DEEP FLOAT EXPERIMENT DESIGN

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Euro-Argo Research Infrastructure Sustainability and Enhancement Project (EA RISE Project) - 824131

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Document Reference

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Deliverable title	**Deep float experiment design**
Description	**Design of deployment plan, configuration of the technical parameters of the floats, and complementary observations**
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Work Package title	**Extension to deep ocean**
Lead Institute	**IFREMER**
Lead authors	**Damien Desbruyères, Martin Amice, Virginie Thierry, Xavier André, Pedro Vélez**
Contributors	
Submission date	**25 May 2020**
Due date	**[M16] - 30 April 2020**
Comments	Due to COVID-19, many people have been teleworking since mid-March 2020. This unprecedented situation led to longer lead times for interactions between partners and manufacturers as well as more uncertainties for deployment cruises and sensor delivery. As a consequence, this deliverable has been released with a one-month delay.
Accepted by	**Pedro Vélez**

Document History

Version	Issue Date	Author	Comments
1.0	25th May 2020	All lead authors	First version

EXECUTIVE SUMMARY

This deliverable is concerned with Task 3.1 of WP3 of the Euro-Argo RISE project. It describes the design of the final inter-comparison experiment of Deep-Argo sensors, which is based on the technological development and the deployment of a deep 3-headed (SBE41, SBE61 and RBR-Argo[3]) and two 2-headed (SBE41 and RBR) floats. It includes descriptions of the long-term deployment plan, float technical parameters and mission configurations, and of complementary observations that will accompany those deployments. The document will be updated if there is any change in the deployments plans described herein.

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1 Introduction

Extending Argo to the deep ocean

The extent to which the deep interior will continue to absorb anthropogenic heat is an essential question for environmental projections, which requires a most accurate quantification of the deep thermal structure of ocean basins and their changes. The sparsity of hydrographic measurements, however, only allow relatively uncertain estimates of basin-averaged temperature trends, with occupations of coast-to-coast transects spaced out by some years (1 or 2 years at best, but usually 5 to 10 years). Following the evident need of extending the core-Argo array to the ocean bottom, Johnson et al (2015) proposed a straw plan for long-term implementation of a Deep Argo array. Based on decorrelation time scales from core-Argo float time series at 1800m (about 160 days) and deep temperature variance from repeat hydrography sections, they argue that a hypothetical 5° x 5° x 15 days array (about 1200 floats) would substantially reduce uncertainties in global and regional temperature trends.

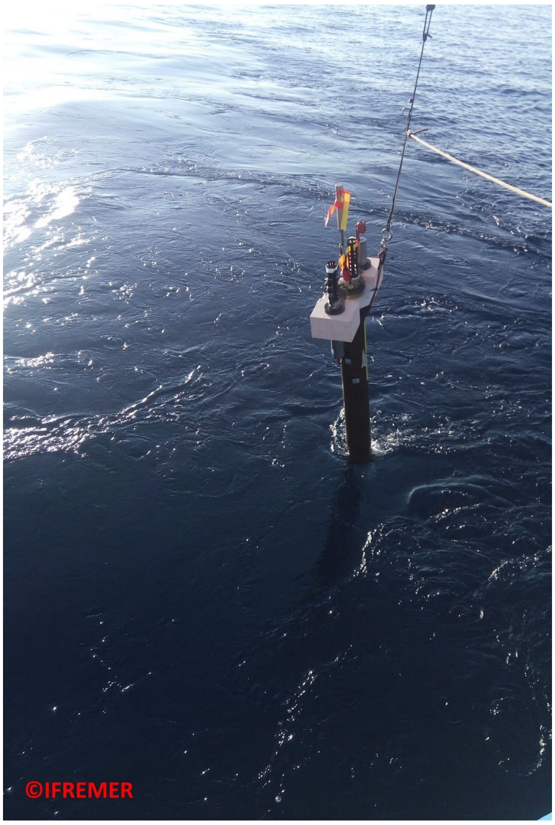
Pilot experiments carried out by the Argo international community have already led to significant advancements for the future implementation of a global and homogeneous Deep-Argo array. As of 4th May 2020, 172 floats have been deployed, gathering altogether 10411 profiles of temperature and salinity down to either 4000 dbar or 6000 dbar with privileged study zones including the subpolar North Atlantic, the southwestern Pacific and Atlantic, and Southern Ocean seas. As of today, the Argo database contains profiles from Deep Argo platforms. Innovative scientific results have already emerged from those first deployments (Johnson et al, 2019, Kobayashi 2018, Racapé 2019), which have contributed to encourage the next phase of the implementation, aimed to be global and coordinated at the international level.

