# ARGO-ITALY:

# ANNUAL REPORT 2018

Pierre-Marie Poulain, Riccardo Gerin, Elena Mauri, Milena Menna, Giulio Notarstefano, Antonio Bussani, Piero Zuppelli and Massimo Pacciaroni

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Trieste, Italy

Approved for release by: ……

Dr. Cosimo Solidoro

Director, Oceanography Section

## TABLE of CONTENTS

## 1. Introduction

ARGO-ITALY is the Italian component of a worldwide in situ global observing system, based on autonomous profiling floats, surface drifters, gliders and ship-of-opportunity measurements. It is primarily focused on the Italian seas, the Mediterranean and Black seas and the Southern Ocean, and includes observations of temperature, salinity, currents and biogeochemical/optical properties of seawater. The ARGO-ITALY objective is to provide a significant and sustained Italian contribution to the global ocean monitoring.

ARGO-ITALY contributes to international programs such as Argo and Euro-Argo (global monitoring of water properties with profiling floats), GDP (Global Drifter Program to measure near-surface temperature and currents), EGO (gliding vehicles to measure water properties) and SOOP (Ship-Of-Opportunity Program to temperature profiles) which have been developed to monitor the entire World Ocean on a long term basis.

ARGO-ITALY is a cost-effective long-term monitoring system that is a unique source of information to study the role of the oceans, and the Mediterranean Sea in particular, on the climate system. It also provides the data required by operational ocean monitoring systems in order to improve significantly extended forecasts of the atmosphere and oceans. ARGO-ITALY contributes to programs of operational oceanography, such as MONGOOS (Mediterranean Oceanography Network for the Global Ocean Observing System) and is essential for the production of marine core and downstream services products of Copernicus Marine Environment Monitoring Service (CMEMS). It is also an important component of GEOSS (Global Earth Observation System of Systems).

ARGO-ITALY is funded by the Italian Ministery of Instruction, University and Research (MIUR) since 2011. The operation of instruments at sea and the collection of data began in February 2012. A dedicated web site was developed to help with the internal organization of the project, to publish graphical and tabulated summaries and photographs on the operation of instruments in near-real time, and to post news, related links, small project calls, etc. related to ARGO-ITALY. The web address is: www.argoitaly.ogs.trieste.it

This report summarizes the activities of ARGO-ITALY in 2018 in terms of procurements of the instruments, their preparation and their deployments. Information about data processing and archiving is also given. Plans for 2019 and beyond are included in the last section.

## 2. Argo float activities in 2018

### 2.1 Float procurement

The following Argo floats were purchased in 2018 with funds of ARGO-ITALY:

1. Eight Arvor-I floats, five Arvor-I floats with dissolved oxygen sensor and seven Arvor-I with sea ice detection algorithm from NKE, Lorient, France. These instruments were acquired via the Euro-Argo ERIC. They are fitted with a Sea-Bird CTD (SBE 41 CP) (and Aanderaa optode sensor) and transmit data via Iridium. Four units were shipped to New Zealand and five units to South Africa for deployments in the Southern Ocean in February 2019. Two units were used in the framework of the PERLE-1 campaign and deployed in the Mediterranean Sea in October 2018 (from R/V Atalante). One unit was shipped to CMRE in La Spezia and was deployed in the Thyrrhenian Sea in September 2018 (from R/V Leonardo). Three units will be deployed under the CALYPSO project and three units under the PERLE-2 campaign, in 2019, in the Mediterranean Sea. Two float will be deployed in the Mediterranean sea in 2019 (from R/V Dallaporta).

2. Three Arvor-Deep floats from NKE, Lorient, France. These deep floats are equipped with a Sea-Bird CTD (SBE 41 CP) (and Aanderaa optode sensor) and transmit data via Iridium. One was shipped directly to Toulon (France) in August 2018 and deployed southeast of Rhodes in October 2018 in the framework of the PERLE 1 campaign (PERLE project) from the R/V Atalante. Unfortunately, the float performed only one cycle (pump failure?). The other two Arvor-Deep floats are still at the Ifremer premises for technical testing in the hyperbaric chamber and pool.

### 2.2 Float deployments

In total, **30 Italian floats** were deployed in 2018 (see Tables 1 and 2 for details). These floats were Provor, Arvor-I and Arvor-Ice designs manufactured by NKE (France), and Dova profilers manufactured by MetOcean (Canada). All floats transmit data via Iridium telemetry.

One float was deployed in the Black Sea and 21 units were released in the Mediterranean (Table 1). In the Mediterranean, most floats have a parking depth at 350 dbar and maximal profiling depths alternating at 700 and 2000 dbar. In the Black Sea, the parking depth was set to 200 dbar. They all have cycles of 5 days, except for 2 Arvor-I floats (WMO 6903242 and 6903248) which had short cycles of 3 h during most of their operating life to measure high-frequency processes.

Most floats were deployed from research vessels of opportunity (i.e., R/V Atalante, R/V Maria S. Merien, R/V Alliance, R/V OGS Explora, R/V Dallaporta, R/V Leonardo for the Mediterranean and R/V Akademik for the Black Sea) with the help of colleagues from France, Italy, Malta and Bulgaria (Figure 1). In the framework of the Seakeepers Society (https://www.seakeepers.org), two floats were deployed in the Tyrrhenian and Ionian seas from the maxi-yatch REO (Figure 2).

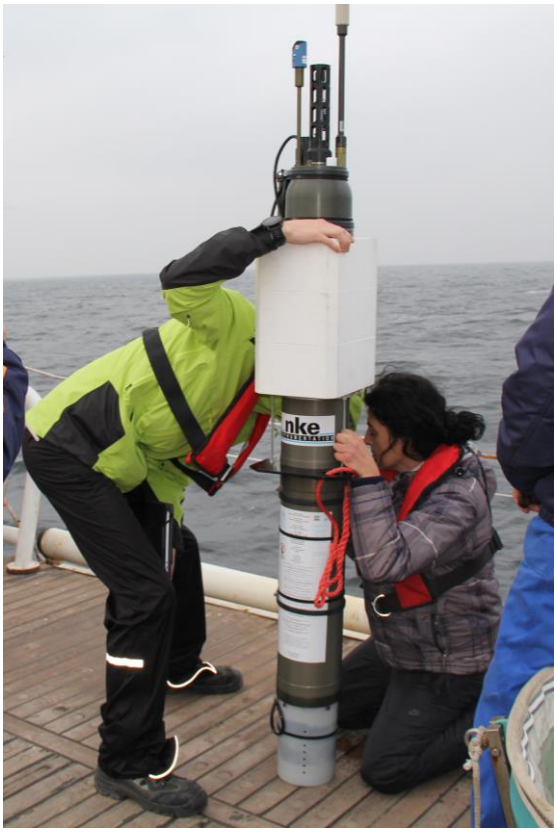


*Figure 1. Deployment of PROVOR NUT float from R/V Akademik in the western Black Sea on 29 March 2018 (V. Slabakova and F. Ricour are listening to the deployments clicks!)*


*Figure 2. Captain L. Triggiani removing the magnet from an Arvor float on M/Y ROE before deployment of the float in the Ionian Sea in July 2018.*

| Model | WMO | Depl. Date | Lat | Lon | Cycles | Last Date | Lat | Lon | Status* | Cycle** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Arvor-I** | 6903234 | 04-Mar-2018 20:39 | 34.27 | 24.60 | 66 | 20-Jan-2019 06:12 | 33.78 | 22.62 | A | 5 |
| **Arvor-I** | 6903236 | 11-Mar-2018 11:09 | 37.38 | 20.33 | 64 | 22-Jan-2019 06:20 | 40.52 | 18.70 | A | 5 |
| **Provor Bio** | 6903235 | 11-Mar-2018 22:50 | 38.40 | 20.03 | 54 | 02-Sep-2018 10:55 | 40.19 | 16.93 | D | 5 |
| **Arvor-I-DO** | 6903237 | 16-Mar-2018 19:58 | 35.49 | 18.50 | 64 | 22-Jan-2019 06:29 | 35.01 | 17.92 | A | 5 |
| **Arvor-I-DO** | 6903238 | 21-Mar-2018 13:42 | 39.18 | 13.33 | 63 | 22-Jan-2019 06:11 | 40.22 | 10.11 | A | 5 |
| **Arvor-I** | 6903239 | 22-Mar-2018 06:08 | 39.22 | 11.75 | 63 | 23-Jan-2019 06:04 | 39.46 | 13.04 | A | 5 |
| **Provor Nut** | **6903240** | **29-Mar-2018 04:32** | **43.17** | **29** | **61** | **05-Jan-2019 04:44** | **42.49** | **34.65** | **A** | **5** |
| **Arvor-I** | 3901974 | 30-May-2018 11:10 | 35.84 | -2.21 | 191 | 22-Jan-2019 16:12 | 36.59 | -4.21 | A | 5 |
| **Arvor-I** | 6903241 | 04-Jul-2018 02:46 | 39.38 | 17.86 | 41 | 22-Jan-2019 06:07 | 37.82 | 15.98 | A | 5 |
| **Arvor-I** | 3901975 | 04-Jul-2018 18:12 | 38.95 | 13.74 | 42 | 22-Jan-2019 06:09 | 40.23 | 12.70 | A | 5 |
| **Arvor-I** | 3901973 | 21-Jul-2018 06:49 | 42.87 | 14.82 | 37 | 13-Jan-2019 06:19 | 42.74 | 15.28 | A | 5 |
| **Arvor-I** | 6903242 | 20-Aug-2018 08:14 | 35.93 | 14.17 | 907 | 13-Dec-2018 09:16 | 34.20 | 15.99 | D | 0.125 |
| **Arvor-I** | 6903248 | 26-Sep-2018 10:20 | 43.84 | 9.82 | 181 | 19-Jan-2019 12:25 | 42.89 | 5.54 | A | 0.125, 5 |
| **Provor Nut** | 6903249 | 06-Oct-2018 11:19 | 39.10 | 18.22 | 37 | 23-Jan-2019 12:37 | 38.92 | 17.34 | A | 5 |
| **Provor Nut** | 6903250 | 08-Oct-2018 22:31 | 39.10 | 18.22 | 34 | 22-Jan-2019 12:35 | 42.02 | 17.65 | A | 5 |
| **Arvor-I** | 6903245 | 18-Oct-2018 04:35 | 34.21 | 26.05 | 18 | 20-Jan-2019 06:16 | 34.21 | 25.69 | A | 5 |
| **Provor Nut** | 6903247 | 18-Oct-2018 04:40 | 34.21 | 26.05 | 38 | 24-Jan-2019 09:51 | 34.19 | 26.91 | A | 5 |
| **Arvor-I** | 3901977 | 22-Oct-2018 04:20 | 35.61 | 28.23 | 20 | 21-Jan-2019 06:10 | 35.04 | 27.39 | A | 5 |
| **Arvor-Deep** | 6903243 | 24-Oct-2018 00:00 | 35.56 | 28.18 | 1 | 24-Oct-2018 06:16 | 35.56 | 28.18 | D | 5 |
| **Arvor-I** | 6903244 | 25-Oct-2018 10:13 | 35.82 | 25.01 | 20 | 24-Jan-2019 06:21 | 36.01 | 25.91 | A | 5 |
| **Arvor-I-DO** | 6903246 | 25-Oct-2018 22:50 | 34.98 | 23.25 | 20 | 24-Jan-2019 06:25 | 34.35 | 24.02 | A | 5 |
| **Arvor-I** | 3901976 | 05-Nov-2018 09:50 | 36.11 | 21.61 | 17 | 20-Jan-2019 06:06 | 35.79 | 21.29 | A | 5 |

**Status in early January 2018: A = active, D = dead;*
***Cycle: Length of cycle in days.*

*Table 1. Status information for the 22 Italian floats deployed in the Mediterranean and Black Sea (bold) during 2018.*

In total, 3 floats (out of 22) stopped functioning before the end of the year 2018. The Arvor-Deep (WMO 6903243) deployed southeast of Rhodes stopped transmitting data after 1 cycle. The Arvor-I float 6903242 was deployed south of Malta Island in August 2018. It was initially programmed to cycle at 3 h intervals in the upper layer of the sea (down to about 200 m) in order to study the internal waves (oscillatory vertical motion in the water column) which are prominent in this area (reaching an amplitude of 10-20 m). It performed more than 900 cycles before stopping transmissions on 13 December 2018. Provor CTS 4 (WMO 6903235, equipped with biogeochemical sensors) was deployed in the northern Ionian in March 2018 and stopped functioning at cycle 55 in the Gulf of Taranto in September 2018.

