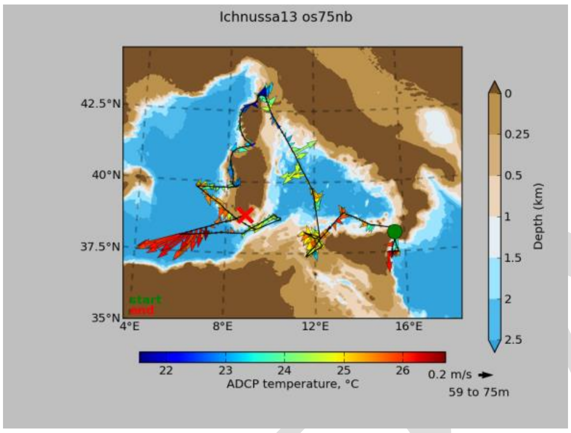

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
82 to 86m

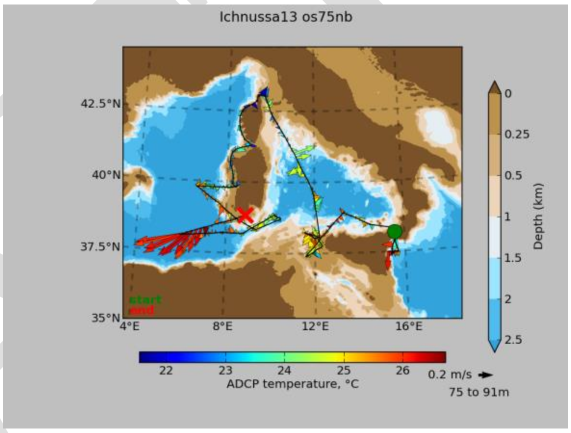

Ichnussa13 wh300
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
21
22
23
24
25
ADCP temperature, °C
0.2 m/s
86 to 90m

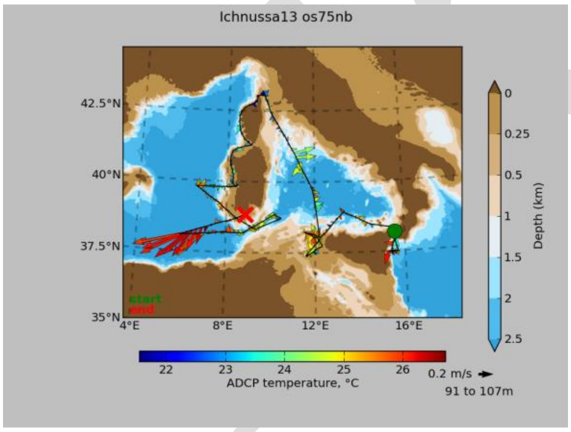
Instrument type: OS 75 kHz

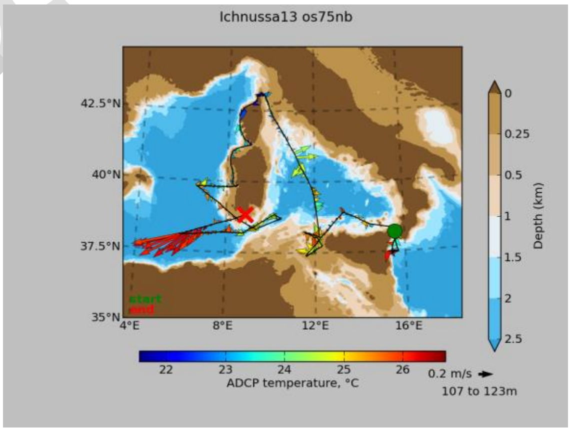


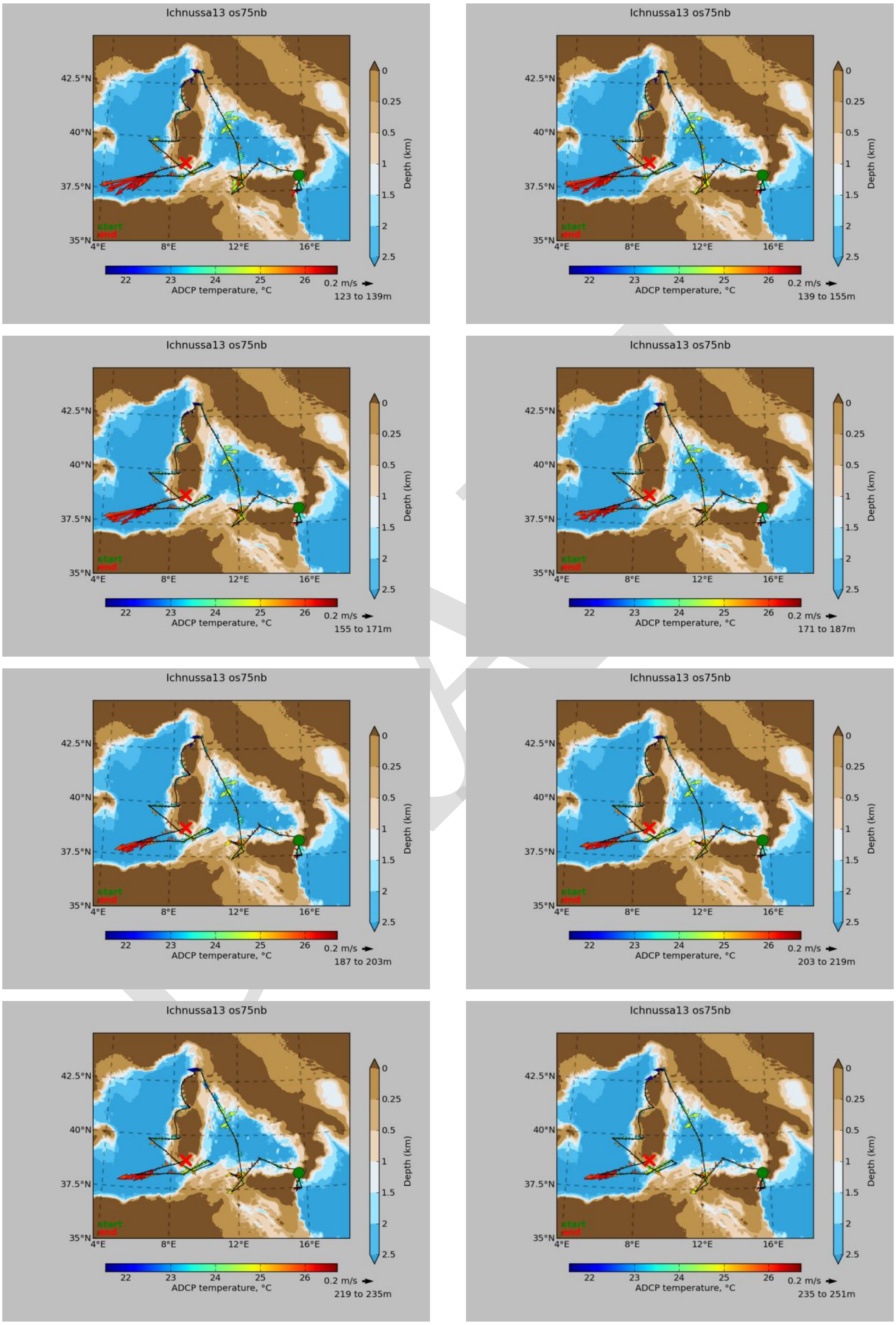


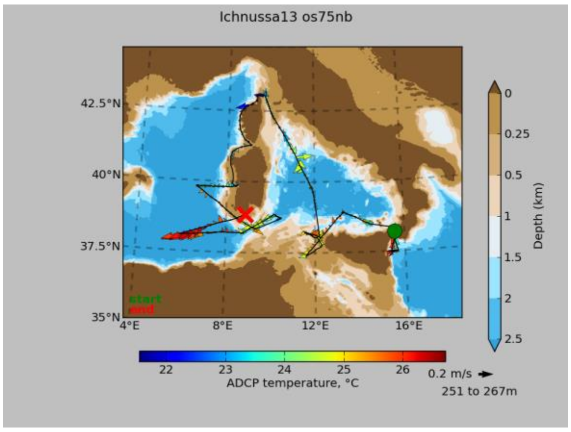


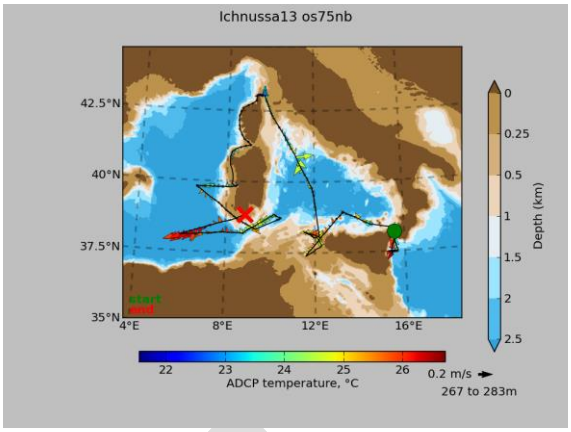


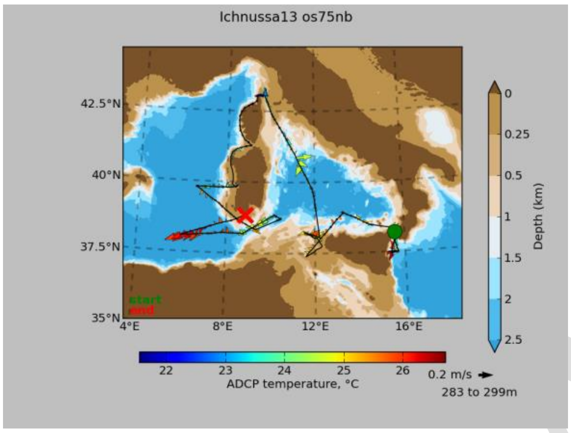


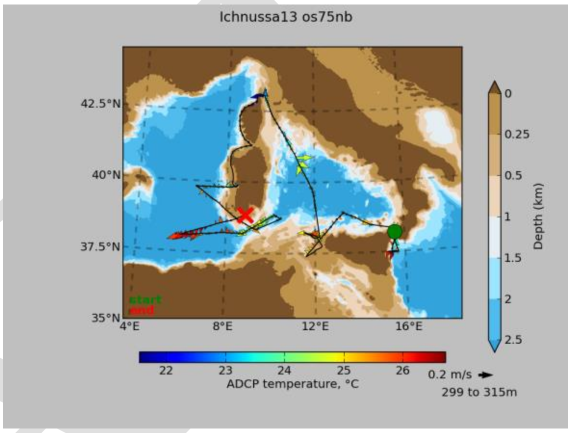


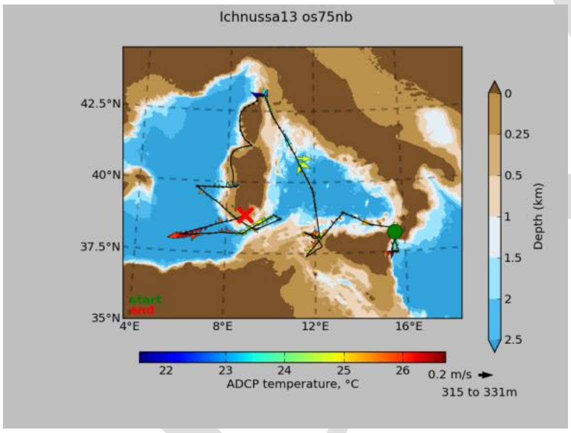

Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
123 to 139m
139 to 155m
155 to 171m
171 to 187m
187 to 203m
203 to 219m
219 to 235m
235 to 251m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
251 to 267m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
267 to 283m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
283 to 299m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
299 to 315m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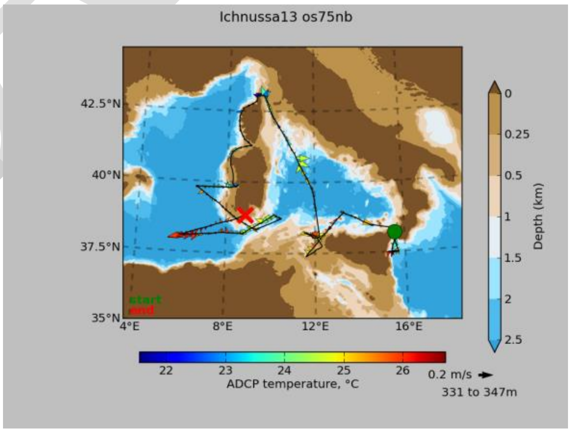
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
315 to 331m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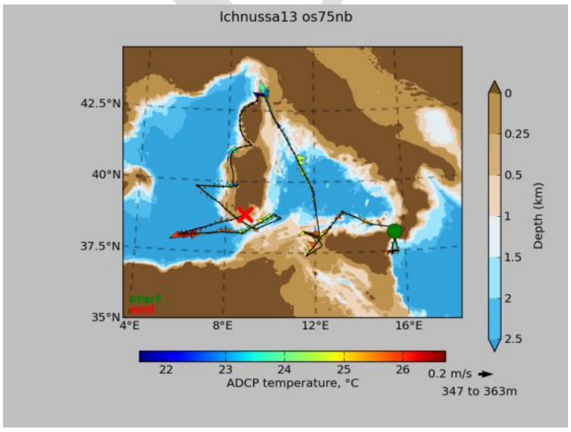
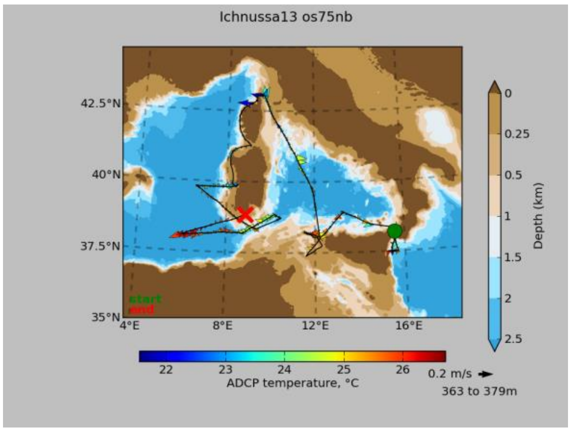
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
331 to 347m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
347 to 363m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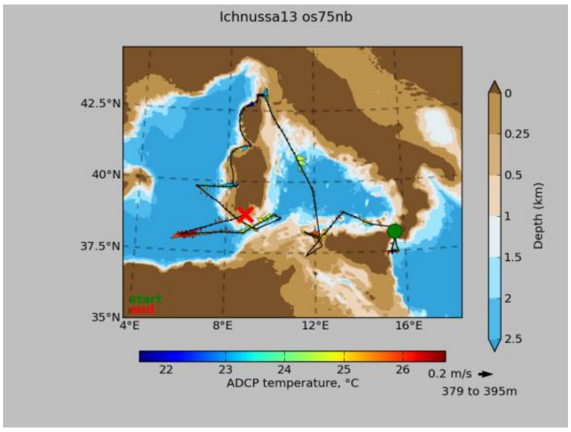
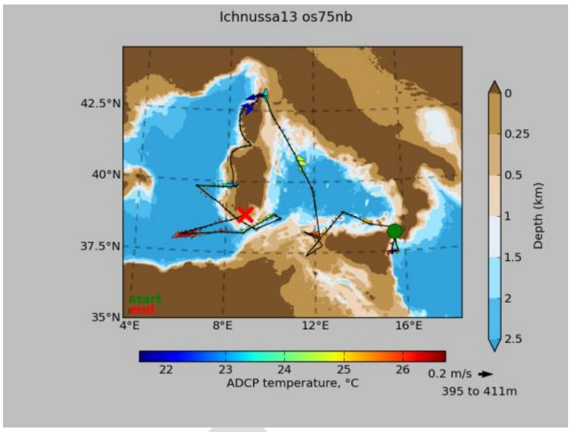
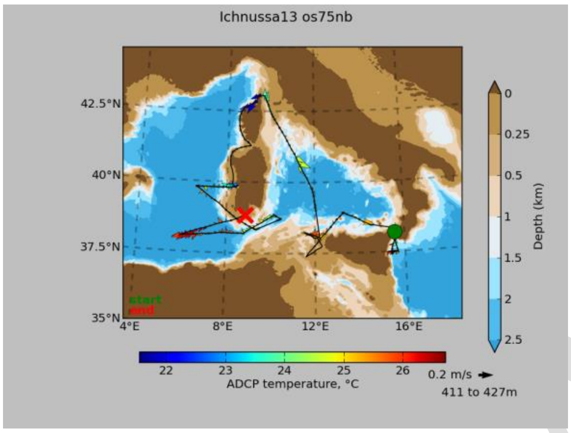
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
0
0.25
0.5
1
1.5
2
2.5
Depth (km)
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
363 to 379m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
379 to 395m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
395 to 411m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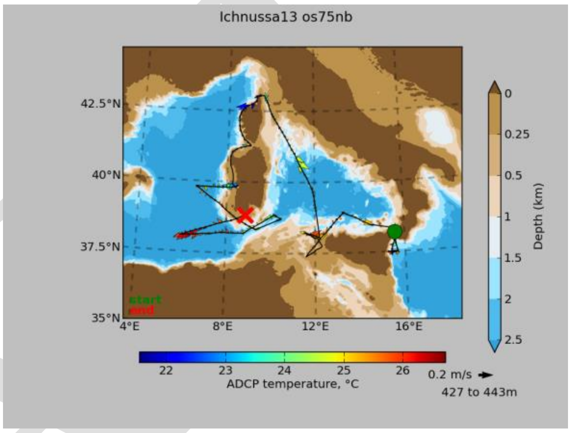
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
411 to 427m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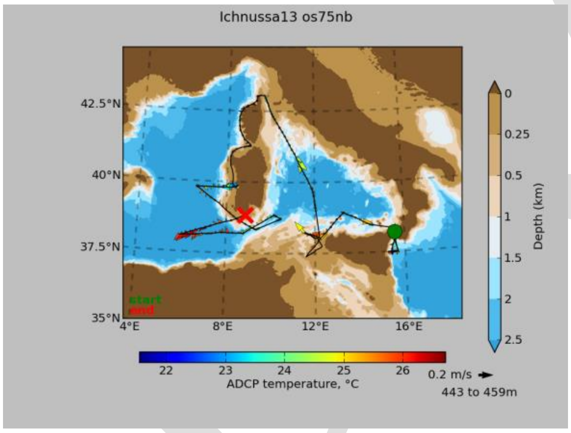
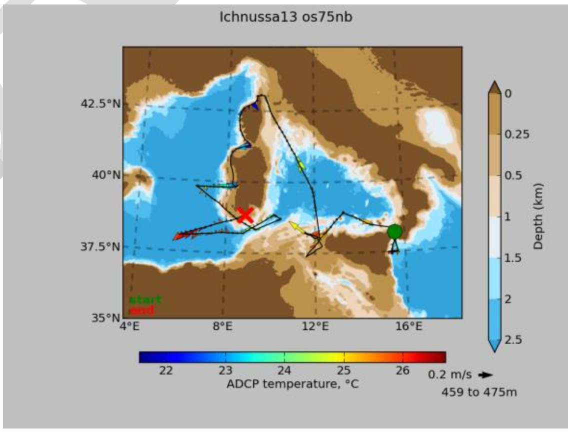
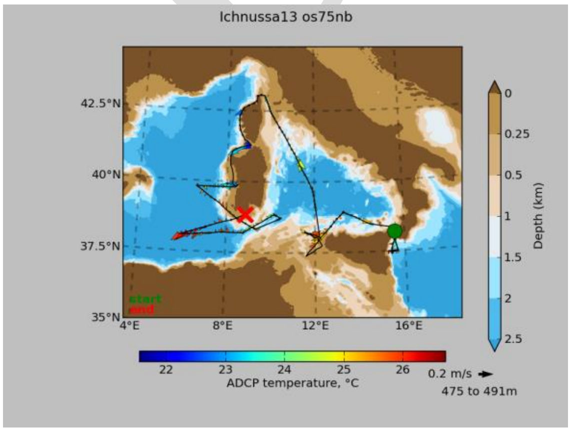
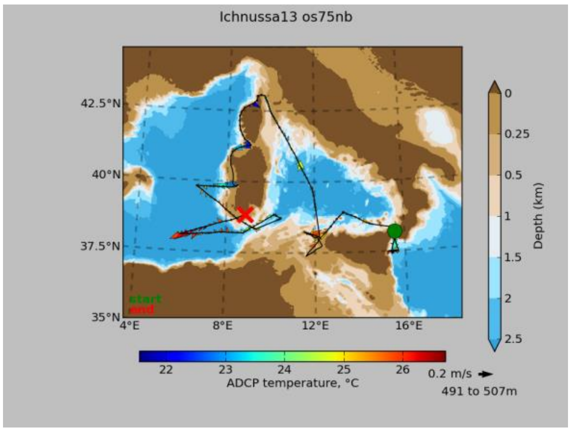
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
427 to 443m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
443 to 459m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
459 to 475m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
475 to 491m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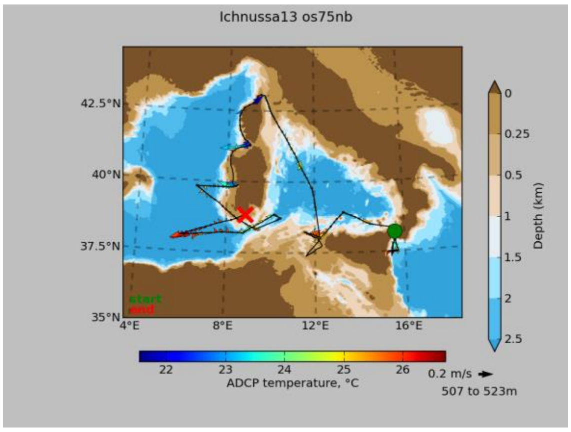
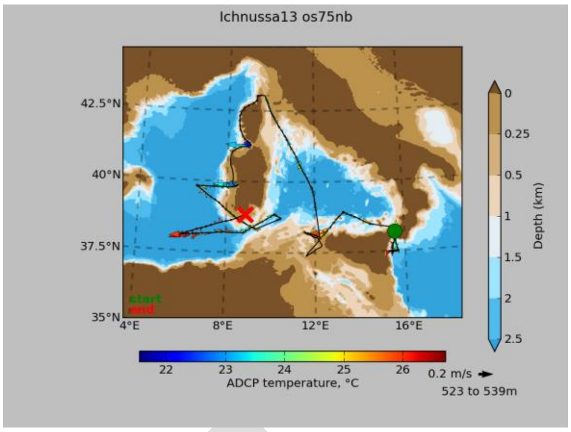
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
491 to 507m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
507 to 523m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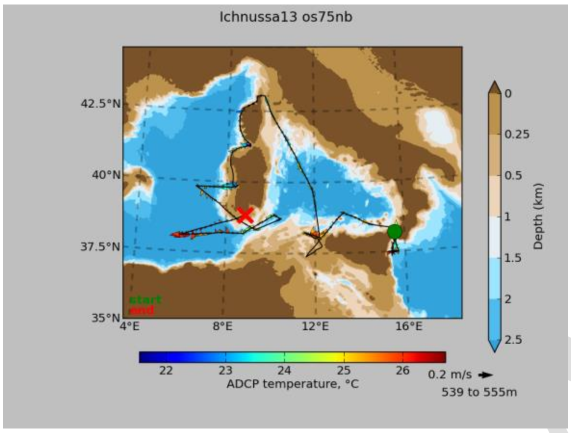
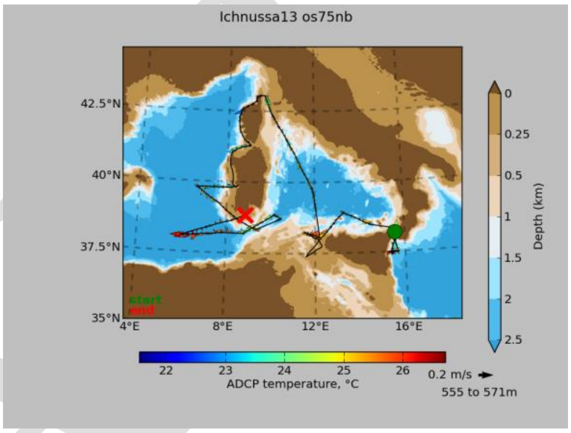
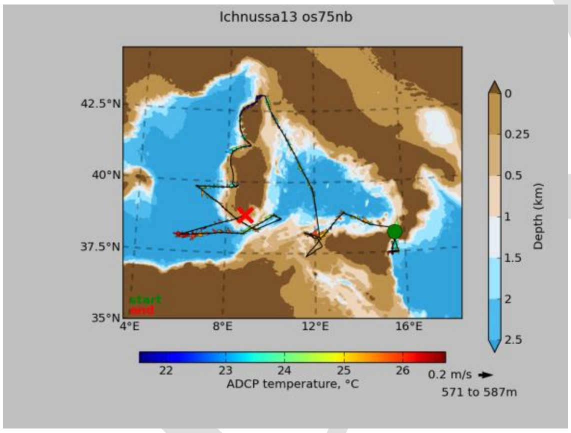
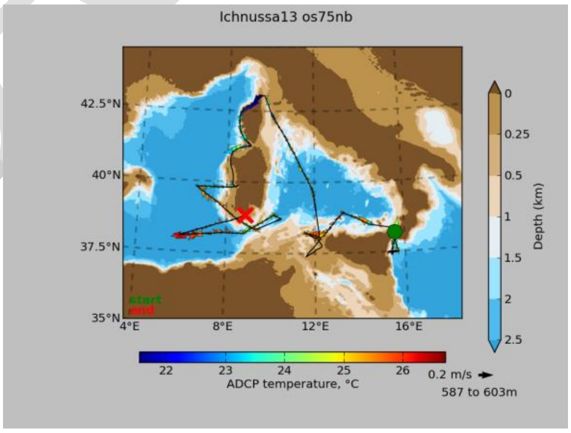
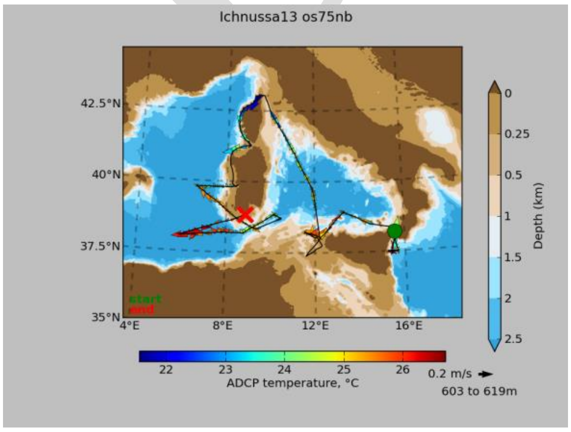
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
523 to 539m