New technologies

Beyond demonstrating the scientific interest of Deep-Argo data, several pilot experiments were aimed to demonstrate the ability of floats to acquire good-quality deep data and evaluate the different available sensors (e.g. precision requirements for climate studies) in order to guide the international community in the global implementation of the network. Possible biases and time drifts in the conductivity sensor, as well as a possible pressure effect on the measurements, are sources of important questions in the community and active efforts are still needed to provide the global Deep-Argo array with the best available technology. We particularly need (1) platforms capable of reaching the deep ocean, (2) temperature, salinity and pressure sensors with the accuracy and stability to address the changes in the deep ocean, and (3) methods to evaluate the quality of the observations and perform corrections when necessary.

Three deep sensors are currently available for Argo. The Sea-Bird SBE41CP (0 - 4000 db range), the SBE61 (0 - 6000 db range; upgrade of SBE41/41CP), and the OEM RBRargo3 sensor (0 - 6000 db range; RBRconcerto3 for the standalone version), developed with a totally different technological approach by RBR Ltd. To inter-compare the respective capabilities of those three sensors, Ifremer has developed “2-headed” (RBR on cap + SBE61 on the side) and "3-headed" (SBE41 on cap + SBE61 & RBR on the sides) multi-sensor Deep-Arvor floats.

As part of Euro-Argo RISE (WP3 - task 3.1), technological developments have been accomplished and short trials at sea (during LOPS campaigns named MICROCO, from the 9th to the 16th of September 2018 and LOPSTECH19-L1, from the 3rd to the 9th of May 2019) have been carried out (3-headed float) to ensure a long-term deployment in 2020. Those trials have shown the overall good functioning of the float, as a platform, and have already revealed differences in the behaviors of the 3 sensors (overestimation of salinity by RBR for example, or different pressure response for the SBE41CP) and problems with the housing of the RBR sensors. Biases, temporal drifts, and pressure effects now require to be estimated in a full float mission at sea, with as many profiles as possible.



Picture of the 3-headed float (left) and schematic of the 2-headed float (right)

Objectives of the deep float experiment

The objective of the full at-sea experiment is to determine and quantify any biases, temporal drifts or pressure effects in the new sensors under typical Argo float mission parameters.

The 3-headed float carries the three sensors that could equip the global Deep-Argo fleet in the coming years: the SBE41 on its cap (standard Argo float CTD), the SBE61 on one flank (upgraded version of the SBE41 designed for the deep ocean), and a new RBR sensor also designed for the deep ocean. Comparisons between those three sensors will enable to assess whether the SBE41 and RBR CTDs meet the precision (for salinity primarily) required for deep-ocean investigations. The SBE61 will be used as reference, together with the shipborne full-depth profile that will be carried out before the deployment (see next section). Evaluation of sensor stability will benefit from the quiescent character of the deployment area and the associated stability of its central and deep water mass properties (temperature and salinity). The stability and accuracy of the pressure sensor will also be assessed, and facilitated owing to the alignment of the three sensors.

However, the RBR sensor mounted on the flank of the 3-headed float is not the final design intended to be mounted on standard deep Argo floats, and data analysis from this particular float will only assess the new inductive technology for the conductivity cell rather than the final generation of deep sensors. This is the purpose of using the 2-headed floats. These floats have on their end caps the final design of the RBR sensor and the SBE61 sensor on the flank. The comparison between the observations from the new sensors would determine if the new RBR inductive technology satisfies the requirements to explore deep and abyssal layers.

2 Deployment plan

Chosen area and water mass stability

The Canary Basin (Figure 1) has been chosen as the deployment area for the 3-headed and the two 2-headed floats because of its central and deep waters being relatively stable over time. This was demonstrated by a 22-year long time series of temperature and salinity of North Atlantic Central Waters (NACW) and the North Atlantic Deep Waters (NADW) in the area (Figure 2) , as derived from repeated bi-annual hydrographic surveys carried out by the Spanish Oceanographic Institute (IEO) since 1997 (Tel et al., 2016)). Such a weak interannual variability of the deep Canarian Basin, as well as its frequent surveying by IEO will ensure a rigorous assessment of the long-term stability of the float sensors at depth.

