Reviewer's 1 comments on the following manuscript:

essd-2020-17, Submitted on 24 Jan 2020
Quality assurance and control on hydrological data off western Sardinia (2000–2004), western Mediterranean.
by Alberto Ribotti, Roberto Sorgente, and Mireno Borghini

Reviewer: Dr. Alain LEFEBVRE, Ifremer, France (Alain.Lefebvre@ifremer.fr)

Dear Dr. LEFEBVRE,

we thank the you for having accepted the review and improved our manuscript with your comments and suggestions.

We agree with the points raised and we have answered all your comments.

Below, reviewer's comments are given in normal font and our responses in red.

Cruises have been defined to "give a useful contribution on the knowledge of the local upper, intermediate and deep circulation and its interaction with the general Mediterranean circulation". Considering these objectives, what is surprising is that proposed variables do not include systematic current measurements but main classical physical and biological variables. Authors should explain why such current measurements were not implemented systematically. Indeed, in section 3. Other acquisition, we understand that current meters were deployed only during a limited number of cruises.

Thanks for having raised this point. LADCP measurements at CNR started in those years and ADCPs were not available during all cruises. After their acquisition, usually current data were stored but never published. A great job is ongoing in these months to rescue and reprocess all raw data and build a complete high quality database.

The following sentence has been added in the 6th paragraph (p.7 lines 211-213): "The rescue and reprocessing of hydrodynamic data is ongoing in order to reorganize them in a quality controlled database. The same will be for the biological parameters. A first dataset of nutrients data from more recent cruises (late 2014 - 2017) is available at https://doi.org/10.5194/essd-2019-136."

A link with the Essential Oceanographic Variables (EOV) and Essential Biodiversity Variables (EBV) as recommended for a well-suited monitoring programme should have been interesting to develop.

We fully agree with the reviewer and this was an error

The materials and methods are described in sufficient details. The authors provided main characteristics of each sensor and also the associated range, accuracy, resolution and response time. The quality of the data is assured as the authors follow (well documented) good practises at sea and in lab. All these information are also included in the two associated SEANOE archives. We can however regret the absence of a validation protocol for fluorescence data.

Fluorescence sensor was calibrated following the instructions described by Sea-Bird Electronics Inc. in its APPLICATION NOTE NO. 9, downloadable at https://www.seabird.com/application-notes, where SEASOFT Coefficients for the Sea Tech Fluorometer are calculated. However no validation of the data has been applied after the cruises.

Anyway the sentence was rewritten as follows, adding a new reference (see p.7 new lines 199-202): "Chl-*a* was calibrated following the instructions given by SBE (2008a) where the SEASOFT™ coefficients for the Sea Tech fluorometer are calculated. No validation of the data has been applied after the cruises. It is reported as Relative Fluorescence Unit (R.F.U.) in the datasets. Also pressure sensors were not calibrated as usually stable but, if problems occurred, it was sent to SBE Inc. in USA for its calibration."

Added the following reference in bibliography "SBE: AN-9: Calculating SEASOFT Coefficients for Sea Tech Fluorometer and WET Labs Flash Lamp Fluorometer (FLF). 1 p, 2008a"

I'm not sure that figures 2, 3 and 5 are very helpful.

We thought that figures could improve the description of the instruments or labs on the text but, as both reviewers noted a redundancy in description plus figures, we have deleted them. Then the numbers of the figures have been updated in the text.

To conclude, I propose that the manuscript should be **accepted subject to minor revisions**.

Minor corrections and comments directly in the text as comments in the attached PDF file:

New pages and lines are mentioned if they changed after correction as *new p.x and7or new line y*.

p.2, line 43: put *in-situ* in *italic* in the whole text. Here it disappeared due to the rewriting of the whole sentence.

p.2, line 44, now lines 43-44: whole sentence rewritten accordingly "Due to such an oceanographic importance, since the '50s French or Italian unsystematic cruises have been organized in the area whose data are available in the PANGAEA (https://www.pangaea.de) and SEANOE repositories (Dumas et al., 2018)."

p.2, line 46, now lines 45-46: acronym defined in the text. Sentence rewritten as "the Science and Technology Organisation - Centre for Maritime Research and Experimentation of the North Atlantic Treatment Organization (NATO STO-CMRE), based in La Spezia,"

p.2, line 53: sentence deleted as it did not improve the information on instruments or data then previously

p.3, line 69, now line 68: changed accordingly

p. 3, line 71, now line 70: I would leave the past "was" as this vessel does not exist anymore

p.3, line 83: changed in the whole text for all parameters

p. 5, line 130, now line 126: changed accordingly

p.5, line 130, now lines 126-132: added what requested but rewriting the sentences as follows "For Chlorophyll-*a* (Chl-*a*), CDOM and DOC all the water samples were filtered on 0.42µm Whatmann GF/F glass microfiber filters for Chl-*a* and 0.22µm membrane filter (Sartorius, Minisart, SM 16534 K) for DOC and CDOM; this to remove the particulate fraction immediately after collection. Then filters were frozen at +4°C to be analyzed at labs following standard procedures described by Lazzara et al. (1990) for Chl-*a*, and by Vignudelli et al. (2004) and Santinelli et al. (2008) for CDOM and DOC. For nutrients, during the first three medgoos cruises water samples were partially analyzed on-board by a Systea µCHEM Auto-analyzer, while remaining samples frozen at -20°C following Strickland and Parsons (1972). In the following cruises all water samples were frozen and then analyzed once back."

p.5, line 135, now line 132: checked in the whole text and reformatted following the Copernicus Word Template

p. 6, line 168, now line 164: corrected

p.6, line 173, now line 168: corrected

p.6 line 175, now 170: corrected

p.7 line 180, now p.6 line 175: corrected

p.7 line 181, now p.6 line 176: corrected

p.7 line 201, now p.6 line 196: rewritten as "If the shift was random, Soc and Voffset for dissolved oxygen, slope and offset for conductivity/temperature were recalculated and then the data corrected following the procedures described in the application notes number 64-2 (SBE, 2008b, 2012) and 31 (SBE, 2016), respectively." Added the following references in bibliography " SBE: AN-64-2: AN64-2: SBE 43 Dissolved Oxygen Sensor Calibration and Data Corrections. 5 pp, 2012" and "SBE: AN-31: Computing Temperature & Conductivity Slope & Offset Correction Coefficients from Lab Calibration & Salinity Bottle Samples. 8 pp, 2016"

p.12 line 355: figure deleted

p.12 lines 356-357: figure deleted

p.12 line 359: figure deleted

p. 14 ex-figure 4, now figure 2: changed decimal separator accordingly

p. 15 ex-figure 6, now figure 3: changed decimal separator and depth format accordingly

p. 16 table 1: changed decimal data format according to ISO 8601

Reviewer's 2 comments on the following manuscript:

essd-2020-17, Submitted on 10 March 2020
Quality assurance and control on hydrological data off western Sardinia (2000–2004), western Mediterranean.
by Alberto Ribotti, Roberto Sorgente, and Mireno Borghini

Reviewer: Dr. Sarantis Sofianos (Referee)

Dear Dr. SOFIANOS,

we thank the you for having accepted the review and improved our manuscript with your comments and suggestions.

We agree with the points raised and we have answered all your comments.

Below, reviewer's comments are given in normal font and our responses in red.

The manuscript "Quality assurance and control on hydrological data off western Sardinia(2000 - 2004), western Mediterranean" by Ribotti et al. presents an open access dataset (and its quality control methods) that includes data acquired during seven oceanographic cruises off the coast of western Sardinia, Western Mediterranean. The main aim of the cruises and the publication of the dataset is to give to the scientific community a contribution to the local circulation and interaction with the general Mediterranean circulation. The description of instrumentation and quality assurance and control methods of the dataset is clear and informative (although the pictures of specific instruments seem redundant).