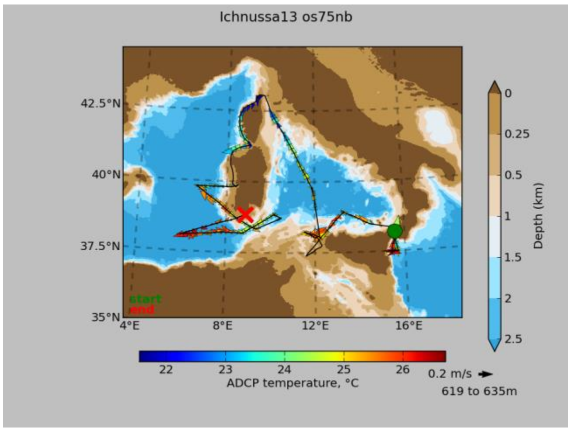

Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
539 to 555m

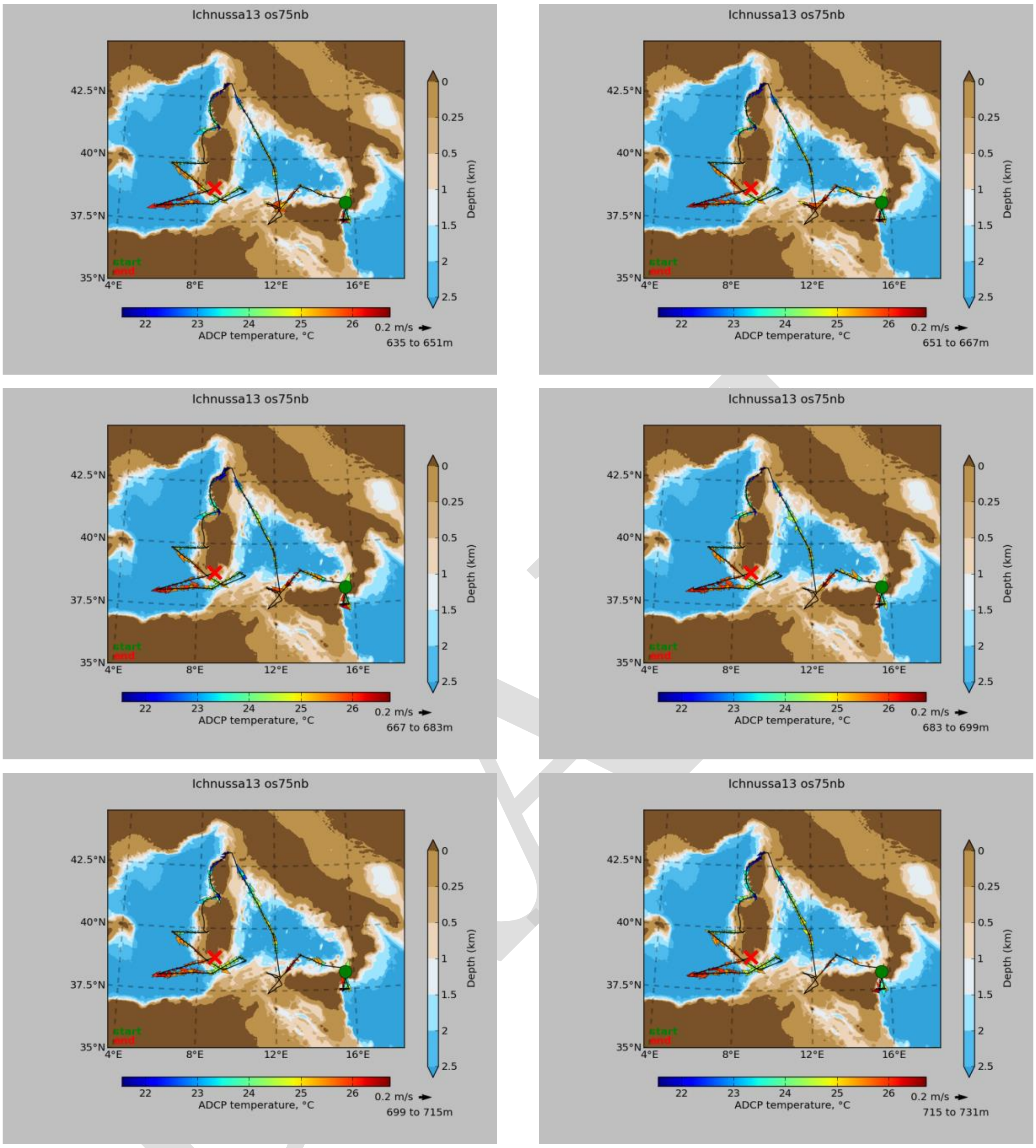

Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
555 to 571m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
571 to 587m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
587 to 603m

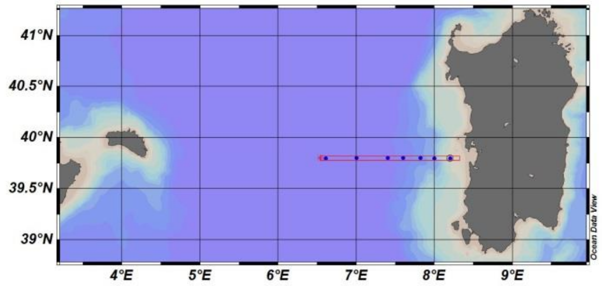

Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
603 to 619m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
619 to 635m


Ichnussa13 os75nb
42.5°N
40°N
37.5°N
35°N
4°E
8°E
12°E
16°E
start
end
Depth (km)
0
0.25
0.5
1
1.5
2
2.5
22
23
24
25
26
ADCP temperature, °C
0.2 m/s
635 to 651m
Ichnussa13 os75nb
651 to 667m
Ichnussa13 os75nb
667 to 683m
Ichnussa13 os75nb
683 to 699m
Ichnussa13 os75nb
699 to 715m
Ichnussa13 os75nb
715 to 731m

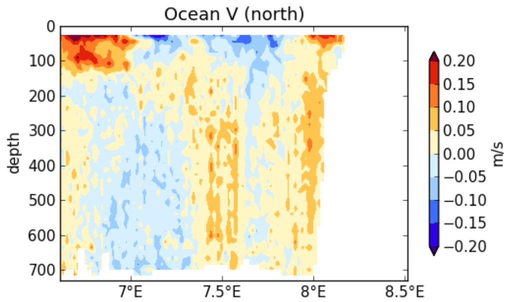
Comparison between LADCP and VMADCP

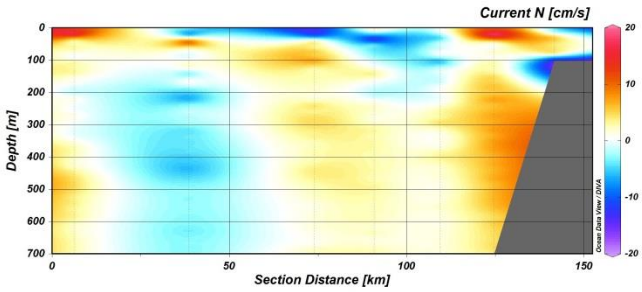
Sardinian Sea transect

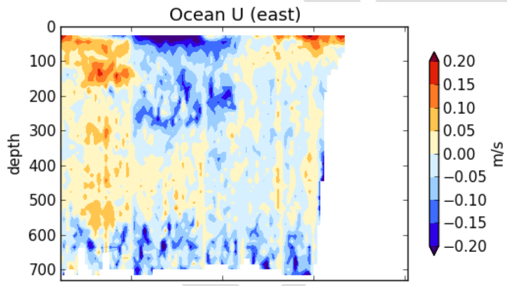


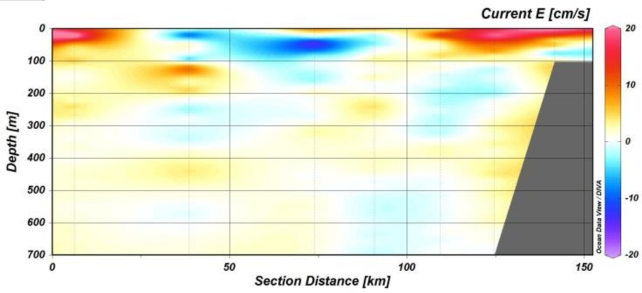
VMADCP (OS 75 kHz)

LADCP



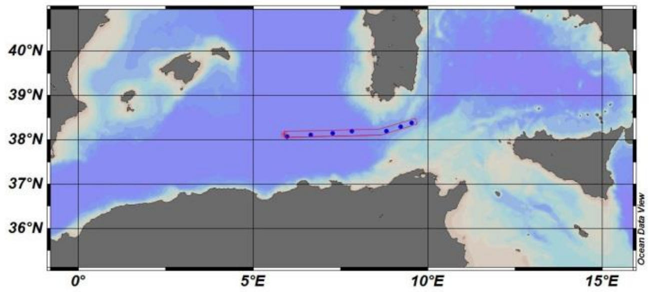






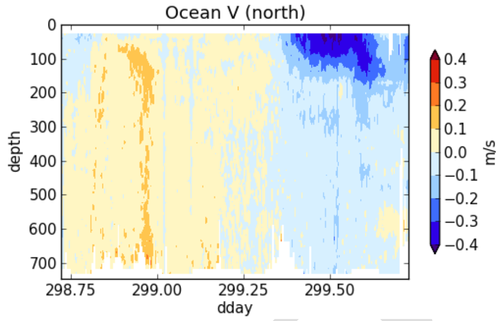
Comparison of the measured velocity through LADCP and VMADCP measurements along the Sardinian Sea transect: N component (positive values are northward) and E component (positive values are eastward).

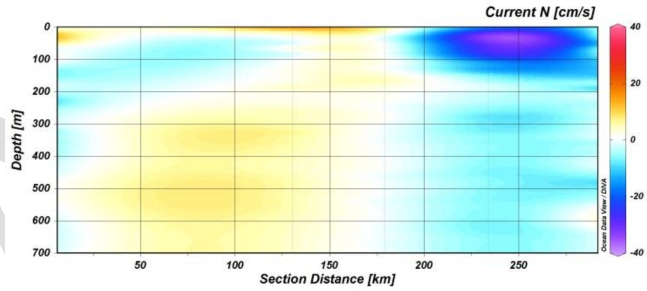
Sardinian Channel transect

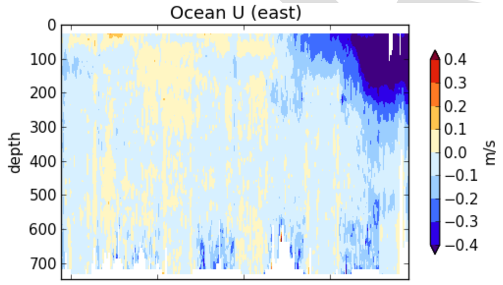


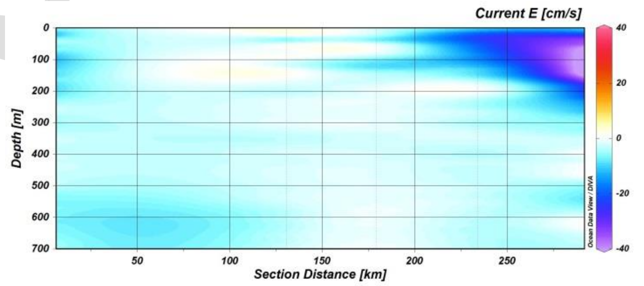
VMADCP (OS 75 kHz)

LADCP





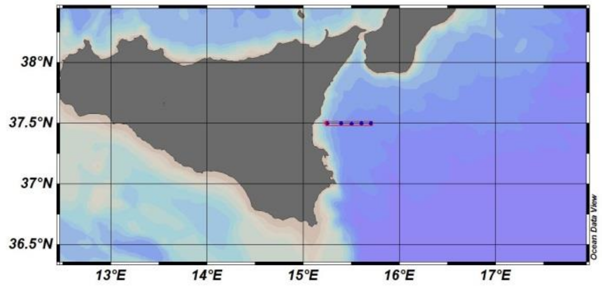


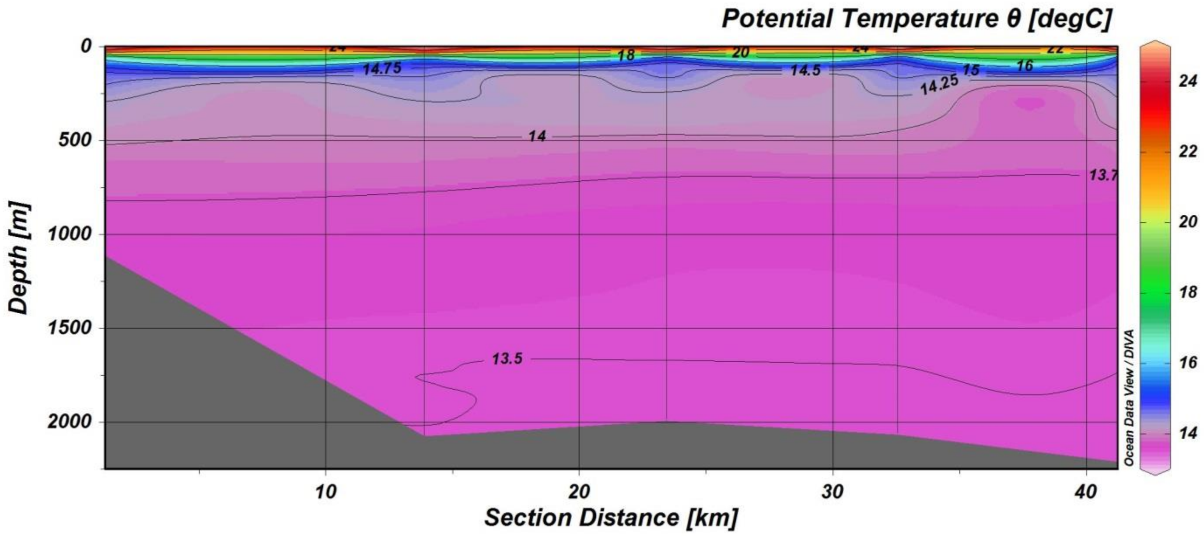


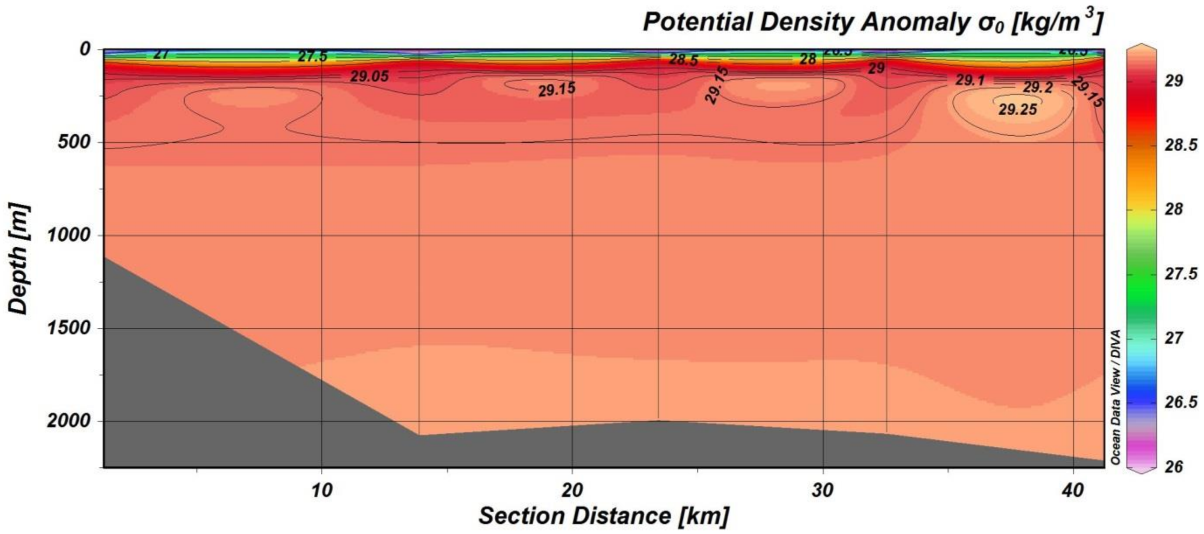
Comparison of the measured velocity through LADCP and VMADCP measurements along the Sardinian Channel transect: N component (positive values are northward) and E component (positive values are eastward).