Five Italian floats were deployed in the South Pacific Ocean and the Pacific sector of the Southern Ocean (Table 2) with the help of Italian colleagues onboard the R/V Palmer while sailing from New Zealand to the Ross Sea. These floats included 1 Dova and 4 Arvor-Ice floats. The Arvor-Ice uses an Ice Sensing Algorithm (ISA) based on temperature readings to abort surfacing when sea ice is present at the sea surface (Pacciaroni et al., 2017). All floats were programmed to cycle between the surface and 2000 dbar every 10 days and to drift at the parking depth of 1000 dbar. The floats were still active in early 2019.

Three Italian floats were also deployed in the South Atlantic Ocean (Table 2) with the help of Italian colleagues onboard the R/V Agulhas II (Figure 3). These floats were all Arvor-I instruments. All the floats were programmed to cycle between the surface and 2000 dbar every 10 days and to drift at the parking depth of 1000 dbar. They were all still active in early 2019.

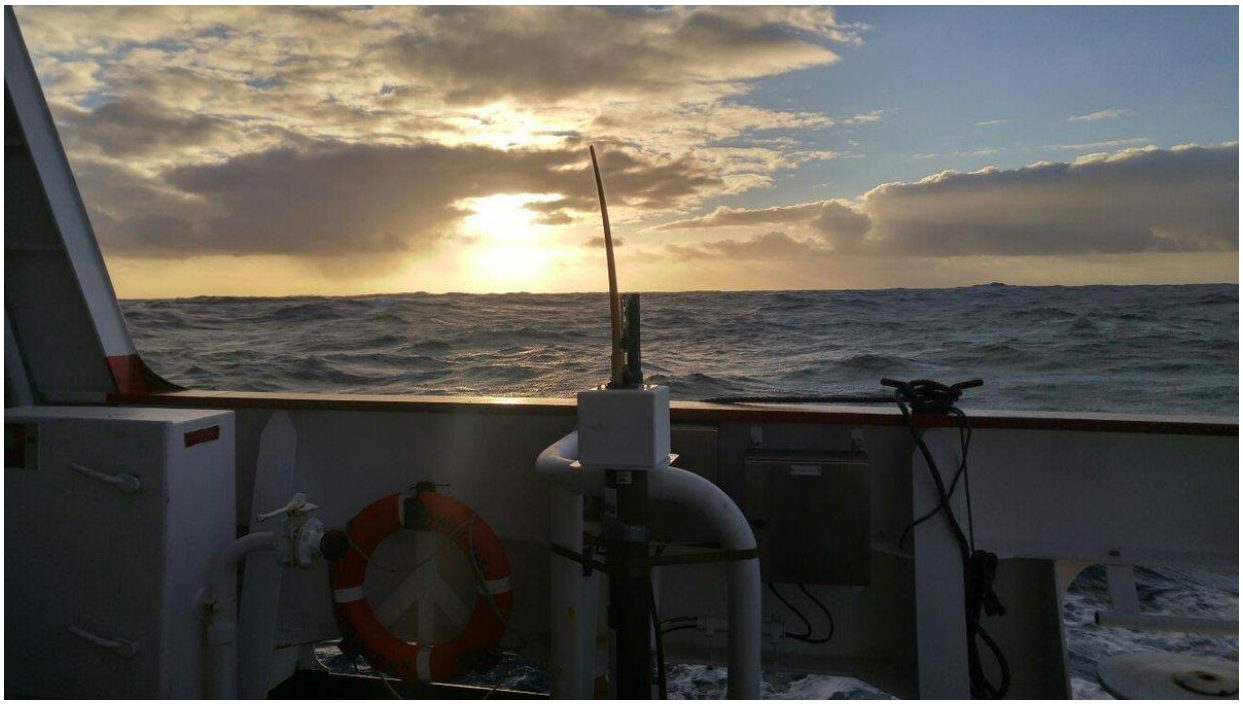

*Figure 3. Sunset in the Southern Ocean and an Arvor-I ready to be deployed from R/V Agulhas II in February 2018.*

| Model | WMO | Depl. Date | Lat | Lon | Cycles | Last Date | Lat | Lon | Status* | Cycle** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Arvor-I** | 3901961 | 29-Jan-2018 23:22 | -61 | -24.44 | 37 | 16-Jan-2019 21:25 | -54.26 | 15.09 | A | 10 |
| **Arvor-I** | 3901963 | 30-Jan-2018 05:35 | -60 | -26.28 | 36 | 17-Jan-2019 03:32 | -60.01 | -26.28 | A | 10 |
| **Arvor-I** | 3901962 | 06-Feb-2018 23:11 | -53.98 | 1.67 | 36 | 14-Jan-2019 21:05 | -52.57 | 16.27 | A | 10 |
| **Arvor-I-ICE** | 6903229 | 23-Feb-2018 16:54 | -63.02 | 161.09 | 35 | 21-Jan-2019 05:53 | -61.62 | 155.8 | A | 10 |
| **Arvor-I-ICE** | 6903230 | 24-Feb-2018 09:06 | -61 | 158.34 | 32 | 02-Jan-2019 05:45 | -63.99 | 174.68 | A | 10 |
| **Arvor-I-ICE** | 6903231 | 25-Feb-2018 00:41 | -59.02 | 155.82 | 35 | 23-Jan-2019 05:51 | -64.67 | -174.04 | A | 10 |
| **Arvor-I-ICE** | 6903232 | 25-Feb-2018 17:30 | -56.98 | 153.44 | 35 | 23-Jan-2019 05:31 | -55.57 | 174.47 | A | 10 |
| **Dova** | 6903233 | 26-Feb-2018 07:22 | -55.03 | 152.5 | 34 | 22-Jan-2019 04:46 | -56.55 | 170.01 | A | 10 |

**Status in early January 2017: A = active, D = dead.*
***Cycle: Length of cycle in days.*

*Table 2. Status information for the 8 Italian floats deployed in the Southern Ocean, South Atlantic and South Pacific during 2018.*

In summary, at the end of 2018, the ARGO-ITALY program had a total of 65 active floats, including 30 instruments in the Mediterranean Sea, 6 in the Black Sea (Figure 4) and 29 in the South Pacific, South Atlantic and Southern Oceans (south of 60˚S) (Figure 5).

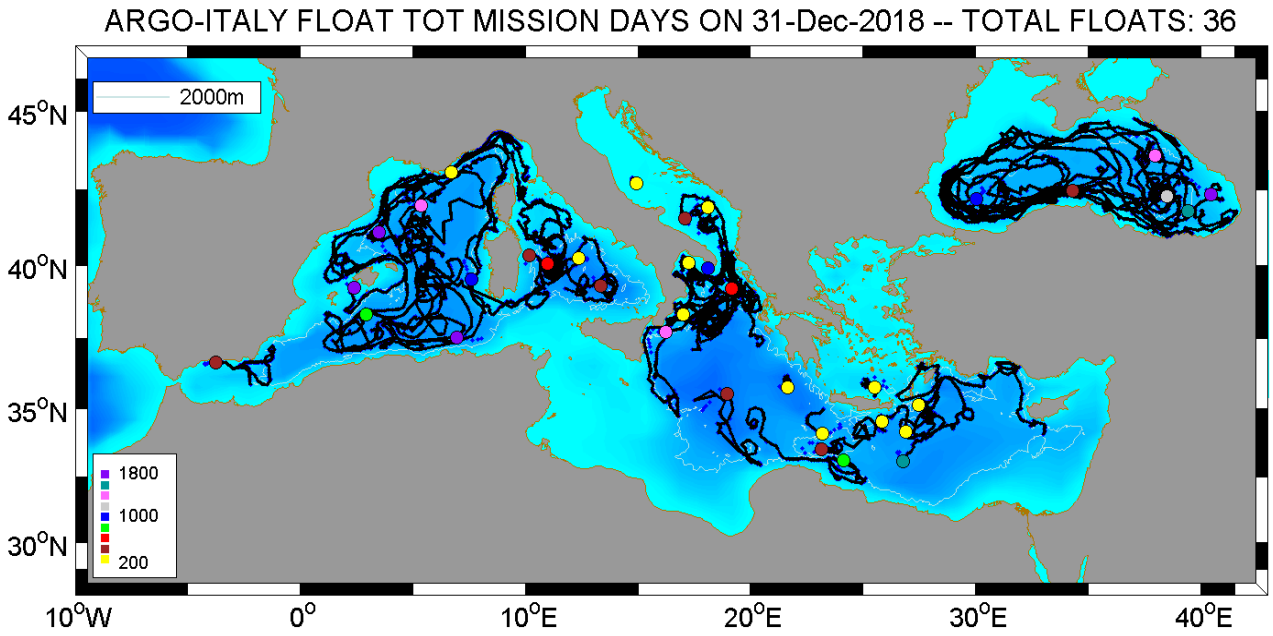


*Figure 4. Trajectories and positions (circle symbols) on 31 December 2018 of the 36 ARGO-ITALY floats active in the Mediterranean and Black Sea at the end of 2018. The circle symbols are color-coded as a function of float age in days.*

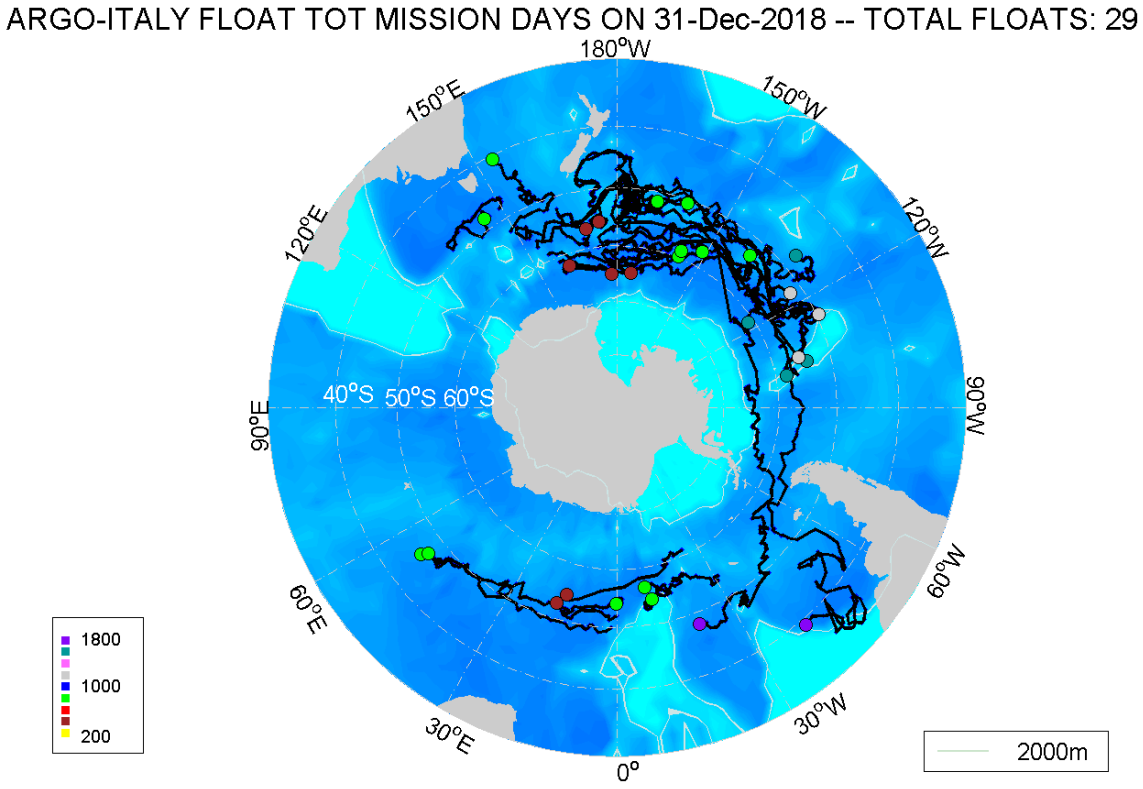


*Figure 5. Trajectories and positions (circle symbols) on 31 December 2018 of the 29 ARGO-ITALY floats in the South Pacific, South Atlantic and Southern Oceans. The circle symbols are color-coded as a function of float age in days.*

The temporal evolution of the number of active floats is shown in Figure 6 with weekly resolution, along with the annual numbers of float deployments and float deaths for the period 2012-2018. The float population in 2012-2018 is essentially increasing and reaching 60-70 active instruments in 2018, although we notice a slight decrease starting in 2017. In 2018, the number of floats which stopped transmitted was rather high (32) probably due to the natural aging of the ARGO-ITALY network and also due to the short operating lifes of some float types.