We thought that figures could improve the description of the instruments or labs on the text but, as both reviewers noted a redundancy in description plus figures, we have deleted them. Then the numbers of the figures have been updated in the text.

The information is also included in the SEANOE archives. Based on the aim of the cruises, the absence of hydrodynamic (ADCP) data makes the dataset "weaker" and less informative. The reason for not including this data should be better explained by the authors.

Thanks for having raised this point. As explained to referee 1 too, LADCP measurements at CNR started in those years and ADCPs were not available during all cruises. After their acquisition, usually current data were stored but never used. A great job to rescue, reprocess all raw data and build a complete high quality database is ongoing in these months.

The following sentence has been added in the 6th paragraph (p.7 lines 211): "The rescue and reprocessing of hydrodynamic data is ongoing in order to reorganize them in a quality controlled database."

p.1 line 15: corrected

p.1 line 28: corrected

p.2 line 35: corrected

p.2 line 44: apart from the sentence was completely rewritten

p. 3 lines 83-84, now lines 82-83: units corrected

p.4 line 96, now line 95: corrected

p.6 line 156, now line 151: corrected

Quality assurance and control on hydrological data off western Sardinia (2000 - 2004), western Mediterranean

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Abstract. Seven oceanographic cruises in five years were organized in the Sardinia Sea with the repeated collection of physical, chemical and biological data. An accurate and sustained quality assurance on physical sensors was acted through prior and post-cruise calibration and verified during *in-situ* acquisitions with the use of redundant sensors and other instruments. Moreover, for dissolved oxygen and conductivity, seawater samples at standard depths were frequently analyzed on-board. Then an accurate quality control was used to verify all hydrological data profiles, that passed a further quality check following standard procedures. Finally all hydrological data have been included in two online public open access datasets in the SEANOE repository (https://doi.org/10.17882/59867 and https://doi.org/10.17882/70340, Ribotti et al., 2019a,b). During and after all cruises also ~~chlorophyll~~Chlorophyll-*a* and nutrients analyses were carried on but data are not yet open access; the same for water current profiles, both at casts and during vessel moves, and geophysical data. These ocean data are the first covering the whole Sardinia Sea for its whole extension. Here data and assurance/control procedures used are described as they became standards in deep sea acquisitions in the years.

Keywords: Sardinia, CTD, hydrological data, data quality check, sensor calibration

1 Introduction

Between May 2000 and January 2004 the National Research Council (CNR) of Italy collected hydrodynamic, chemical and biological data in the Sardinia Sea during seven multidisciplinary oceanographic cruises, named from medgoos1 to medgoos7. These cruises were the first covering the whole Sardinia Sea, from the shelf to the open sea, with oceanographic measurements. They were realized with the main aim to give a useful contribution on the knowledge of the local upper, intermediate and deep circulation and its interaction with the general Mediterranean circulation.

The study area is limited between 38°N and 42~~-~~°N in latitude and between 7~~-~~°E and the western Sardinian coast in longitude, with an offshore bottom reaching a depth of ~~2950 m~~2950m in the abyssal plain. The shelf extends from 5.~~5 km~~5km at north to ~~37 km~~37km in its ~~centre~~center with a shelf break at about ~~200 m~~200m depth (Conforti et al., 2016; Brambilla et al., 2019).

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It is an area of passage of re-circulating waters between the two Mediterranean sub-basins and the Atlantic Ocean (Astraldi et al., 1999; Millot, 2005; Millot and Taupier-Letage, 2005; Schroeder et al., 2013) and is strongly influenced by the Algerian large scale dynamics (Bouzinac and Millot, 1999; Puillat et al., 2002; Pessini et al., 2018). Very energetic surface fronts, cyclonic and anticyclonic vortices, up and downwelling events play an important role in variability and transport of physical, biological and chemical characteristics of the water masses (Puillat et al., 2003, 2006; Santinelli et al. ,2008; Olita et al., 2013, 2014). Here, thanks to the data acquired during the first medgoos cruises, Puillat et al. (2003) and Ribotti et al. (2004) identified the main water masses usually ~~retrieved~~observed in the rest of the western Mediterranean sea, like the Atlantic Water (AW) in the upper 150 m, the Winter Intermediate Water and its modified version known as the Temperature Minimum Layer (Benzohra and Millot, 1995; Sorgente et al., 2003; Allen et al., 2008) at about 100-120 m depth in the AW, the Intermediate Waters below to 800 m depth and the Western Mediterranean Deep Waters (WMDW) to the bottom. Here, since 2005 the old WMDW has been undermined by the warmest and saltier new WMDWs that diffused all over the Western Mediterranean sub-basin due to the transfer of the Eastern Mediterranean Transient signal inside. This water is characterized by high heat and salt contents from the advected LIW, originating the new WMDW in the north-western Mediterranean sub-basin (Gasparini et al., 2005; Schroeder et al., 2006; Zunino et al., 2012; Ribotti et al., 2016).

~~Despite of~~Due to such an oceanographic importance~~ and apart the above mentioned medgoos cruises, just a few in-situ measurements were organized and ocean data acquired in this area in the years, apart~~ , since the '50s French or Italian unsystematic cruises ~~since the '50s to nowadays and~~have been organized in the area whose data are available in the PANGAEA (https://www.pangaea.de) and SEANOE repositories (Dumas et al., 2018). In 2014, the Science and Technology Organisation - Centre for Maritime Research and Experimentation of the North Atlantic Treatment Organization (NATO STO-CMRE), based in La Spezia, organized a 2-week experiment with a large use of ocean instruments and two research vessels in a limited area (~~110x110 km^2~~110x110km^2). Its aim was to improve local ocean numerical simulations and forecasts and study the local ocean variability and structures (Onken, 2017a,b; Knoll et al., 2017; Hemming et al., 2017; Onken et al., 2018; Hernandez-Lasheras and Mourre, 2018).

Then recent experiments with drifters and deep sea gliders were realized in the Sardinia Sea and between Sardinia and Balears, partially described by Olita et al. (2014).

In 2000-2004, instruments, sensors and data passed severe controls following internationally accepted oceanographic processes, necessary to obtain high-quality data. ~~They changed and were adapted depending by several factors like the working environment, the oceanographic instruments/sensors used, the type of data acquired.~~ These practices included quality assurance, control and assessment, standards and best practices refined till nowadays (Hood et al., 2010; Bushnell et al., 2019; Pearlman et al., 2019). In this paper we describe all the procedures or best practices followed to assure and control the quality of the acquired data during the medgoos cruises, the sensors used, their calibrations and intercomparisons.

Acquired hydrological data are in two datasets stored in an open access repository, called SEA scieNtific Open data Edition (SEANOE) (Ribotti et al., 2019a,b), linked with the EMODnet Data Network of marine centers and European thematic data portals like SeaDataNet and EurOBIS.

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In the following two paragraphs (2 and 3) vessel, instruments and sensors used in the seven cruises are described, with a distinction between data in repositories (par. 2) and not part of any repository (par. 3). The calibration of temperature and conductivity sensors are part of the paragraph 4 while in paragraph 5 the on board control of CTD sensors stability is detailed. Discussion and conclusions close the paper.

2 Instrumentation technology

During the seven cruises profiles of physical/chemical parameters were acquired at planned stations whose number varied due to the length and the strategy adopted at each cruise, the wideness of the covered area, and the sea conditions. So the activities range from the 38 stations realized during the 6-days-long medgoos1 in 2000 and the 92 during the 21-days-long medgoos6 in 2003. In September 2001, ~~just~~only the southern part of the Sardinia Sea with 41 stations was covered due to bad weather conditions.