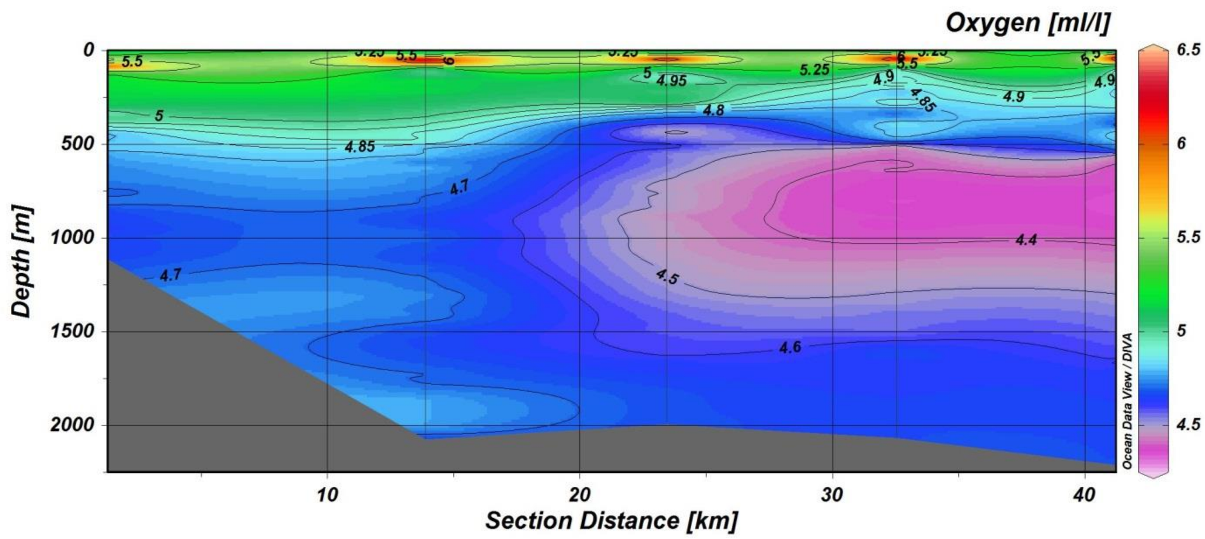
Hydrology

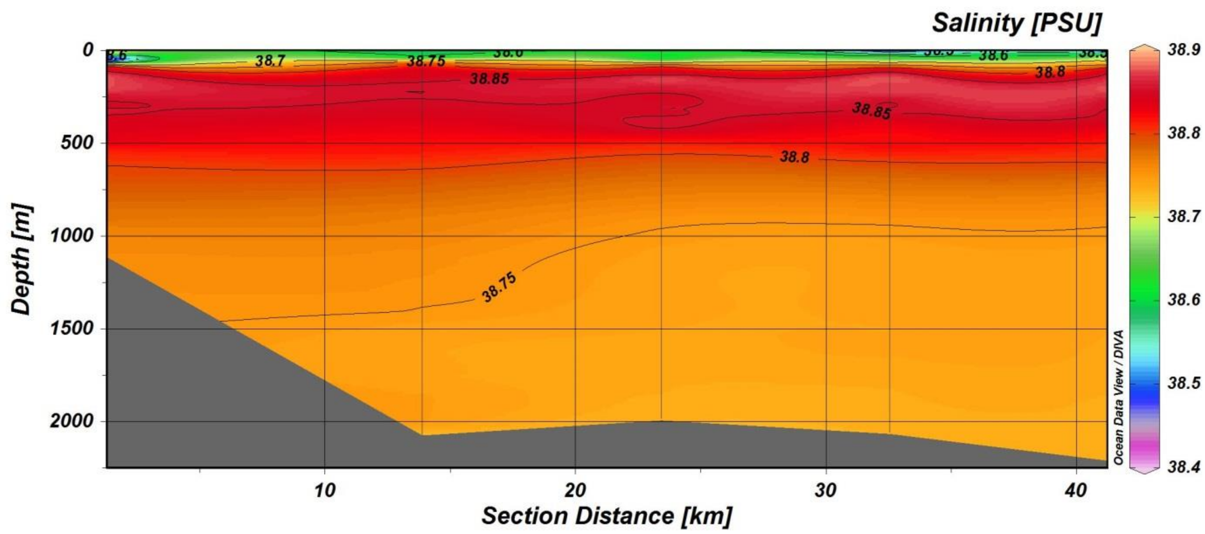
South-Est Sicily transect

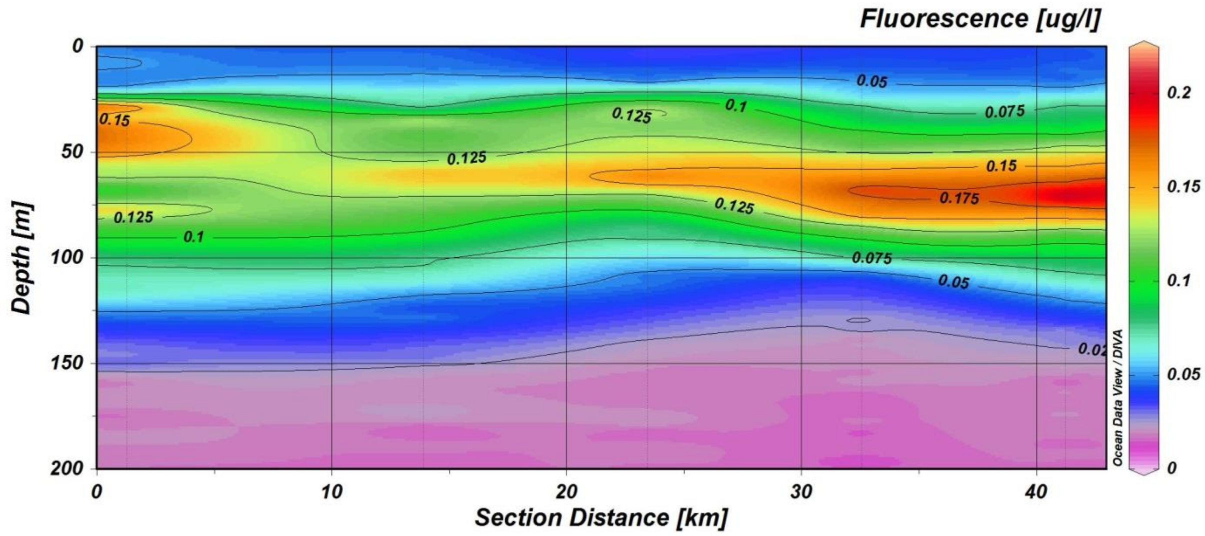


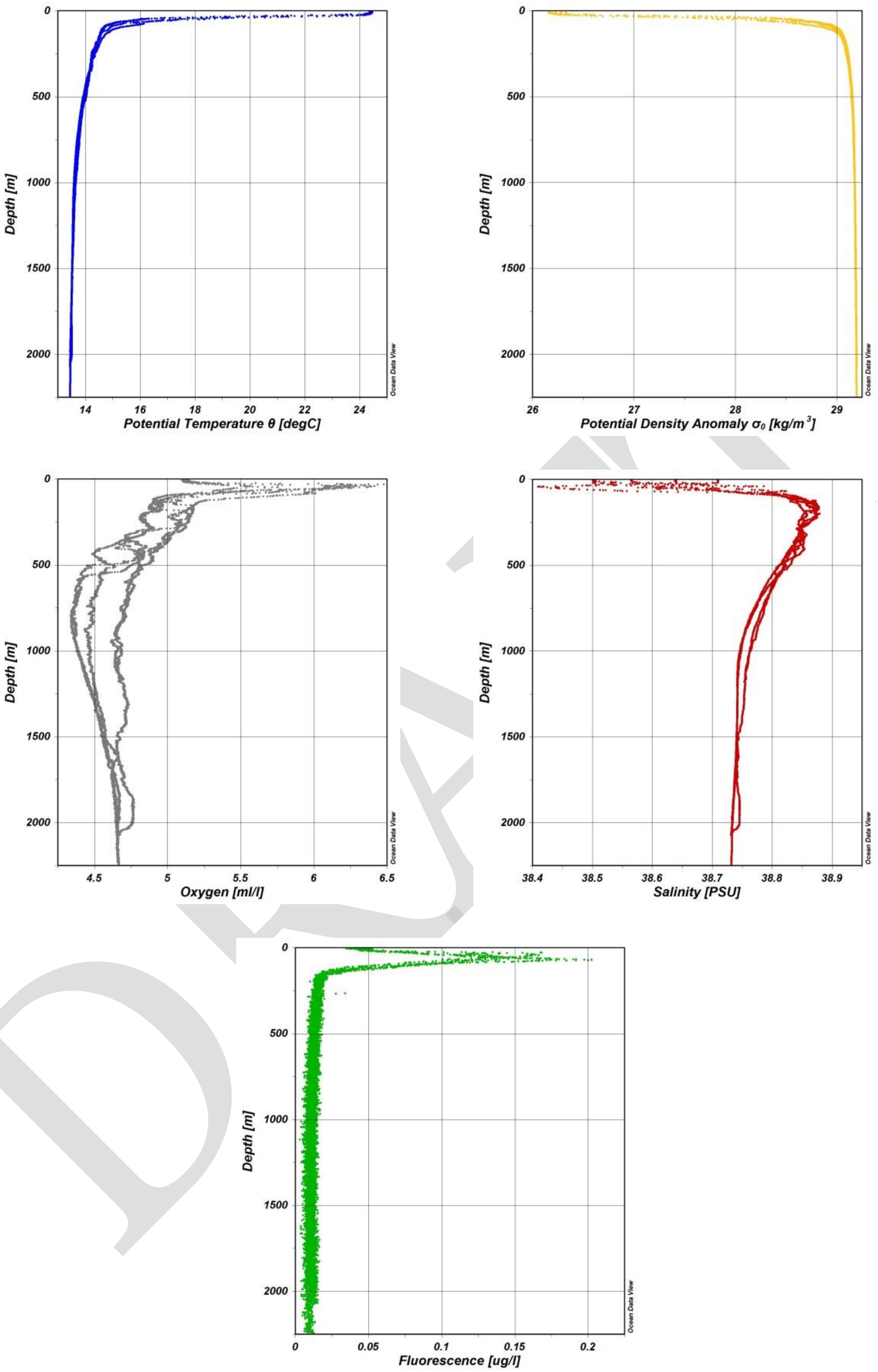





Oxygen [ml/l]
Depth [m]
0
500
1000
1500
2000
Section Distance [km]
10
20
30
40
6.5
6
5.5
5
4.5
Ocean Data View / DIVA
5.5
5
4.85
4.7
4.95
4.8
5.25
4.9
4.85
4.4
4.5
4.6

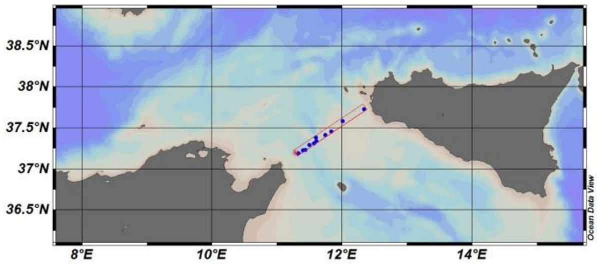

Salinity [PSU]
Depth [m]
0
500
1000
1500
2000
Section Distance [km]
10
20
30
40
38.9
38.8
38.7
38.6
38.5
38.4
Ocean Data View / DIVA
38.7
38.75
38.85
38.6
38.8
38.75

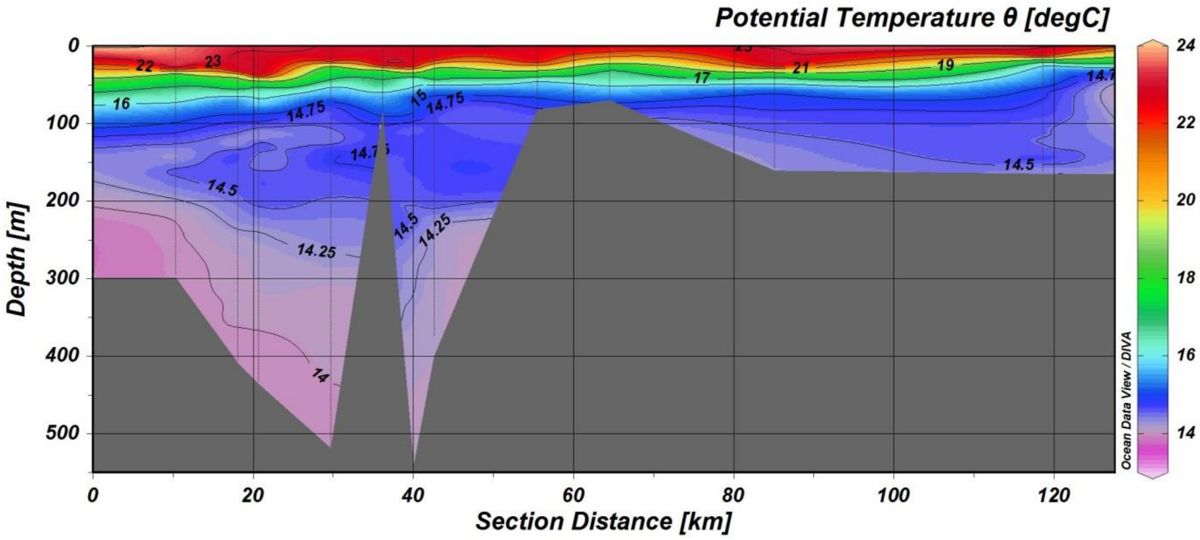

Fluorescence [ug/l]
Depth [m]
0
50
100
150
200
Section Distance [km]
0
10
20
30
40
0.2
0.15
0.1
0.05
0
Ocean Data View / DIVA
0.15
0.125
0.1
0.05
0.075
0.175
0.125

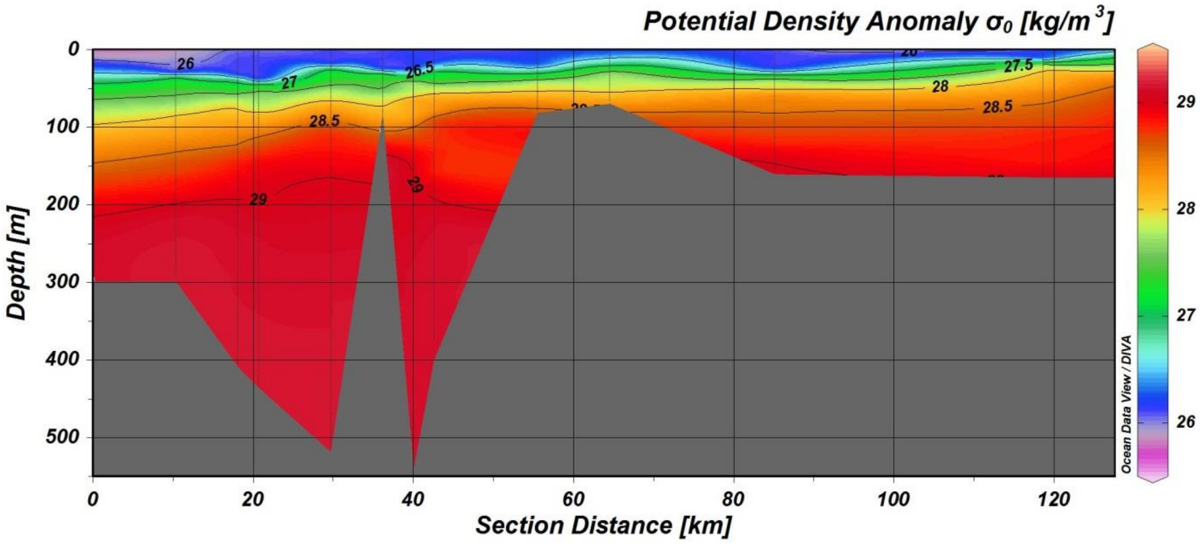


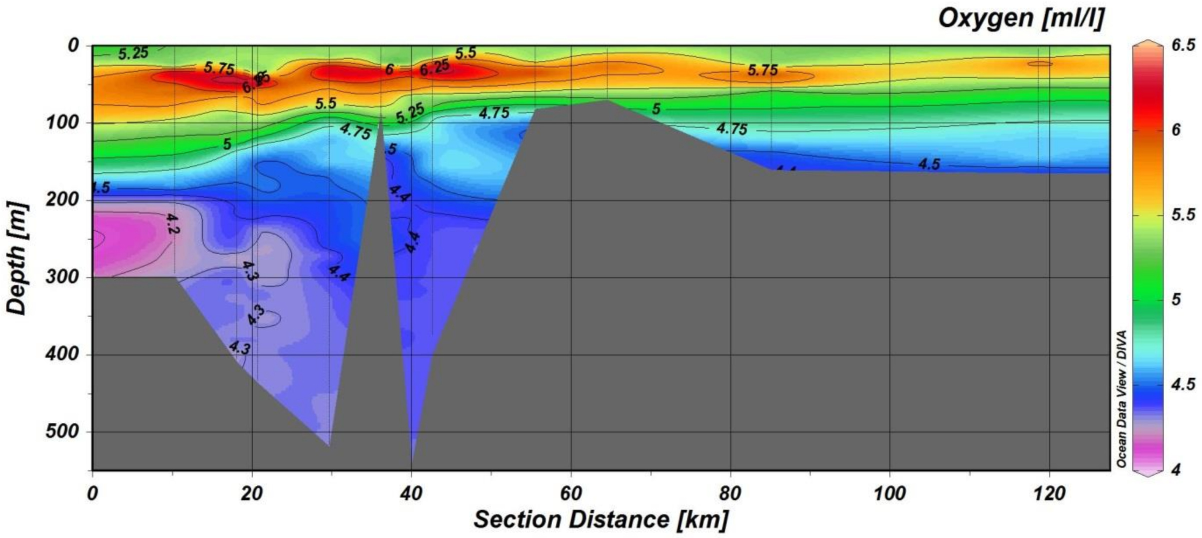
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

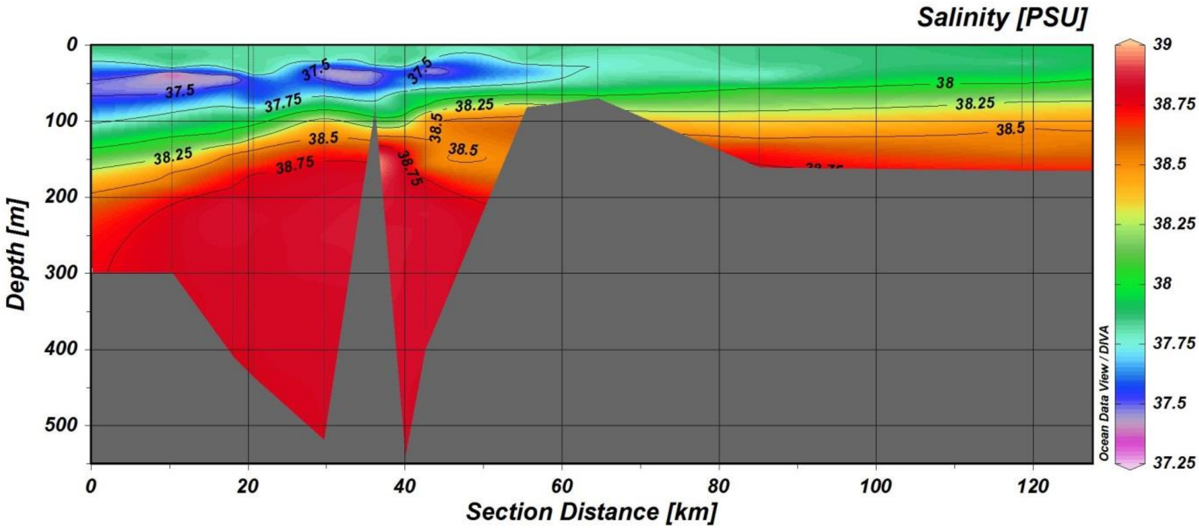
Sicily Strait transect

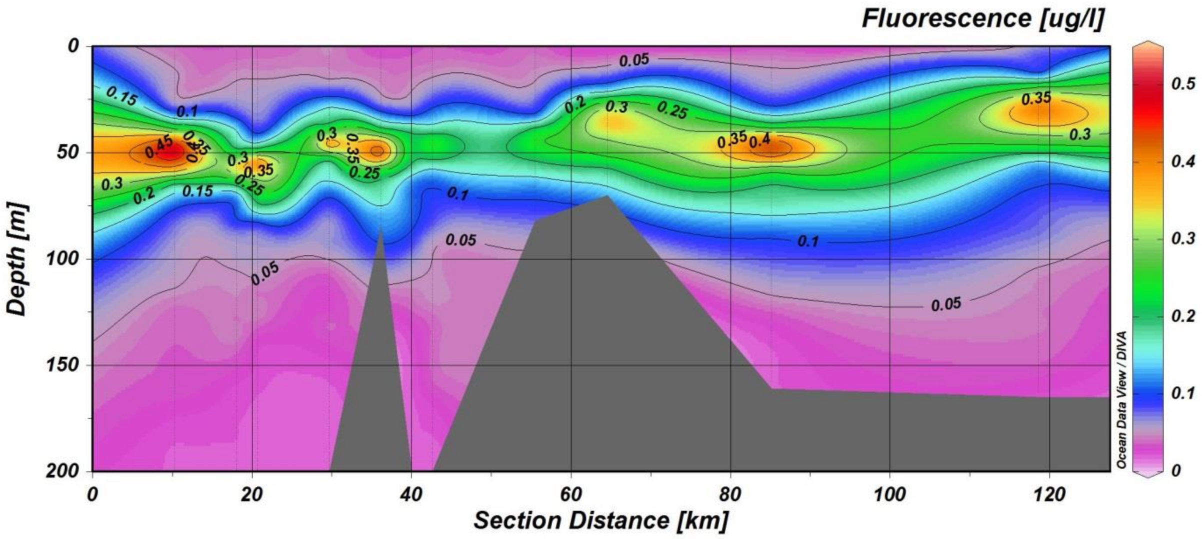


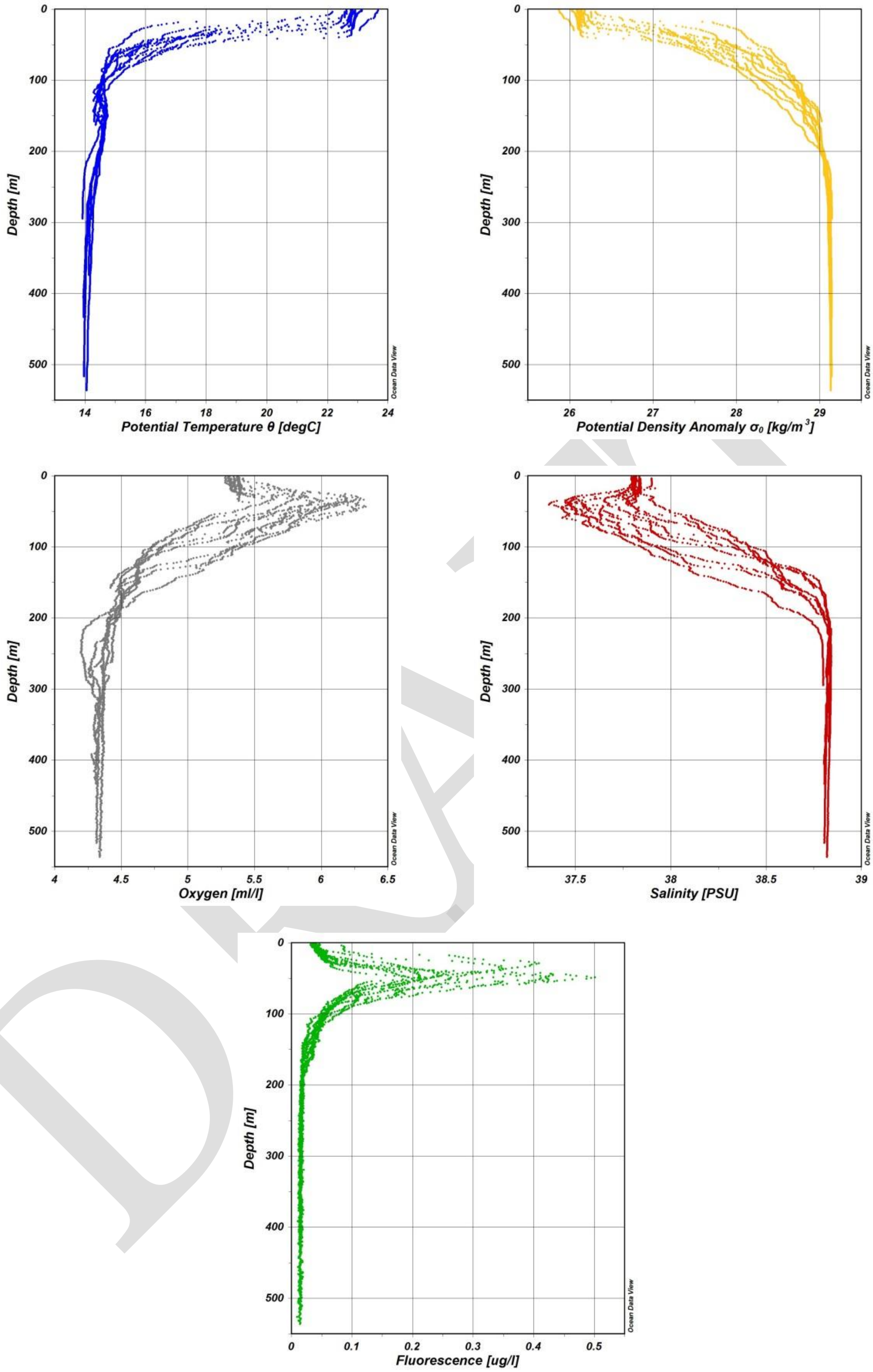





Oxygen [ml/l]
Depth [m]
0
100
200
300
400
500
0
20
40
60
80
100
120
Section Distance [km]
6.5
6
5.5
5
4.5
4
Ocean Data View / DIVA