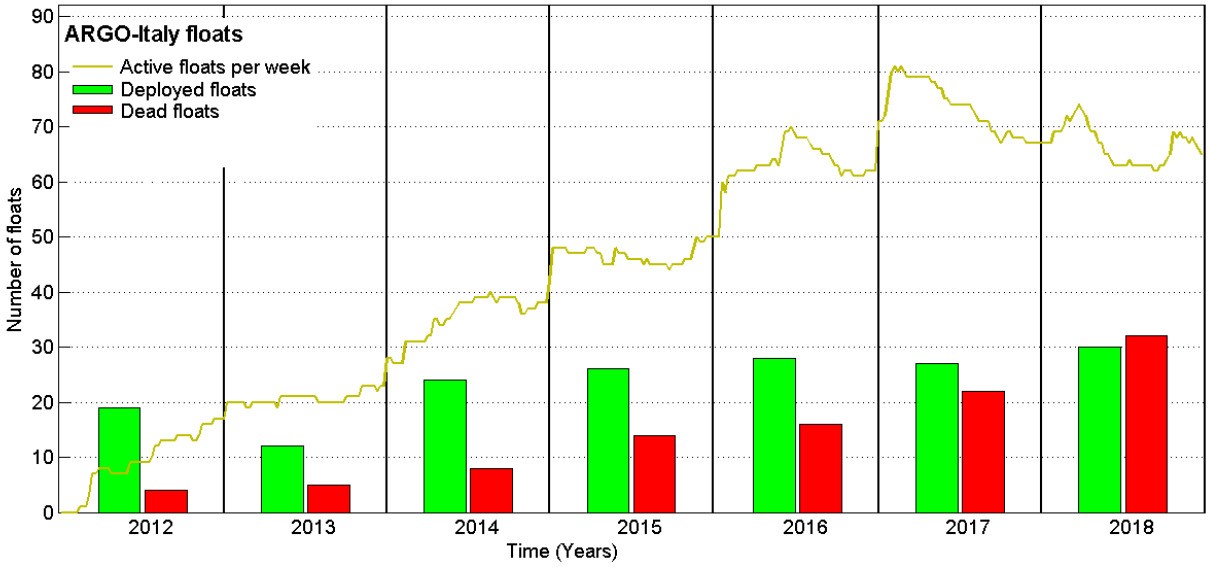


*Figure 6. Temporal evolution of the number of ARGO-ITALY active floats with weekly resolution and histogram of the annual float deployments and losses.*

Since 18 February 2012, a total of **166 ARGO-ITALY floats** have been deployed, 104 in the Mediterranean and Black seas, and 62 in the oceans of the Southern Hemisphere. In less than 7 years, they have provided about **19700 CTD profiles**. The histograms of number of CTD profiles per float is shown in Figure 7. Fortytwo floats have done more than 180 profiles. In total, 14 floats (~8 %) have failed just after deployment.

After about 7 years of activities in the Mediterranean and Black seas, the maximum operating life of the ARGO-ITALY floats is about 5 years (~1850 days, see Figure 8). If we consider all the floats (dead + alive) the mean half-life is about 500 days for all floats in the Mediterranean and Black seas (Figure 8, top). Excluding the floats still alive but with life <= 500 days, we obtain a better estimate of mean half-life reaching 900 days (Figure 8, middle). Floats with Argos positioning and telemetry system appear to have a similar mean half-life, when compared to the floats with Iridium. Arvor and Apex floats show the longest performances with a mean half-life of about 900 days (Figure 8, bottom).

For the floats deployed in the South Pacific, South Atlantic and Southern Ocean the maximal operating life is about 6 years, and the mean half-life is approching two years (Figure 9). In general, the Nova and Dova floats have significantly lower survival rates. After a little more than 3 years since their first deployments in October 2015, only 12 floats (out of 40 units, i.e., 30%) were still fully operational in early 2019.

Note that these survival rate statistics have to be interpreted with caution since most of the floats are still alive (36 floats out of 106 units for the Mediterranean and Black seas, 29 floats out of 60 in the Southern Hemisphere). Furthermore, these statistics include the floats with all the types of “end of operating life” (low battery power, stranding, unvolontary and voluntary recovery, etc.).

Table 3 summarizes the main statistics of the ARGO-ITALY floats for the period 2012-2018. In 2018, more than 4700 CTD profiles were obtained with Italian Argo floats. These profiles provided data on a total vertical distance of more than 4800 km in 2018. For the period 2012-2018, the 166 floats of ARGO-ITALY provided data on a total vertical distance around 22000 km in about 19700 profiles.

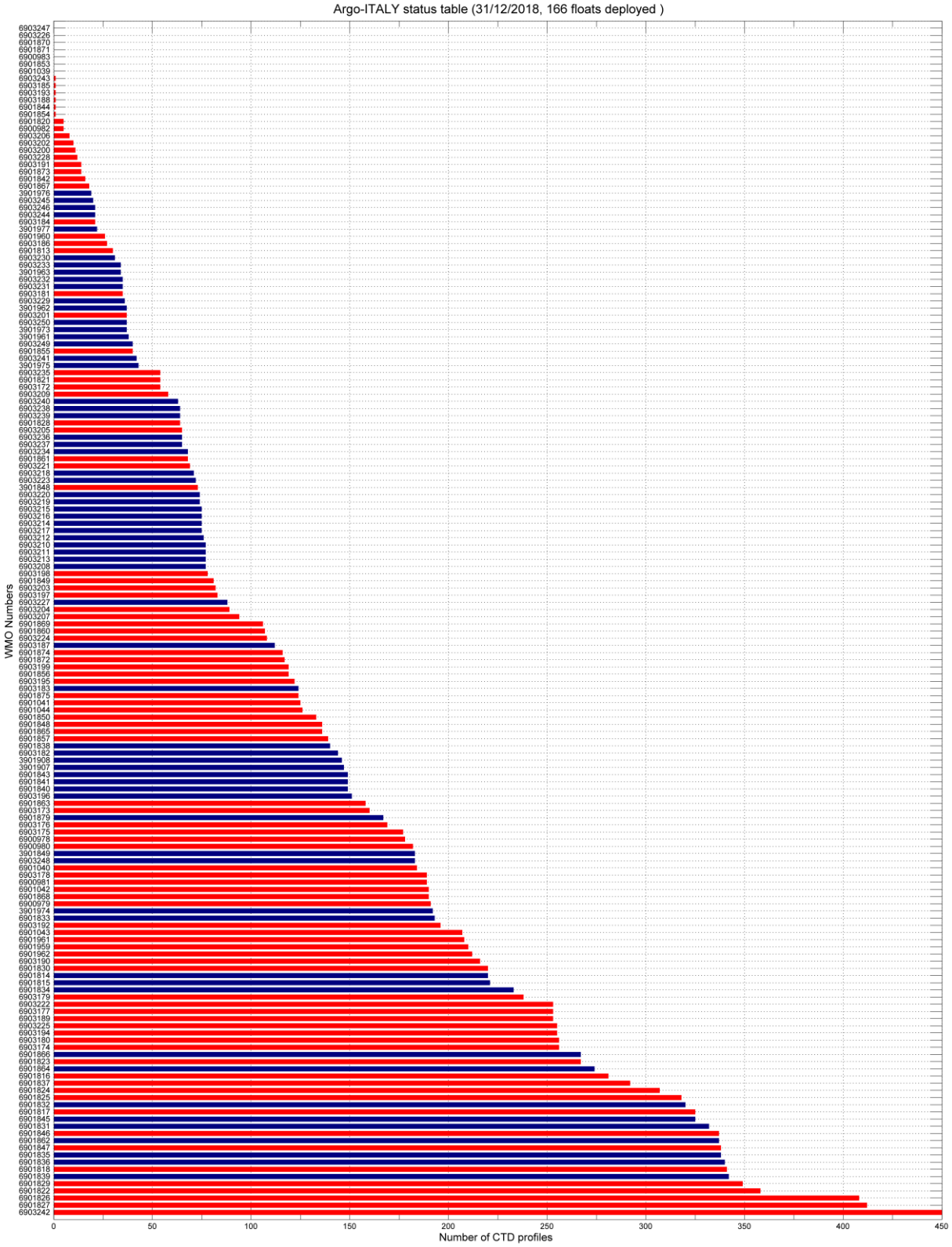


*Figure 7. Histogram of the number of CTD profiles per float (red: dead float, blue: alive at the end of 2018).*

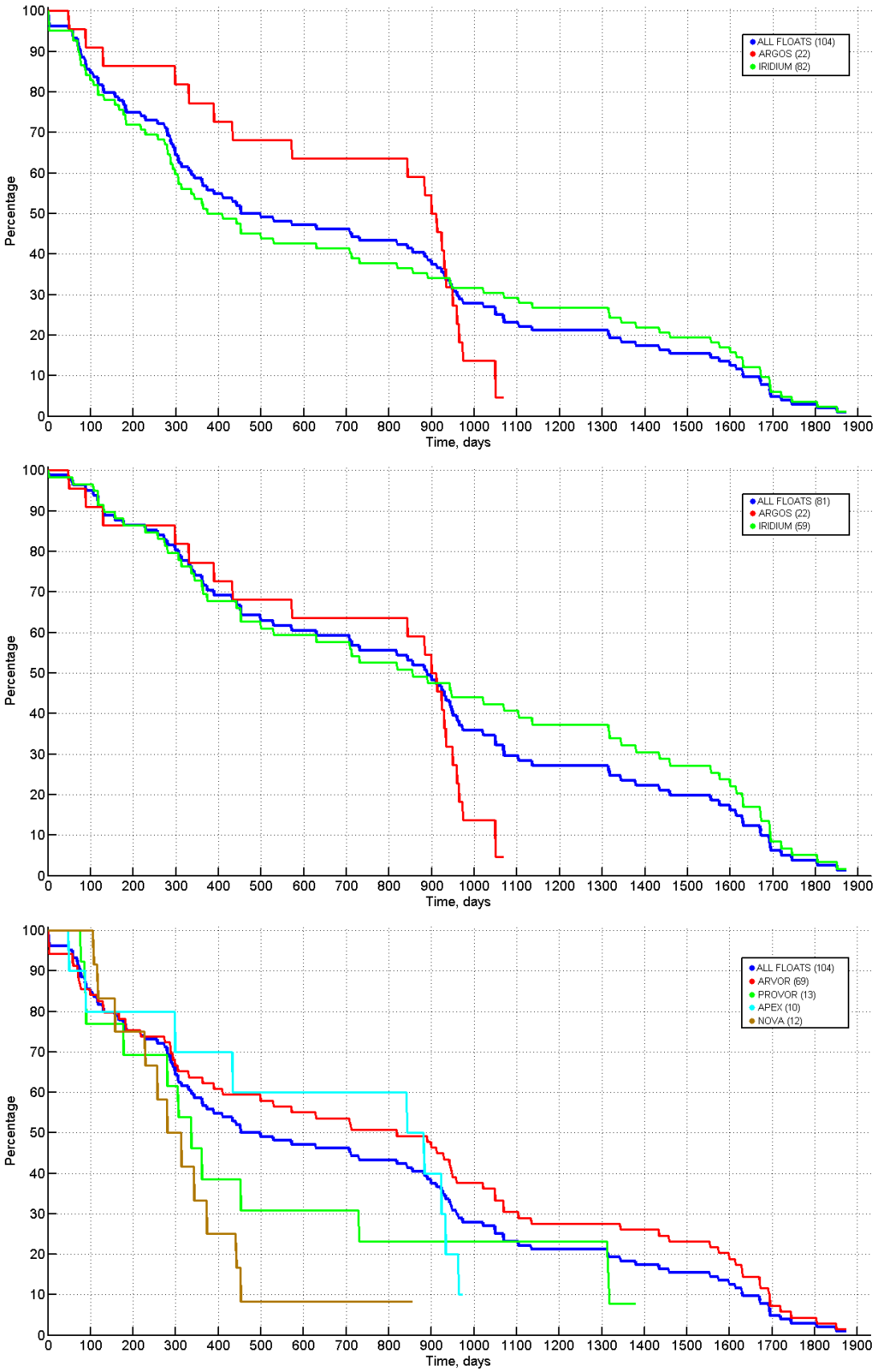


*Figure 8. Survival rate diagrams for the ARGO-ITALY floats in the Mediterranean and Black seas, separated by transmission mode (top and middle) and float type (bottom).*