The 61,30 meters long R/V Urania of CNR was used in all cruises. This was a modern multidisciplinary research vessel equipped with instruments to study physical and chemical water quality parameters, and laboratories for biological and geological analyses. For its dynamic positioning the vessel was equipped with an integrated navigation system constituted by two DGPS antennas and one Loran C that ensured an optimal use of the scientific equipment during the cruises. Such a system was managed through a software by Andrews Hydrographics installed on PC HP386, 33 MHz that permitted to download navigation and meteorological data in ASCII format with geographic and kilometric coordinates at frequency till 10 minutes.

On board, a SBE911 plus CTD probe (by Sea-Bird Inc.), mounted on a 24 10-liters Niskin bottles rosette for water column sampling, was used to acquire hydrological data during all the seven cruises (figure 1).

In specific, the sensors installed on the probe had the following characteristics (table 1):

• pressure [db]: a Digiquarz 4000 pressure transducer was used. The transducer had a resolution of 0.~~01 ppm~~01ppm, oscillator frequency ~~34 KHz~~34KHz - 38KHz and temperature range 0~~ ~~°C - 125~~ ~~°C;

• water temperature [deg C]: a SBE-3/F thermometer with response time of 70 ms, temperature range -5~~ °~~°C - + 35~~ °,~~°C, accuracy about 0.004~~ ° ~~°C per year, resolution 0.0003~~ ° ~~°C. The international practical temperature scale known as IPTS-68 was applied on data from medgoos1, 2 and 6 while the international temperature scale of 1990, known as ITS-90, on data from medgoos4 and from medgoos3, 5, 7 on secondary sensors;

• conductivity [mS/cm]: a SBE-4 sensor with a range of 0.~~0 – 7 S~~0S/m - 7S/m, resolution 0.~~00004 S~~00004S/m, accuracy about 0.~~0003 S~~0003S/m per month and response time of 0.~~085 sec~~085sec with pump or 0.~~17 sec~~17sec without pump;

• dissolved oxygen: a SBE-13 Beckman/YSI sensor with a range of 0~~ – 15 ml~~.0ml/l - 15ml/l, accuracy of 0.~~1 ml~~1ml/l, resolution 0.~~01 ml~~01ml/l and response time 2 sec at a temperature of 25~~ ~~°C during cruises medgoos1, 2, 3, 4. During cruises

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Formattato: Tipo di carattere: 10 pt medgoos5, 6, 7 a SBE-43 polarographic membrane sensor for pumped CTD applications with titanium (~~7000 m~~7000m) housing was used with a range of 120% of surface saturation in all natural waters, accuracy of ±2% of saturation;

• fluorescence: a Sea Tech Inc. fluorometer with energy emitted by the flash lamp of 0.~~25 J~~25J for flash, temperature range 0°C - 25 °C, resolution 0.15 μg/l.

Redundant or secondary sensors were always used for a data quality assessment (as defined in Bushnell et al., 2019) of both temperature and salinity measurements, ~~apart~~except during the cruise medgoos1 in May-June 2000 (see table 1). A secondary SBE-43 sensor for dissolved oxygen was also added just in the last three cruises, from medgoos5 to 7. These redundant sensors were a useful method of comparison to evaluate the stability of primaries both during the acquisition and at a following visual quality check of profiles.

For the same reason, digital deep sea reversing thermometers RTM 4002 by Sensoren Instrumente Systeme GmbH (SiS) were mounted on Niskin bottles during medgoos4 (3 thermometers) and 5 (4 thermometers). These instruments acquired sea temperature at depths, defined by the closing of the Niskin bottle where they were mounted on, usually sampling near the bottom where temperature is more stable. Reversing thermometers had a depth range of up to 10000 meters and a temperature range between -2°C and +40 °C. They had a resolution of ±0.001 °C between -2.000°C and 19.999 °C, of ±0.01 °C between 20.00 °C and 40.00 °C and a stability of 0.00025 °C per month. Its pressure housing was made of a glass tube closed at its ends by metal stoppers, one containing the platinum sensor and the other the battery. Its internal mercury switch was activated by inverting the instrument at defined depths.

3 Other acquisitions

In some cruises (see table 1) currentmeters data were acquired on both at a station (Lowered Acoustic Doppler Current Profiler or LADCP) and in route (Shipborne Acoustic Data Current Profiler or SADCP) while geophysical sub-bottom profiler data just during the cruise medgoos2. At casts, the real time display of CTD data made it possible to identify a certain number of stations where to take water samples for the estimation of nutrients (nitrites, nitrates and phosphates), Chlorophyll-~~α~~*a*, chromophoric dissolved organic matter (CDOM) and dissolved organic carbon (DOC). As all these data are not in the two datasets in the SEANOE repository mentioned above (Ribotti et al., 2019a,b), they will be shortly described here as part of the amount of cruises data. All measures were carried out trying to reconcile the different procedures.

The Sub-Bottom Profiler was a GeoPulse Transmitter Model 5430A at frequencies ranging between ~~2 KHz~~2KHz and ~~15 KHz~~15KHz with a maximum emitted power of ~~10 KW~~10KW. It was used on a small portion of the western Sardinian shelf north of Oristano just in April 2001 during the cruise medgoos2.

Starting from the cruise medgoos2, profiles of current speed were acquired during CTD casts by two synchronized 300 kHz RDI Workhorse ADCPs, by RD Instruments Inc. in USA (now Teledyne), configured in modality Lowered and installed on the rosette one looking up (named slave) and the second down (named master). They acquired horizontal current data in 20 cells 10 m width each from the instrument with an impulse per second. Then under the keel of the vessel, a ~~38 kHz~~38kHz ADCP profiled currents in ~~8 m~~8m wide cells over ~~1000 m~~1000m depth through an impulse per second during transfers between stations. Another impulse was used to correct the water speed and obtain its real speed as regards to the sea bottom (bottom tracking). Configuration of ADCPs used in the two modes, Lowered and Shipborne, in 2001-2004 are in agreement with the more recent internationally recognized GO-SHIP protocols described by Hood et al. (2010).

For ~~nutrients,~~ Chlorophyll~~-α,~~ *a* (Chl-*a*), CDOM and DOC all the water samples were filtered on 0.42µm Whatman GF/F glass microfiber filters for Chl-*a* and 0.22µm membrane filter (Sartorius, Minisart, SM 16534 K) for DOC and CDOM; this to remove the particulate fraction immediately after collection~~ and~~. Then filters were frozen at ~~different temperatures (+~~+4~~ ° C for DOC samples and −20 ° C for nutrients)~~°C to be analyzed at labs following standard procedures ~~like that~~ described ~~in Strickland and Parsons (1972) for nutrients, in~~ by Lazzara et al. (1990) for ~~Chlorophyll-α, in~~Chl-*a*, and by Vignudelli et al. (2004) and Santinelli et al. (2008) for CDOM and DOC. ~~In~~For nutrients, during the first three medgoos cruises ~~nutrient~~water samples were partially analyzed on-board by a Systea µCHEM Auto-analyzer, while remaining samples frozen at -20°C following Strickland and Parsons (1972). In the following cruises all water samples were frozen and then analyzed once back.

4 Pre- and post cruise calibration procedures

The pre- and a post-cruise calibration of the sensors of temperature and conductivity was performed at the oceanographic instrument (CTD) calibration facilities of the SACLANT Undersea Research Center (SACLANTCEN, now STO-CMRE) in La Spezia, Italy. The Centre was funded in 1959 initially for submarine warfare but it developed and maintained unique, in Italy and for years, an oceanographic instruments test and calibration facility that enabled the acquisition of high-quality ocean data. Two calibration seawater tanks were equipped with two very high precision Neil Brown ATB-1250 Platinum Resistance Thermometer Bridge ~~(figure 2)~~ for temperature and two very high precision Neil Brown CSA-1250 conductivity/salinity adaptor for conductivity. Seawater samples were analyzed for conductivity by highly précised 8400B Autosal Laboratory Salinometer, from Guildline Instruments Ltd™, standardized with IAPSO Standard Seawater and an accuracy of <0.~~002 psu~~002psu on a range of salinity between ~~2~~2psu and ~~42 psu~~42psu.