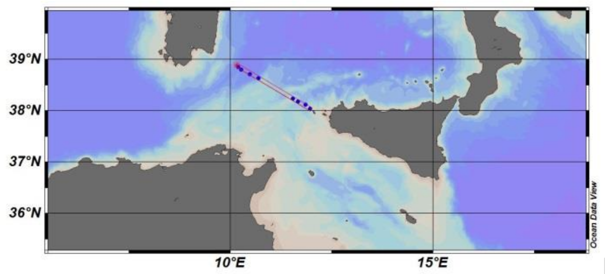

Salinity [PSU]
Depth [m]
0
100
200
300
400
500
0
20
40
60
80
100
120
Section Distance [km]
39
38.75
38.5
38.25
38
37.75
37.5
37.25
Ocean Data View / DIVA

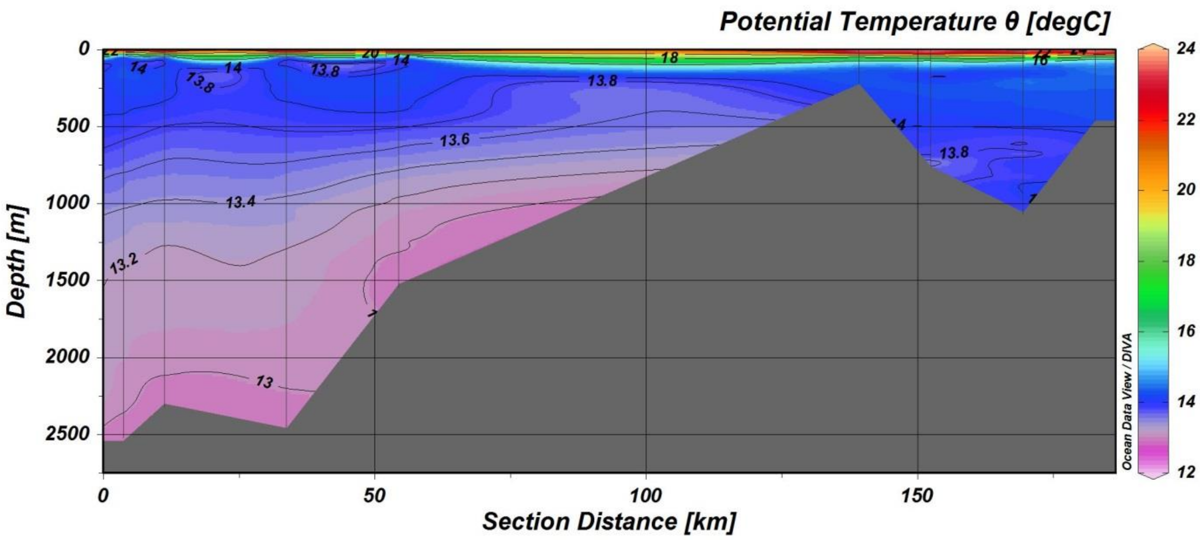

Fluorescence [ug/l]
Depth [m]
0
50
100
150
200
0
20
40
60
80
100
120
Section Distance [km]
0.5
0.4
0.3
0.2
0.1
0
Ocean Data View / DIVA

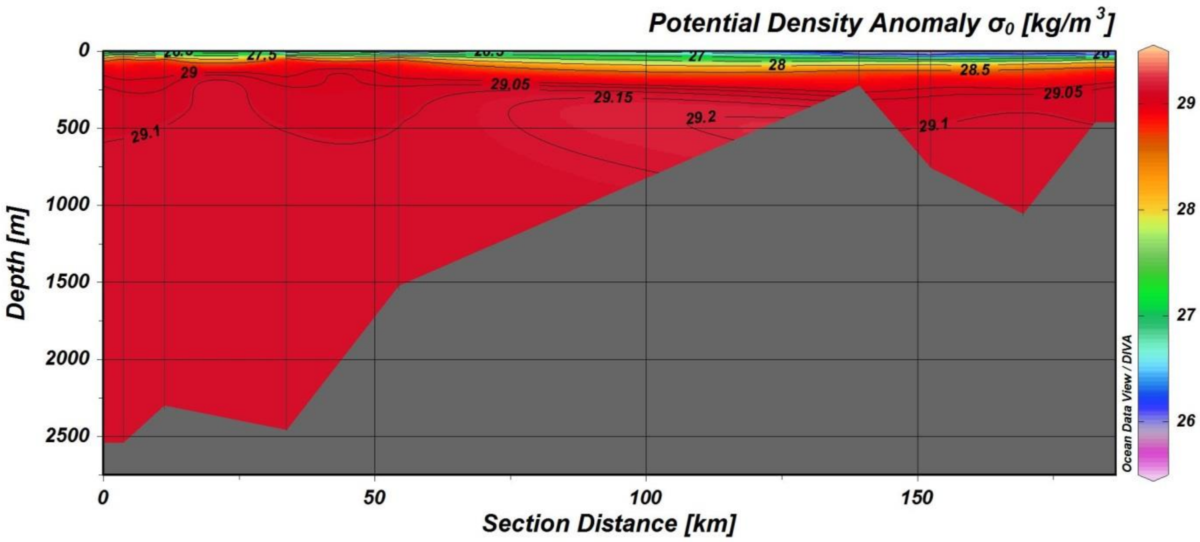


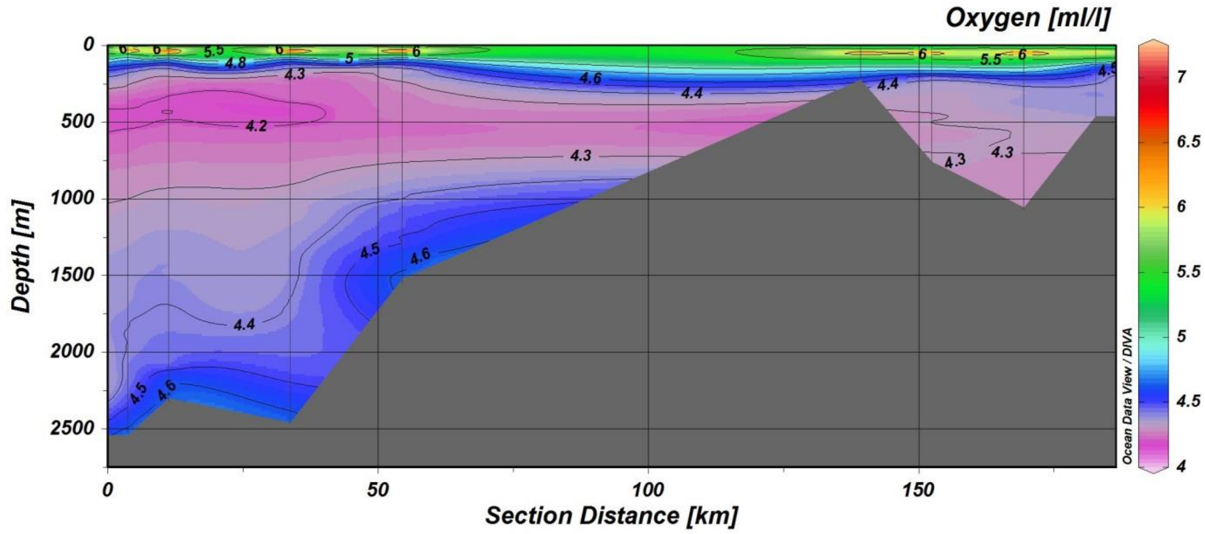
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

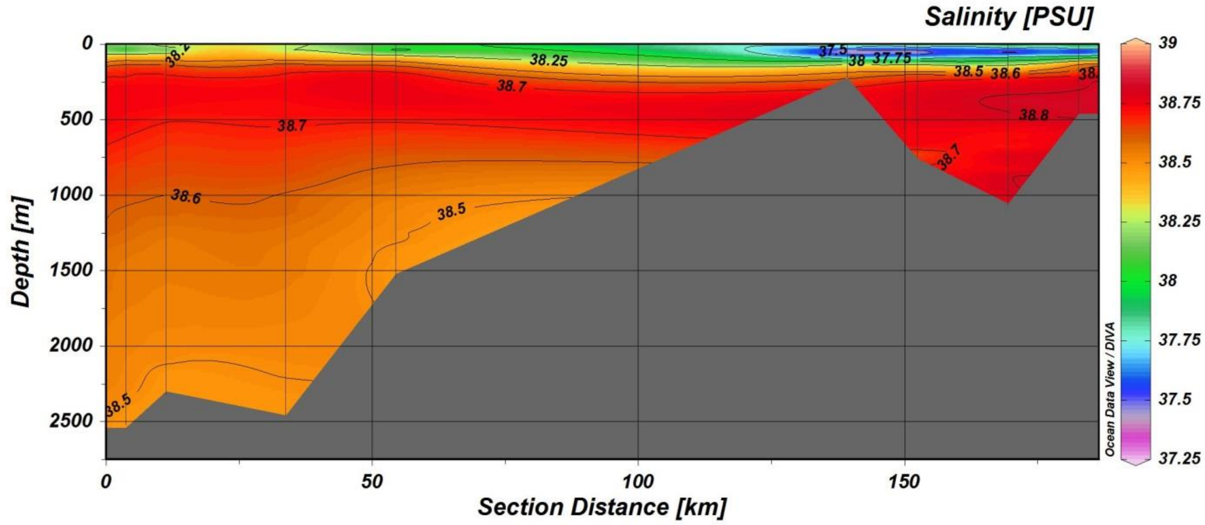
Sicily-Sardinia transect

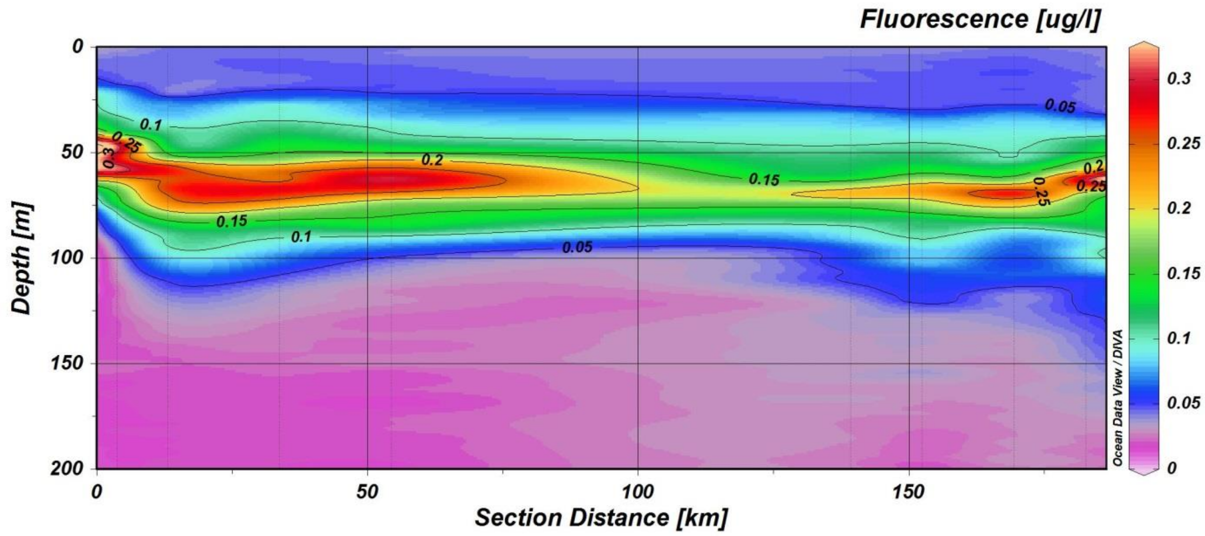


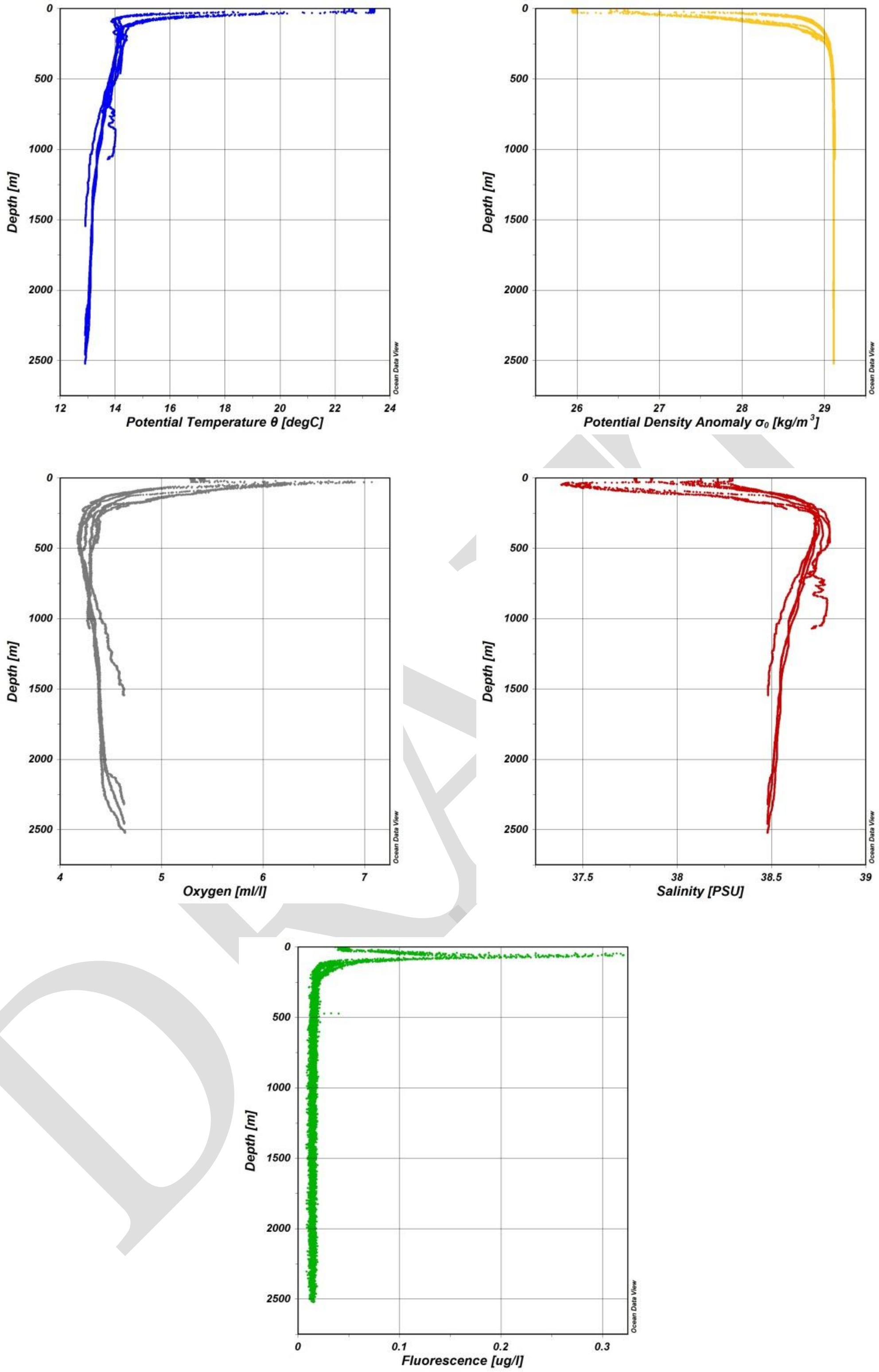





Oxygen [ml/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

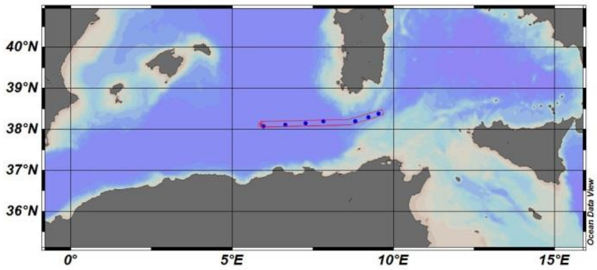

Salinity [PSU]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

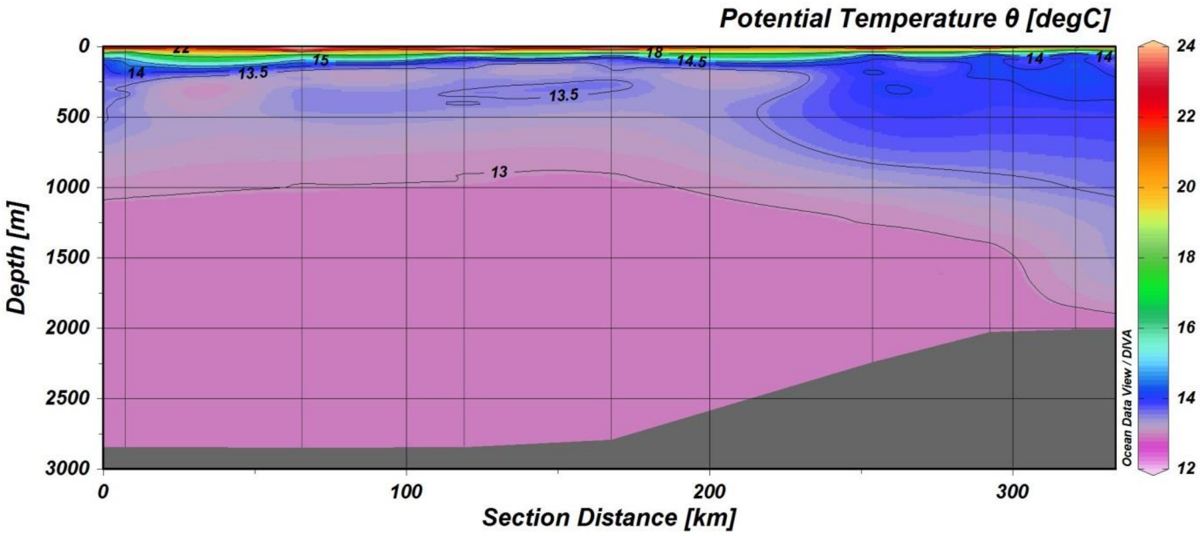

Fluorescence [ug/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

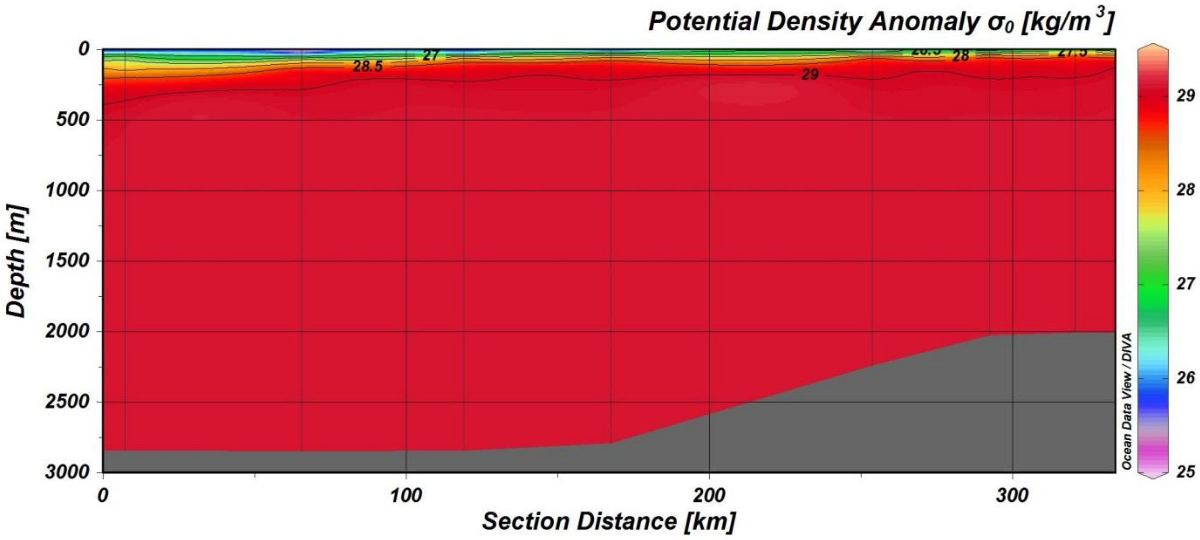


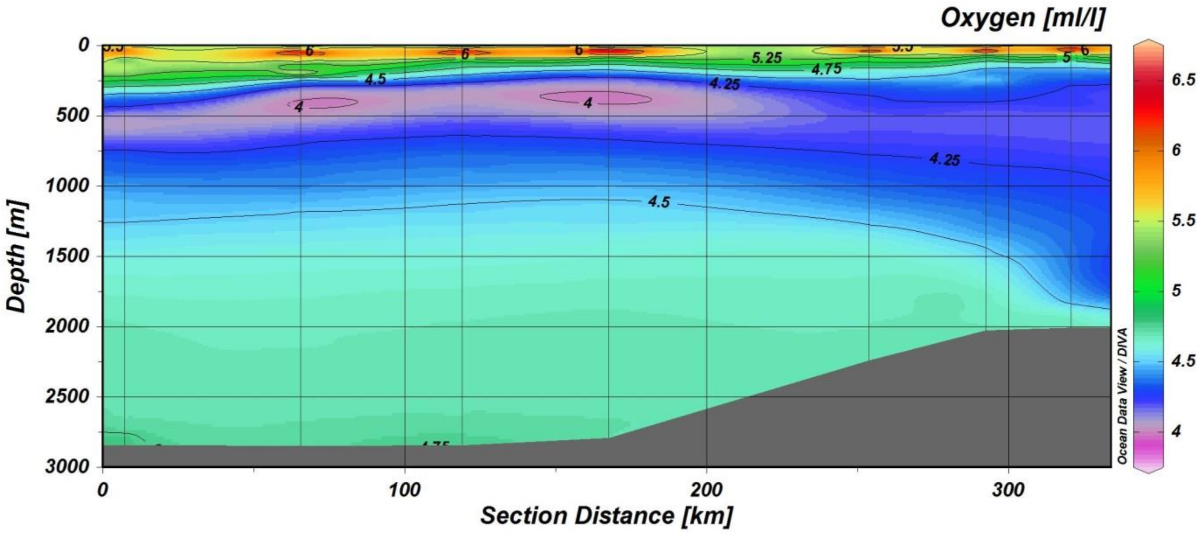
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