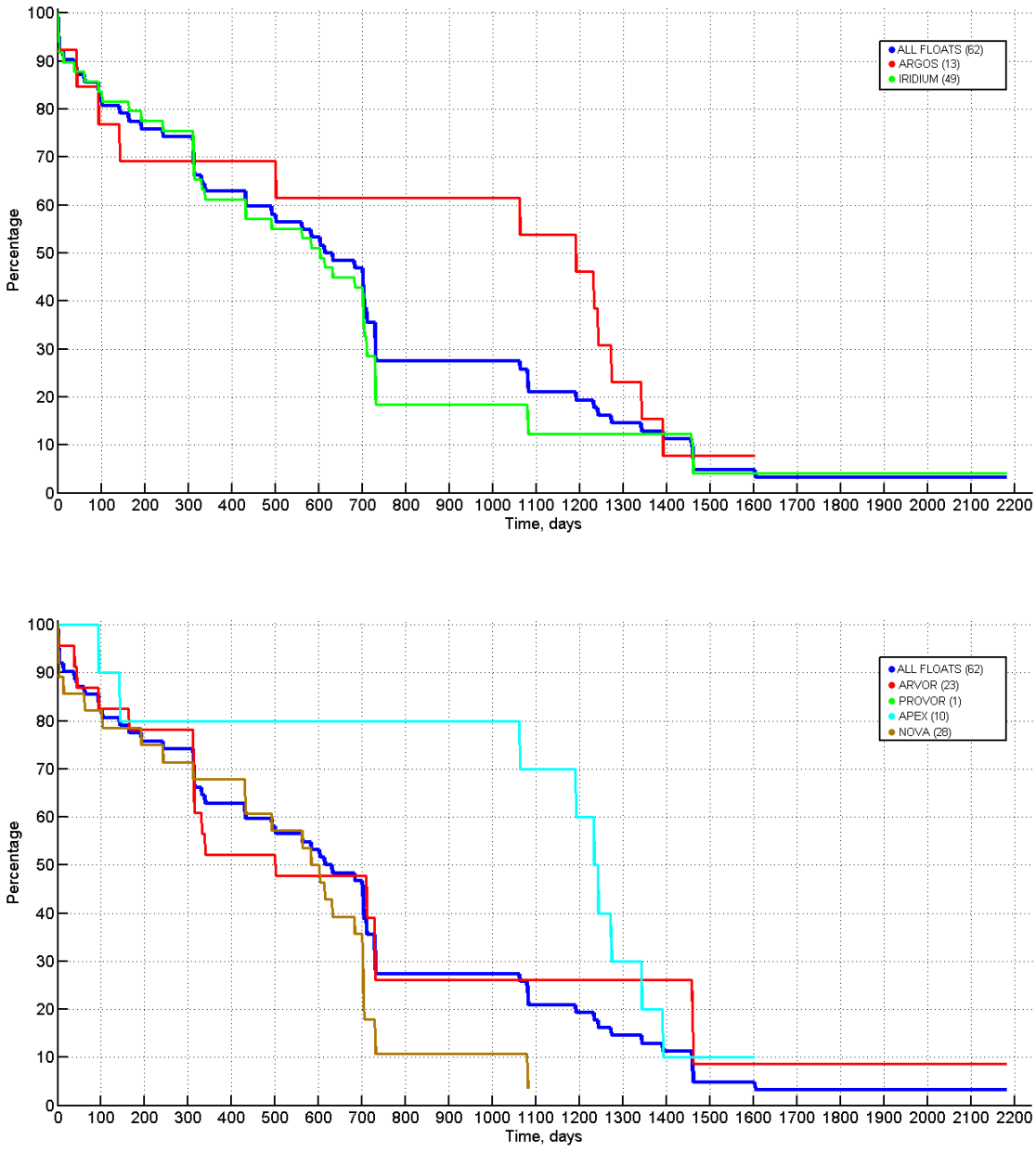


*Figure 9. Survival rate diagrams for all the ARGO-ITALY floats in the South Pacific, South Atlantic and Southern Ocean, separated by transmission mode (top) and float type (bottom).*

| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2012-2018 |
|---|---|---|---|---|---|---|---|---|
| **Deployments** | | | | | | | | |
| CTD floats deployed in Med | 13 | 7 | 13 | 11 | 9 | 8 | 16 | 77 |
| CTD floats deployed in BS | 4 | 1 | 2 | 1 | 1 | 2 | 0 | 11 |
| CTD floats deployed in SO, South Pacific and Atlantic | 2 | 3 | 7 | 10 | 15 | 17 | 8 | 62 |
| Bio floats deployed | 0 | 0 | 3 | 4 | 1 | 0 | 5 | 13 |
| Deep floats | | | | | 2 | 0 | 1 | 3 |
| **Total floats deployed** | **19** | **11** | **25** | **26** | **28** | **27** | **30** | **166** |
| **CTD profiles** | | | | | | | | |
| CTD profiles in Med | 400 | 1099 | 1560 | 1743 | 2358 | 2147 | 2962 | 12269 |
| CTD profiles in BS | 105 | 236 | 323 | 268 | 260 | 298 | 298 | 1788 |
| CTD profiles in SO, South Pacific and Atlantic | 6 | 90 | 205 | 475 | 815 | 1418 | 1087 | 4096 |
| Bio profiles | 0 | 0 | 244 | 266 | 373 | 261 | 360 | 1504 |
| Deep profiles | | | | | 15 | 65 | 11 | 91 |
| **Total profiles** | **511** | **1425** | **2332** | **2752** | **3821** | **4189** | **4718** | **19748** |
| **Vertical distances (km)** | | | | | | | | |
| Distance in Med | 440 | 902 | 1485 | 1813 | 2195 | 2307 | 2156 | 11298 |
| Distance in BS | 71 | 210 | 283 | 257 | 247 | 294 | 295 | 1657 |
| Distance in SO, Souther Pacific and Atlantic | 2 | 125 | 380 | 875 | 1374 | 2658 | 2020 | 7434 |
| Distance of bio floats | 0 | 0 | 199 | 245 | 335 | 248 | 293 | 1320 |
| Distance of deep floats | | | | | 50 | 194 | 43 | 287 |
| **Total distance (km)** | **513** | **1237** | **2347** | **3190** | **4201** | **5701** | **4807** | **21996** |

*Table 3. Statistical information on the performance of the ARGO-ITALY floats in 2012-2018.*

## 3. Drifter activities in 2018

### 3.1 Drifter procurement

In 2018, only 10 CODE-OGS low-cost drifters were purchased from MAXO Moldings, Basiliano (UD), Italy using ARGO-ITALY funding,

### 3.2 CALYPSO drifter deployments

Twenty five Italian drifters were deployed in May 2018 as a contribution to the CALYPSO project in the eastern Alboran Sea and Algerian basin (Figure 10). Drifters were released in a tight cluster across the Almeria-Oran Front (black dots). Among these drifters, 14 are the CODE-OGS low-cost drifters (blue tracks). More details on this drifter design can be found in Poulain et al. (2017) and Gerin et al. (2016). The remaining 11 instruments are SVP drifters (red tracks). Table 4 shows the status information of these drifters.

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| a300234065610140 | 31-May-2018 13:39 | 35.92 | -2.26 | 06-Jul-2018 22:53 | 37.83 | 3.24 | D | SVP |
| a300234065610150 | 31-May-2018 13:47 | 35.92 | -2.24 | 07-Jun-2018 19:03 | 35.72 | -0.91 | D | SVP |
| a300234065610160 | 31-May-2018 13:55 | 35.92 | -2.23 | 13-Jun-2018 07:33 | 35.85 | -0.04 | D | SVP |
| a300234065610170 | 31-May-2018 14:04 | 35.92 | -2.21 | 27-Jun-2018 18:13 | 36.33 | -1.73 | D | SVP |
| a300234065610180 | 31-May-2018 14:13 | 35.94 | -2.19 | 07-Jul-2018 01:13 | 35.57 | -1.17 | D | SVP |
| a300234065610260 | 31-May-2018 14:25 | 35.95 | -2.21 | 07-Jul-2018 18:23 | 35.57 | -1.17 | D | SVP |
| a300234065610540 | 31-May-2018 14:32 | 35.95 | -2.23 | 06-Jul-2018 16:13 | 35.65 | -0.98 | D | SVP |
| a300234065610580 | 31-May-2018 14:38 | 35.95 | -2.24 | 03-Jul-2018 03:33 | 35.48 | -2.69 | D | SVP |
| a300234065611120 | 31-May-2018 14:48 | 35.94 | -2.26 | 05-Jul-2018 17:23 | 38.27 | 3.14 | D | SVP |
| a300234065611130 | 31-May-2018 15:00 | 35.92 | -2.29 | 11-Jul-2018 15:53 | 37.08 | 4.8 | D | SVP |
| a300234065611140 | 31-May-2018 15:12 | 35.95 | -2.29 | 12-Jun-2018 12:43 | 36.76 | 2.9 | D | SVP |
| aTrace34 | 30-May-2018 13:07 | 35.87 | -2.36 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| iTrace10 | 31-May-2018 13:47 | 35.92 | -2.24 | 08-Jun-2018 14:23 | 36.31 | 0.54 | D | CODE |
| jTrace2 | 31-May-2018 13:53 | 35.91 | -2.23 | 17-Jun-2018 04:39 | 37.91 | 3.42 | D | CODE |
| iTrace12 | 31-May-2018 13:55 | 35.92 | -2.23 | 16-Jun-2018 12:08 | 36.66 | 2.61 | D | CODE |
| gTrace13 | 31-May-2018 14:04 | 35.92 | -2.21 | 16-Jun-2018 10:04 | 36.99 | 4.11 | D | CODE |
| aTrace29 | 31-May-2018 14:13 | 35.94 | -2.19 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| hTrace5 | 31-May-2018 14:18 | 35.94 | -2.21 | 17-Jun-2018 14:05 | 37.93 | 3.78 | D | CODE |
| hTrace6 | 31-May-2018 14:24 | 35.93 | -2.23 | 17-Jun-2018 21:18 | 37.56 | 3.57 | D | CODE |
| aTrace30 | 31-May-2018 14:25 | 35.95 | -2.21 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| iTrace7 | 31-May-2018 14:31 | 35.93 | -2.24 | 20-Jun-2018 00:11 | 38.45 | 3.35 | D | CODE |
| aTrace31 | 31-May-2018 14:32 | 35.95 | -2.23 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| aTrace32 | 31-May-2018 14:38 | 35.95 | -2.24 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| aTrace33 | 31-May-2018 14:48 | 35.94 | -2.26 | 31-Oct-2018 00:00 | 42.06 | 11.77 | D | CODE |
| hTrace9 | 31-May-2018 14:53 | 35.96 | -2.23 | 18-Jun-2018 22:33 | 37.4 | 3.44 | D | CODE |

**Status in March 2019: A = active, D = dead*

*Table 4. Status information for the Italian drifters deployed during the CALYPSO project.*