Before SBE sensors calibration, the two temperature sensors in the bath were adjusted to a triple-point-of-water cell (TPW) at the temperature of 0.01°C and a thermometric standard Gallium-melting-point cell for the highest value of 29.7646°C. So at SACLANTCEN a calibration of these sensors was realized exceeding WOCE standards (Millard and Yang, 1993). These two calibrations permitted to substantially generate a slope correction, used in the configuration file of the SBE Seasoft™ suite of programs, for data acquired during each cruise then improving their quality.

5 On board control of CTD sensors stability

Despite the calibration of temperature and conductivity sensors before and after each cruise, all sensors can significantly drift over the course of a cruise. This can dramatically reduce the quality of the data. As high quality conductivity and oxygen data ~~permit to define~~enable the definition of local water masses with high precision, particularly in the deep, then the use of international standards is mandatory in oceanography. The stability of conductivity and dissolved oxygen sensors must be verified on-board through the comparison with data from water samples. During the cruise all involved personnel and all acquired data are usually together so it is easier to check and correct repetitive problems before they can further degrade the data.

Conductivity data were checked against the on-board analyses by a Guildline™ 8400B Autosal Laboratory Salinometer, similar to that described above, while dissolved oxygen data against Winkler titration method with a measured precision in triplicate analyzed sample of 0.01ml/l (expressed in standard deviation). The sampling was at defined depths at surface, 25, 50, 100, 200, 300, 400, 500, 750, 1000, 1250, 1500, 1750, 2000, 2500, 3000 metres, and bottom.

The Autosal salinometer was operated in a small temperature-regulated room part of the on board wet laboratory and its bath temperature was held at 24±2~~ °C (figure 3 left).~~°C. The salinometer was daily standardized with the use of IAPSO Standard Seawater provided by 200 ml clear sealed glass bottles, before starting the analyses. Seawater for conductivity was taken after that for dissolved oxygen and collected in ~~250 ml~~250ml clear bottles with screw cap. Each bottle and its cap were rinsed three times with the sampled water, and filled to its shoulder. Then they were stored no longer than 24 hours in the conditioned room before their analyses. Niskin bottles collected water at the deepest casts of the cruise and at least once a day.

The oxygen sensors used during the cruises were not calibrated, so during each cruise different verifications were realized ~~(figure 3 right)~~ to verify possible sensors shifts through the Winkler titration method (Winkler, 1888). This method, used for *in-situ* dissolved oxygen analyses, consists of reacting oxygen in the samples with two reagents (I and II) and with a final titration. The reagent I is a solution of $MnSO_4$ and NaOH while the reagent II is a solution of NaI ~~e~~and H_2SO_4. The utmost attention is paid to draw the oxygen samples first from Niskins and into dark glass bottles. This avoids the formation of air bubbles during the sampling itself or the execution of the analysis. The sampling was realized as for conductivity ~~for~~considering frequency and methodology. The water sampled at ~~100 m~~100m of depth was used to obtain three blank solutions in dark glass bottles and one standard solution in a larger plastic bottle. So blanks and standards were run often. Then different quantities of reagents were added: 0.~~5 ml~~5ml (the usual for all samples) of reagent I and reagent II in the first blank, its double in the second blank and the triple in the third. No reagents were initially added in the standard solution. All samples and the three blank solutions, not the standard, were left in the ~~darkness~~dark for at least 2 hours and then analysed within 24 hours from their collection. During the analysis of the standard solution, reagents I and II, 0.~~5 ml~~5ml of H_2SO_4 and then of KIO_3 were added. The samples have been analysed through the programme TIAMO 2.0™, that stands for *TItration And MOre*», by Metrohm. Thanks to the data from the water samples, the possible estimations of changes of slope (Soc) and

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offset (Voffset), in the linear relationship between oxygen concentration and voltage output that indicate a loss of sensitivity of the sensors, were realized performing a linear regression line of the data calculated from the following Eq. (1) (Owens and Millard Jr, 1985; Millard and Yang, 1993; SBE, ~~2008~~2008a):

$$\varphi = Oxsol(T,S) * (1.0 + A * T + B * T^2 + C * T^3) * e^{\left(\frac{E*P}{K}\right)} \quad (1)$$

where Oxsol(T,S) is the oxygen solubility (ml/l) at a defined temperature and salinity, T and K are the CTD temperatures in °C and in °K, P is the CTD pressure (dbars) and A, B, C, E are calibration coefficients.

At a defined deep station, the regression is calculated by using the measured Winkler oxygen concentration divided by φ as dependent variable and the oxygen sensor output voltage as independent variable.

In figure ~~4~~2 an example of linear regression applied on a deep CTD station with the calculation of the new Soc (0~~,~~.3936) and the new Voffset = -0~~,~~.2094/SOC = -0~~,~~.2094/0~~,~~.3936 = -0~~,~~.53201

During cruises from medgoos4 to medgoos7 temperature data were checked at defined depths against reverse thermometers ~~(figure 5)~~ installed in correspondence of the bottles number 1, 3, 5, 7 of the rosette sampler.

Furthermore CTD and oxygen data were compared with those analyzed on board from samples or acquired with other instruments in order to determine or visually check possible shifts. Acquired CTD data were processed through the standardized procedures of the SBE Data Processing™ software. After comparisons and in case of malfunction, the use of the secondary sensor instead of the primary was evaluated (in figure ~~6~~3 a plot for conductivity and dissolved oxygen).

After the post-cruise calibration, if the shift was constant or systematic then an average of all data (primary, secondary, samples, etc) was used to correct data. ~~If shift was random, a trend was considered for data correction~~If the shift was random, Soc and Voffset for dissolved oxygen, slope and offset for conductivity/temperature were recalculated and the data corrected following the procedures described in the application notes number 64-2 (SBE, 2008b, 2012) and 31 (SBE, 2016), respectively.

~~Finally Chlorophyll~~ Chl-*a* fluorescence ~~(Chl-α) and pressure sensors were not calibrated. The first~~was calibrated following the instructions given by SBE (2008a) where the SEASOFT™ coefficients for the Sea Tech fluorometer are calculated. No validation of the data has been applied after the cruises. It is reported as Relative Fluorescence Unit (R.F.U.) in the datasets. ~~The~~Also pressure ~~sensor is~~sensors were not calibrated as usually stable but, if problems occurred, it was sent to SBE Inc. in USA for its calibration.

6 Data availability

The two datasets described in this study are publicly available and free of charge from the SEANOE data repository (Ribotti et al., 2019a, https://doi.org/10.17882/59867 and Ribotti et al., 2019b, https://doi.org/10.17882/70340). The presented datasets are composed of CTD data in Ocean Data View (ODV) TXT Spreadsheet and Collection files formats divided per cruise. Metadata are available in TXT, RIS, XLS, RTF, BIBTEX formats. Data and metadata from all cruises, apart medgoos1, are also stored and available under request in the Mediterranean Marine Data at http://www.mediterraneanmarinedata.eu/, a CNR - ENEA collaborative initiative with the aim to archive and distribute oceanographic data and information.

The rescue and reprocessing of hydrodynamic data is ongoing in order to reorganize them, quality controlled, in a database. The same will be for the biological parameters. A first dataset is of nutrients data from more recent cruises (late 2014 - 2017) is available at https://doi.org/10.5194/essd-2019-136.