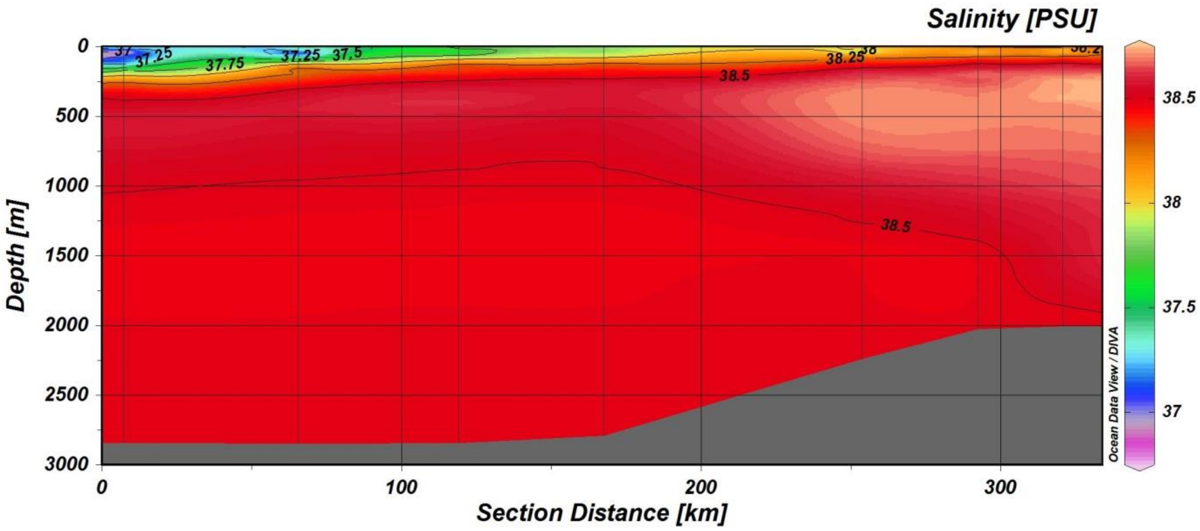
Sardinian Channel transect

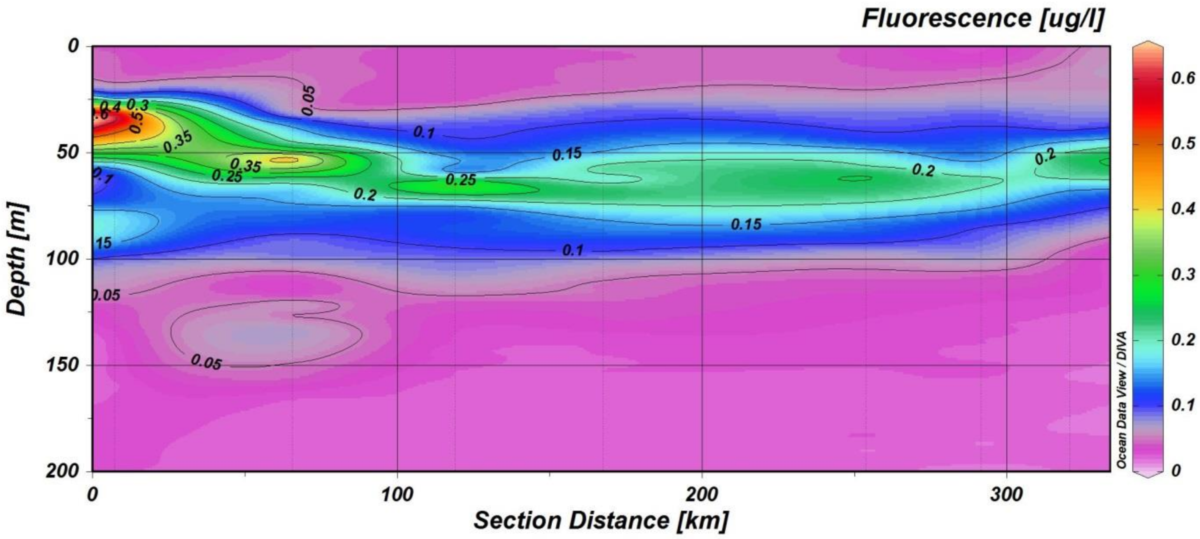


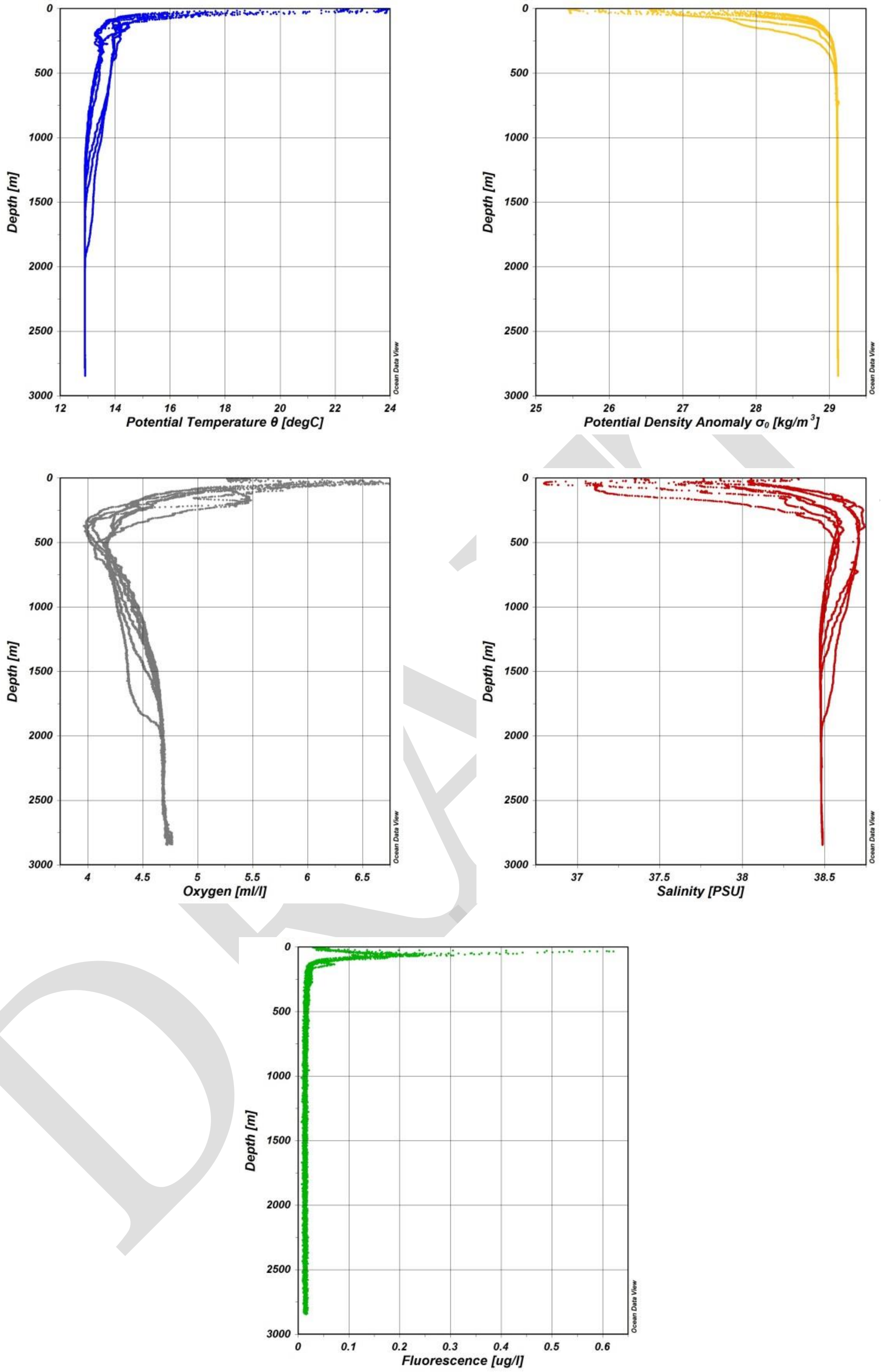





Oxygen [ml/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

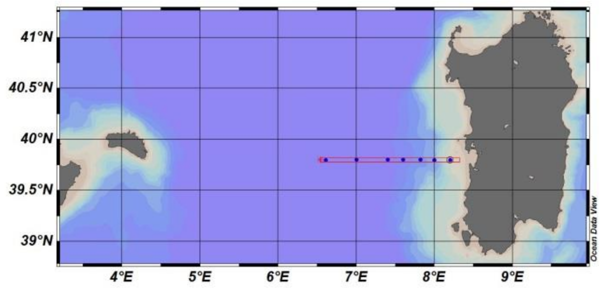

Salinity [PSU]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

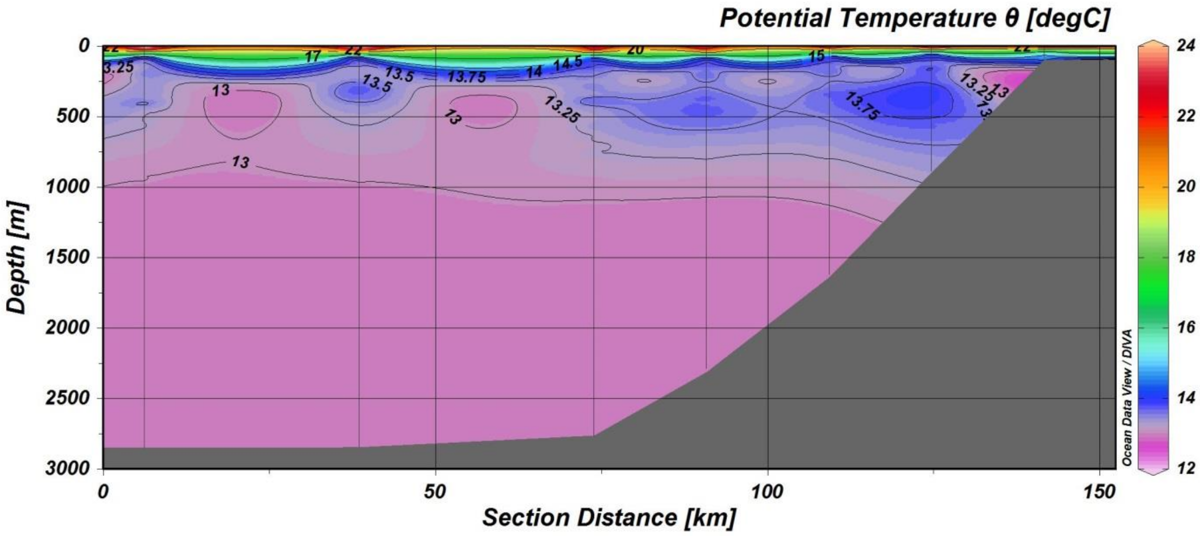

Fluorescence [ug/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

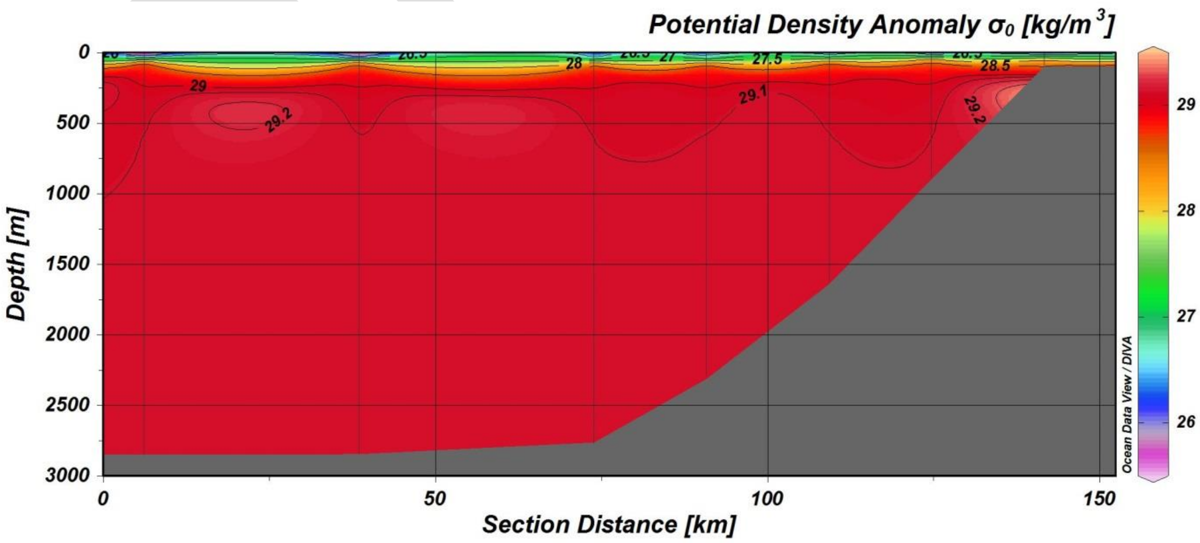


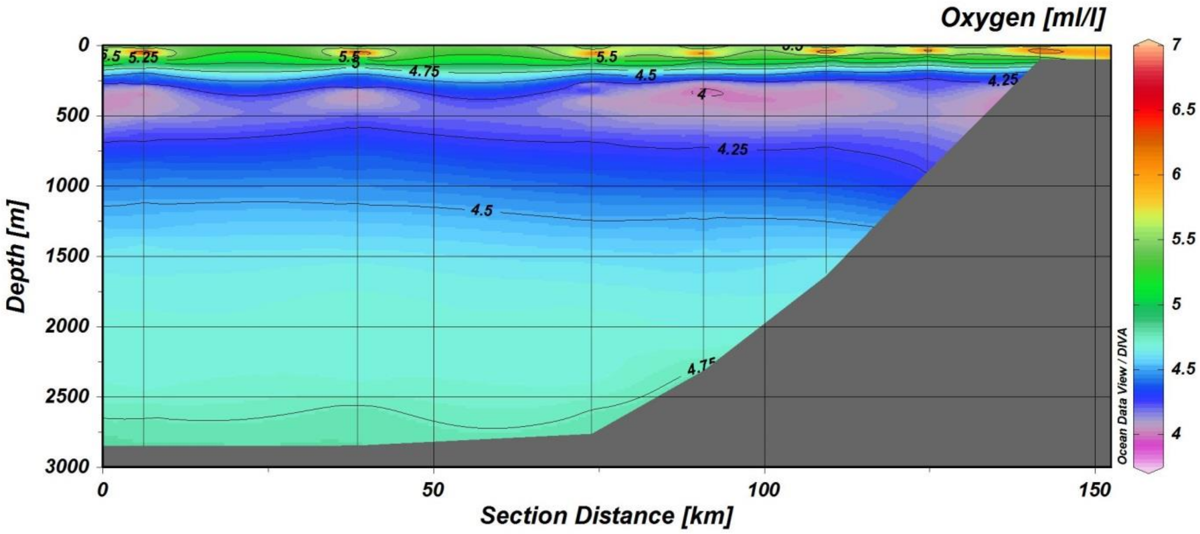
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

