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European Maritime and Fisheries Fund (EMFF)

MOCCA

D3.3.1 Description of the at sea monitoring procedure

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Consisting of:

Organisation/Natural person	Represented by	Statute	Contributing entities[1]
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The French Republic	Ifremer	Member	SHOM, INSU/CNRS, Meteo-France, IRD, IPEV
The Federal Republic of Germany	BSH	Member	GEOMAR, University of Hamburg, Alfred-Wegener-Institute for Polar and Marine Research (AWI)
The Hellenic Republic	HCMR	Member	N/A
The Italian Republic	OGS	Member	N/A
The Kingdom of the Netherlands	KNMI	Member	N/A
The Republic of Finland	FMI	Member	N/A
The United Kingdom of Great Britain and Northern Ireland	Met Office	Member	NOCS, BODC
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0.1	01.06.2016	Draft	Initial document creation
0.2	17.10.2016	Draft	Revision
0.3	12.12.2016	QC	For internal quality control
1.0	16.12.2016	Final	Final version for submission

[1] As indicated in the "Technical and Scientific description of the Euro-Argo ERIC" July 2013 attached to the Euro-Argo Statutes.

[2] Integers correspond to submitted versions.

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1. INTRODUCTION

This document summarizes MOCCA activities on the elaboration of at sea monitoring procedures in order to follow the 150 floats bought through the project, and that will be used to monitor the European fleet.

Monitoring of floats after they are deployed is coordinated by the ERIC with the support of national float experts. In June 2016, a review of existing at-sea monitoring tools was presented to the Euro-Argo Management Board and a first monitoring flow for the float life cycle was designed:

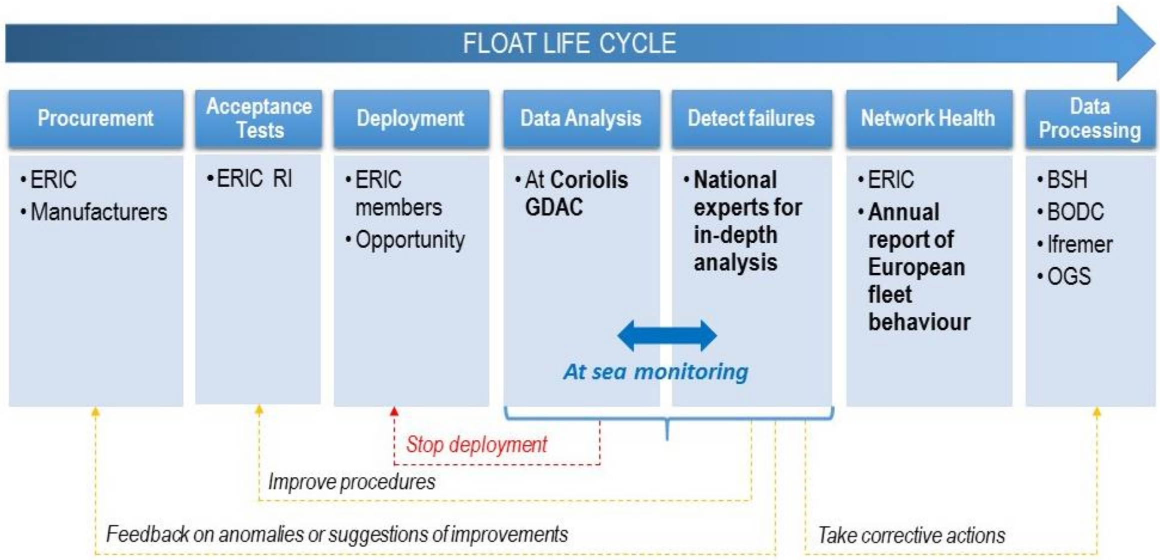


Figure 1: At sea monitoring workflow

Discussions highlighted the fact that it is important to know what are the questions we want to answer when reporting on fleet status, so the ERIC issued a questionnaire that was filled by Euro-Argo partners and associated institutions, providing feedback on the current needs and where to put efforts. Survey results showed that there is a strong need to report on status, performance and technical aspects.

This phase took much time than expected and thus delayed slightly the initial schedule of Annex I of the Grant Agreement for defining comprehensive at sea monitoring procedures. It was decided that ERIC would work jointly with the AIC for deriving global statistics (age distribution, life expectancy, deployment maps etc.) and that existing tools at Coriolis will be enhanced in 2017 to monitor the European fleet, especially considering technical aspects: reports on the cases of early failures of individual floats, for known issues the current status of floats and finally the monitoring of critical technical parameters defined by partners (battery voltage, last transmission date etc.) through a web interface with dashboards/status tables.

Meanwhile, existing tools at Coriolis and via the telecommunications provider were used. Euro-Argo technical team has analysed carefully the telecommunications of floats already deployed. Floats metadata, data and technical messages were also closely examined using in-house tools, and float status were reported to partners.