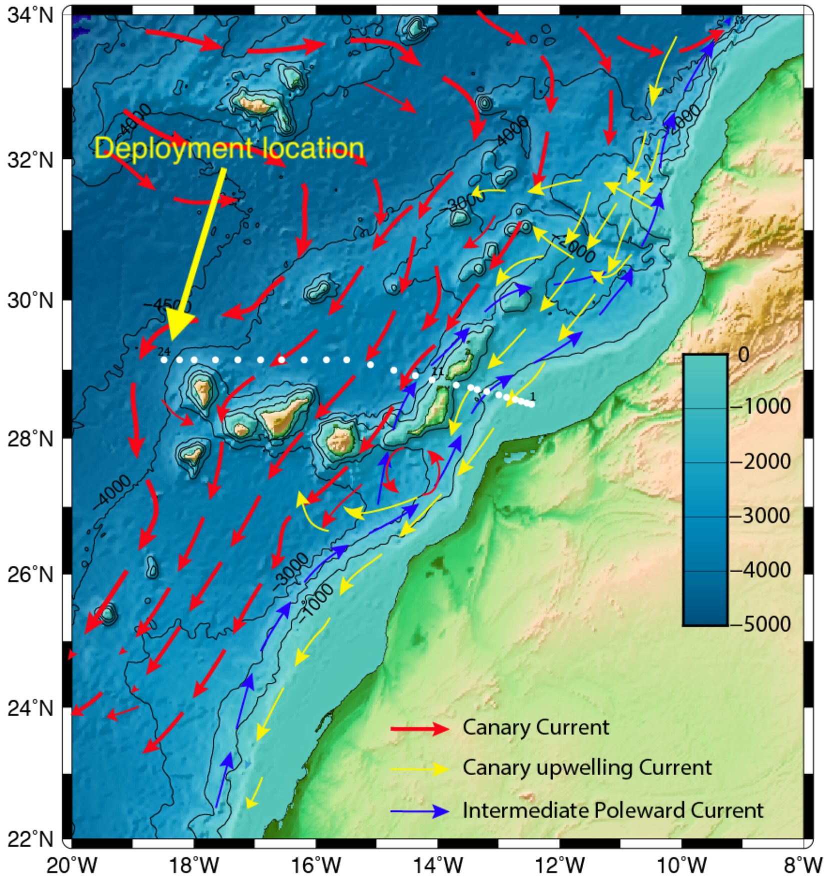


Figure 1. Sketch of the mean ocean circulation in the Canary Basin, where the floats would be deployed. The white dots are the locations of the CTD stations carried out by the IEO's ocean observing system in the area, that goes back to 1997.

The NACW and NADW have a long term trend in salinity over potential temperature of -0.001∓0.003 and -0.002∓0.001 per decade (Figure 3), respectively. These values (per year) are smaller than the accuracy of the conductivity sensors in the present generation of Argo floats.

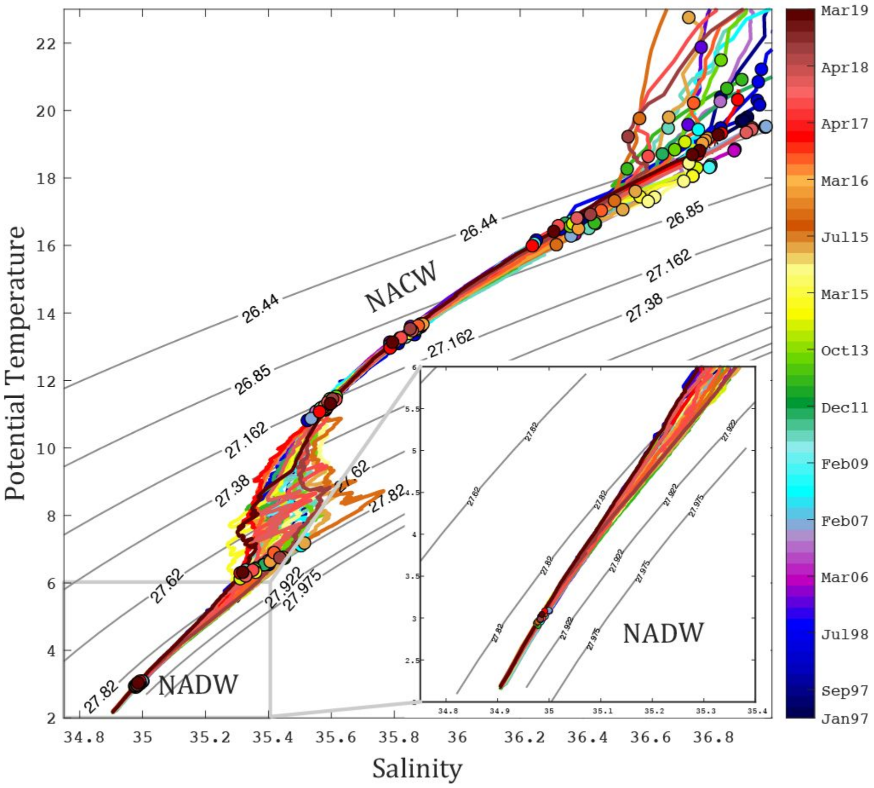


Figure 2. Potential temperature/salinity diagram in the westernmost station (24). The color code refers to the date of the survey, from January 1997 to March 2019; and the dots are placed at the following pressure levels : 10, 50, 90, 200, 400, 600, 1400, 2600 and 3600. The inset is a zoom of the diagram over the property area of the NADW.