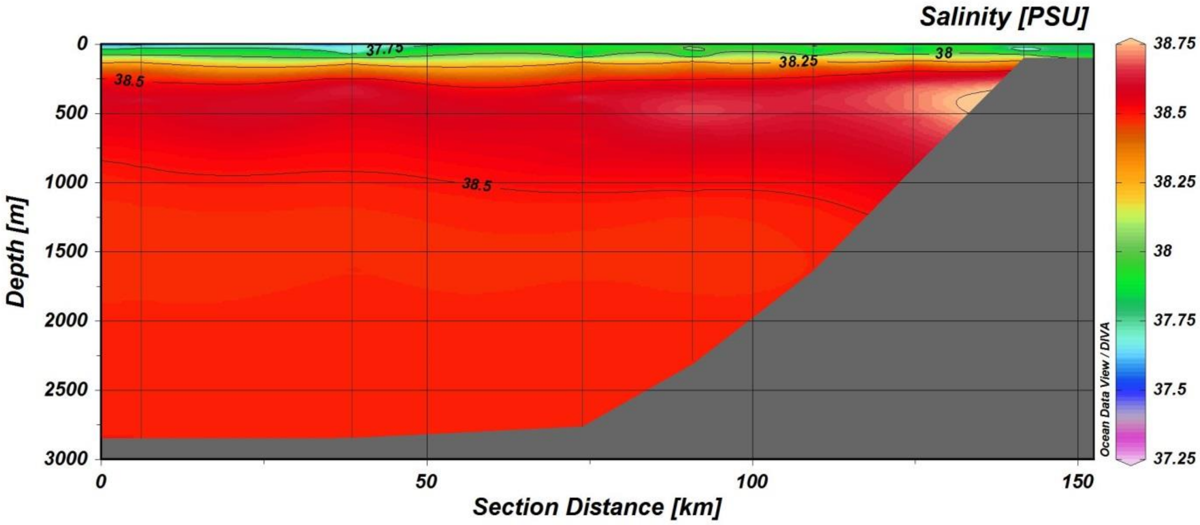
Sardinian Sea transect

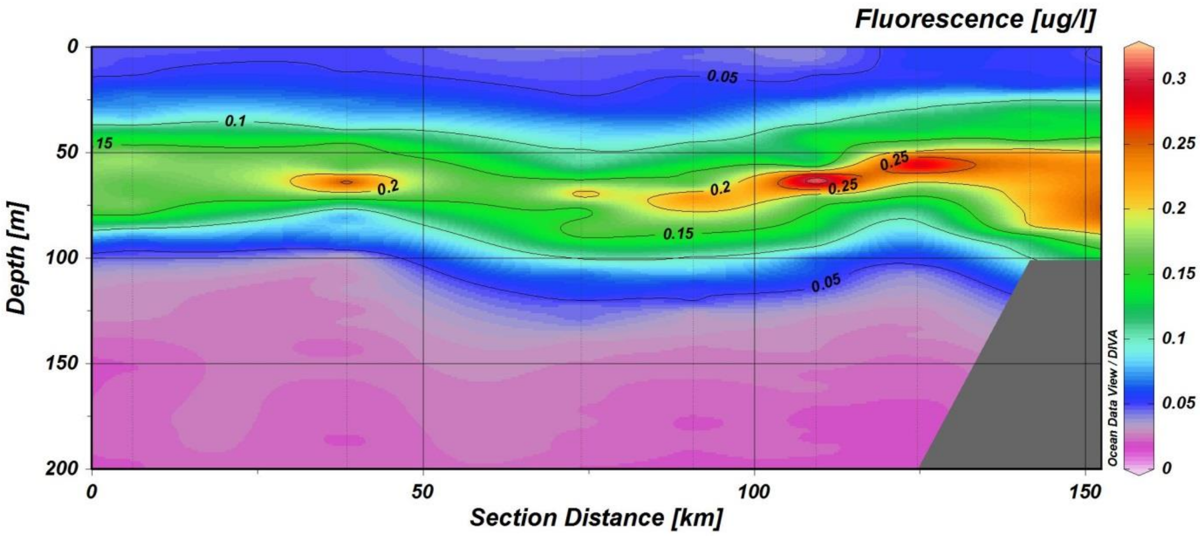


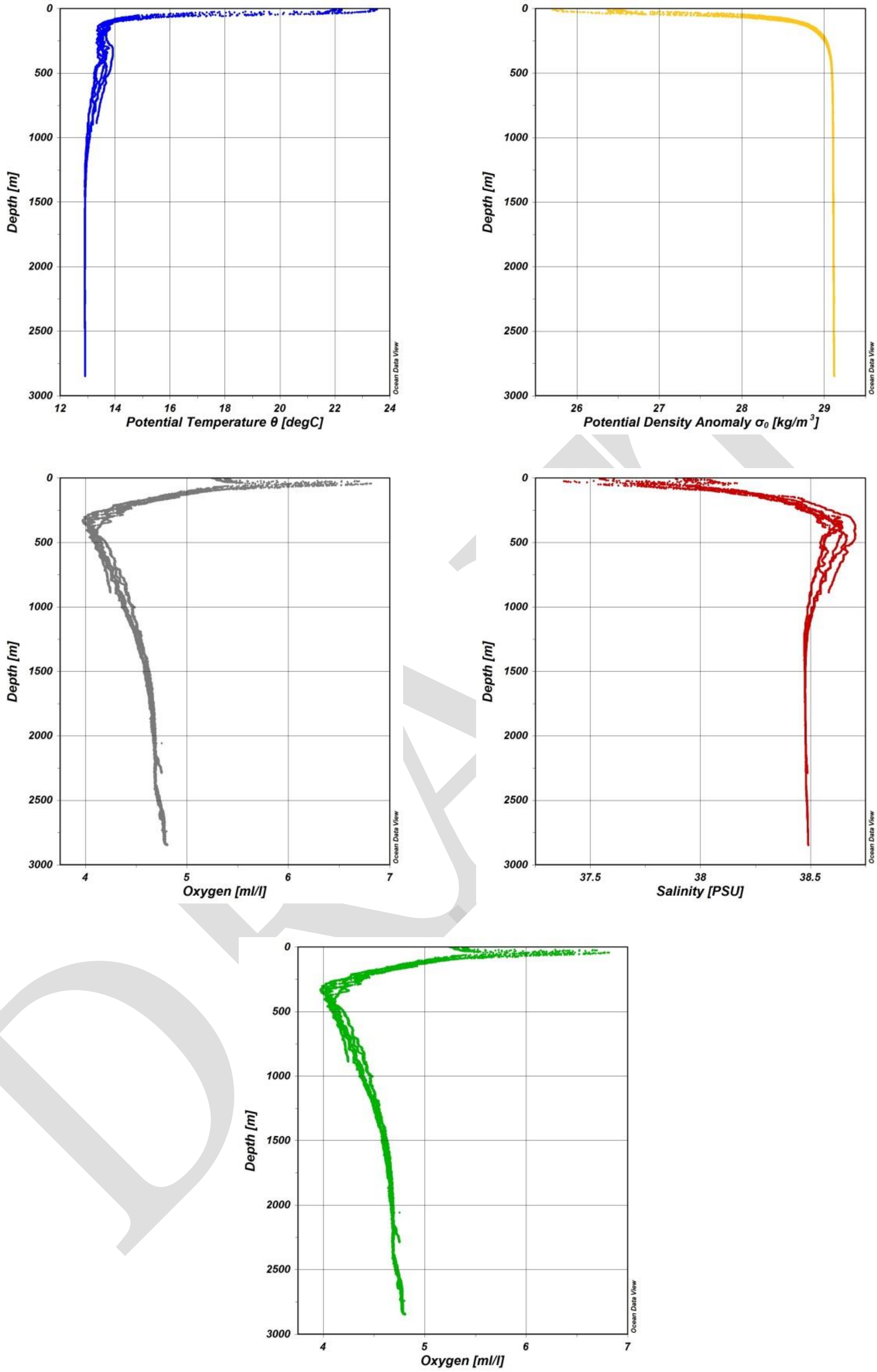





Oxygen [ml/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

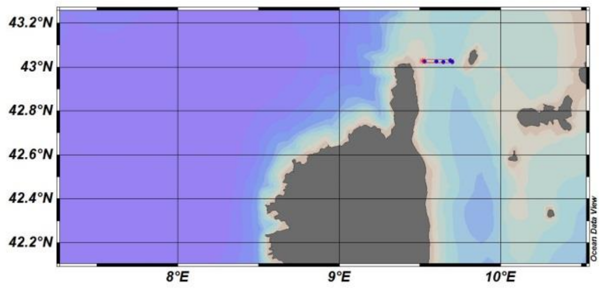

Salinity [PSU]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

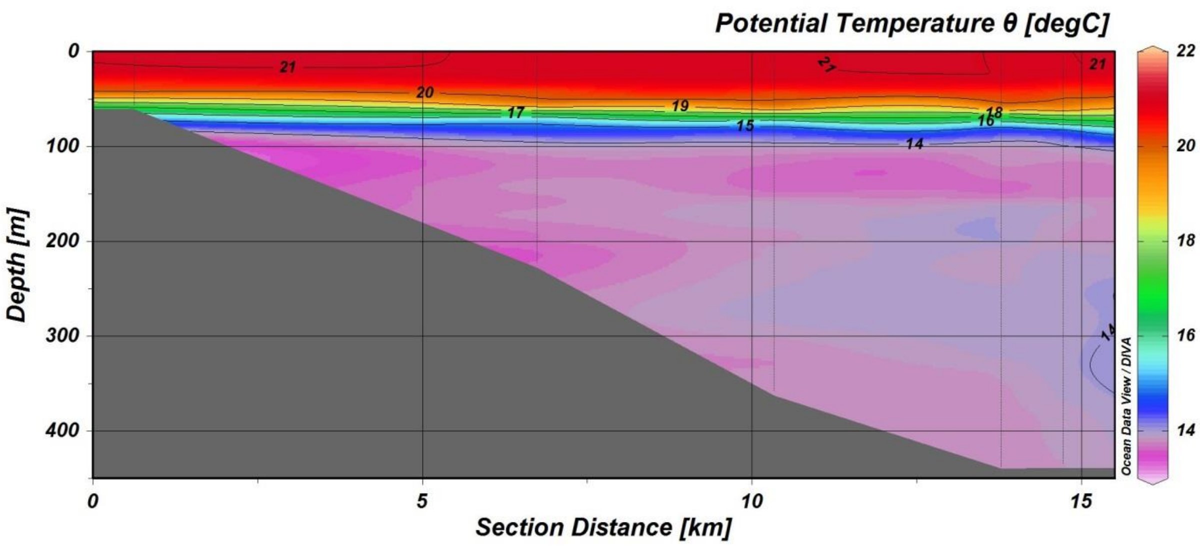

Fluorescence [ug/l]
Depth [m]
Section Distance [km]
Ocean Data View / DIVA

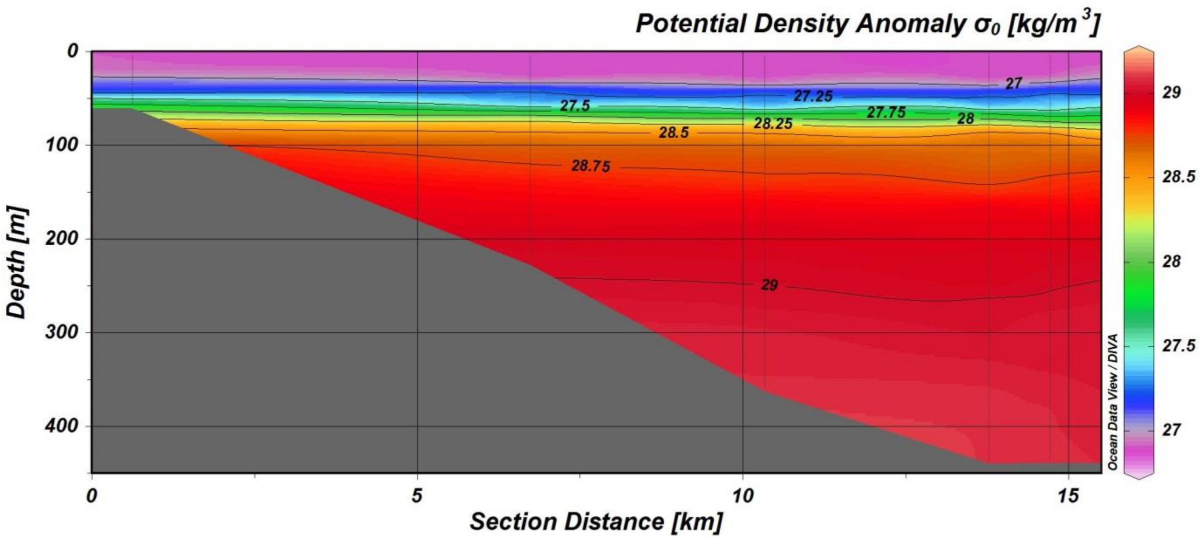


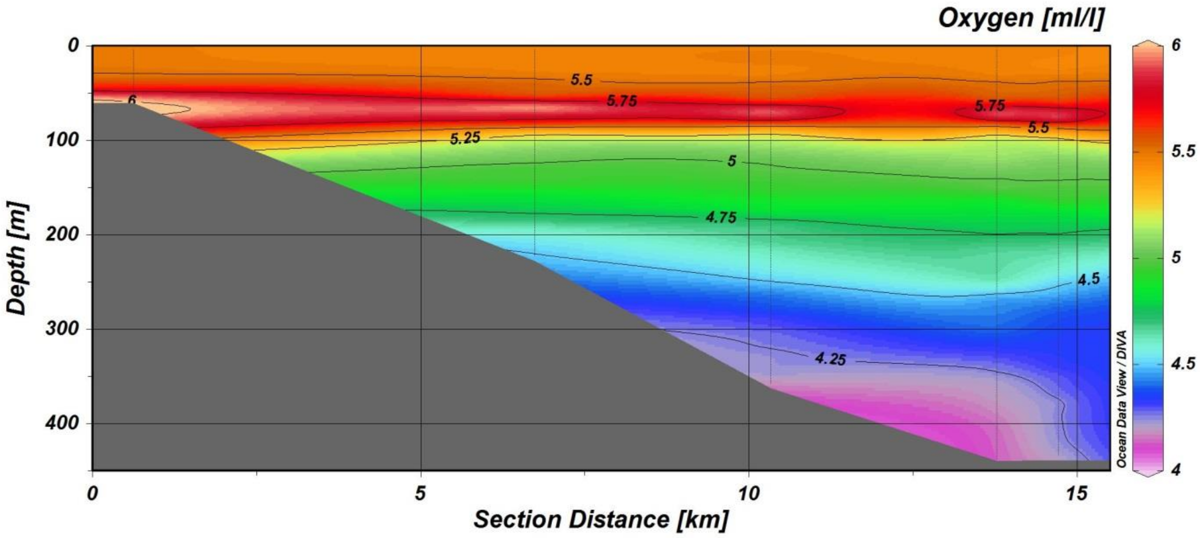
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

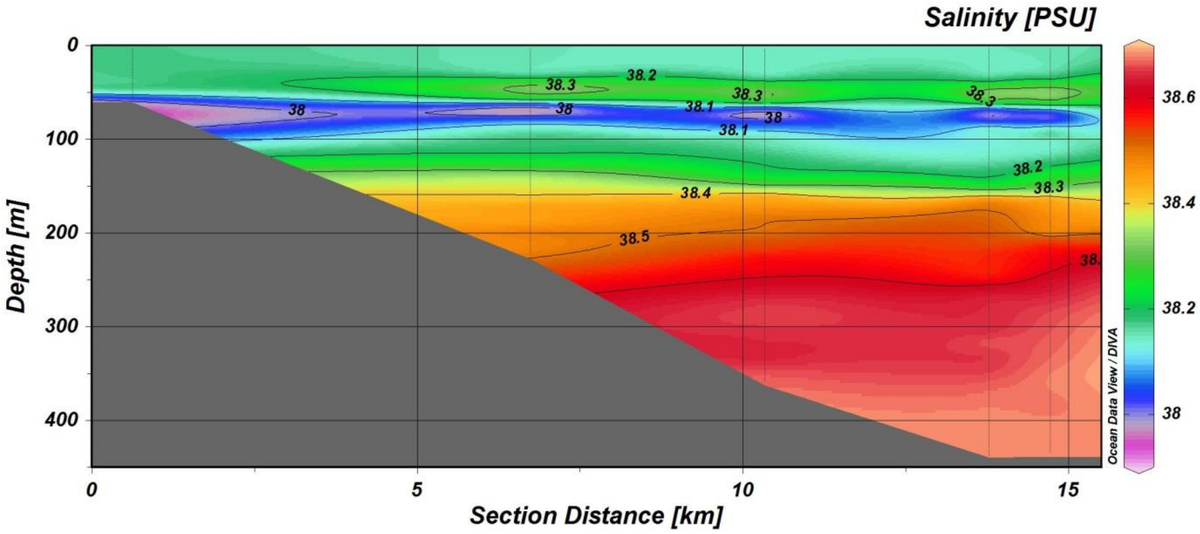
Corsica Channel transect

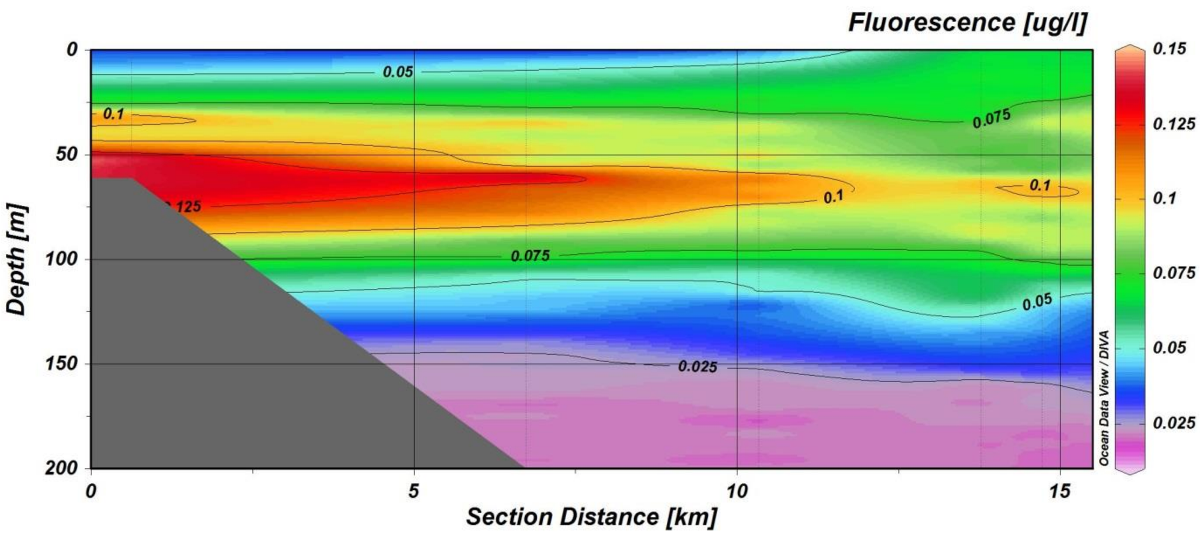


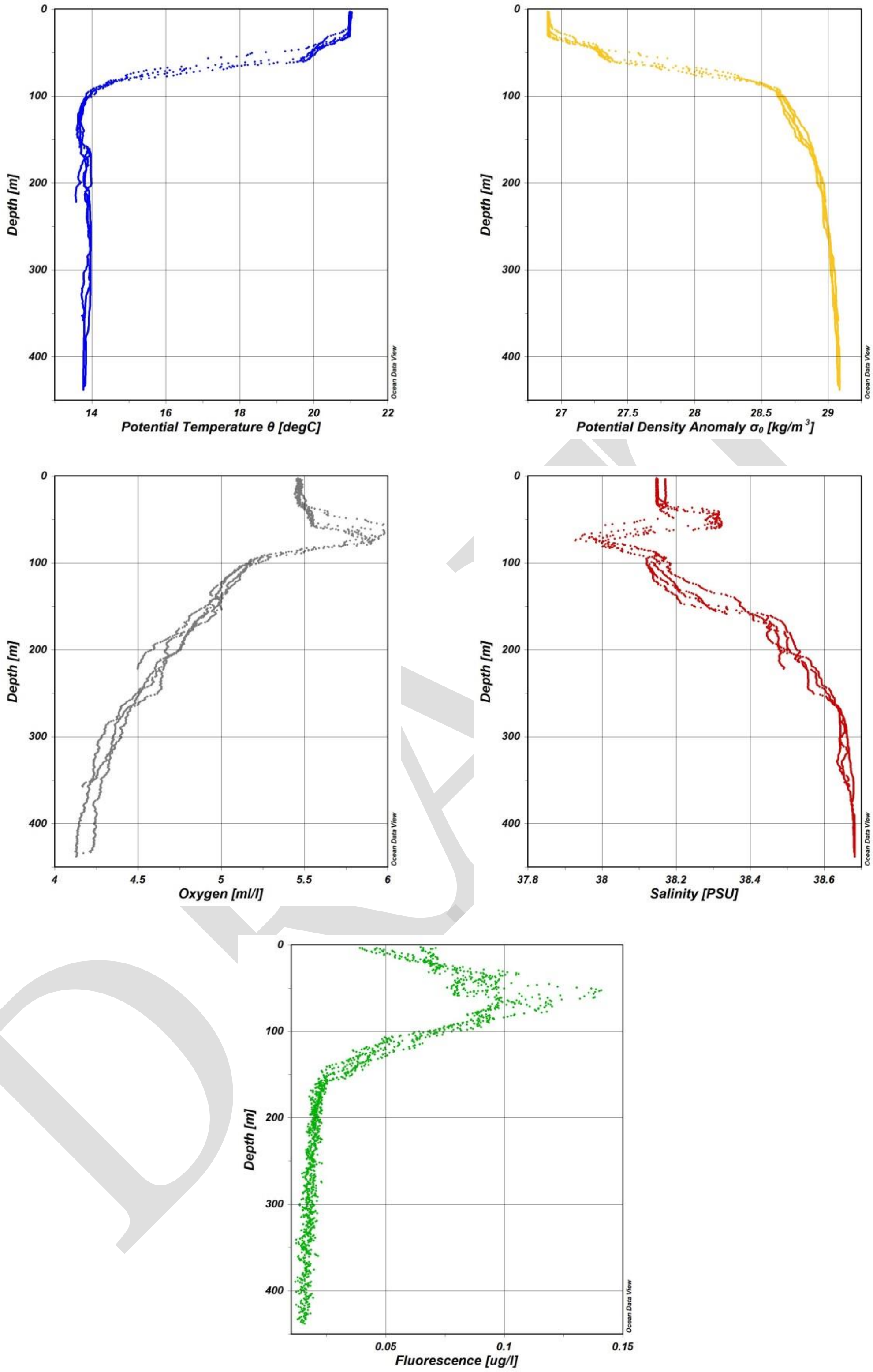





Oxygen [ml/l]
Depth [m]
Section Distance [km]
0
100
200
300
400
0
5
10
15
5.5
5.75
5.75
5.5
6
5.25
5
4.75
4.5
4.25
6
5.5
5
4.5
4
Ocean Data View / DIVA

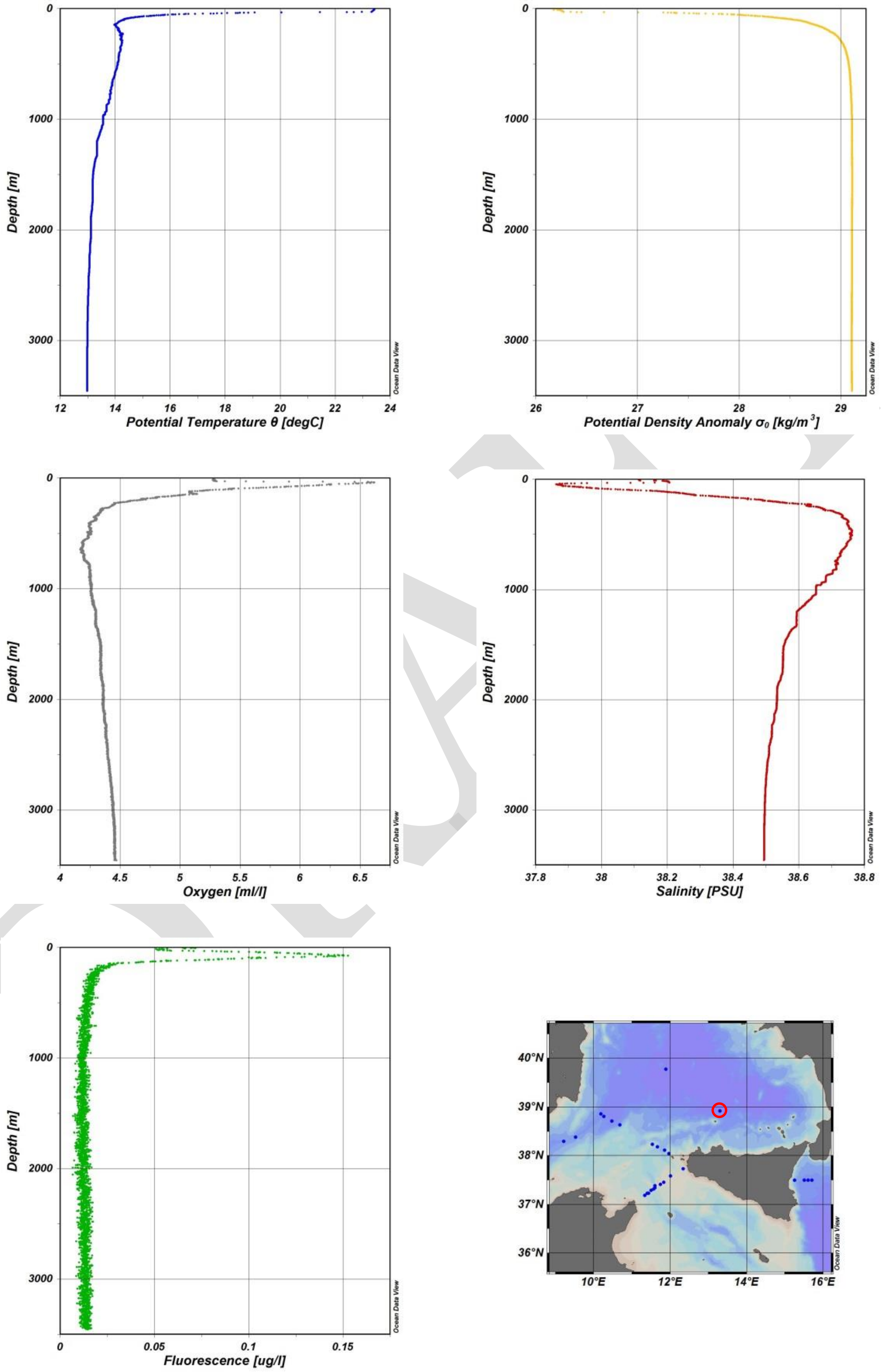

Salinity [PSU]
Depth [m]
Section Distance [km]
0
100
200
300
400
0
5
10
15
38.2
38.3
38.3
38.3
38
38
38.1
38
38.1
38.2
38.3
38.4
38.5
38.6
38.4
38.2
38
Ocean Data View / DIVA


Fluorescence [ug/l]
Depth [m]
Section Distance [km]
0
50
100
150
200
0
5
10
15
0.05
0.1
0.075
0.1
0.1
0.075
0.05
0.025
0.15
0.125
0.1
0.075
0.05
0.025
Ocean Data View / DIVA



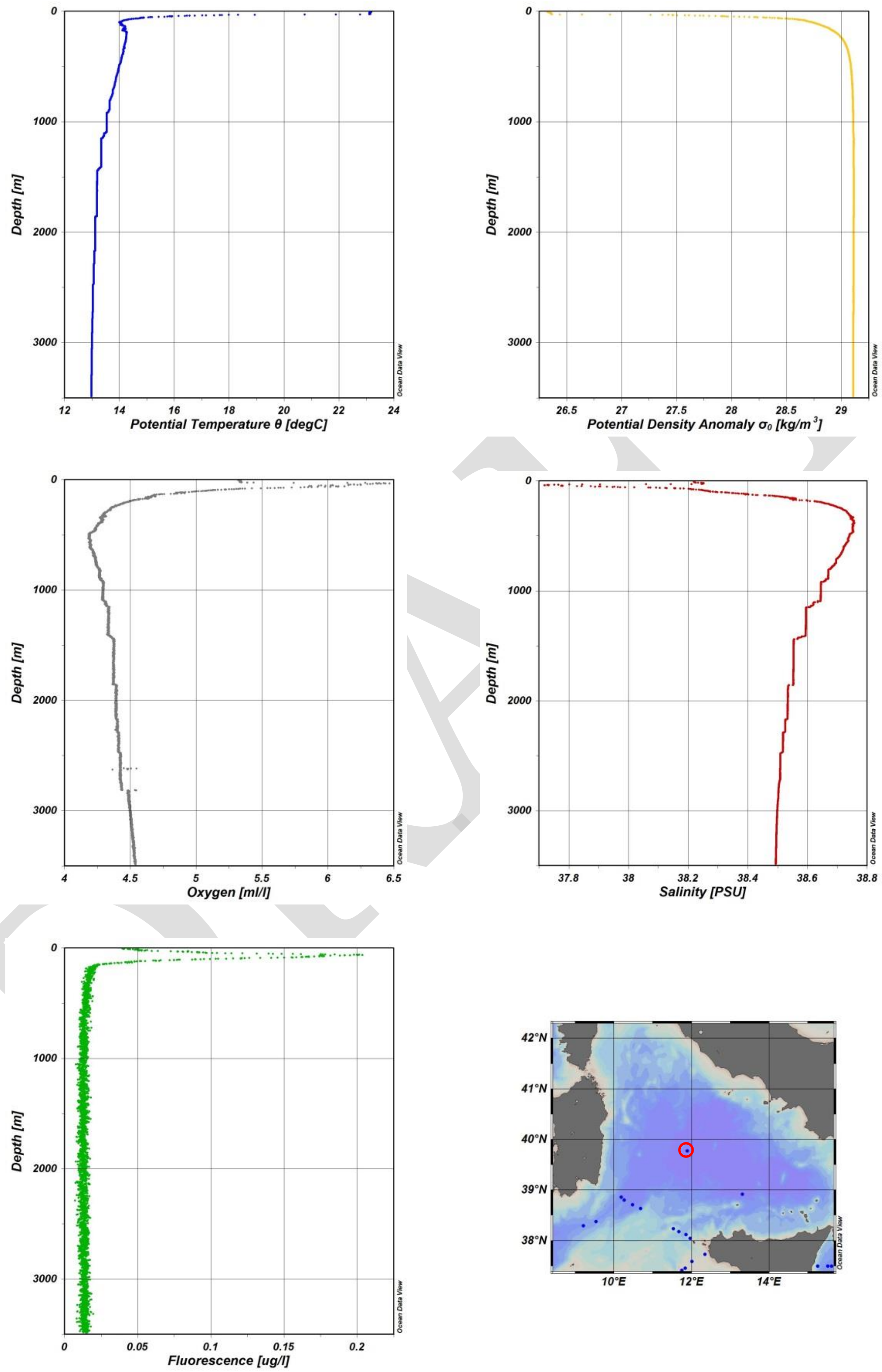
Hydrological parameters measured along the transect. Section and scatter plots: potential temperature θ, potential density anomaly σ_o, oxygen, salinity, fluorescence.