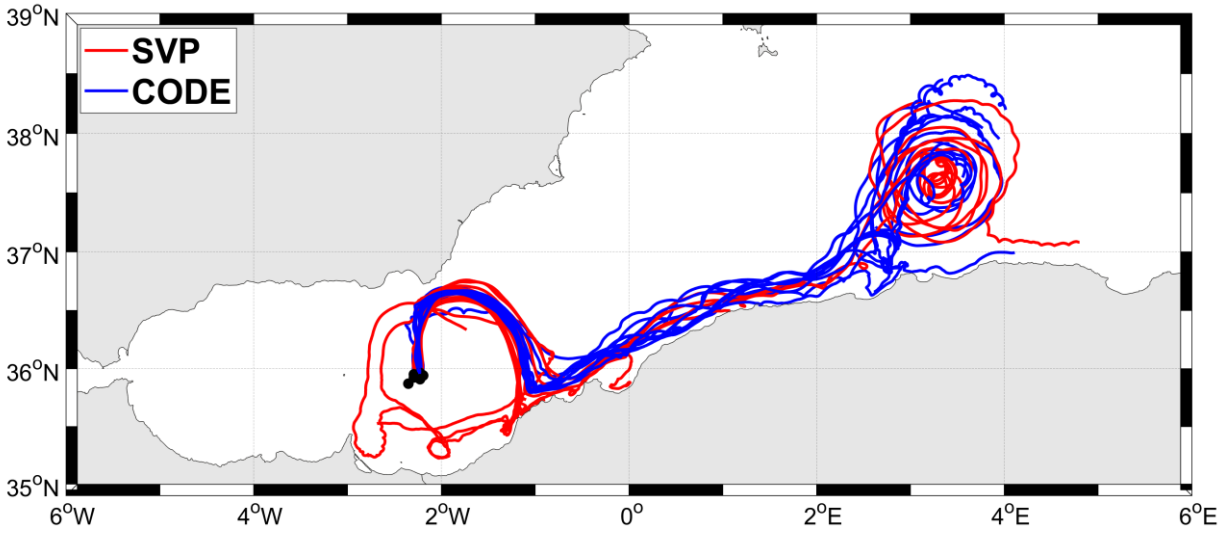


*Figure 10. Trajectories and deployment positions (black dots) of twentyfive Italian drifters deployed in the western Mediterranean during the CALYPSO cruise in May 2018.*

### 3.3 Deployments in the eastern Mediterranean

In 2018 the surface circulation of the eastern part of the Mediterranean Sea was investigated in the framework of two international project: MELMAS and PERLE. The ARGO-ITALY contribution to the MELMAS project consists in 6 CODE-OGS, listed in Table 5. The trajectories of the MELMAS drifter are shown in Figure 11; drifters were deployed in two clasters of three instruments each one.

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| aTrace21 | 10-Jun-2018 06:40 | 32.23 | 34.51 | 19-Jun-2018 07:45 | 33.26 | 35.14 | D | CODE |
| aTrace23 | 10-Jun-2018 06:40 | 32.23 | 34.51 | 17-Jun-2018 04:34 | 33.25 | 35.11 | D | CODE |
| aTrace22 | 10-Jun-2018 06:40 | 32.23 | 34.51 | 17-Jun-2018 14:54 | 33.23 | 35.19 | D | CODE |
| aTrace26 | 10-Jun-2018 10:58 | 32.33 | 34.24 | 28-Jun-2018 03:35 | 32.47 | 34.85 | D | CODE |
| aTrace25 | 10-Jun-2018 10:58 | 32.33 | 34.24 | 03-Jul-2018 10:37 | 32.42 | 34.84 | D | CODE |
| aTrace24 | 10-Jun-2018 10:58 | 32.33 | 34.24 | 30-Jun-2018 03:40 | 32.42 | 34.87 | D | CODE |

**Status in March 2019: A = active, D = dead*

*Table 5. Status information for the Italian drifters deployed during the MELMAS project.*

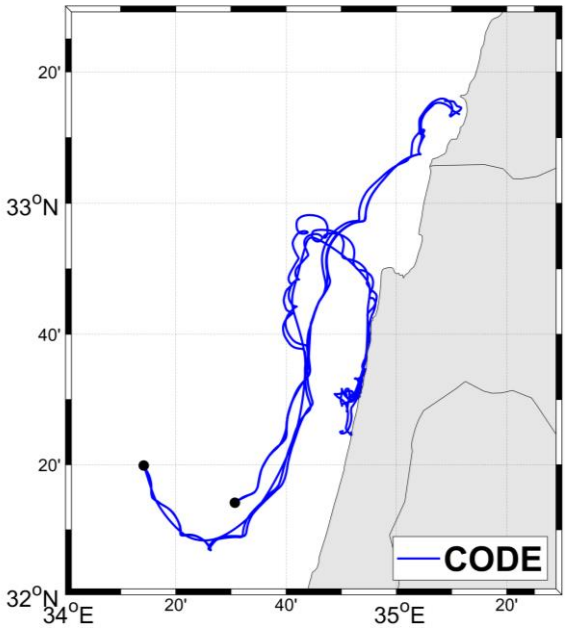


*Figure 11. Trajectories and deployment positions (black dots) of six Italian drifters deployed in front of the Istraeli coast in the framework of MELMAS project in June 2018.*

The ARGO-ITALY contribution to the PERLE project consists in 5 SVP, deployed in the region south east of Crete Island in October 2018. The status information and the drifter trajectories are listed in Table 6 and showed in Figure 12, respectively.

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| a300234065616260 | 15-Oct-2018 07:27 | 34.21 | 25.44 | 31-Oct-2018 08:00 | 34.94 | 24.47 | D | SVP |
| a300234065616590 | 15-Oct-2018 14:05 | 34.37 | 25.91 | 18-Mar-2019 06:02 | 34.13 | 22.17 | A | SVP |
| a300234065616860 | 16-Oct-2018 07:37 | 34.21 | 27.09 | 18-Mar-2019 06:00 | 33.88 | 26.29 | A | SVP |
| a300234065617130 | 16-Oct-2018 21:22 | 33.9 | 26.64 | 13-Mar-2019 13:00 | 34.07 | 33.27 | A | SVP |
| a300234065617120 | 18-Oct-2018 20:39 | 33.8 | 27.55 | 18-Mar-2019 06:00 | 35.81 | 35.51 | A | SVP |

**Status in March 2019: A = active, D = dead*

*Table 6. Status information for the Italian drifters deployed during the PERLE project.*

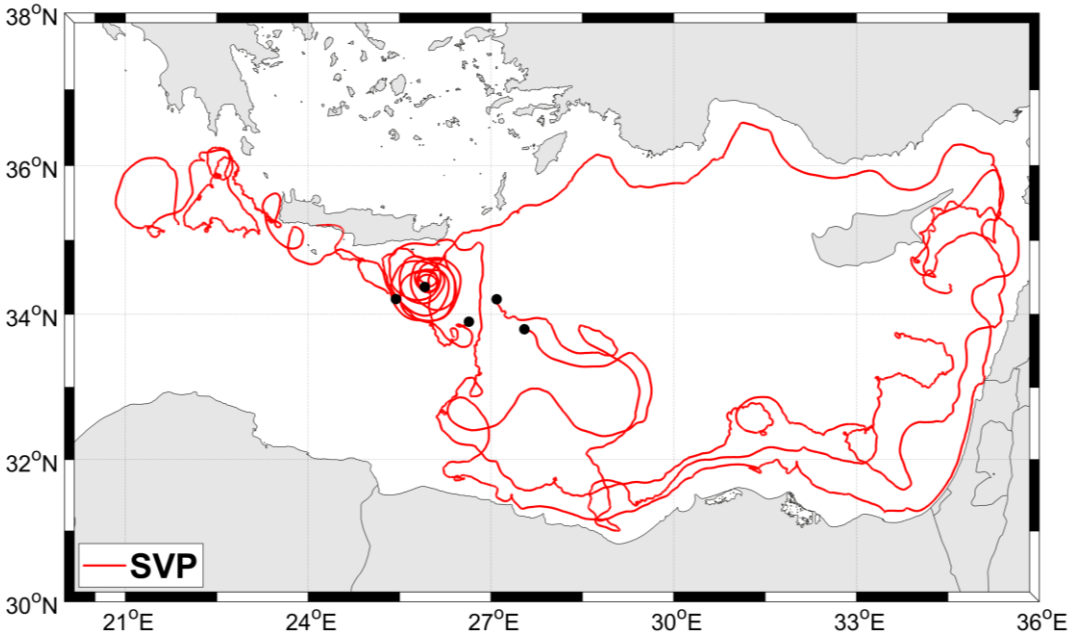


*Figure 12. Trajectories and deployment positions (black dots) of five Italian drifters deployed southeast of Creta in the framework of PERLE project in October 2018.*

### 3.4 Deployments off the northeastern Tyrrhenian coast

In 2018, two CODE-OGS drifters were given to colleagues of the LOSEM (Laboratorio di Oceanologia Sperimentale ed Ecologia Marina) laboratory, University of Tuscia. They used the drifters to monitor the summer circulation along the Civitavecchia coast. They carried out numerous deployments and recoveries of the instrumentation during the period July-September 2018 (see Table 7). The trajectories of these drifters are showed in Figure 13. Further details about these experiments, their motivation and comparisons with other data can be found in Martellucci et al. (2019).

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| bTrace28 | 04-Jul-2018 13:23 | 42.05 | 11.79 | 05-Jul-2018 09:08 | 42.1 | 11.76 | D | CODE |
| cTrace27 | 04-Jul-2018 13:26 | 42.05 | 11.79 | 05-Jul-2018 09:20 | 42.1 | 11.77 | D | CODE |
| dTrace27 | 09-Jul-2018 08:09 | 42.05 | 11.79 | 10-Jul-2018 13:05 | 42.03 | 11.82 | D | CODE |
| cTrace28 | 09-Jul-2018 08:26 | 42.04 | 11.78 | 10-Jul-2018 15:34 | 41.94 | 11.88 | D | CODE |
| eTrace27 | 19-Jul-2018 09:04 | 42.07 | 11.75 | 20-Jul-2018 15:24 | 41.98 | 11.98 | D | CODE |
| dTrace28 | 19-Jul-2018 09:08 | 42.07 | 11.74 | 20-Jul-2018 15:42 | 41.98 | 11.97 | D | CODE |
| fTrace27 | 29-Jul-2018 16:59 | 42.07 | 11.75 | 01-Aug-2018 16:45 | 41.93 | 11.82 | D | CODE |
| eTrace28 | 29-Jul-2018 17:04 | 42.07 | 11.74 | 01-Aug-2018 16:37 | 41.97 | 11.8 | D | CODE |
| gTrace27 | 07-Aug-2018 15:46 | 42.07 | 11.77 | 08-Aug-2018 15:01 | 42.01 | 11.73 | D | CODE |
| fTrace28 | 07-Aug-2018 19:26 | 42.05 | 11.78 | 08-Aug-2018 14:53 | 42.01 | 11.72 | D | CODE |
| gTrace28 | 22-Aug-2018 15:10 | 42.08 | 11.77 | 24-Aug-2018 07:09 | 42.24 | 11.58 | D | CODE |
| hTrace27 | 23-Aug-2018 02:38 | 42.08 | 11.79 | 23-Aug-2018 07:03 | 42.08 | 11.79 | D | CODE |
| iTrace27 | 23-Aug-2018 07:11 | 42.08 | 11.78 | 19-Nov-2018 12:00 | 42.07 | 11.78 | D | CODE |
| jTrace27 | 17-Sep-2018 11:06 | 42.07 | 11.77 | 17-Sep-2018 14:47 | 42.09 | 11.78 | D | CODE |
| hTrace28 | 17-Sep-2018 11:09 | 42.07 | 11.77 | 17-Sep-2018 14:35 | 42.08 | 11.77 | D | CODE |
| kTrace27 | 18-Sep-2018 08:58 | 42.07 | 11.78 | 18-Sep-2018 15:51 | 42.08 | 11.79 | D | CODE |
| iTrace28 | 18-Sep-2018 09:02 | 42.06 | 11.77 | 18-Sep-2018 15:47 | 42.09 | 11.79 | D | CODE |

**Status in March 2019: A = active, D = dead*

*Table 7. Status information for the Italian drifters deployed off the Civitavecchia coast.*


*Figure 13. Trajectories of the CODE-OGS drifters deployed off the Civitavecchia coast during the period July-September 2018. The trajectories of Trace27 are in red, whereas the trajectories of Trace28 are in black.*

### 3.5 Deployments of DWS drifters

Three Directional Wave Spectra (DWS) drifters were deployed in the Mediterranean Sea in 2018 during two different oceanographic cruises (Table 8, Figure 14). In March 2018, the Italian colleagues involved in the TRANSMED cruise on board R/V Maria S. Merian, deployed two DWS drifters in the southern Ionian Sea and in the Cretan Passage (Figure 14, left panel). In October 2018, OGS colleagues on board R/V OGS-Explora, in transit between the Ionian and the Adriatic seas, deployed a DWS in the northen Ionian Sea (Figure 14, right panel).