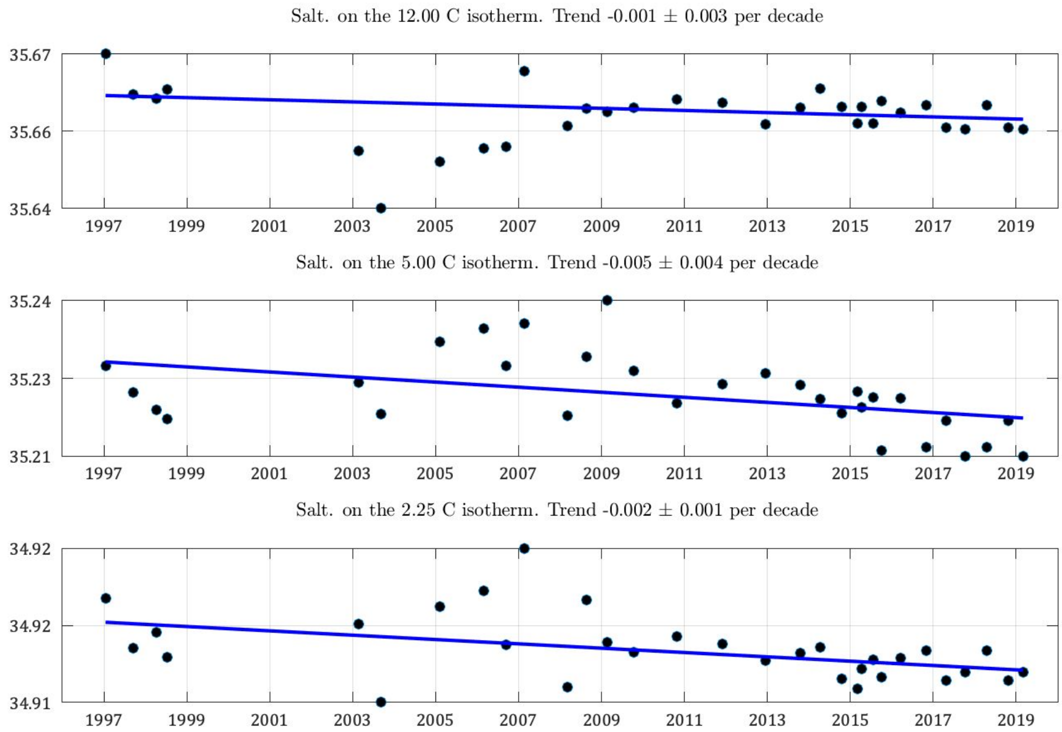


Figure 3. Time series of salinity averaged over the 12ºC, 5ºC and 2.25ºC potential temperature surfaces at station 24. These surfaces are representative of the North Atlantic Central Waters and the upper and lower North Atlantic Deep Waters, respectively. The blue lines indicate a linear robust fit to the data.

Deployment cruise

3-headed float

It is planned to deploy the 3-headed float during the IEO Raprocan2011 cruise in November 2020. At the time of writing this report (May 2020), the plan is to begin the cruise on November 3rd from Santa Cruz de Tenerife and sail to station 24, where the bottom is at 4235 m, to deploy the 3-headed and 2-headed floats. However, and depending on the final duration of the cruise, the deployment may be done further west of station 24, where the hydrographic properties of the water masses are as stable as in station 24, but it would minimize the risk of eastward drift of the floats. In any case, before the deployment of the float a full-depth CTD cast, using a SBE911+ with dual CT sensors, will be carried out. If the weather conditions permit it, the deployment of the floats will be carried out using an inflatable boat to avoid any damage to the float; otherwise, the deployment would be carried out using a crane, although ensuring the floats are deployed smoothly and safely.

Although the departing port is Santa Cruz de Tenerife, the floats will be send before 4th October 2020 to Vigo (Nave logistica flota IEO, Rua da Devesa, 7, 36350, Nigran, Pontevedra.) in order to avoid issues with the local customs authorities, the Canary Islands being in a different custom regime than the rest of Europe.

In the description of the work of the Grant agreement it was planned that IFREMER would deploy the 3-head deep Argo float in the Eastern North Atlantic Subpolar Gyre. However, as indicated in the final section (see paragraph 4), we experienced delays in having the deep RBR sensor. Given that the Canary basin area is regularly surveyed by IEO oceanographic cruises, as indicated, and because its central and deep waters are being relatively stable over time, we have decided to relocate the deployment to the Canary basin. This change does not affect the objective of the experiment, that is to assess the stability and accuracy of the new deep Argo sensors.

2-headed floats

The two 2-headed floats will be deployed, as indicated in the Description of the work, in the Canary basin. It is planned to deploy them in the cruise to be carried out in March 2021 (see section 4).

3 Float configurations

Strategy

For booth, the 3-headed and 2-headed floats, the mission is divided into two stages:

- The first stage objective is to determine the coherence of the acquisitions between the SBE41, SBE61 and RBR sensors. The sensors will be configured to have high-resolution acquisition with observations every 30 s in the descent and ascent profiles, and every hour during the drifting . This stage will last the first 3 cycles of the float with a 2 days period. The parking depth and profile depth would be 4000 m

- The second stage objective is to determine the long-term stability of the sensors, which will be configured to measure high resolution profiles only during the ascent, at prefixed depths and every 6 hours during the drifting. Additionally, and to maximize the life expectancy of the float, the float cycle periods will be lengthened to 10 days to evaluate the stability of the sensor with long temporal time series. The parking depth would be 3000 m and the profile depth 4000 m

The transition to the second stage will be done by reprogramming the float through the iridium communication system. The floats will be monitored continuously, and if necessary the configuration would be changed via Iridium.