Geostar station



Hydrological parameters measured at Geostar station: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

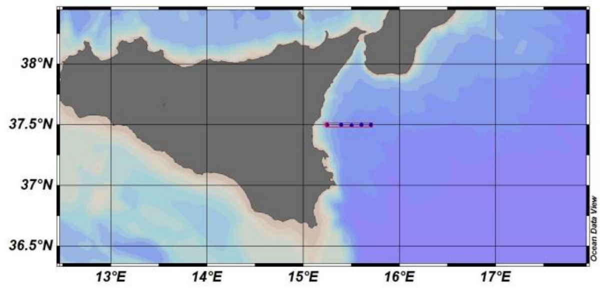
51 station

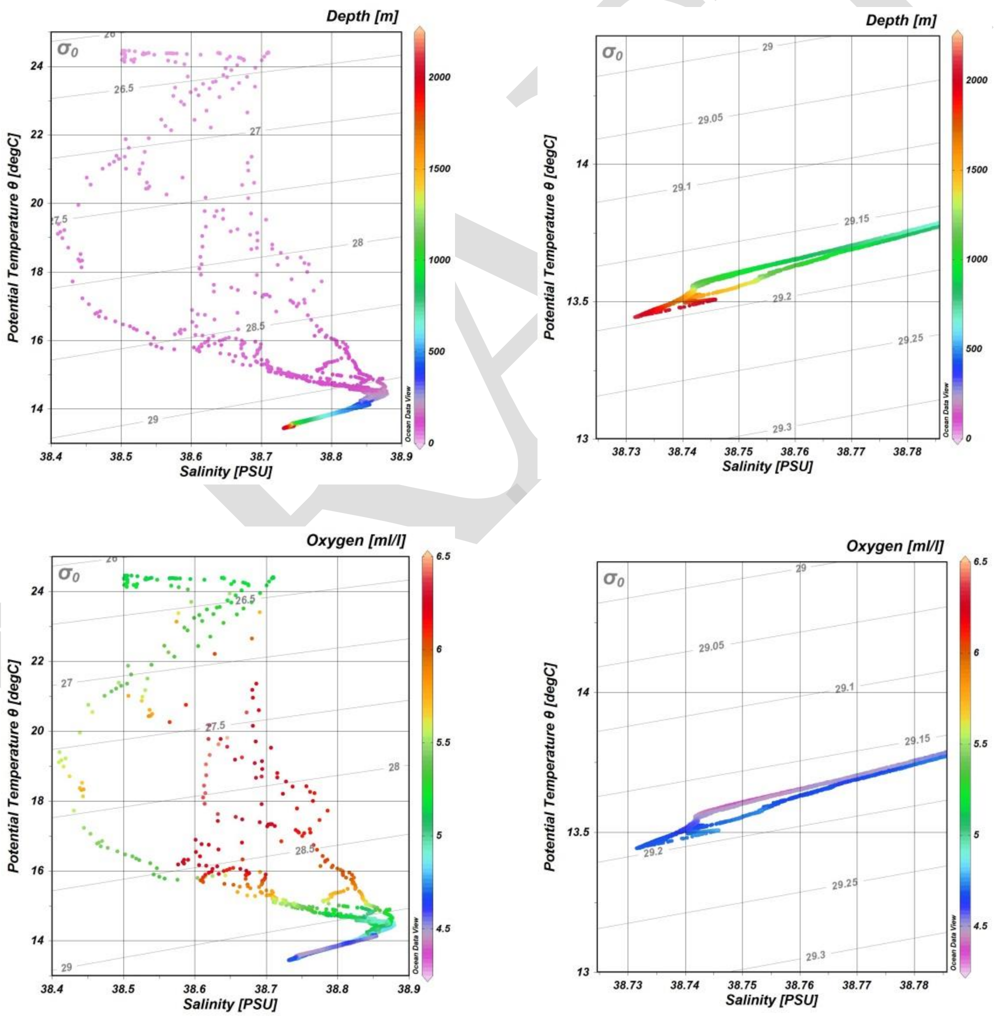


Hydrological parameters measured at 51 station: potential temperature θ, potential density anomaly σ_0, oxygen, salinity, fluorescence.