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| a300234065413830 | 04-Mar-2018 20:55 | 34.42 | 24.25 | 27-Apr-2018 06:00 | 31.02 | 29.62 | D | DWS |
| a300234065414030 | 16-Mar-2018 20:09 | 35.48 | 18.51 | 14-May-2018 09:00 | 32.03 | 24.09 | D | DWS |
| a300234065514480 | 06-Oct-2018 11:20 | 39.1 | 18.22 | 27-Nov-2018 03:00 | 42.91 | 16.77 | D | DWS |

**Status in March 2019: A = active, D = dead*

*Table 8. Status information for the Italian DWS drifters deployed in the Mediterranean in 2018.*

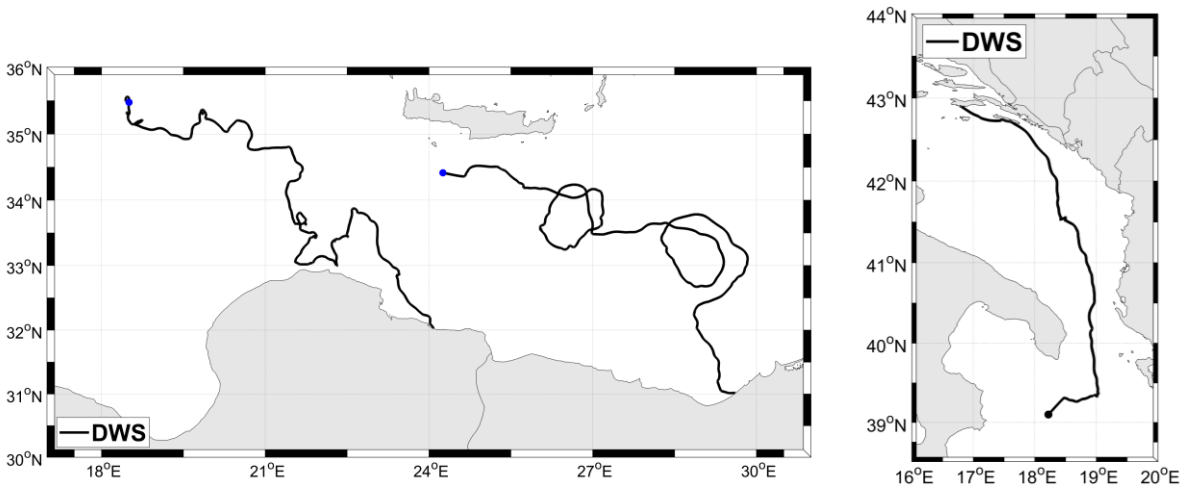


*Figure 14. DWS drifters deployed in the Mediterranean from the R/V Maria S. Merian in March 2018 (left panel) and from th R/V OGS-Explora in October 2018 (right panel), respectively.*

### 3.6 Deployments of SVP drifters in the Southern Ocean

Table 9 shows the status information of the SVPB drifters deployed in February 2018 in the South Pacific from R/V Araon with the help of Italian colleagues as a contribution to the PNRA (Programma Nazionale di Ricerca in Antartide) project. All these drifters were still alive in March 2019 (Table 9); their tracks are showed in Figure 16.

It is interesting to note that one drifter (IMEI a300234062832730), deployed south of New Zealand in January 2015 (see Poulain et al., 2016), completed the circumnavigation of the Antarctica continent in early January 2018 (see Poulain et al., 2017) and it is still active in March 2019 (Figure 17, white track). Another drifter (IMEI a300234062831750) deployed during the same mission in January 2015 (Poulain et al., 2016) completed the circumnavigation a few weeks ago (Figure 17, black track) and it is currently moving along the New Zealand coast.

| IMEI | Deploy Date | Lat | Lon | Last Date | Lat | Lon | Status | Type |
|---|---|---|---|---|---|---|---|---|
| a300234064836280 | 23-Feb-2018 16:57 | -63.02 | 161.09 | 05-Mar-2019 06:00 | -51.11 | -49.28 | A | SVPB |
| a300234064837000 | 24-Feb-2018 01:10 | -62 | 159.68 | 04-Mar-2019 21:00 | -55.71 | -67.55 | A | SVPB |
| a300234064836010 | 24-Feb-2018 09:10 | -60.99 | 158.33 | 05-Mar-2019 06:00 | -49.8 | -41.3 | A | SVPB |
| a300234064837010 | 24-Feb-2018 16:53 | -60.01 | 157.06 | 05-Mar-2019 06:00 | -55.28 | -65.95 | A | SVPB |
| a300234064839010 | 25-Feb-2018 00:45 | -59.02 | 155.82 | 05-Mar-2019 06:00 | -56.42 | -128.38 | A | SVPB |
| a300234064838270 | 25-Feb-2018 09:15 | -57.95 | 154.51 | 05-Mar-2019 06:00 | -52.33 | -77.71 | A | SVPB |
| a300234064838010 | 25-Feb-2018 17:35 | -56.97 | 153.44 | 05-Mar-2019 06:00 | -51.53 | -112.28 | A | SVPB |
| a300234064838260 | 26-Feb-2018 00:28 | -56.01 | 152.97 | 05-Mar-2019 06:00 | -58.28 | -83.35 | A | SVPB |
| a300234064838000 | 26-Feb-2018 07:12 | -55.04 | 152.51 | 05-Mar-2019 06:00 | -55.83 | -103.41 | A | SVPB |

**Status in March 2018: A = active, D = dead*

*Table 9. Status information for the Italian drifters deployed in the South Pacific /Southern Ocean in 2018.*

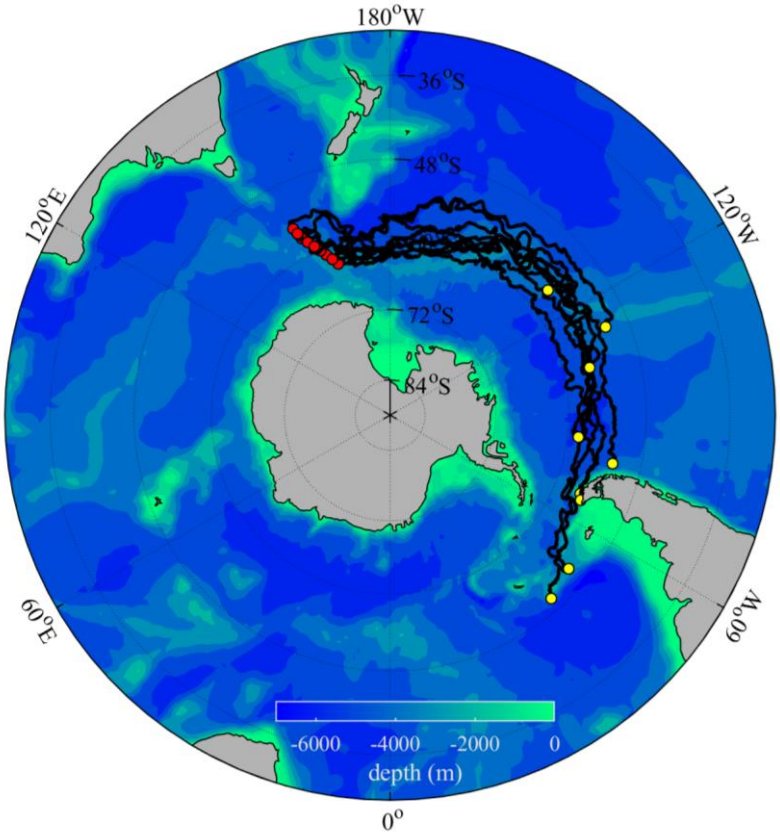


*Figure 16. Trajectories, deployment positions (red dots) and last position (yellow dots) of the nine Italian drifters deployed in the South Pacific in February 2018. Drifter data are updated to 05-March-2019.*

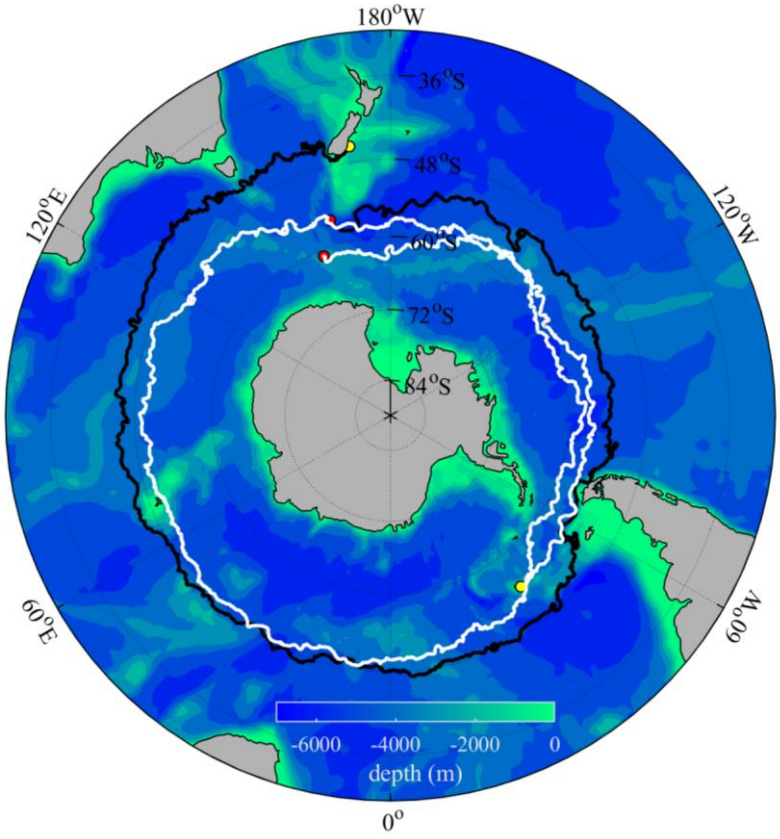


*Figure 17. Trajectories, deployment position (red dots) and last position updated on 5 March 2019 (yellow dots), of drifters a300234062832730 (white track) and a300234062831750 (black trak), deployed south of New Zealand in January 2015.*

## 4. Glider activities in 2018

### 4.1 Glider component procurement and glider maintenance

In 2018, a new SeaGlider with unpumped (flushed) Seabird CT, AAnderaa oxygen sensor and WetLabs triplet sensor (for the measurements of the fluorescence, CDOM and particle backscattering) was bought. It arrived at OGS in August 2018. A scientific battery for the SeaGlider and a complete battery set for the Slocum glider were purchased in spring and autumn 2018, respectively. The Slocum gliders "unit 402" and "unit 403" were refurbished with new batteries at the OGS glider laboratory, while the firmware of the SeaGlider Amerigo was updated and the scientific battery was replaced in Cyprus by our collaborators.

### 4.2 Glider testing

All the gliders were tested before their deployment. In particular, the glider "unit 403" was tested at the OGS laboratory in January 2018 before its deployment in the South Adriatic Sea. The SeaGlider Amerigo were remotely tested in Cyprus with the help of colleagues of the University of Cyprus and the CYPRUSUBSEA company. The gliders "unit 402" and "unit 403" were extensively tested in the laboratory and at sea (in the Gulf of Trieste) starting in August 2018 due to some malfunctions which occurred during the previous missions and tests. The new Seaglider "Marco" was tested and prepared for the deployment in the South Adriatic Sea in October-November 2018.

### 4.3 Glider laboratory

In 2018, only consumable goods were purchased for the OGS glider laboratory.

### 4.4 Glider operations

The OGS Slocum glider "unit 403" was deployed in the South Adriatic Sea on 29 January 2018 for the CONVEX18 experiment (Figure 18). The purpose of the experiment was to study the post convection and the effect of the deep water formation in the North Adriatic Sea. The glider covered only part of the transect Bari – Dubrovnik and was prematurely recovered on 17 February 2018 after 2 complete transects. The instrument collected scientific data (pressure, temperature, conductivity, oxygen, chlorophyll, CDOM and backscatter) down to almost 1000 m depth (200 m for the biological parameters; see Figure 19).