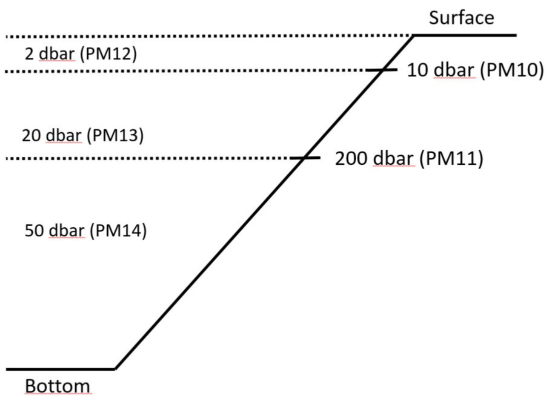
Sampling configuration

The floats has two sampling configurations, managed by two different electronic boards:

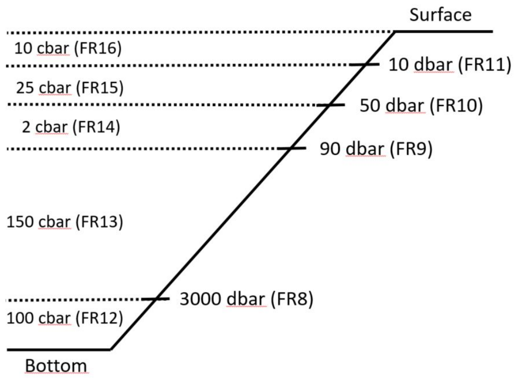
- one dedicated to the core-Argo mission, and only for the SBE41CP sensor;
- one dedicated to the 2-headed/3-headed sensor comparison, which powers and communicates with the two/three sensors: SBE41CP, SBE61 and RBR*argo*[3].

The following graphs shows the depth sampling strategies for both boards:

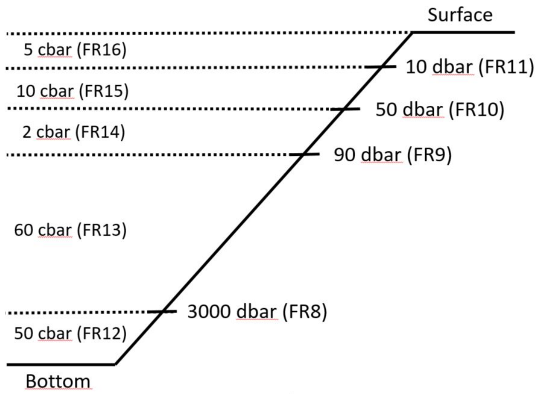
- for the Core-Argo, the SBE41CP acquisition (float mission parameters : PM10 to PM14) for both stage 1 and stage 2 would be :



- for the SBE41CP, SBE61 and RBR acquisition (acquisition PCB parameters : FR8 to FR16), stage 1 only:



- for the SBE41CP, SBE61 and RBR acquisition (FR8 to FR16), stage 2 only :



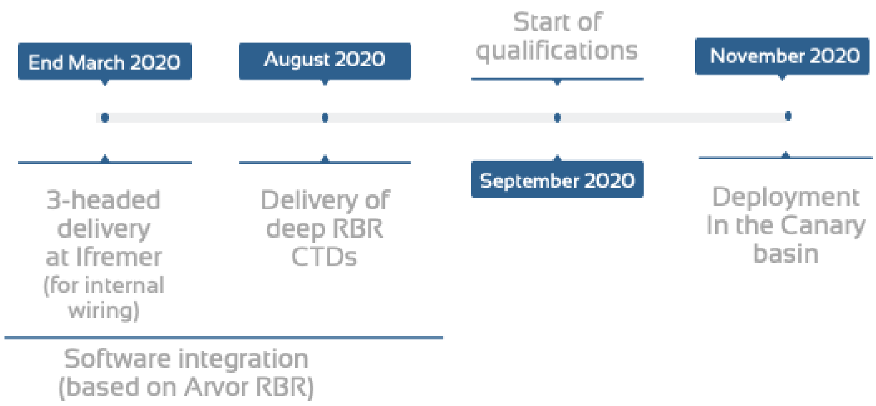
Annex I and II include all the technical and mission parameters configuration at launch, for the first stage (first 3 cycles) and for the second stage configuration.

4 Final comments and deviations from the initial plans

During the pressure characterization of one of the new RBR's deep probes, RBR found a mechanical failure associated with the material used to build the housing. They found that the problem affects other instruments with the same model of conductivity cells in the same material batch, including the one intended to be mounted on the Euro-Argo RISE 3-headed float. This fact was unknown at the submission of the proposal .