To date, 1 float (among the 47 already deployed) was identified as faulty because of the CTD data that is erroneous. An attempt for recovery in the Nordic Seas will be carried out in next spring to try to identify the problem, and redeploy the float if possible.

2. EXISTING AT SEA MONITORING TOOLS

A review of existing at sea monitoring tools was presented to the Euro-Argo Management board in June 2016, collecting examples of websites or in-house procedures used by some Argo floats communities to follow-on their floats after deployment.

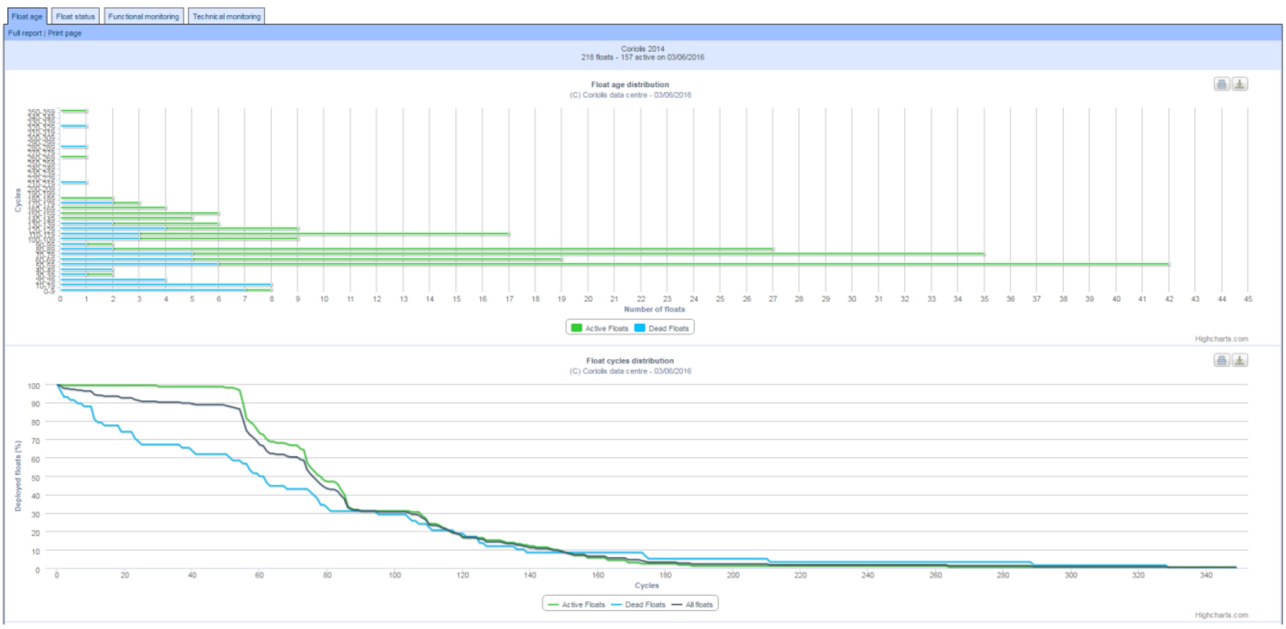
We describe here the tools and ideas that we think could be useful to monitor the MOCCA floats.

2.1. Example of Coriolis

The analysis tools have been developed by Ifremer/Coriolis and are accessible at:

http://www.coriolis.eu.org/Data-Products/At-sea-monitoring

One needs to ask Coriolis to define a batch selection of a subset of floats (by country, program, deployment year, float type etc.). Statistics are then computed periodically on this batch (age, number of cycles, cartography, dead/alive etc.).



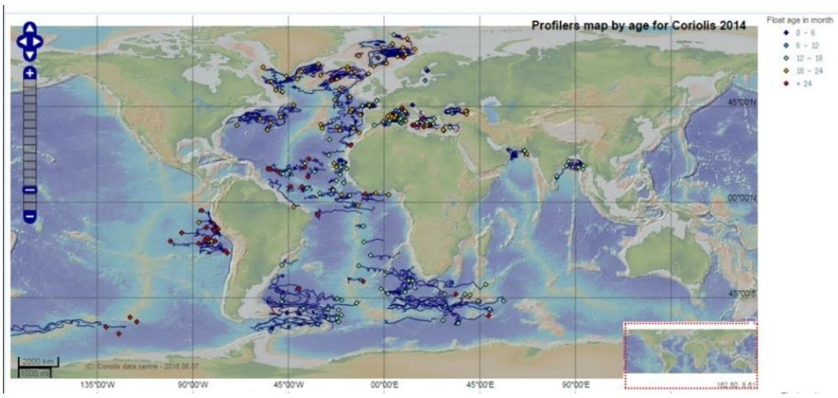


Figure 2: Screenshots of Coriolis at sea monitoring tools with graphs of float age distribution (top) and trajectories (left).

These tools allow “functional” & “technical” monitoring. We describe below what we mean by these definitions:

Global statistics on a fleet
This could be understood as a collection of indicators describing a fleet: age distribution, maps with deployments, impact of floats on filling the Argo design array, life expectancy etc.