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7 Discussion and conclusion

Several processes to obtain high-quality ocean data were followed during the 2000-2004 medgoos cruises in the Sardinia Sea, western Mediterranean. Quality assurance, control, assessment, standard and best practices, defined at international level (see Bushnell et al., 2019) and after decades of practices in ocean data acquisition, were considered during all cruises and are in agreement with recent standardized procedures for all sensors (Hood et al., 2010). Sensors pre and post-calibration, use of redundant ones, comparisons with on-board analyzed water samples showed their efforts resulted in achieving the required accuracy standard for that period, due to sensors accuracies, and for today. Uncertainty of measurements, defined as "the quantification of the doubt that exists about results of any measurements", exists in these data but reduced by the skill of the same operators or analysts following all the processes at any time for all the years and cruises. Now oceanographic data from seven cruises are collected in two open access datasets available online, including ocean parameters like conductivity, temperature, dissolved oxygen and Chlorophyll-~~α~~*a* fluorescence. These ocean data are the first available for the Sardinia Sea, important to characterize the general circulation and the dynamics in the western Mediterranean.

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Author contribution

AR led some cruises, organized the two datasets and led the writing of the paper. MB led some cruises, finalized QA and QC procedures described in the paper and collaborated to the paper writing. RS collaborated to the paper writing.

Competing interests

The authors declare that they have no conflict of interests.

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MFSPP (MAS3-CT98–0171); the EU MFSTEP (EVK3-CT-2002-00075). Authors thank the chiefs and the crews onboard the R/V Urania during the mentioned cruises for essential their support, Dr. M. Di Bitetto as CNR cruises leader/co-leader and Dr. S. Vallerga and Dr. R. Sorgente as CNR in charge of funding projects. We want also to thank Dr. G.M.R Manzella from ENEA in La Spezia (Italy) to have created and maintained the Mediterranean Marine Database for years.

References

Allen, J. T., Painter, S. C., and Rixen, M.: Eddy transport of Western Mediterranean Intermediate Water to the Alboran Sea. J. Geophys. Res., 113, C04024, https://doi.org/10.1029/2007JC004649, 2008

Astraldi, M., Balopoulos, S., Candela, J., Font, J., Gacic, M., Gasparini, G.P., Manca, B., Theocharis, A., and Tintoré, J.: The role of straits and channels in understanding the characteristics of Mediterranean circulation. *Prog. Oceanogr.*, *44*(1-3), 65 - 108, https://doi.org/10.1016/S0079-6611(99)00021-X, 1999

Benzohra, M., and Millot, C.: Characteristics and circulation of the surface and intermediate water masses off Algeria. Deep-Sea Res. I, 42, 10, 1803–1830, https://doi.org/10.1016/0967-0637(95)00043-6, 1995

Bouzinac, C; and Millot, C.: Hydrology and currents observed in the channel of Sardinia during the PRIMO1 experiment from November 1993 to October 1994. J. Mar. Syst., 20, 1, 333-355, doi: 10.1016/S0924-7963(98)00074-8, 1999

Brambilla, W., Conforti, A., Simeone, S., Carrara, P., Lanucara, S., and De Falco, G.: Data set of submerged sand deposits organized in an interoperable spatial data infrastructure (Western Sardinia, Mediterranean Sea). Earth Syst. Sci. Data, 11 (2), 515-527, https://doi.org/10.5194/essd-11-515-2019, 2019

Bushnell, M., Waldmann, C., Seitz, S., Buckley, E., Tamburri, M., Hermes, J., Henslop, E., and Lara-Lopez, A.: Quality Assurance of Oceanographic Observations: Standards and Guidance Adopted by an International Partnership. Front. Mar. Sci., 6:706, doi: 10.3389/fmars.2019.00706, 2019

Conforti, A., Budillon, F., Tonielli, R., and De Falco, G.: A newly discovered Pliocene volcanic field on the western Sardinia continental margin (western Mediterranean). Geo-Mar. Lett., 36, 1, 1-14, https://doi.org/10.1007/s00367-015-0428-0, 2016

Dumas, F., Garreau, P., Louazel, S., Correard, S., Fercoq, S., Le Menn, M., Serpette, A., Garnier, V., Stegner, A., Le Vu, B., Doglioli, A., and Gregori, G.: PROTEVS-MED field experiments: Very High Resolution Hydrographic Surveys in the Western Mediterranean Sea. SEANOE, https://doi.org/10.17882/62352, 2018

Gasparini, G.P., Ortona, A., Budillon, G., Astraldi, M., and Sansone, E.: The effect of the Eastern Mediterranean Transient on the hydrographic characteristics in the Strait of Sicily and in the Tyrrhenian Sea. Deep-Sea Res. I, 52, 6, 915-935, https://doi.org/10.1016/j.dsr.2005.01.001, 2005

Hemming, M.P., Kaiser, J., Heywood, K.J., Bakker, D.C.E., Boutin, J., Shitashima, K., Lee, G., Legge, O., and Onken, R.: Measuring pH variability using an experimental sensor on an underwater glider. Ocean Sci., 13, 427-442, https://doi.org/10.5194/os-13-427-2017, 2017

Hernandez-Lasheras, J., Mourre, B.: Dense CTD survey versus glider fleet sampling: comparing data assimilation performance in a regional ocean model west of Sardinia. Ocean Sci., 14, 1069-1084, https://doi.org/10.5194/os-14-1069-2018, 2018

Hood, E.M., Sabine, C.L., and Sloyan, B.M.: The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines. IOCCP Report No.14, ICPO Publication Series No.134, Hood, Sabine, and Sloyan eds., available online at http://www.go-ship.org/HydroMan.html.

Knoll, M., Borrione, I., Fiekas, H.-V., Funk, A., Hemming, M.P., Kaiser, J., Onken, R., Queste, B., and Russo, A.: Hydrography and circulation west of Sardinia in June 2014. Ocean Sci., 13, 889-904, https://doi.org/10.5194/os-13-889-2017, 2017

Lazzara, L., Bianchi, F., Falcucci, M., Hull, V., Modich, M., and Ribera D'Alcalà, M.: Pigmenti clorofilliani. In: Metodi nell'ecologia del plancton marino, Nova Thalassia, 1st ed., Innamorati, M., Ferrari, I., Marino, D., Ribera D'Alcalà, M., Eds., Edizione LINT, Trieste, Italy; 11, 207-223, 1990

Millard, R.C., and Yang, K.: CTD Calibration and Processing Methods Used at Woods Hole Oceanographic Institution. Woods Hole Oceanog. Inst. Tech. Rept., WHOI-93-44, 101 pp, 1993

Millot, C.: Circulation in the Mediterranean Sea: Evidences, debates and unanswered questions. Sci. Mar., 69 (S1), 5-21, https://doi.org/10.3989/scimar.2005.69s15, 2005

Millot, C., and Taupier-Letage, I.: Circulation in the Mediterranean Sea. In: The Mediterranean Sea. Handbook of Environmental Chemistry book series; Saliot, A. Eds., Springer, Berlin-Heidelberg, Germany; 5k, https://doi.org/10.1007/b107143, 2005

Olita, A., Ribotti, A., Fazioli, L., Perilli, A., and Sorgente, R.: Surface circulation and upwelling in the western Sardinia sea: a numerical study. Cont. Shelf Res., 71, 95-108, https://doi.org/10.1016/j.csr.2013.10.011, 2013

Olita, A., Sparnocchia, S., Cusí, S., Fazioli, L., Sorgente, R., Tintoré, J., and Ribotti, A.: Observations of phytoplankton spring bloom onset triggered by a density front in NW Mediterranean. Ocean Sci., 10, 4, 657-666, doi:10.5194/os-10-667-2014, 2014

Onken, R.: Validation of an ocean shelf model for the prediction of mixed-layer properties in the Mediterranean Sea west of Sardinia. Ocean Sci., 13, 2, 235-257, https://doi.org/10.5194/os-13-235-2017, 2017a