T-S diagrams

South-Est Sicily transect

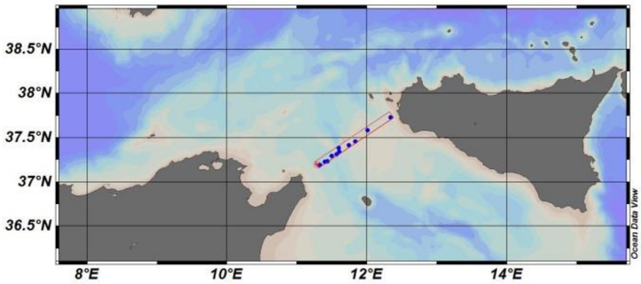


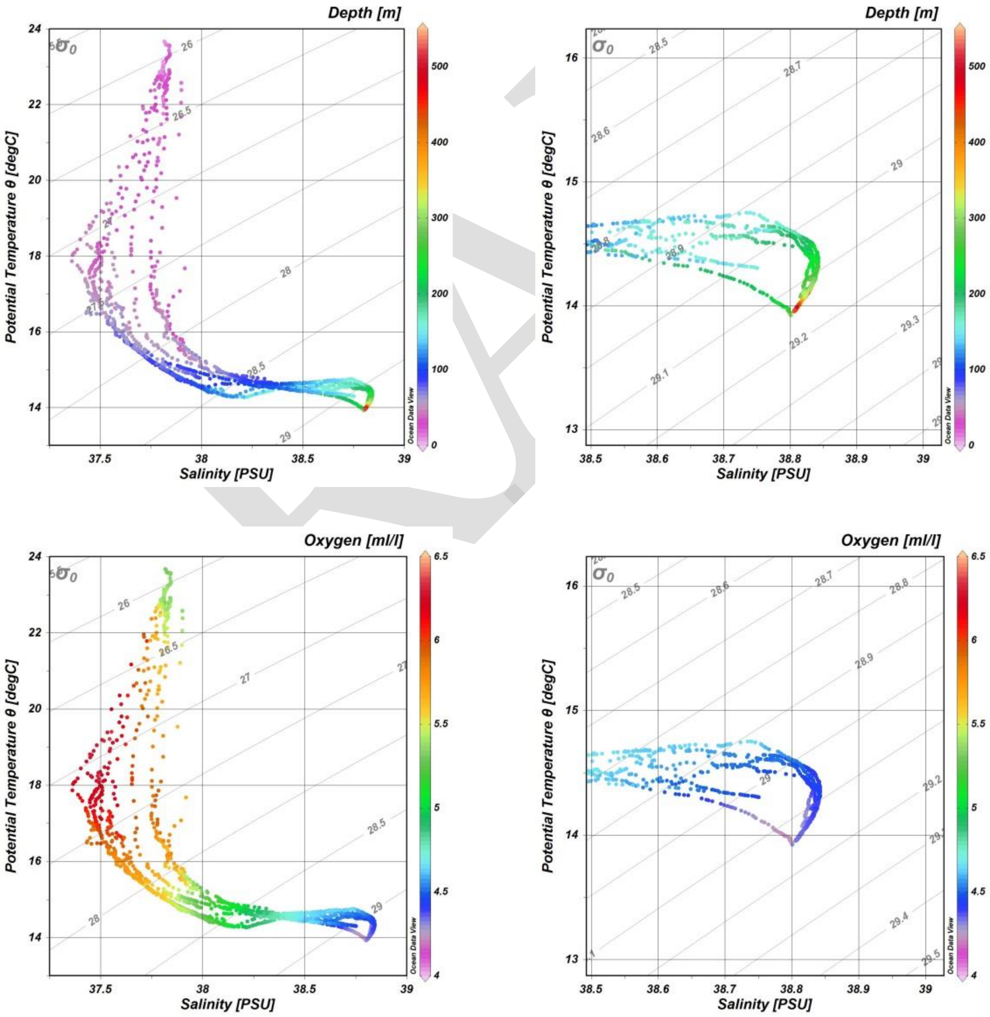


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Sicily Strait transect

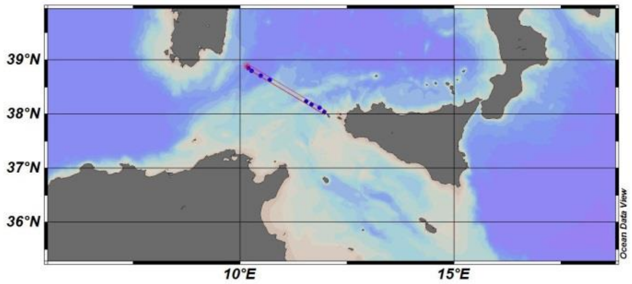


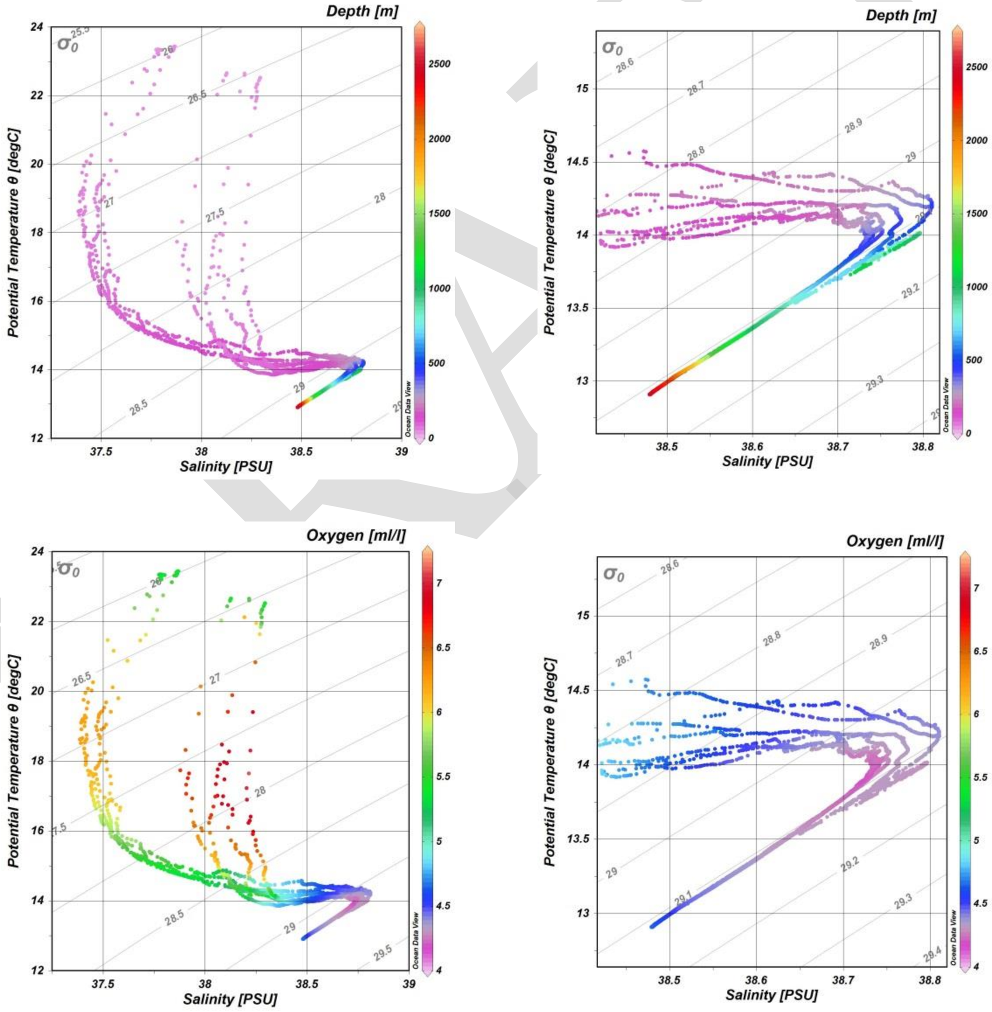


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Sicily Sardinia transect

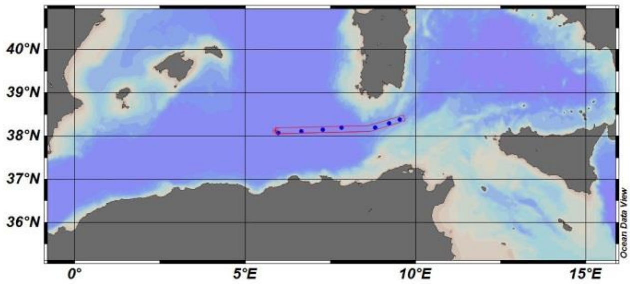


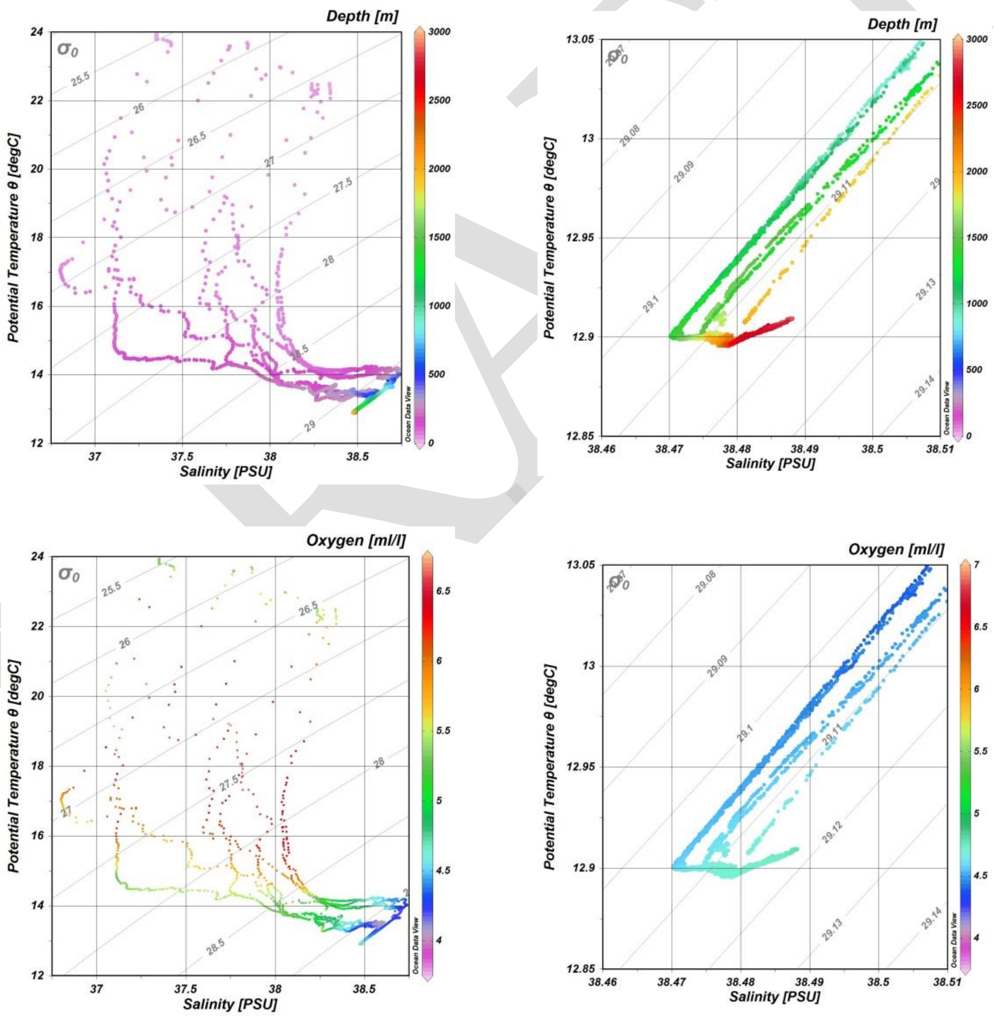


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Sardinian Channel transect

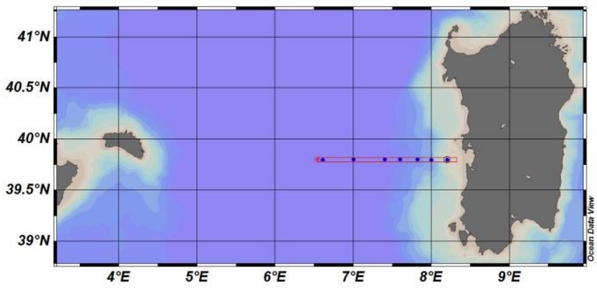


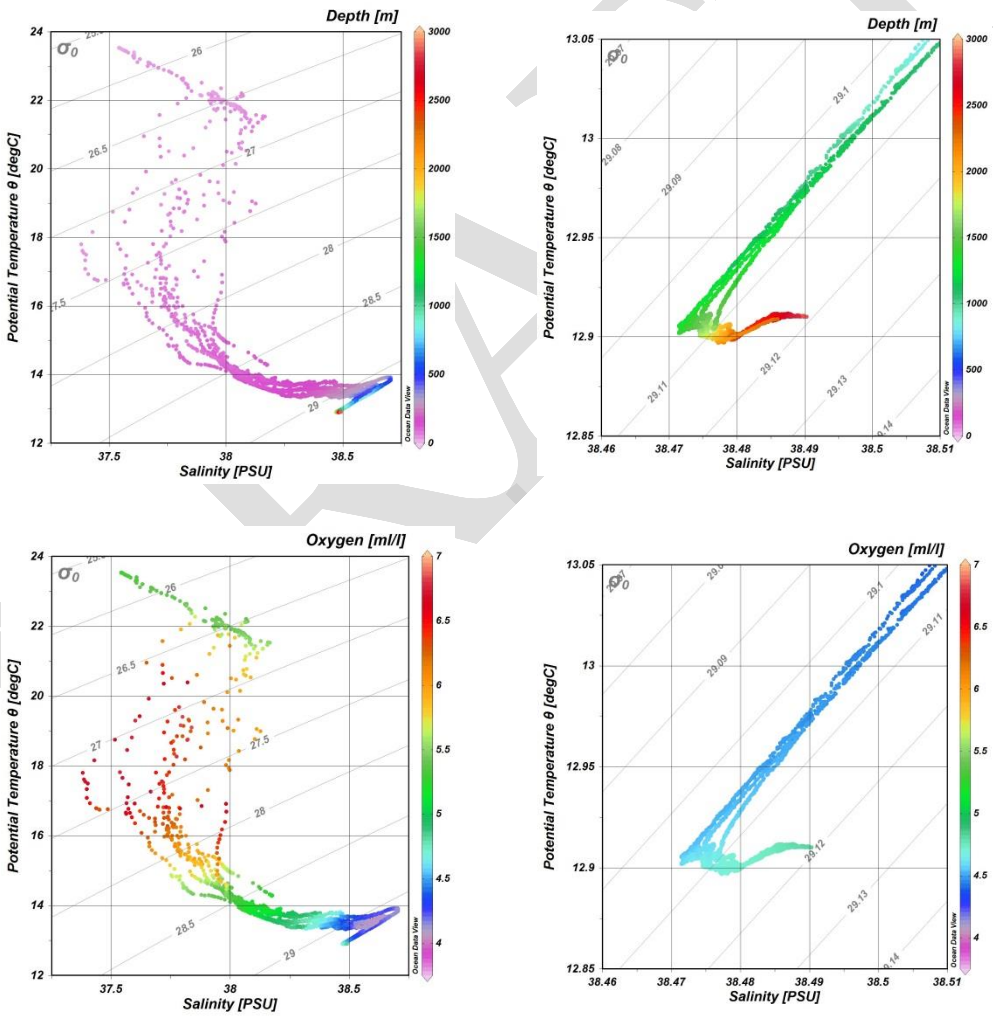


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Sardinian Sea transect

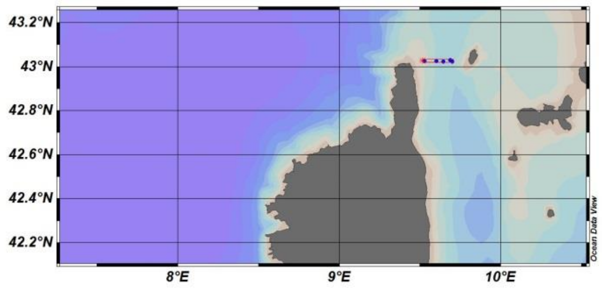


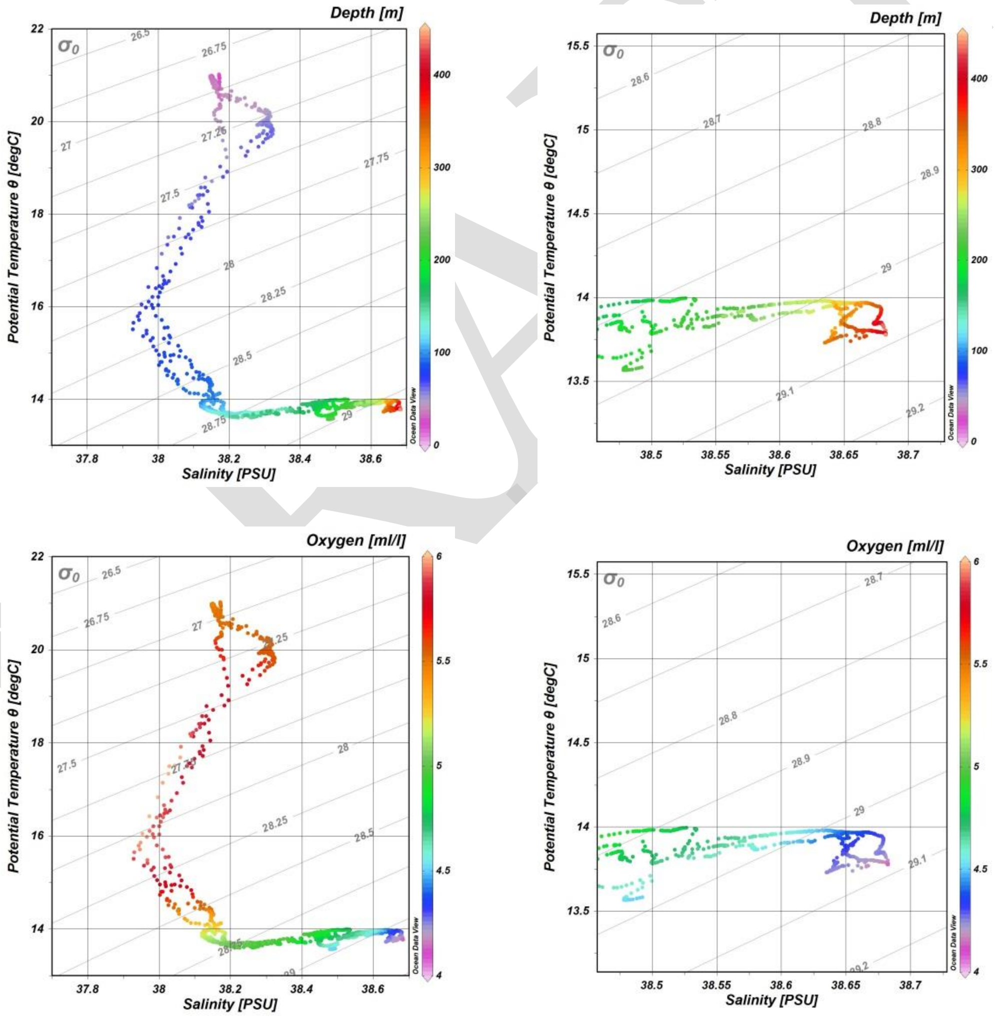


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Corsica Channel transect

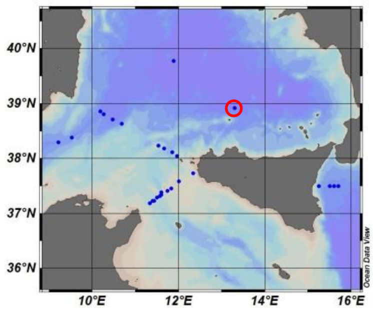


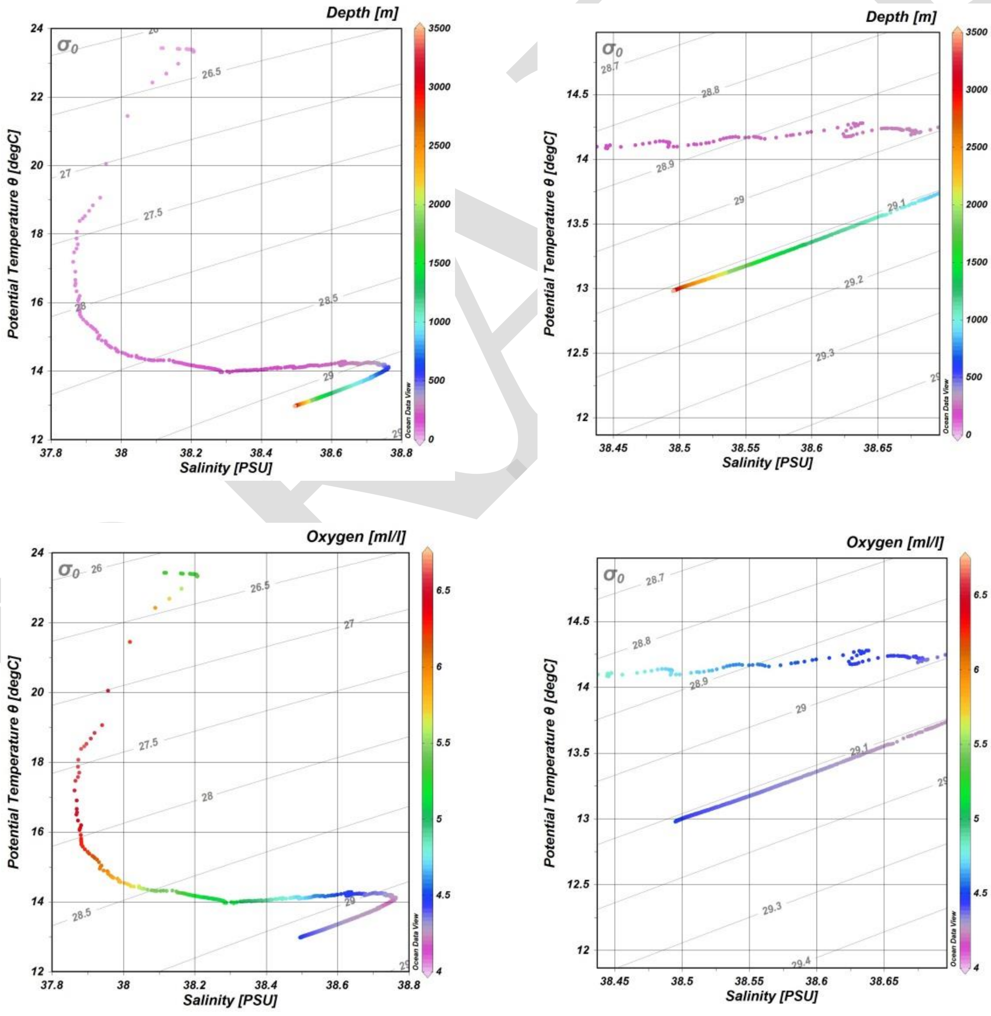


T-S diagrams calculated for the stations along the transect. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

Geostar station

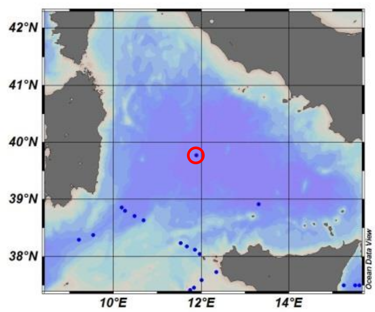


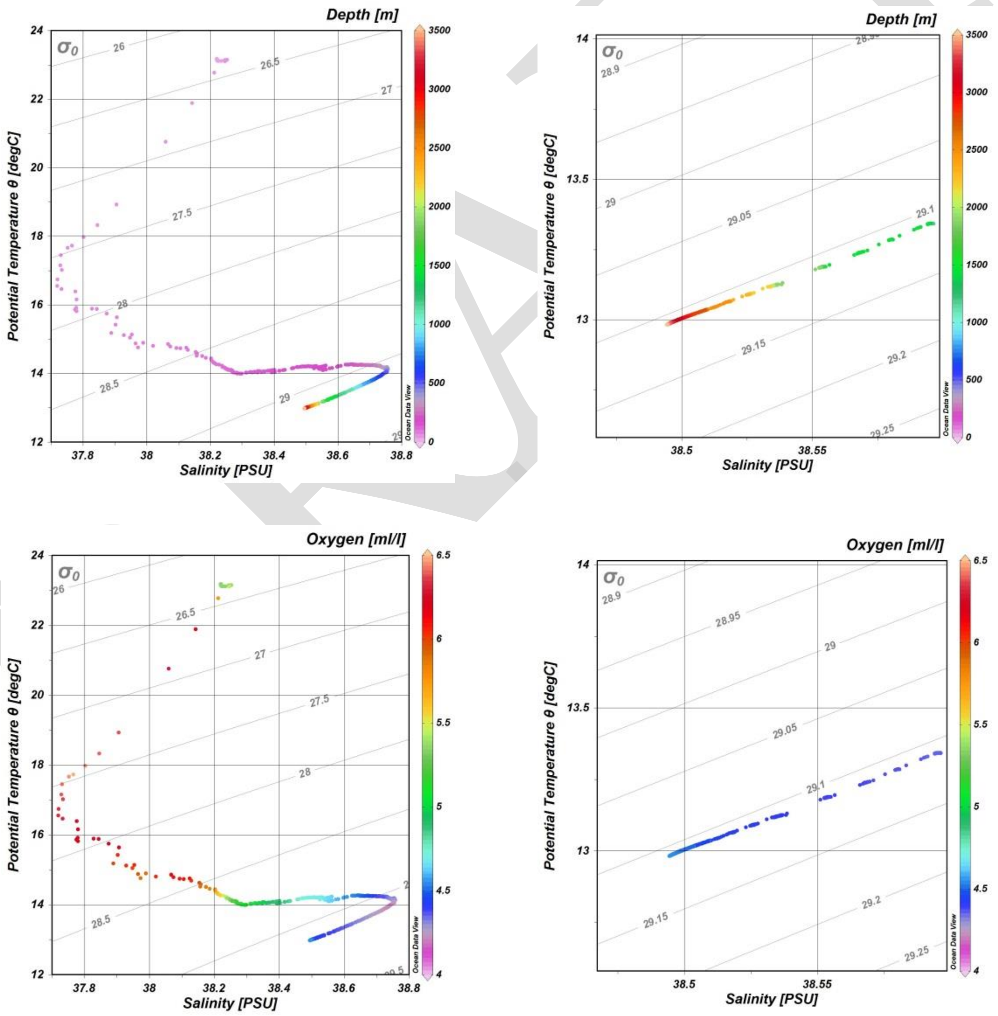


T-S diagrams calculated for the Geostar station. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

51 station

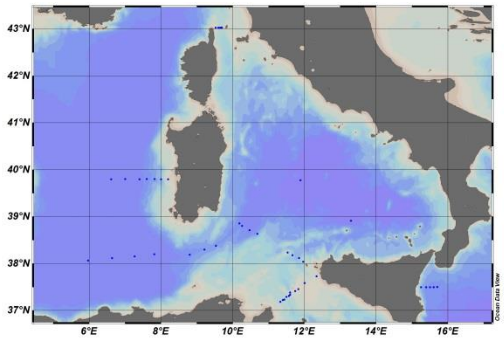


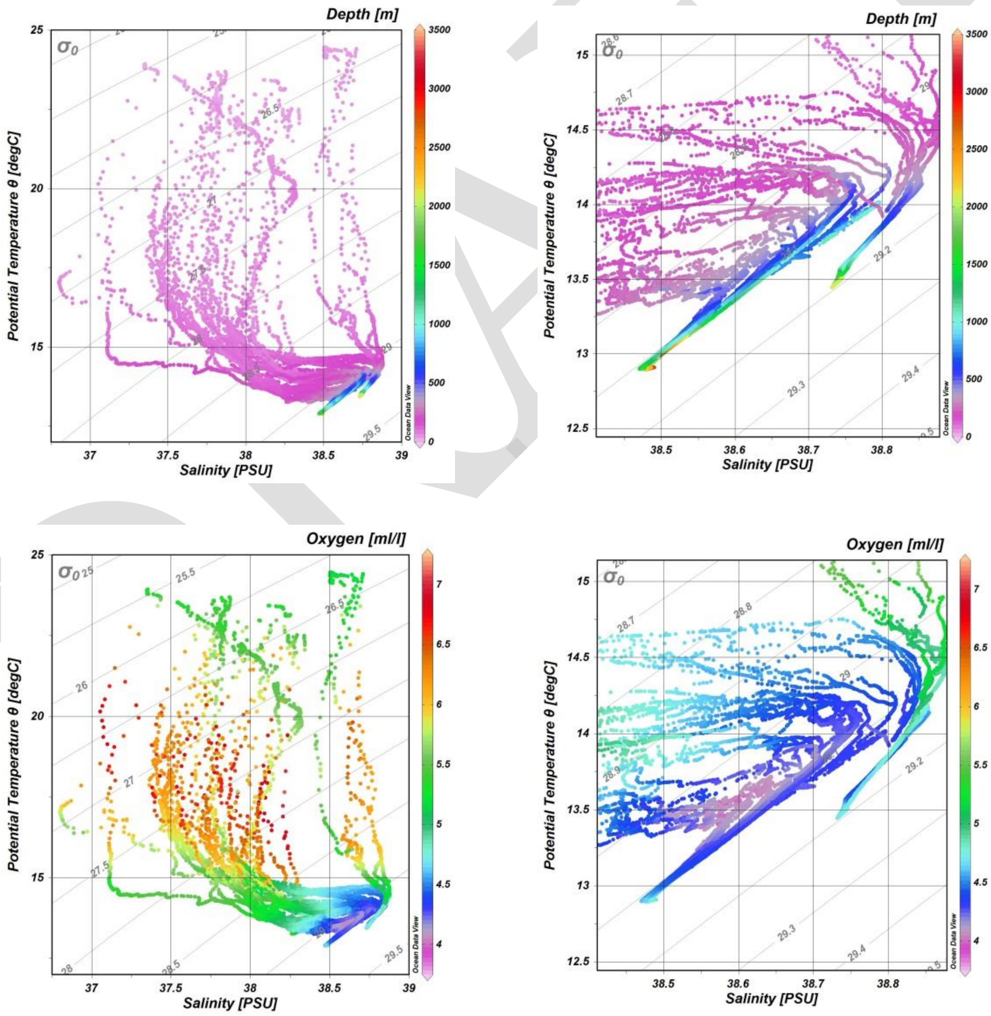


T-S diagrams calculated for the 51 station. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

T-S diagrams

All CTD stations

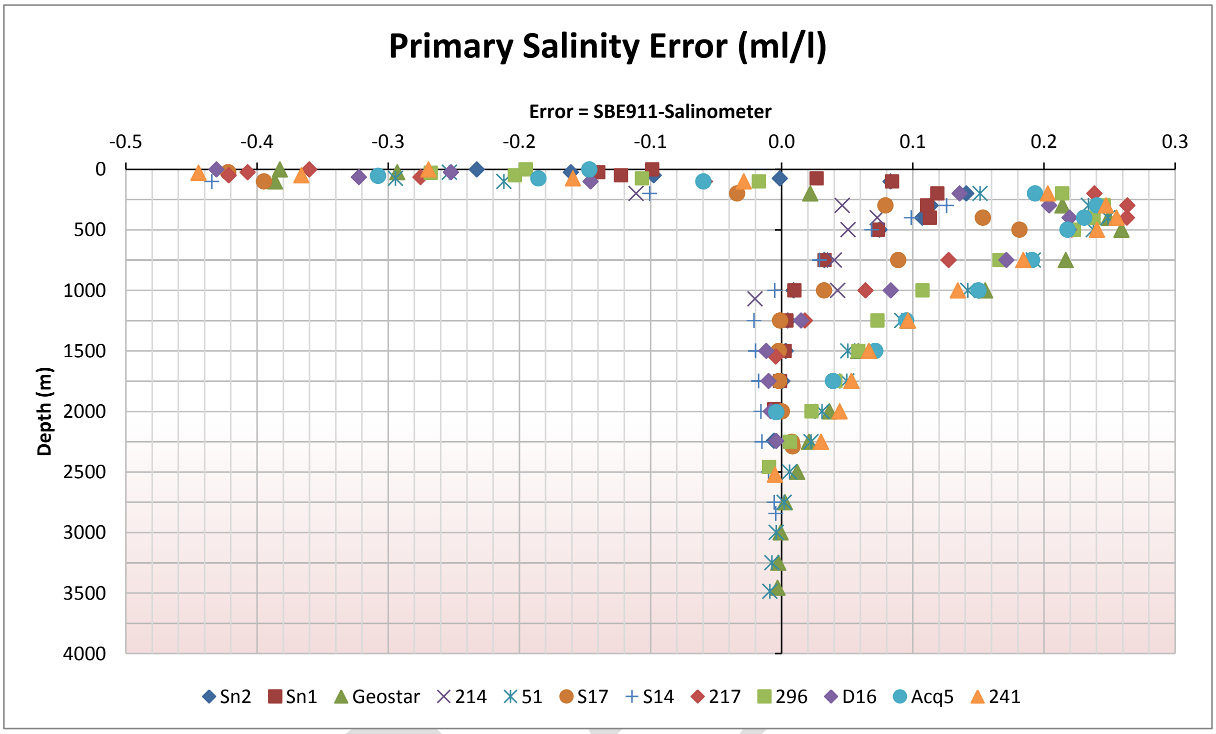


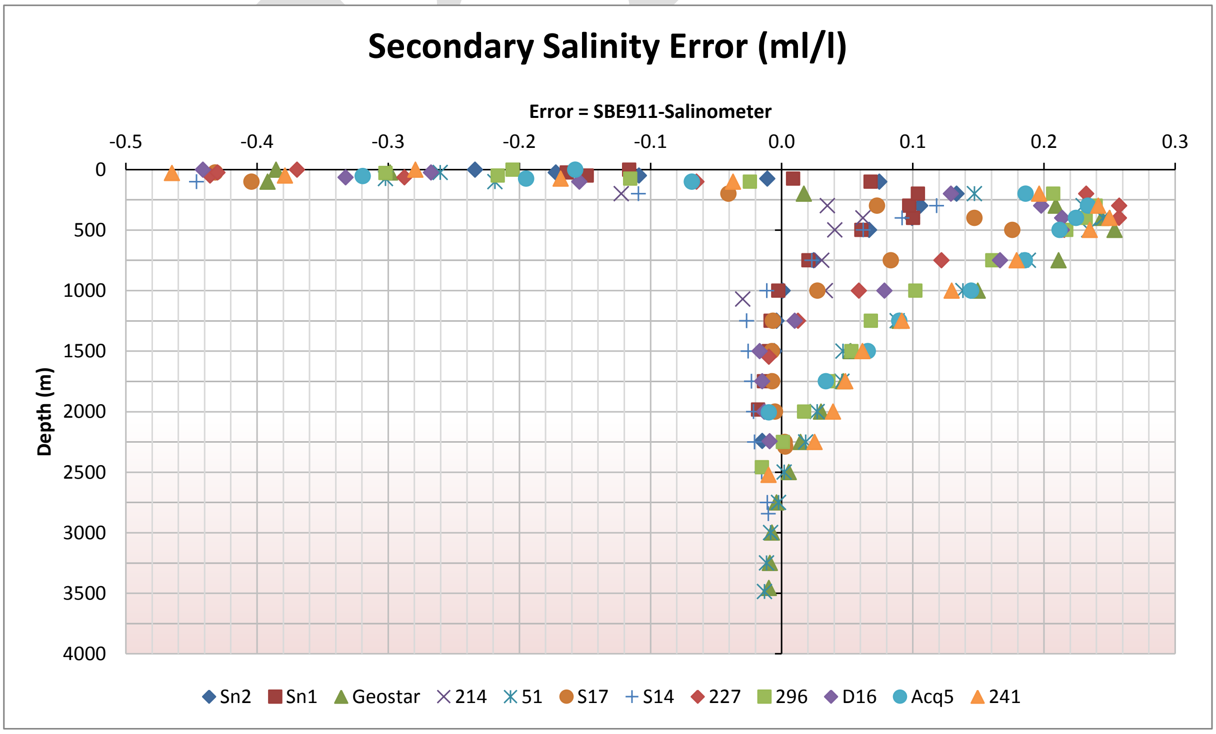


T-S diagrams calculated for all the CTD stations. Upper plots: TS vs. Depth. Lower plots: TS vs. Oxygen. On the left: whole profile TS diagrams. On the right: zoom close to the bottom.

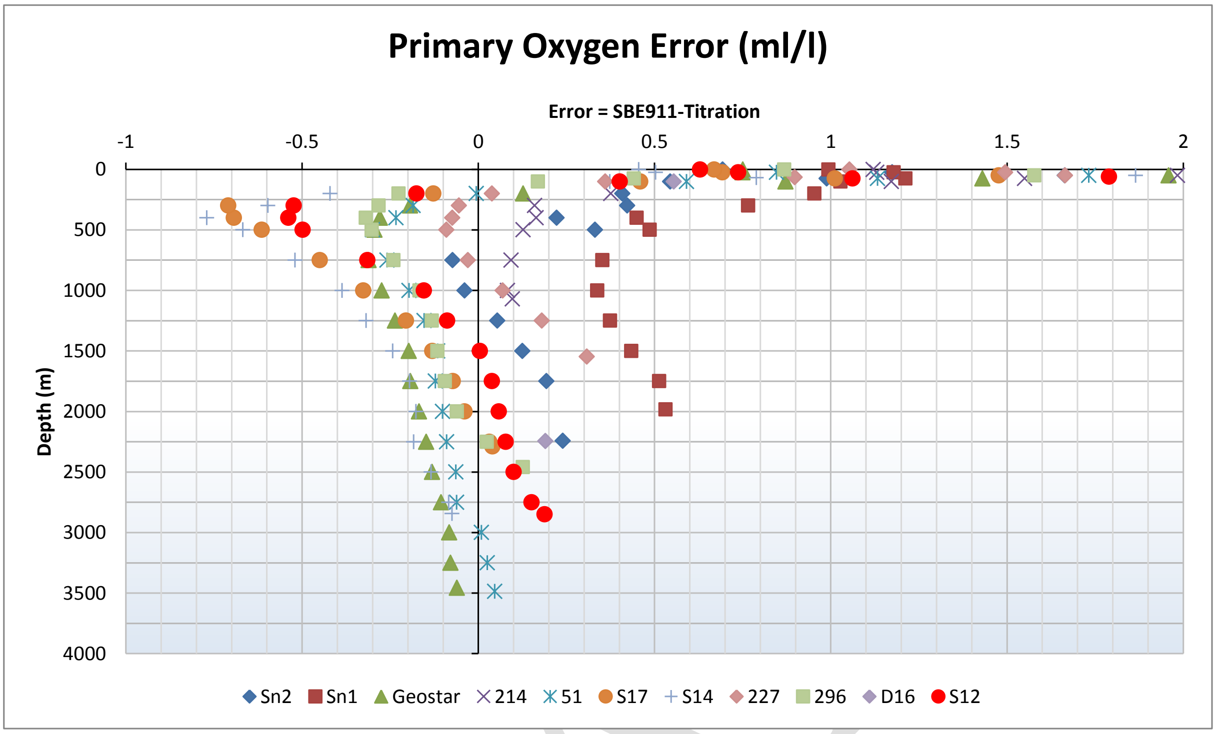
On board calibration of sensors

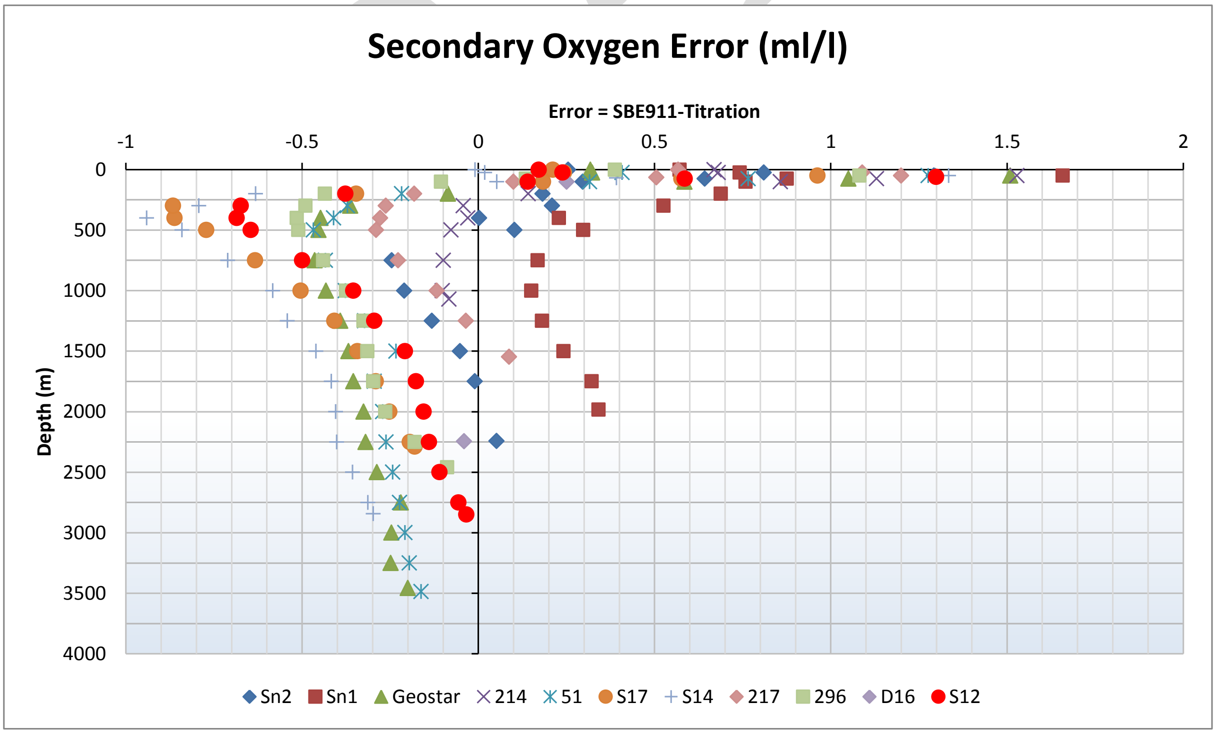
Salinity sensors





Dissolved oxygen sensors





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