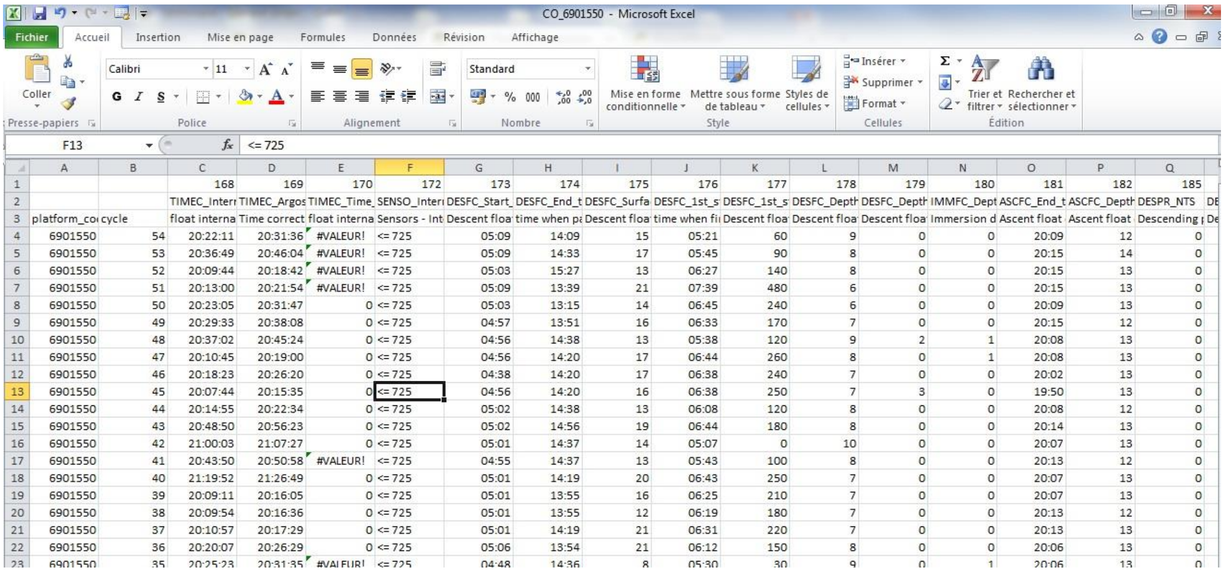
Functional monitoring
Functional monitoring would answer the question whether there is a problem in the fleet or not. It says something about the performance and availability of the system, but does not help to answer the question of how to solve any problems you may find.

Technical monitoring
Technical monitoring prepares material to find out what is wrong and concerns itself with the health of individual Argo floats. It needs the expertise of human technical person to perform analysis.

Figure 3: Quantitative identification of failures of a batch (sensor bias, voltage drop, transmission loss, out of tolerance of technical parameters etc.)

Coriolis tools give access to the following information:

- Tables with listing of batch (tab active / dead floats)
- Metadata and QC information
- Access to individual float page
- Download Excel file with all technical information



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1			168	169	170	172	173	174	175	176	177	178	179	180	181	182	185
2			TIMEC_Interı	TIMEC_Argos	TIMEC_Time_	SENSO_Interı	DESFC_Start_	DESFC_End_t	DESFC_Surfa	DESFC_1st_s	DESFC_1st_s	DESFC_Depth	DESFC_Depth	IMMFC_Dept	ASCFC_End_t	ASCFC_Depth	DESPR_NTS
3	platform_co	cycle	float interna	Time correct	float interna	Sensors - Int	Descent floa	time when pa	Descent floa	time when fi	Descent floa	Descent floa	Descent floa	Immersion d	Ascent float	Ascent float	Descending
4	6901550	54	20:22:11	20:31:36	#VALEUR!	<= 725	05:09	14:09	15	05:21	60	9	0	0	20:09	12	0
5	6901550	53	20:36:49	20:46:04	#VALEUR!	<= 725	05:09	14:33	17	05:45	90	8	0	0	20:15	14	0
6	6901550	52	20:09:44	20:18:42	#VALEUR!	<= 725	05:03	15:27	13	06:27	140	8	0	0	20:15	13	0
7	6901550	51	20:13:00	20:21:54	#VALEUR!	<= 725	05:09	13:39	21	07:39	480	6	0	0	20:15	13	0
8	6901550	50	20:23:05	20:31:47	0	<= 725	05:03	13:15	14	06:45	240	6	0	0	20:09	13	0
9	6901550	49	20:29:33	20:38:08	0	<= 725	04:57	13:51	16	06:33	170	7	0	0	20:15	12	0
10	6901550	48	20:37:02	20:45:24	0	<= 725	04:56	14:38	13	05:38	120	9	2	1	20:08	13	0
11	6901550	47	20:10:45	20:19:00	0	<= 725	04:56	14:20	17	06:44	260	8	0	1	20:08	13	0
12	6901550	46	20:18:23	20:26:20	0	<= 725	04:38	14:20	17	06:38	240	7	0	0	20:02	13	0
13	6901550	45	20:07:44	20:15:35	0	<= 725	04:56	14:20	16	06:38	250	7	3	0	19:50	13	0
14	6901550	44	20:14:55	20:22:34	0	<= 725	05:02	14:38	13	06:08	120	8	0	0	20:08	12	0
15	6901550	43	20:48:50	20:56:23	0	<= 725	05:02	14:56	19	06:44	180	8	0	0	20:14	13	0
16	6901550	42	21:00:03	21:07:27	0	<= 725	05:01	14:37	14	05:07	0	10	0	0	20:07	13	0
17	6901550	41	20:43:50	20:50:58	#VALEUR!	<= 725	04:55	14:37	13	05:43	100	8	0	0	20:13	12	0
18	6901550	40	21:19:52	21:26:49	0	<= 725	05:01	14:19	20	06:43	250	7	0	0	20:07	13	0
19	6901550	39	20:09:11	20:16:05	0	<= 725	05:01	13:55	16	06:25	210	7	0	0	20:07	13	0
20	6901550	38	20:09:54	20:16:36	0	<= 725	05:01	13:55	12	06:19	180	7	0	0	20:13	12	0
21	6901550	37	20:10:57	20:17:29	0	<= 725	05:01	14:19	21	06:31	220	7	0	0	20:13	13	0
22	6901550	36	20:20:07	20:26:29	0	<= 725	05:06	13:54	21	06:12	150	8	0	0	20:06	13	0
23	6901550	35	20:25:23	20:31:35	#VALEUR!	<= 725	04:48	14:36	8	05:30	30	9	0	1	20:06	13	0