Onken, R.: Forecast skill score assessment of a relocatable ocean prediction system, using a simplified objective analysis method. Ocean Sci., 13, 6, 925-945, https://doi.org/10.5194/os-13-925-2017, 2017b

Onken, R., Fiekas, H.-V., Beguery, L., Borrione, I., Funk, A., Hemming, M., Hernandez-Lasheras, J., Heywood, K. J., Kaiser, J., Knoll, M., Mourre, B., Oddo, P., Poulain, P.-M., Queste, B.Y., Russo, A., Shitashima, K., Siderius, M., and Thorp Küsel, E.: High-resolution observations in the western Mediterranean Sea: the REP14-MED experiment. Ocean Sci., 14, 2, 321-335, https://doi.org/10.5194/os-14-321-2018, 2018

Owens, W.B., and Millard Jr., R.C.: A new algorithm for CTD oxygen calibration. J. Physical Oceanography, 5, 15, 621-631, https://doi.org/10.1175/1520-0485(1985)015<0621:ANAFCO>2.0.CO;2, 1985

Pearlman, J., Bushnell, M., Coppola, L., Karstensen, J., Buttigieg, P.L., Pearlman, F., Simpson, P., Barbier, M., Muller-Karger, F.E., Munoz-Mas, C., Pissierssens, P., Chandler, C., Hermes, J., Heslop, E., Jenkyns, R., Achterberg, E.P., Bensi, M., Bittig, H.C., Blandin, J., Bosch, J., Bourles, B., Bozzano, R., Buck, J.J.H., Burger, E.F., Cano, D., Cardin, V., Llorens, M.C., Cianca, A., Chen, H., Cusack, C., Delory, E., Garello, R., Giovanetti, G., Harscoat, V., Hartman, S., Heitsenrether, R., Jirka S., Lara-Lopez, A., Lantéri, N., Leadbetter, A., Manzella, G.M.R., Maso, J., McCurdy, A., Moussat, E., Ntoumas, M., Pensieri S., Petihakis, G., Pinardi, N., Pouliquen, S., Przeslawski, R., Roden, N.P., Silke J., Tamburri, M.N., Tang H., Tanhua, T., Telszewski, M., Testor, P., Thomas, J., Waldmann, C., and Whoriskey, F.: Evolving and Sustaining Ocean Best Practices and Standards for the Next Decade. Front. Mar. Sci., 6:277. doi: 10.3389/fmars.2019.00277, 2019

Pessini, F., Olita, A., Cotroneo, Y., and Perilli, A.: Mesoscale eddies in the Algerian Basin: do they differ as a function of their formation site? Ocean Sci., 14, 669-688, https://doi.org/10.5194/os-14-669-2018, 2018

Puillat, I., Taupier-Letage, I., and Millot, C.: Algerian Eddies lifetime can near 3 years. J. Mar. Syst., 31(4): 245-259, https://doi.org/10.1016/S0924-7963(01)00056-2, 2002

Puillat, I., Sorgente, R., and Ribotti, A.: Circulation in the Sardinian Sea: a synergetic approach by in situ data, a three dimensional model and infrared imagery. In: Abstract Proceedings of the EGS-AGU-EUG Joint Assembly; Nice, France, 6-11 April 2003, 5, 13117, 2003

Puillat, I., Sorgente, R., Ribotti, A., Natale, S., and Echevin, V.: Westward branching of LIW induced by Algerian anticyclonic eddies close to the Sardinian slope. Chem. Ecol., 22, S1, S293 - S305, https://doi:10.1080/02757540600670760, 2006

Ribotti, A., Puillat, I., Sorgente, R., and Natale, S.: Mesoscale circulation in the surface layer off the southern and western Sardinia island in 2000–2002. Chem. Ecol., 20 (5), 345–363, https://doi.org/10.1080/02757540410001727963, 2004

Ribotti, A., Sorgente, R., Olita, A., Orilia, F., Borghini, M., and Reseghetti, F.: Indication of recent warming process at intermediate level in the Tyrrhenian Sea from SOOP XBT measurements. Medit. Mar. Sci., 17/2, 467-483, doi: http://dx.doi.org/10.12681/mms.1196, 2016

Ribotti, A., Di Bitetto, M., Borghini, M., and Sorgente, R.: CTD profiles in western Sardinia (2000 - 2004), western Mediterranean. SEANOE database, https://doi.org/10.17882/59867, 2019a

Ribotti, A., Perilli, A., Sorgente, R., and Borghini, M.: Hydrological profiles in the Mediterranean Sea (2002 - 2006). SEANOE database, https://doi.org/10.17882/70340, 2019b

Santinelli, C., Ribotti, A., Sorgente, R., Gasparini, G.P., Nannicini, L., Vignudelli, S., and Seritti, A.: Coastal dynamics and dissolved organic carbon in the western Sardinian shelf (Western Mediterranean). J. Mar. Syst., 74, 1-2, 167-188, https://doi.org/10.1016/j.jmarsys.2007.12.005, 2008

~~SBE~~SBE: AN-9: Calculating SEASOFT Coefficients for Sea Tech Fluorometer and WET Labs Flash Lamp Fluorometer (FLF). 1 p, 2008a

SBE: AN-64-2: SBE 43 Dissolved Oxygen Sensor Calibration and Data Corrections using Winkler Titrations. ~~SBE Application Note NO. 64-2,~~ 10 pp, ~~2008~~2008b

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SBE: AN-64-2: AN64-2: SBE 43 Dissolved Oxygen Sensor Calibration and Data Corrections. 5 pp, 2012

SBE: AN-31: Computing Temperature & Conductivity Slope & Offset Correction Coefficients from Lab Calibration & Salinity Bottle Samples. 8 pp, 2016

Schroeder, K., Gasparini, G.P., Tangherlini, and M., Astraldi, M.: Deep and intermediate water in the western Mediterranean under the influence of the Eastern Mediterranean Transient. Geoph. Res. Letters, 33, 21, L21607, https://doi.org/10.1029/2006GL027121, 2006

Schroeder, K., Millot, C., Bengara, L., Ben Ismail, S., Bensi, M., Borghini, M.,, Budillon, G., Cardin, V., Coppola, L., Curtil, C., Drago, A.F., El Moumni, B., Font, J., Fuda, J.L., García-Lafuente, J., Gasparini, G.P., Kontoyiannis, H., Lefevre, D., Puig, P., Raimbault, P., Rougier, G., Salat, J., Sammari, C., Sánchez Garrido, J.C., Sanchez-Roman, A., Sparnocchia, S., Tamburini, C., Taupier-Letage, I., Theocharis, A., Vargas-Yáñez, M., and Vetrano, A.: Long-term monitoring programme of the hydrological variability in the Mediterranean Sea: a first overview of the HYDROCHANGES network. Ocean Sci., 9, 301-324, https://doi.org/10.5194/os-9-301-2013, 2013

Sorgente, R., Ribotti, A., and Puillat, I.: Water masses and diagnostic circulation west off Sardinia from March 23rd to April 4th, 2001. In: Building the European Capacity in Operational Oceanography; Proceedings of the Third International Conference on EuroGOOS; Athens, Greece; 2-6.12.2002, Elsevier Oceanography Series, 69, 100-104, https://doi.org/10.1016/S0422-9894(03)80017-X, 2003

Strickland, J.D.H., and Parsons, T.R.: A practical handbook of seawater analyses. Bull. Fish. Research. Bd. Can., 167, 310

Vignudelli, S., Santinelli, C., Murru, E., Nannicini, L., Seritti, A.: Distributions of dissolved organic carbon (DOC) and chromophoric dissolved organic matter (CDOM) in coastal waters of the northern Tyrrhenian Sea (Italy). Estuar., Coast. Shelf Sci., 60, 1, 133-149, https://doi.org/10.1016/j.ecss.2003.11.023, 2004