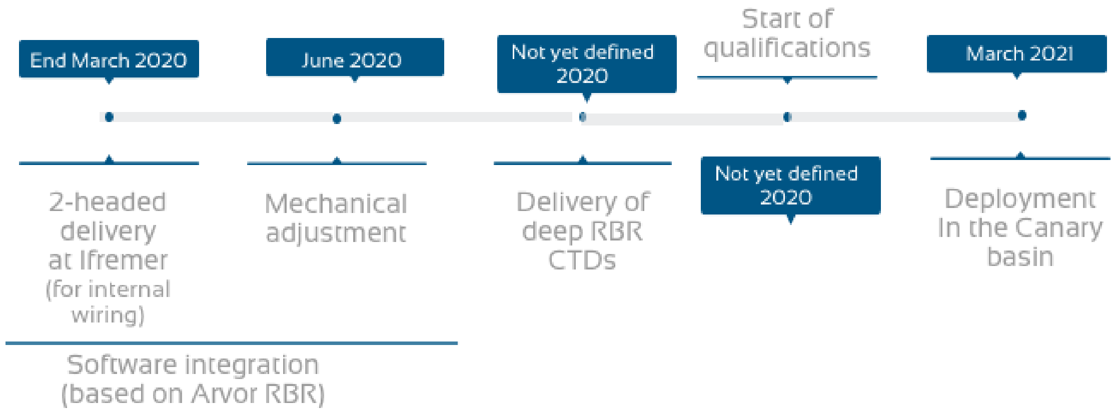
After several delays, RBR plans (as of May 2020) to deliver the new deep sensor to IFREMER's facilities in August 2020. During the first week of September 2020 the 3-headed float will be tested in the IFREMER's testing pool and directly shipped to Cadiz for its long-term deployment.

In the original Description of the work, it was foreseen that the deployment of the 3-headed float would be done in M20 (MS7 - August 2020). Nevertheless, as indicated above, due to technical issues with the deep RBR probe, we expect a 3-month delay in the achievement of the milestone for the 3-headed float. The deployment plans will be adapted to the available cruises of the IEO at the time of the availability of a fully tested instrument.



Timeline for the 3-headed float

The delayed delivery of RBR deep sensors is also affecting the two 2-headed floats. Although the mechanical test could be done by June 2020, and the adaptation of the software shortly after that, it does not seem feasible to have the floats ready for the November cruise, since the sensors are still not ready due to similar problems than those described for the 3-headed float. In the Description of the work, it was also foreseen that the deployment of the 2-headed float would be done in M20 (MS7 - August 2020) on an already scheduled cruise. As a consequence, the milestone for the deployment of the 2-headed float is expected to be postponed to the next planned cruise of IEO in March 2021.



Timeline for the 2-headed floats

The design of this intercomparison experiment has been done under the COVID-19 crisis and therefore there are two issues that can, substantially, affect the current plans.

The first one is that, although so far there is no information regarding the rescheduling of the IEO's cruises; it may be possible that in the forthcoming weeks, the IEO's float coordinator decides to change the current schedule and this may delay, or even cancel, the November cruise. However, this cruise is part of the long-term ocean observing system of the IEO, and therefore every year two cruises are planned, around March and November.

The second one is that the lockdown associated with COVID-19 may delay the delivery of the deep sensors, or its qualifications. Despite being in close contact with RBR to have the latest information for the delivery of the sensor, partners are facing an unexpected situation due to COVID-19 crisis, and it is still unclear if further delays will happen and how long they could last.

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Annex I - 3-headed float configuration parameters

Configuration for the first stage (first 3 cycles)

The tables below give the mission and technical parameters programmed at launch, and valid for the first three cycles.

Mission configuration

The green cells are for the sampling strategy and the yellow ones for the cycling strategy

#	Description	default Value	Config.	Unit
PM0	Number of Cycles	255	255	-
PM1	Cycle Period	10	**2**	days
PM2	First Cycle Period	2	**3**	days
PM3	Estimated Surface Arrival Time	6	6	hours
PM4	Delay Before Mission	0	**30**	min
PM5	Descent Sampling Period	0	**30** during 3 first cycles	s
PM6	Drift Sampling Period	12	**1** during 3 first cycles	hours
PM7	Ascent Sampling Period	10	10	s
PM8	Drift Depth	1000	**4000** during 3 first cycles	dbar
PM9	Profile Depth	3500	**4000**	dbar
PM10	Surface/Intermediate Layers Threshold	10	10	dbar
PM11	Intermediate/Bottom Layers Threshold	200	200	dbar
PM12	Surface Slices Thickness	1	**2**	dbar
PM13	Intermediate Slices Thickness	10	**20**	dbar
PM14	Bottom Slices Thickness	25	**50**	dbar
PM15	End Of Life Transmission Period	60	60	minutes