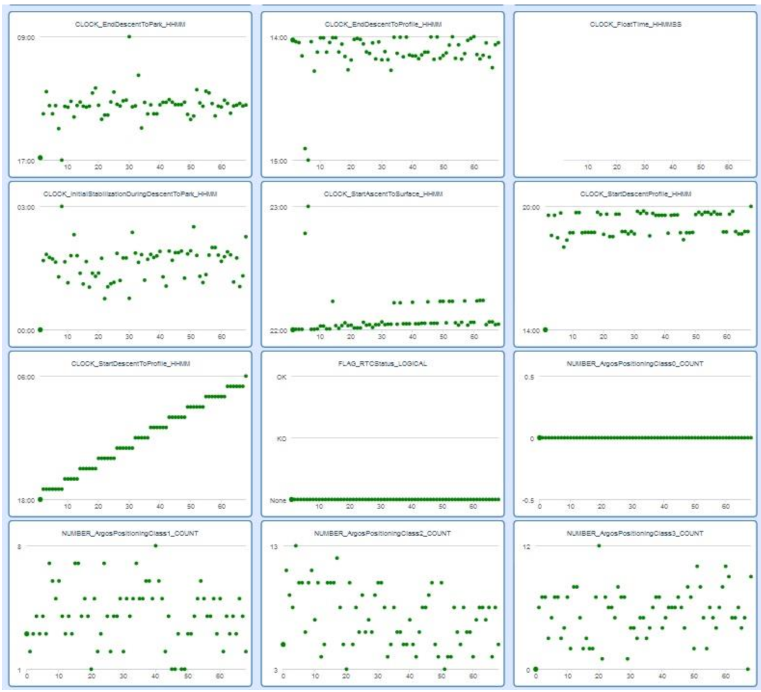


Figure 4: Top: Excel file with all technical parameters per cycle (now with V3.1 format).
Right: Associated plots

Although these tools allow the monitoring of some of the float parameters, we consider that evolutions should be made in order to define alert thresholds, to group and prioritize plots etc.

2.2. Example of WHOI

Woods Hole Oceanographic Institution (WHOI) has developed webpages for global analysis of their floats (geographical selection, mouse-over basic information and links to data, trajectory, engineering plots):