Winkler, L. W.: The determination of dissolved oxygen in water. Ber. Deut. Chem. Ges., 1888, 21, 2843-2846, 1972

Zunino, P., Schroeder, K., Vargas-Yáñez, M., Gasparini, G.P., Coppola, L., García-Martínez, M.C., and Moya-Ruiz, F.: Effects of the Western Mediterranean Transition on the resident water masses: pure warming, pure freshening and pure heaving. J. Mar. Syst., 96–97, 15-23, https://doi.org/10.1016/j.jmarsys.2012.01.011, 2012

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Figure Captions

Figure 1. All the CTD casts during the seven cruises in the Sardinia Sea (western Mediterranean)

Figure 2. ~~An ATB-1250 Platinum Resistance Thermometer Bridge. [FOTO]~~Linear regression line calculated for the dissolved oxygen data of a CTD station

~~Figure 3. The on-board laboratory for conductivity (left) and dissolved oxygen (right) analysis from seawater samples during the seven cruises.~~

~~Figure 4. Linear regression line calculated for the dissolved oxygen data of a CTD station~~

~~Figure 5. A reverse thermometer on a Niskin bottle of the rosette~~

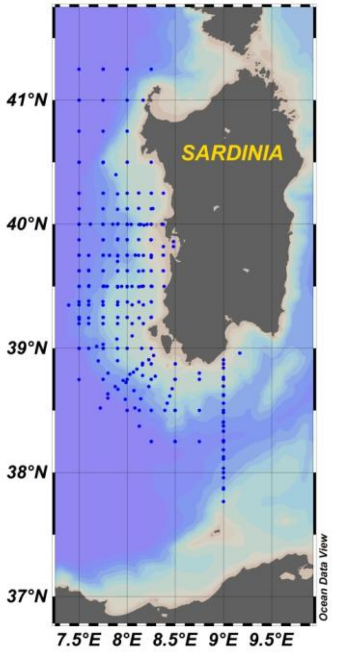
~~Figure 6.~~Figure 3. The salinity (up) and dissolved oxygen (down) errors between what measured by the sensor on the probe and what measured on board from water samples for the two conductivity/oxygen sensors, 1 and 2, along a vertical profile in a deep station.

Table Captions

Table 1. The list of sensors used and activities realized during the seven medgoos cruises. Numbers in brackets for reversed thermometers are the numbers of the Niskin bottles where installed. L and SADCP stand for Lowered and ~~Shipborn~~Shipborne Acoustic Current Profile, respectively

Formattato: Allineato a sinistra, Interlinea singola

385 **Figure 1**



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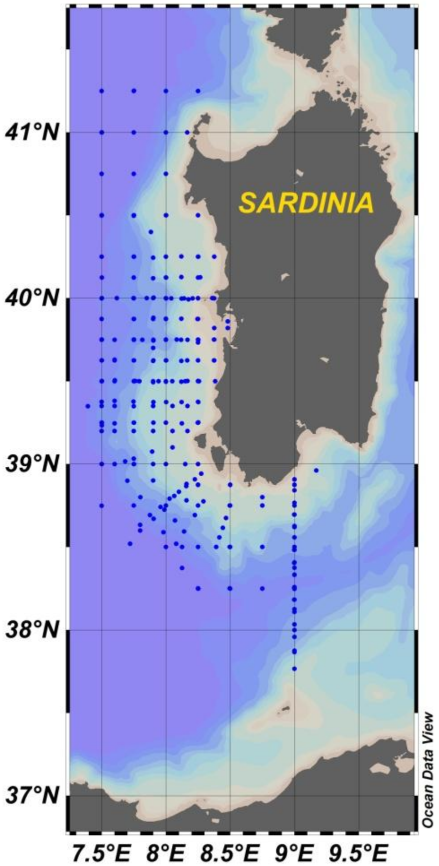
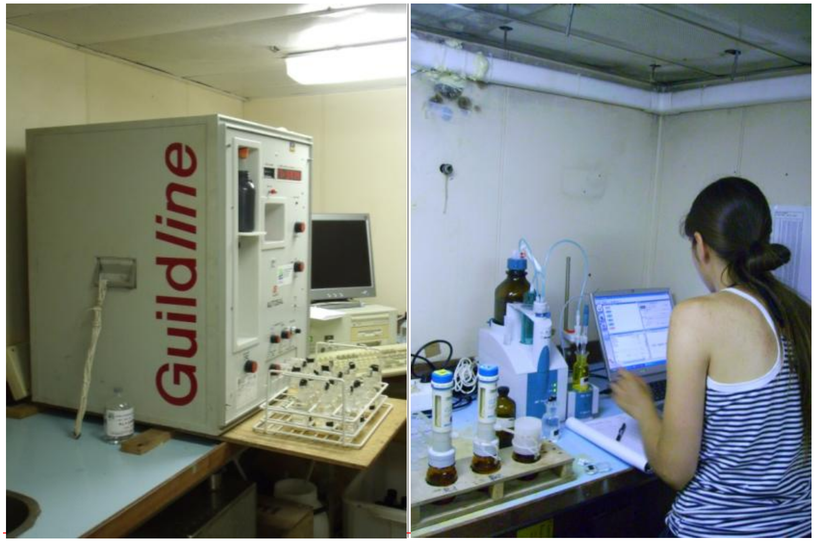

SARDINIA
41°N
40°N
39°N
38°N
37°N
7.5°E
8°E
8.5°E
9°E
9.5°E
Ocean Data View

Figure 2

~~**Figure3**~~



~~**Figure4**~~

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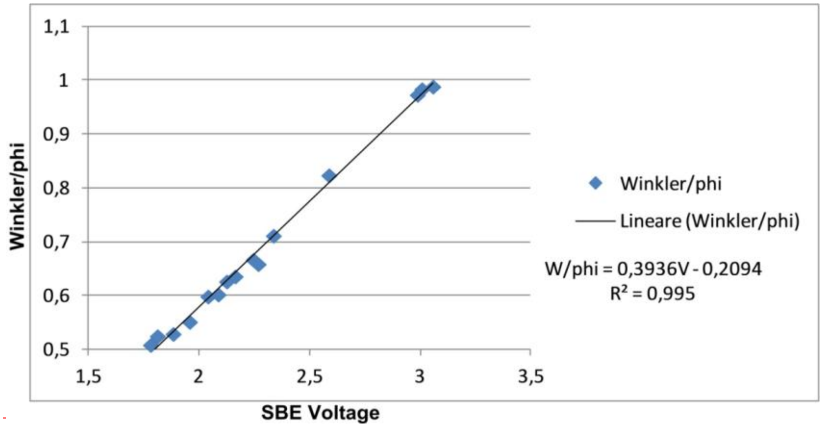
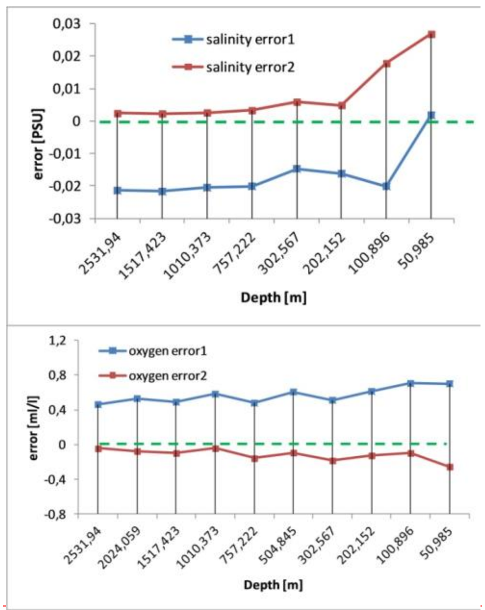
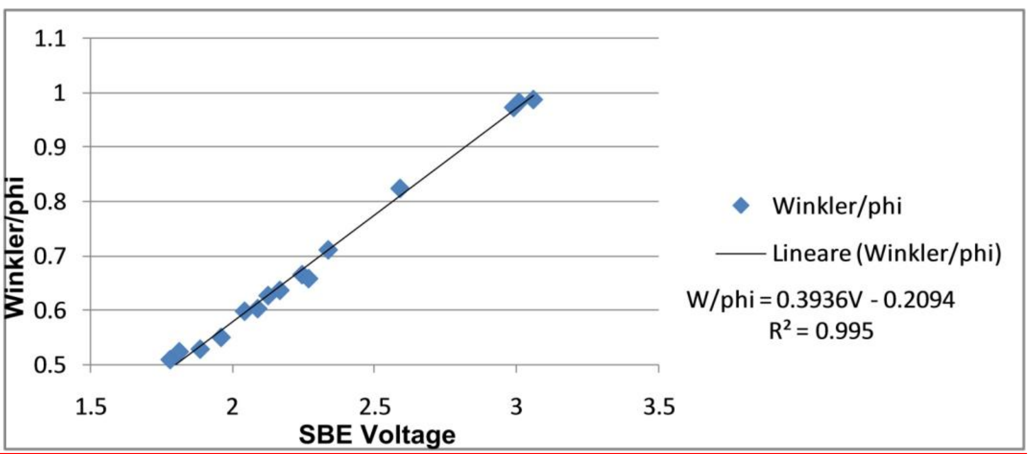