PM16	Inter-Cyle Surface Waiting	0	0	minutes
PM17	Surface Waiting After Subsurface Grounding	60	60	minutes

Technical configuration

#	Description	default Value	Config.	Unit
PT 0	Max valve activation at surface	1100	**2400**	csec
PT 1	Max valve volume during descent and repositioning	17	17	cm^3
PT 2	Max pump activation during repositioning	450	450	csec
PT 3	Pump duration during ascent	1120	1120	csec
PT 4	Pump duration for surfacing	24000	**32000**	csec
PT 5	Pressure tolerance for positioning (+/-)	50	50	dbar
PT 6	Max pressure before emergency ascent	4220	4220	dbar
PT 7	1st threshold for buoyancy reduction	2	2	dbar
PT 8	2nd threshold for buoyancy reduction	7	**12**	dbar
PT 9	Repositioning number threshold	2	2	-
PT 10	Grounding management mode	0	0	-
PT 11	Max valve volume before grounding detection	47	47	cm^3
PT 12	Grounding management threshold	200	200	dbar
PT 13	Pressure shift on grounding	100	100	dbar
PT 14	Pressure tolerance during drift (+/-)	50	50	dbar
PT 15	CTD acquisition mode (1: continuous ; 2: spot sampling)	1	1	-
PT 16	Alternate profile period (1: disabled)	1	1	days

PT 17	Alternate profile depth	4000	4000	dbar
PT 18	Average descent speed (mm/s)	30	**28**	mm/sec
PT 19	Pressure increment	0	0	dbar
PT 20	Cutoff pressure of CTD pump during ascent	5	5	dbar
PT 21	Auxiliary sensors measure (0: none; 1: dissolved oxygen)	0	0	-
PT 22	Ascent end pressure	10	10	dBar
PT 23	Average ascent speed	90	90	mm/sec
PT 24	Ascent speed control period	2	2	min
PT 25	Minimum pressure difference during ascent speed control	10	10	dbar
PT 26	Descent speed control period	5	5	min
PT 27	Minimum pressure difference during descent speed control	4	4	dbar
PT 28	GPS session retries	24	24	-
PT 29	Hydraulic message transmission (0: no; 1: yes)	1	1	-
PT 30	In air acq.: Sampling period	30	30	s
PT 31	In air acq.: Acquisition duration	5	5	min
PT 32	In air acq.: Duration of pumping at surface	30000	30000	cs
PT 33	In air acq.: Periodicity measurement	0	0	
PT 34	Iridium session timeout	60	60	min
PT 35	Vacuum coef A	x	float dependant	-
PT 36	Vacuum coef B	x	float dependant	-

Ice configuration

Although there is no ice in the deployment area, the float's algorithm still needs these parameters to work properly.

#		Default value	Config.	Units
PG 0	ICE DETECTION : Number of days without emergence (PG0), after one ISA detection	10	10	days
PG 1	ICE DETECTION : Number of days, with ISA active, before force an emergence	90	90	days
PG 2	ISA : Start pressure (PG2)	50	50	dbar
PG 3	ISA : Stop pressure (PG3)	20	20	dbar
PG 4	ISA : Temperature median (PG4)	-1790	-1790	m°C
PG 5	ISA : Deceleration threshold (PG5)	150	150	dbar
PG 6	ISA : Scrutation pressure delay on ascent (PG6)	2	2	min
PG 7	ISA : Stabilization pressure on ascent (PG7)	4	**10**	dbar
PG 8	ISA : Pumping activation delay on ascent (PG8)	500	**1120**	cs
PG 9	SATELLITE MASK : Session timeout (PG9)	5	5	min
PG 10	ASCENT HANGING : Confirmation delay (PG10)	30	30	min
PG 11	BUOYANCY INVERSION : Offset pressure (PG11)	20	20	dbar
PG 12	BUOYANCY INVERSION : EV volume per action (PG12)	9	9	cm3
PG 13	BUOYANCY INVERSION : EV volume max (PG13)	900	900	cm3

3-headed specific configuration: PY

#	Description	default Value	Config.	Unit
PY 00	3-headed RBR and/or SBE61 acquisition	1	1	-

3-headed specific configuration: FR

#	Description	default Value	Config.	Unit
FR 00	Cycle**	0	0	-
FR 01	RBR status: 0 off - 1 on	1	1	-
FR 02	SBE61 status: 0 off - 1 on	1	1	-
FR 03	RBR synchro - Rank of the sample chosen before the arrival of the SBE41 frame	2	2	-
FR 04	SBE61 synchro - Rank of the sample chosen before the arrival of the SBE41 frame	1	1	-
FR 05	Max delay between SBE41 and SBE61	280	280	ms
FR 06	Poffset SBE61	0	0	cbar
FR 07	Pcutoff SBE61	0	**50**	cbar
FR 08	Threshold bottom / near bottom	3000	3000	dbar
FR 09	Threshold near bottom / intermediate	2000	**90**	dbar
FR 10	Threshold intermediate / near surface	200	**50**	dbar
FR 11	Threshold near surface / surface	10	10	dbar
FR 12	Thickness in bottom layers	400	**100** during 3 first cycles	cbar
FR 13	Thickness in near bottom layer	250	**150** during 3 first cycles	cbar
FR 14	Thickness in intermediate layer	200	**2** during 3 first cycles	cbar
FR 15	Thickness in near surface layer	100	**25** during 3 first cycles	cbar
FR 16	Thickness in surface layer	10	10 during 3 first cycles	cbar