http://argoweb.whoi.edu/ and http://argo.whoi.edu/

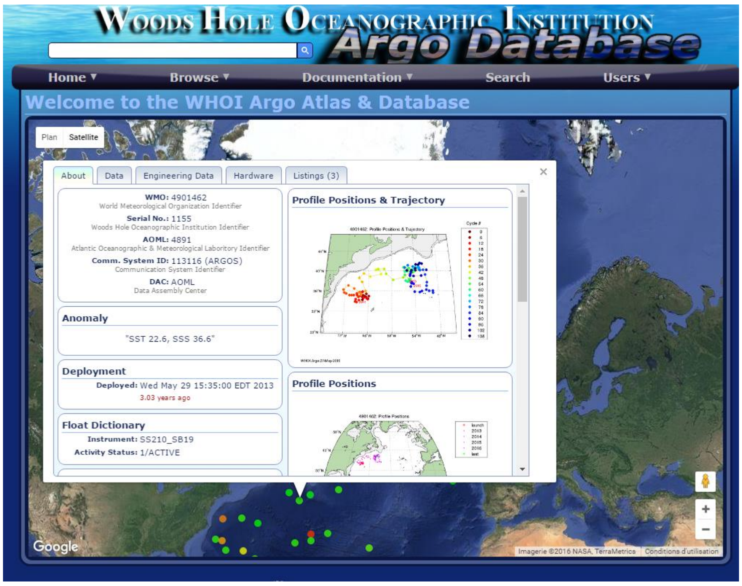


Figure 5: Example of WHOI Argo float webpages

WHOI floats recently reporting

Float ID	Last Update (GMT)	Cycle #	Last Cycle Time (days)	Last Cycle Pmax (dbar)	Last Cycle minV (volts)	Hi-Res	Cruise ID	Platform
7084	2016-06-14 04:14	189	0.27	288	13.3	1	A16N	RONALD BROWN
7174	2016-06-14 03:34	249	0.27	343	13.2	1	EN-533	ENDEAVOR
7146	2016-06-14 03:14	219	0.28	292	13.1	1	A16N	RONALD BROWN
7217	2016-06-14 02:44	82	9.94	2008	8.9	0	EX-14-02 Leg 3	OKEANOS EXPLORER
7337	2016-06-14 00:48	13	9.89	2066	13.0	0	n/a	BAP ZIMIC
7045	2016-06-14 00:12	139	9.70	1014	7.2	0	Semester at Sea 2012	M/V Explorer
7148	2016-06-14 00:01	221	0.27	345	13.0	1	A16N	RONALD BROWN
7297	2016-06-13 23:53	31	9.93	2004	12.6	0	NPB15-08	NATHANIEL B. PALMER
7054	2016-06-13 23:35	130	9.69	993	9.1	0	JCOMMOPS_ZR2335_008	Lady Amber
7234	2016-06-13 23:24	75	9.96	2006	10.8	0	AX08	MAERSK VILNIUS
7161	2016-06-13 23:12	251	0.29	425	10.9	1	RB-13-05 NTAS	RONALD BROWN
7300	2016-06-13 22:33	32	9.93	2007	13.1	0	AX08	MAERSK VILNIUS
7049	2016-06-13 22:19	111	9.71	989	4.3	0	al130801	MY Alucia
7033	2016-06-13 21:38	136	9.72	1009	5.0	0	Semester at Sea 2012	M/V Explorer
7191	2016-06-13 19:35	94	9.97	2036	5.5	0	CLIVAR A16S	RONALD BROWN
7196	2016-06-13 19:17	68	9.94	2006	9.7	0	AX08	MAERSK VILNIUS
7032	2016-06-13 18:49	135	9.70	993	6.0	0	JCOMMOPS_ZR2335_008	Lady Amber
7336	2016-06-13 17:36	13	9.92	2013	13.2	0	n/a	BAP ZIMIC
7047	2016-06-13 15:50	143	5.55	1001	10.4	0	Semester at Sea 2012	M/V Explorer
7216	2016-06-13 15:20	82	9.93	2008	9.5	0	EX-14-02 Leg 3	OKEANOS EXPLORER
7140	2016-06-13 11:45	330	1.25	303	9.6	1	A16N	RONALD BROWN

Figure 6: Example of WHOI Argo float dashboard

WHOI at sea monitoring tools also provide:

- Float statistics sorted by launch year, status or endurance
- Table listing with QC info, coloured by status
- Engineering plots of technical parameters

We consider that coloured dashboards and engineering plots of some well-defined key float parameters would be of great help in monitoring the MOCCA floats.