~~**Figure5**~~

~~**Figure6**~~

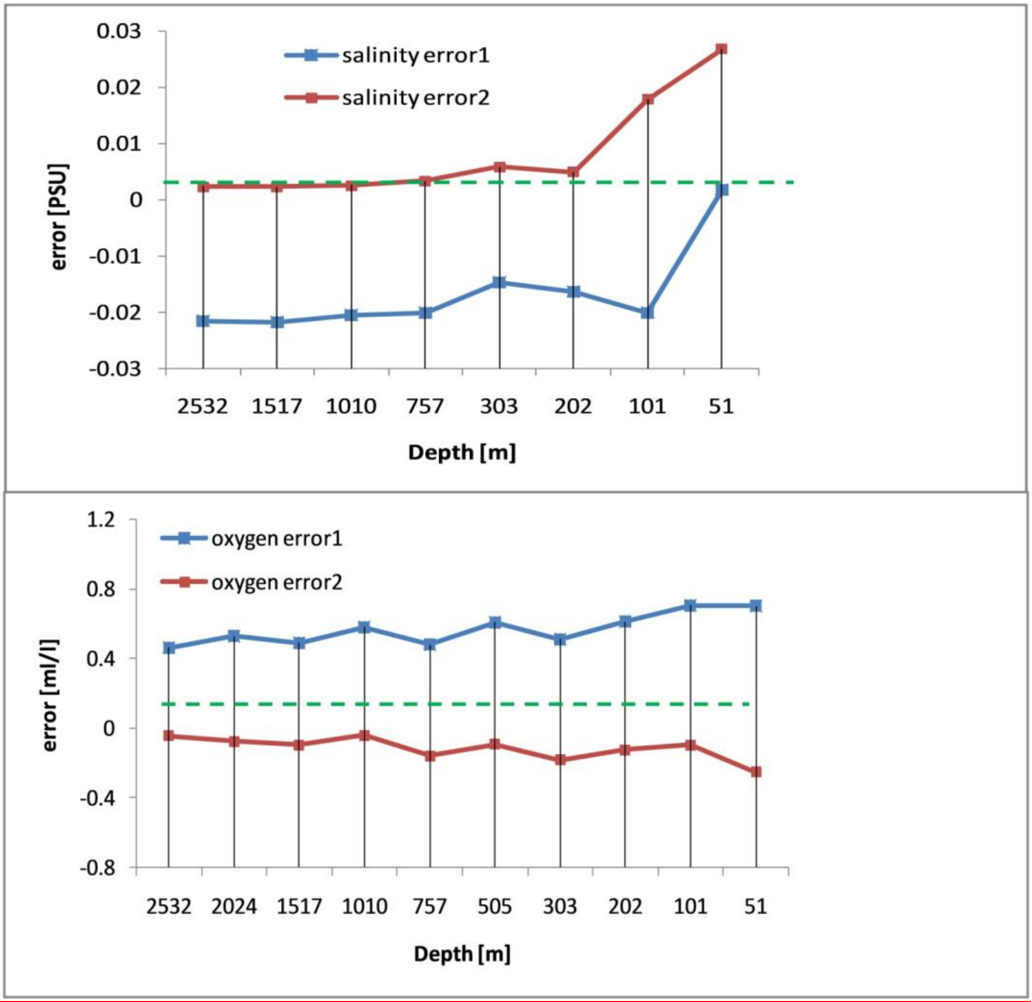


salinity error1
salinity error2
error [PSU]
0,03
0,02
0,01
0
-0,01
-0,02
-0,03
2531,94
1517,423
1010,373
757,222
302,567
202,152
100,896
50,985
Depth [m]
oxygen error1
oxygen error2
error [ml/l]
1,2
0,8
0,4
0
-0,4
-0,8
2531,94
2024,059
1517,423
1010,373
757,222
504,845
302,567
202,152
100,896
50,985
Depth [m]



Winkler/phi
1.1
1
0.9
0.8
0.7
0.6
0.5
1.5
2
2.5
3
3.5
SBE Voltage
Winkler/phi
Lineare (Winkler/phi)
W/phi = 0.3936V - 0.2094
R² = 0.995

Figure 3



0.03
0.02
0.01
0
-0.01
-0.02
-0.03
error [PSU]
salinity error1
salinity error2
2532
1517
1010
757
303
202
101
51
Depth [m]
1.2
0.8
0.4
0
-0.4
-0.8
error [ml/l]
oxygen error1
oxygen error2
2532
2024
1517
1010
757
505
303
202
101
51
Depth [m]

Table 1

	medgoos1	medgoos2	medgoos3	medgoos4	medgoos5	medgoos6	medgoos7
Date	~~28~~2000/05~~-~~~~02~~/28-2000/06/~~2000~~02	~~23~~2001/03~~-~~~~03~~/23-2001/04/~~2001~~03	2001/09/ 10-20~~/09/2001~~	2002/05/4-23~~/05/2002~~	~~31~~2002/10~~-~~~~18~~/31-2002/11/~~2002~~18	~~28~~2003/03~~-~~~~17~~/28-2003/04/~~2003~~17	2004/01/07-26~~/01/2004~~
# days	6	12	11	20	20	21	20
R/V	Urania	Urania	Urania	Urania	Urania	Urania	Urania
# CTDs	38	67	41	68	42	92	87
Reverse Thermometer (bottle #)				3 (1, 3, 5)	4 (1, 3, 5, 7)		
SBE-13 O2 Sensor	X	X	X	X			
SBE-43 O2 Sensor					X	X	X
Fluorescence	X	X	X	X	X	X	X
LADCP	X	X	X	X	X		
SADCP	X						
CTD secondary sensors							
Secondary Temperature		X	X	X	X	X	X
Secondary Conductivity		X	X	X	X	X	X
SBE-43 O2					X	X	X
Water samples for following analyses of							
DOC	23	66	39		55		
Nutrients	23	66	39		55		
Phytoplancton		X	X	X	X		
Chl-~~a~~*a*		66	39	X	55		
On-board analyses							
O2	X		X	X	X	X	X
Conductivity	X		X	X	X	X	X

Tabella formattata