FR 17	IRIDIUM PT14 (FR17=PT14)**	X	0	-
FR 18	IRIDIUM PW7 (FR18=PW7)**	X	0	-
FR 19	Do not use**	X	0	-

Number of samples/profiles for the 3 first cycles (stage 1)

Core-Argo SBE41CP CTD samples

Zone	Layer (dbars)	Sample thickness (dbars)	SBE41 samples (**for descent + descent**)
Surface	0-10	2	5*2=10
Intermediate	10-200	20	9.5*2=19
Bottom	200-4000	50	76*2=152
		Total	**181**

Estimating 15 SBE41-only CTD samples/packet, 3 packet/SBD, 3 SBD/min, the transmission dedicated to SBE41-SBE61-RBR triplets would be **2 minutes**.

SBE41-SBE61-RBR CTD samples

Zone	Layer (dbars)	Sample thickness (dbars)	SBE41-SBE61-RBR CTD samples (**for descent + descent**)
Surface	0-10	1	10*2 = 20
Near surface	10-50	2.5	16*2 = 32
Intermediate	50-90	0.2	200*2 = 400

Near Bottom	90-3000	15	194*2 = 388
Bottom	3000-4000	10	100*2 = 200
		Total	**1040**

Estimating 4 SBE41-SBE61-RBR CTD samples/packet, 3 packet/SBD, 3 SBD/min, the transmission dedicated to SBE41-SBE61-RBR samples would be **29 min**.

Estimated transmission duration - total

Technical and configuration packets: approx 9 packets = 1 min

SBE41 only : 2 min

SBE41-SBE61-RBR: 29 min

TOTAL: 32 min.

Configuration for the second stage (cycles >3)

Only the differences from the configuration at launch are listed here. This change is not automatic but must be sent remotely with Iridium.

#	Description	default Value	Config.	Unit
PM1	Cycle Period	10	**10** after 3rd cycle	days
PM5	Descent Sampling Period	0	0 after 3rd cycle	s
PM6	Drift Sampling Period	12	**6** after 3rd cycle	hour
PM8	Drift Depth	1000	**3000** after 3rd cycle	dbar

#	Description	default Value	Config.	Unit
FR 12	Thickness in bottom layers	400	**50**	cbar

			after 3rd cycle	
FR 13	Thickness in near bottom layer	250	**60** after 3rd cycle	cbar
FR 14	Thickness in intermediate layer	200	**2** after 3rd cycle	cbar
FR 15	Thickness in near surface layer	100	**10** after 3rd cycle	cbar
FR 16	Thickness in surface layer	10	**5** after 3rd cycle	cbar

Number of samples/profile for the other cycles (>3)

Core-Argo SBE41CP CTD samples

Zone	Layer (dbars)	Sample thickness (dbars)	SBE41 samples **(ascent only)**
Surface	0-10	2	5
Intermediate	10-200	20	9.5
Bottom	200-4000	50	76
		Total	**91**

Based on the following: 15 SBE41-only CTD samples/packet, 3 packet/SBD, 3 SBD/min, the estimated transmission dedicated to SBE41-SBE61-RBR triplets is : **1 min**.

SBE41-SBE61-RBR CTD samples

Zone	Layer (dbars)	Sample thickness (dbars)	SBE41-SBE61-RBR CTD samples **(ascent only)**
Surface	0-10	0.5	20

Near surface	10-50	1	40
Intermediate	50-90	0.2	200
Near Bottom	90-3000	6	485
Bottom	3000-4000	5	200
		Total	**945**

Based on the following: 4 SBE41-SBE61-RBR CTD samples/packet, 3 packet/SBD, 3 SBD/min, the estimated transmission dedicated to SBE41-SBE61-RBR samples is : 26 min.

Estimated transmission duration - total

Technical and configuration packets: approx 9 packets = 1 min

SBE41 only : 1 min

SBE41-SBE61-RBR: 26 min

TOTAL: **28 min**.

Annex II - 2-headed float configuration

The configuration of the 2-headed floats is the same as the 3-headed float, except:

#	Description	default Value	Config.	Unit
FR 01	RBR status: 0 off - 1 on	1	0*	-

* RBR sensor will be mounted directly on the Deep-Arvor, and data will be acquired according to PM parameters.