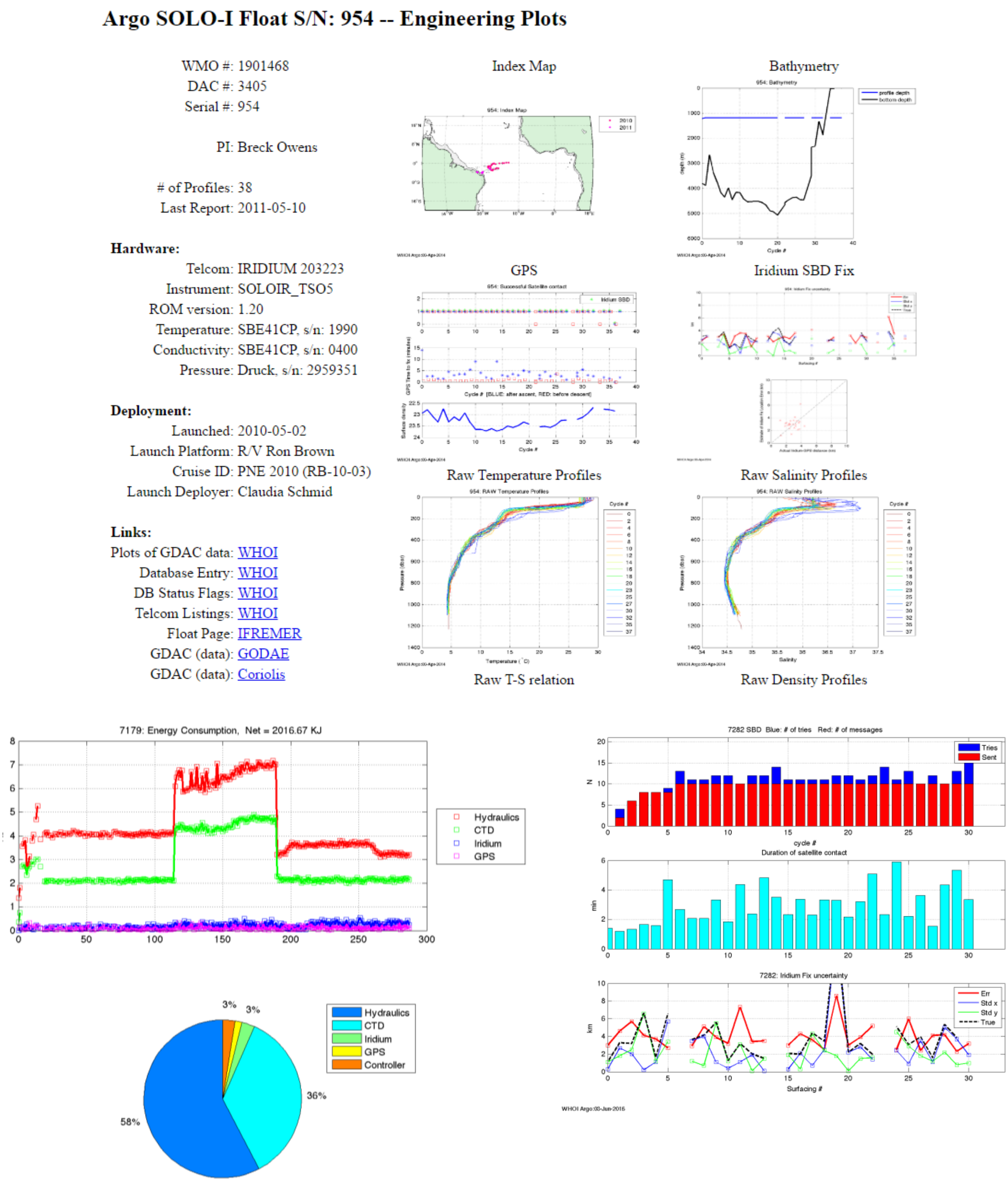
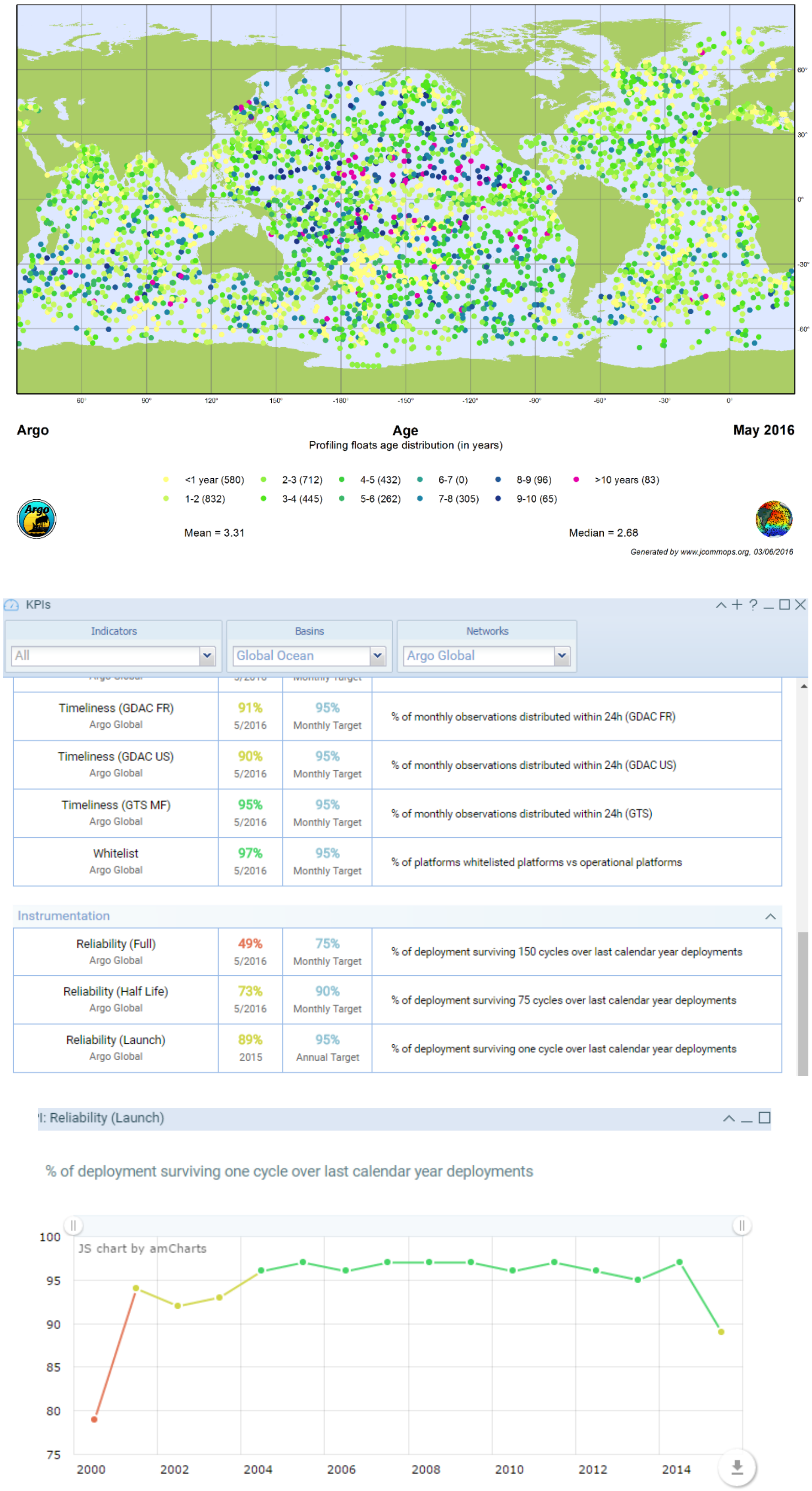