The OGS SeaGlider "Amerigo" was deployed on 22 May 2018 southeast of Cyprus for the MELMAS project (Figure 20). The main goal of the MELMAS (Monitoring of the Eastern Levantine with Mobile Autonomous Systems) project is to measure the currents and water mass properties in the eastern areas of the Levantine Basin (Eastern Mediterranean Sea) and to study the complex circulation features governing the dynamics near the Israeli coast and in the open sea. The glider covered more than 1000 km and was recovered on 23 July 2018. The instrument collected scientific data (pressure, temperature, conductivity, oxygen, chlorophyll, CDOM and backscatter) down to almost 1000 m depth (200 m for the biological parameters; see Figure 21).

The new OGS SeaGlider "Marco" was deployed across the South Adriatic Sea from 22 November to 4 December 2018 (PreConvex19 experiment; Figure 22). The goal of the experiment was to study the pre-convection condition of the water column in the North Adriatic

Sea. The glider covered the transect Bari – Dubrovnik and the central area of the South Adriatic Pit. It was piloted down to almost 1000 m depth in the area of the Pit, collecting high frequency data of pressure, temperature, conductivity, oxygen, chlorophyll, CDOM and backscatter (Figure 23).

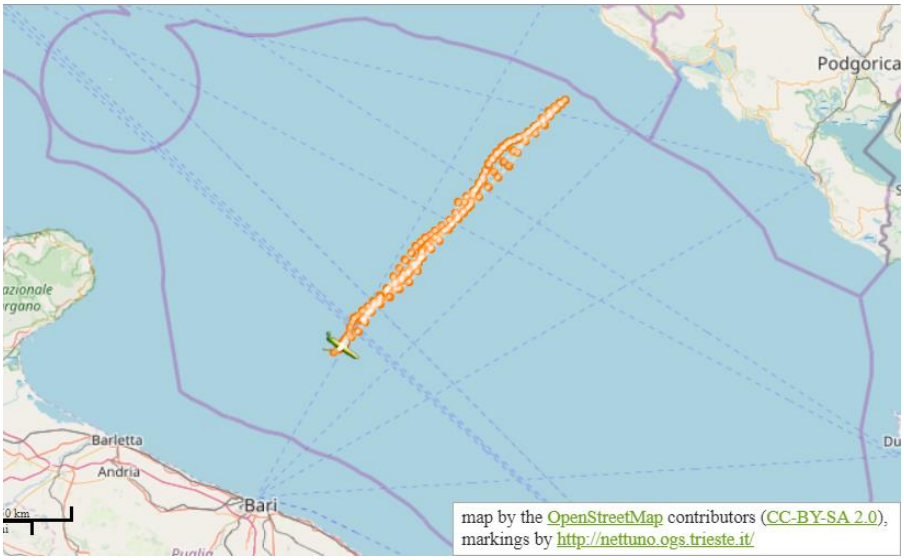


*Figure 18. Glider "unit 403" trajectory during the CONVEX18 experiment in the South Adriatic Sea (29 January – 17 February 2018). The glider symbol indicates the last position of the instrument. Orange symbols correspond to surfacing locations.*

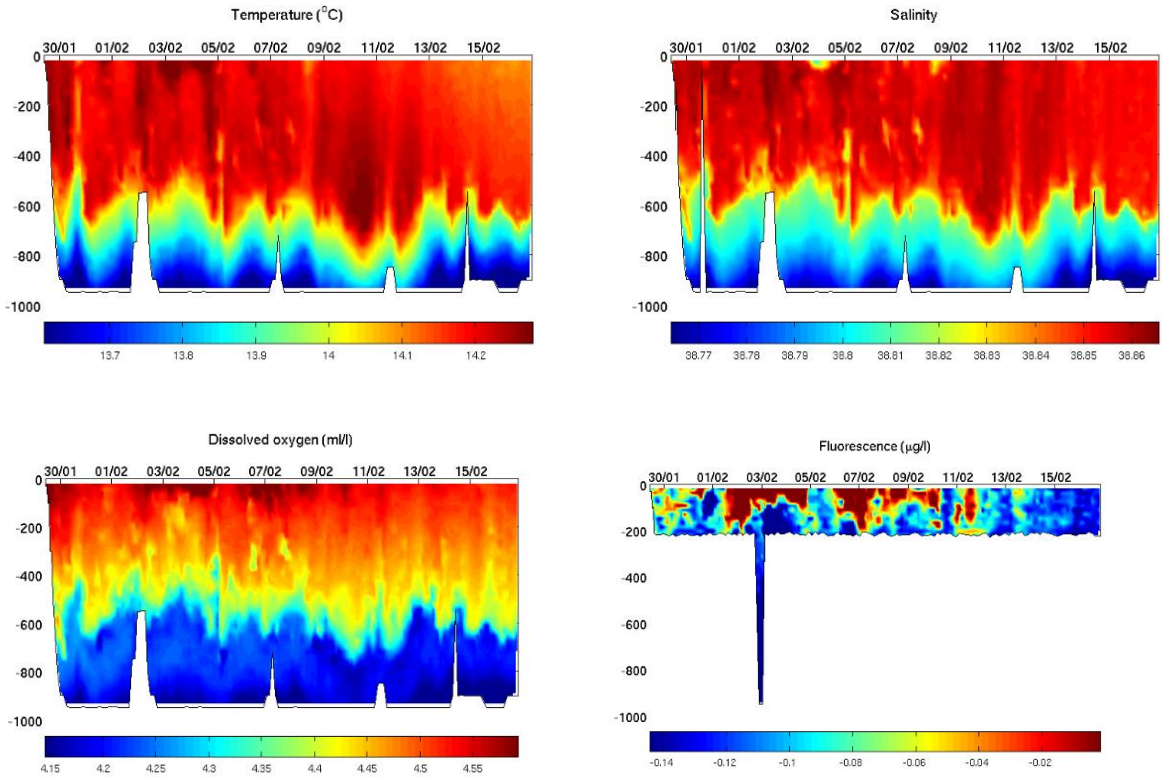


*Figure 19. Color-coded vertical section along the glider path of temperature (top-left), salinity (top-right), dissolved oxygen (bottom-left) and fluorescence (bottom-right) during the CONVEX18 experiment in the South Adriatic Sea.*


*Figure 20. SeaGlider "Amerigo" trajectory during the MELMAS project in the Levantine Basin (22 May – 23 July 2018, Eastern Mediterranean Sea). Orange symbols correspond to surfacing locations.*

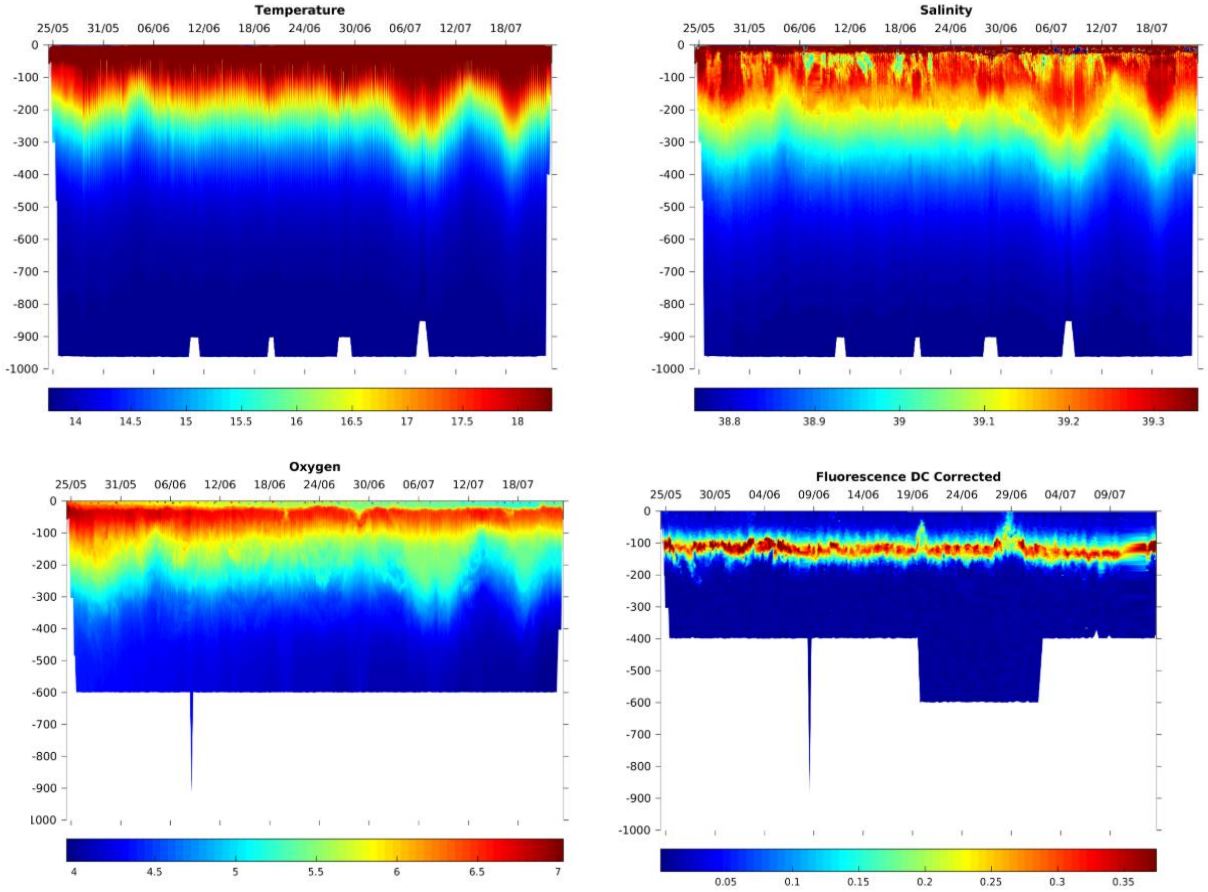


*Figure 21. Color-coded vertical section along the glider path of temperature (top-left), salinity (top-right), dissolved oxygen (bottom-left) and fluorescence (bottom-right) during the MELMAS project in the Levantine Basin (Eastern Mediterranean Sea).*


*Figure 22. SeaGlider "Marco" trajectory during the PreCONVEX19 experiment in the South Adriatic Sea (22 November – 4 December 2018). The glider and the green circle symbols indicate the last position of the instrument and the last waypoint, respectively. Orange symbols correspond to surfacing locations.*

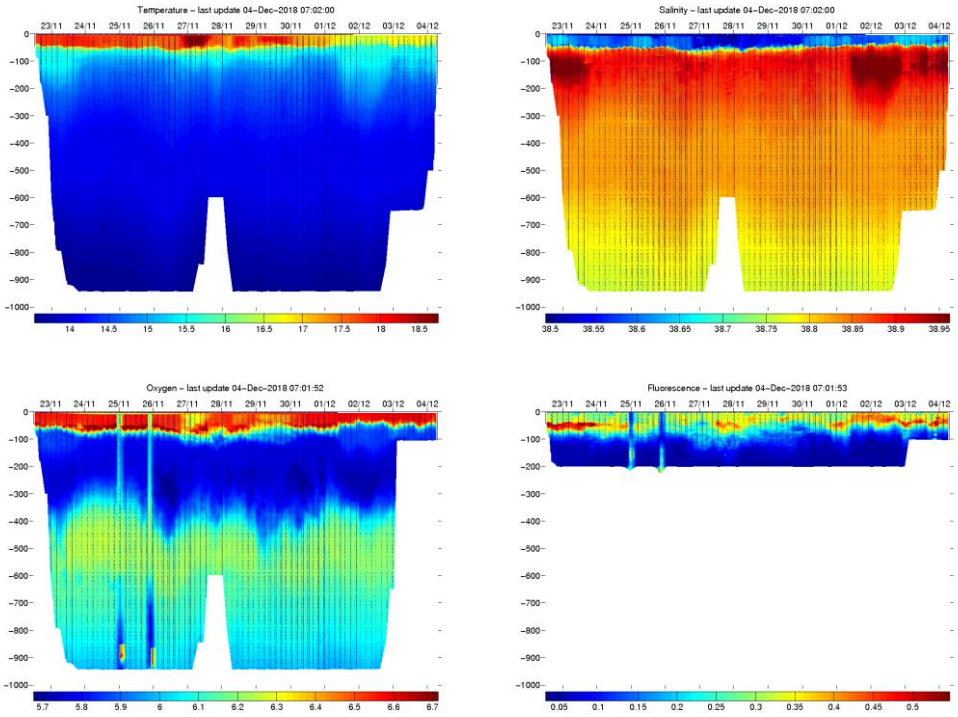


*Figure 23. Color-coded vertical section along the glider path of temperature (top-left), salinity (top-right), dissolved oxygen (bottom-left) and fluorescence (bottom-right) during the PreCONVEX19 experiment (*22 November - 4 December 2018*).*

### 4.5 Glider data processing and webpage

The glider data acquired during all the missions were processed and displayed in real time on the webpage: http://nettuno.ogs.trieste.it/sire/glider/glider_mission_now.php

Other webpages (password protected) with technical informations and other parameters were available in real time to the OGS glider pilots. A first data elaboration was set up following EGO (Everyone Glider Observatories) recommendations to provide a unique and coherent data set in terms of format and quality.

## 5. Other activities in 2018

### 5.1 Near real-time data processing

The data of drifters, floats and gliders were processed and archived in near real-time at OGS. This processing includes some editing and the production of graphics and tables which are posted on the ARGO-ITALY web pages. In parallel, the raw drifter and float data were sent to global Data Assembly Centers (AOML/NOAA, Miami, Florida for the drifters and Coriolis, Ifremer, Brest, France for the floats). In addition, the SVP drifter and float data were distributed in near real-time on the Global Telecommunication System (GTS) and were identified by a WMO number.

The data of the Provor Bio and Provor Nut floats were processed by LOV and made available in near-real time (files in Argo NetCDF format with real time QC) on their server (http://www.oao.obs-vlfr.fr/BD_FLOAT/NETCDF/).

A new web site for ARGO-ITALY was developed starting in 2017. It was partially implemented in 2018 and will become fully operational in 2019. This new web site allows visualizing the data of the instruments in near-real time more efficiently.

### 5.2 Delayed Mode quality control of Argo physical data

The delayed mode quality control (DMQC) of the physical data (pressure, temperature and salinity) provided by the Italian floats in the Mediterranean and Black seas was done for 58 floats (all information and statistics to create the D-files sent to Coriolis). The temperature and salinity data of those floats were quality controlled following the standard Argo procedure, covering the period 2010-2018. The float salinity calibration needs an accurate reference dataset and these data have to be quite close in time and space to the float measurements. The latter is necessary, in order to reduce the effects of both the inter-annual and the seasonal variability of the Mediterranean Sea, mostly in the upper and intermediate layers of the water column. For this reasons, OGS collected CTD data in complement of the official reference dataset using two approaches: personal contacts and regional data services. The standard statistical method adopted by the Argo community for the salinity correction is strictly affected by the natural changes in the water column of the Mediterranean Sea and hence a careful interpretation of the method results is necessary. For this reason, we adopted other qualitative checks (i.e., the comparison between nearby floats and analysis of the deepest portion of the temperature-salinity diagram) in order to increase reliability of the analysis. The DMQC of the Italian floats deployed in the Southern Ocean (and South Pacific and Atlantic oceans) is ready to start, since OGS has collected the reference dataset, implemented the technique and prepared the software.

### 5.3 Italian contribution to Argo bibliography in 2018

The following papers involving Italian scientists were published in 2018. They use Argo data for basic oceanographic research and operational oceanography purposes.

Buongiorno Nardelli, B., S. Mulet, and D. Iudicone, 2018: Three-Dimensional Ageostrophic Motion and Water Mass Subduction in the Southern Ocean. Journal of Geophysical Research: Oceans, 123, 1533-1562, https://doi.org/10.1002/2017JC013316

Droghei, R., B. Buongiorno Nardelli, and R. Santoleri, 2018: A New Global Sea Surface Salinity and Density Dataset From Multivariate Observations (1993–2016). Frontiers in Marine Science, 5, https://doi.org/10.3389/fmars.2018.00084

Gentile, V., S. Pierini, P. de Ruggiero, and L. Pietranera, 2018: Ocean modelling and altimeter data reveal the possible occurrence of intrinsic low-frequency variability of the Kuroshio Extension. Ocean Modelling, 131, 24-39, https://doi.org/10.1016/j.ocemod.2018.08.006

Marini S., Corgnati L, Mantovani C., Bastianini M., Ottaviani E., Fanelli E., Agussi J., Griffa and Poulain P.-M., 2018: Automated estimate of fish abundance through the autonomous imaging device GUARD1. Measurement, 126, 72-75.

Reseghetti, F., L. Cheng, M. Borghini, I. M. Yashayaev, G. Raiteri, and J. Zhu, 2018: Assessment of Quality and Reliability of Measurements with XBT Sippican T5 and T5/20. Journal of Atmospheric and Oceanic Technology, 35, 1935-1960, https://doi.org/10.1175/JTECH-D-18-0043.1

Sammartino, M., S. Marullo, R. Santoleri, and M. Scardi, 2018: Modelling the Vertical Distribution of Phytoplankton Biomass in the Mediterranean Sea from Satellite Data: A Neural Network Approach. Remote Sensing, 10, 1666, https://doi.org/10.3390/rs10101666

Stanev E. V., Poulain P.-M. , Grayek S., Kenneth S. J., Claustre H. And Murray J. W., 2018: Understanding the Dynamics of the Oxic-Anoxic Interface in the Black Sea. Geophysical Research Letters, 10.1002/2017GL076206

Storto, A., P. Oddo, A. Cipollone, I. Mirouze, and B. Lemieux-Dudon, 2018: Extending an oceanographic variational scheme to allow for affordable hybrid and four-dimensional data assimilation. Ocean Modelling, 128, 67-86, https://doi.org/10.1016/j.ocemod.2018.06.005

Verri, G., N. Pinardi, P. Oddo, S. A. Ciliberti, and G. Coppini, 2018: River runoff influences on the Central Mediterranean overturning circulation. Climate Dynamics, 50, 1675-1703, https://doi.org/10.1007/s00382-017-3715-9

Vilibić I., Mihanović H., Janeković I., Denamiel C., Poulain P.-M., Orlić M., Dunić N., Dadić V., Pasarić M., Muslim S., Gerin R., Matić F., Šepić, J., Mauri, E., Kokkini Z., Tudor M., Kovac Ž. and Džoić T., 2018: Wintertime dynamics in the coastal northeastern Adriatic Sea: the NAdEx 2015 experiment. Ocean Sci., 14, 237-258

Von Schuckmann, K.et al., 2018: Copernicus Marine Service Ocean State Report. Journal of Operational Oceanography, 11, S1-S142, https://doi.org/10.1080/1755876X.2018.1489208

### 5.4 OGS technical reports related to ARGO-ITALY published in 2018

Poulain P.-M., Ozgokmen T., Guigand C. Wirth N., Casas B. And Centurioni L., 2018: CALYPSO PILOT EXPERIMENT 2018 27 May – 2 June 2018 R/V ALLIANCE & R/V SOCIB Lagrangian Drifter and Float Deployments. Tech. Report OGS 2018/45 Sez. OCE 12 MAOS, Trieste, Italy.

## 6. Plans for 2019 and beyond

### 6.1 Floats

With the funding available in 2018-2019, we plan to acquire the following instruments:

- 20 standard Argo floats with Iridium telemetry. Five of these floats will have additional oxygen sensors. Seven will have the Ice Sensing algorithm (ISA);
- 1 BGC float with among others nitrate and pH sensors.

The Italian deployment plans for 2018 and 2019 are detailed in Table 9. The main areas of interest are the Mediterranean and Black seas and the Southern Ocean.

| Year | T/S floats (some of them with DO) | | BGC floats | | Deep floats | | Total |
|---|---|---|---|---|---|---|---|
| | Quantity | Area | Quantity | Area | Quantity | Area | |
| 2019 | 14<br>2<br>10 | Mediterranean<br>Black Sea<br>South Hemisphere | 1 | Mediterranean<br>Black Sea | 1 | Mediterranean | **28** |
| 2020 | 14<br>2<br>10 | Mediterranean<br>Black Sea<br>South Hemisphere | 1 | Mediterranean<br>Black Sea | 1 | Mediterranean | **28** |

*Table 9. Italian float deployment plans for 2019-2020.*

On the longer time frame, Italy is interest to maintain contributions to the Argo Core mission and the BGC and Deep Argo Extension with numbers similar to those listed in Table 9. OGS is committed to carry out DMQC on all the Argo floats of the Mediterranean and Black seas, and on some floats in the World Ocean, as part of the CMEMS, MOCCA, Euro-Argo RISE and other European projects over the coming years.

### 6.2 Drifters

We plan to buy about 40 SVP drifters with the funding available in 2018-2019. Drifter deployment plans for 2019 and 2020 are described in Table 10.

| Year | SVP drifters | |
|---|---|---|
| | Quantity | Area |
| 2019 | 10 | Southern Ocean |
| | 15 | Mediterranean |
| 2020 | 10 | Southern Ocean |
| | 15 | Mediterranean |

*Table 10. ARGO-ITALY drifter deployment plans for 2019-2020.*

### 6.3 Gliders

The OGS Slocum and SeaGlider gliders are planned to be operated in the South Adriatic Sea in winter and late autumn 2019 to monitor dense water formation processes. One Seaglider will also be operated as part of the MELMAS project in the eastern Levantine Basin in winter-spring 2019.

### 6.4 Other

MIUR is committed to provide funding in order to sustain the Italian contribution to Argo beyond 2019 as a founding member of the Euro-Argo Research Infrastructure Consortium. In addition to the Italian national funding, OGS has funding from other projects (e.g., MOCCA funded by the EU DG MARE, Euro-Argo RISE funded by EU H2020 and MELMAS funded by the Italian Ministry of Foreign Affairs) for activities related to Argo.

## 7. Distribution list

This report will be distributed, amongst others, to the ARGO-ITALY International Scientific Advisory Committee:

Luca Centurioni (lcenturioni@ucsd.edu)
Laurent Mortier (mortier@locean-ipsl.upmc.fr)
Pierre-Yves Le Traon (pierre-yves.letraon@mercator-ocean.fr)
Enrico Zambianchi (enrico.zambianchi@uniparthenope.it)
Annalisa Griffa (agriffa@rsmas.miami.edu)
Maurizio Ribera D'Alcala (maurizio@szn.it)
Nadia Pinardi (n.pinardi@sincem.unibo.it)
Alessandro Crise (acrise@inogs.it )

## 8. Acknowledgements

We would like to thank the following individuals for their help with the logistics of drifter, float and glider operations:

Stefano Kuckler, Caterina Fanara
OGS, Trieste, Italy

Mireno Borghini
ISMAR-CNR, La Spezia, Italy

Pierpaolo Falco, Yuri Cotroneo, Luigi Marziani, Pasquale Castagno and Giorgio Budillon
Parthenope University, Naples, Italy

Violeta Slabakova and Atanas Palazov
Institute of Oceanology-BAS,Varna, Bulgaria

The captains and crews of R/V Minerva I, R/V OGS Explora, R/V Akademik, R/V Alliance, R/V Leonardo and the fishing boats “Pasquale Cristina” and “Marianna”.

The captain (Luca Triggiani) and crew of M/Y Roe and the Seakeepers Society.

## 9. References

Gerin, R., Bussani A., Zuppelli P. and Poulain P.-M. (2018) OGS low-cost drifters used within the LOGMEC experiment (September 2017), Rel. 2018/1 sez. OCE 1 MAOS, 28 pp.

Marini, S., L. Corgnati, C. Mantovani, M. Bastianini, E. Ottaviani, E. Fanelli, J. Aguzzi, A. Griffa and P.-M. Poulain (2018) Automated estimate of fish abundance through the autonomous imaging device GUARD1. Measurement, 26, 72-75, https://doi.org/10.1016/j.measurement.2018.05.035.

Martellucci, R., Costanzo, L., Marcelli, M., Menna, M., Gerin, R., Bussani, A., Poulain, P.-M. (2019) Misure di correnti superficiali lungo la costa tirrenica nord orientale. Rel. 2019/12 OCE 2 MAOS.

Pacciaroni, M., Poulain P.-M., Notarstefano G. and Bussani A. (2017) Arvor-I with ice detection deployments in the Southern Ocean, Rel. 2017/90 Sez. OCE 27 MAOS, 32 pp.

Poulain, P.-M., Gerin R., Mauri E., Menna M., Notarstefano G., Jungwirth R., Bussani A., Zuppelli P. and Pacciaroni M. (2016). ARGO-Italy: annual report 2015. Rel. 2016/14 sez OCE 8 MAOS. 28 pp.