Figure 7: Example of WHOI Argo float technical plots.

2.3. Example of AIC

The Argo Information Centre (AIC) developed by JCOMMOPS is the official database that allows notifications of float deployments. It also provides monthly/annual maps with float status (age, programme etc.) and more recently derives some KPIs (Key Performance Indicators) on instrumentation, data flows etc.



Timeliness (GDAC FR) Argo Global	91% 5/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC FR)
Timeliness (GDAC US) Argo Global	90% 5/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC US)
Timeliness (GTS MF) Argo Global	95% 5/2016	95% Monthly Target	% of monthly observations distributed within 24h (GTS)
Whitelist Argo Global	97% 5/2016	95% Monthly Target	% of platforms whitelisted platforms vs operational platforms
Instrumentation			
Reliability (Full) Argo Global	49% 5/2016	75% Monthly Target	% of deployment surviving 150 cycles over last calendar year deployments
Reliability (Half Life) Argo Global	73% 5/2016	90% Monthly Target	% of deployment surviving 75 cycles over last calendar year deployments
Reliability (Launch) Argo Global	89% 2015	95% Annual Target	% of deployment surviving one cycle over last calendar year deployments

Figure 8: Examples of AIC tools

After reviewing the examples presented above it was decided to issue a Euro-Argo questionnaire on at sea monitoring to gather partner’s feedbacks and existing practices in order to drive further efforts from ERIC for developing new tools or propose enhancement of existing ones.

3. EURO-ARGO ERIC QUESTIONNAIRE ON AT SEA MONITORING

3.1. Presentation

The survey was released in September 2016 and was opened for 1 month:

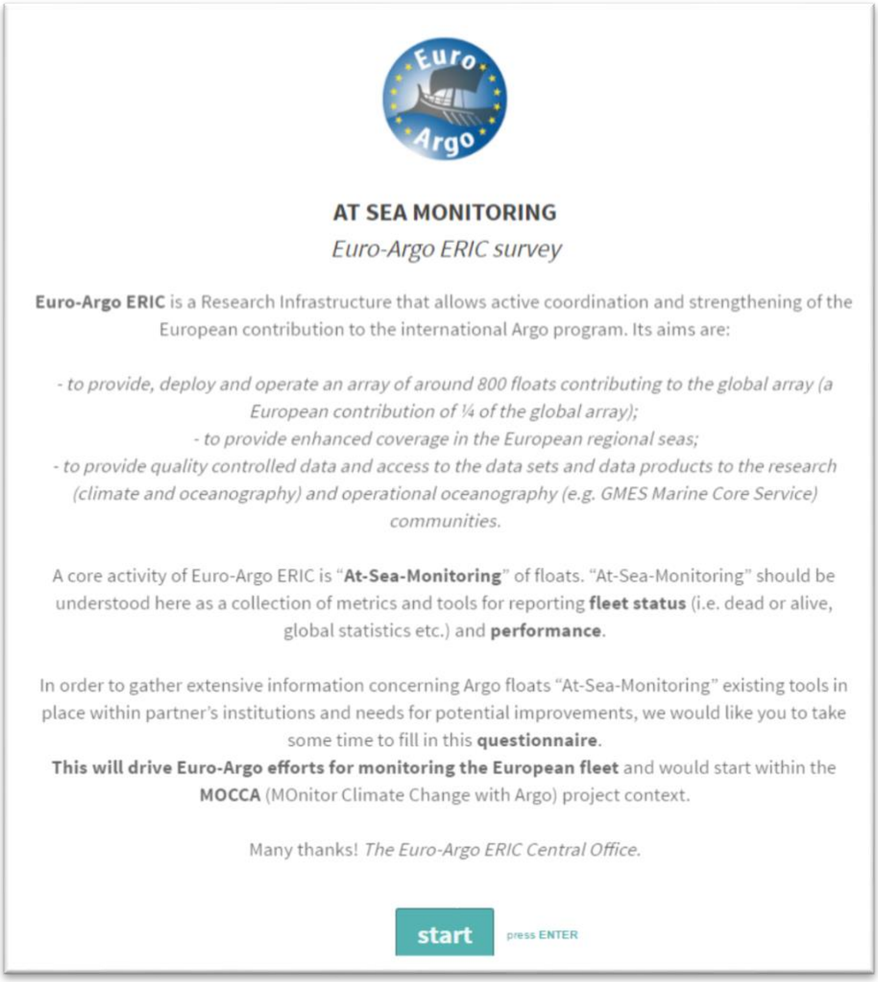


Figure 9: ERIC survey on at sea monitoring. https://euroargo.typeform.com/to/Dwf4lh

The objectives of the questionnaire were to:
- Gather partners reporting requirements
- Identify partners needs relative to At-Sea-Monitoring activities
- Collect existing practices
- Drive further efforts from Euro-Argo

3.2. Questionnaire results

We collected 16 answers from almost every partner/country in Euro-Argo, mainly from Argo Project Managers and Scientists. The average time to complete the survey was 18 min.

Could you precise your role within your country or institution?

16 out of 16 people answered this question

1	An Argo Project Manager/Principal Investigator	10 / **63%**
2	An Oceanographer/Marine Scientist/Researcher	10 / **63%**
3	An Argo Data User	4 / **25%**
4	A Float Technical Expert	3 / **19%**
5	A Ministry Representative	1 / **6%**
6	A Modeller	1 / **6%**
7	Other • DAC Argo product owner	1 / **6%**
8	A Marine Meteorologist	0 / **0%**

Figure 10: Example of survey results

Questionnaire answers revealed that a lot of Euro-Argo partners were already using at sea monitoring tools, mainly in-house. They also use the AIC and Coriolis websites outlined above:

Is your institution using specific tools for monitoring Argo floats?

16 out of 16 people answered this question

1	Yes	13 / **81%**
2	No	3 / **19%**

In case your institution is using specific tools for monitoring Argo floats, could you please specify them?

16 out of 16 people answered this question

1	In-house tools	13 / **81%**
2	AIC	10 / **63%**
3	Coriolis website	10 / **63%**
4	Database	5 / **31%**
5	Other • Company that provides telecommunications with the floats	1 / **6%**

More in details, the in-house tools used could be gathered in the following categories:

- Website developed in order to visualize positions of latest float transmission
  - see its last two months' locations and profiles (either all data or just the ones flagged as good)
  - some metadata information
- Automatic e-mail service set to receive a warning message in cases floats missed two consequent transmissions or has remained on surface and transmits continuously
- Automatic scripts to generate daily tables/graphs
- Automatic scripts to update float's mission command file (based on bathymetry)
- Ferret-scripts to plot positions, vertical profiles and sections

A major output of this questionnaire was the **identification of a contact point in every country or institution** to deal with at sea monitoring activities. Indeed, monitoring of MOCCA floats is coordinated by the ERIC but would need the support of national float experts.

ERIC office has analysed the survey results concerning further needs that we sum-up here:

- Partners are performing some At-Sea-Monitoring activities and seems globally satisfied
- Everybody is interested in At-Sea-Monitoring in order to facilitate reporting requirements (annual basis)
- There is a need to report on status/performance/technical aspects of floats
- 80% people are using in-house tools, then AIC & Coriolis (mainly monthly basis)

3.3. Roadmap

We found that **main needs for global statistics are already addressed by JCOMMOPS on the AIC**. Within MOCCA, ERIC is willing to work with AIC to propose new KPIs that would meet some requirements. We will also work with AIC to improve accuracy of statistics: for instance, to reflect true float life (recoveries, different cycle schemes etc.). Finally, we propose to issue generic monthly report on the fleet once the tools will be in place.

The **main needs for functional monitoring are**:

- Statistics on sensors' performance; we would need to define indicators.
- Warning/notification if systematic mal-function is detected; we need to define alert parameters and thresholds
- Summaries of fleet configuration
- Analyses of failures; this has to be done jointly with national float experts.
- Implement dashboards/status tables

Considering the existing Coriolis tools (presented above) we suggest to use these tools as a basis and enhance them to provide dashboards and to define alert thresholds.

The **main needs for technical monitoring are**:

- Reports on the cases of early failures of individual floats
- For known issues the current status of floats. As and when new issues are identified these would be added
- Implement monitoring of critical technical parameters defined by partners

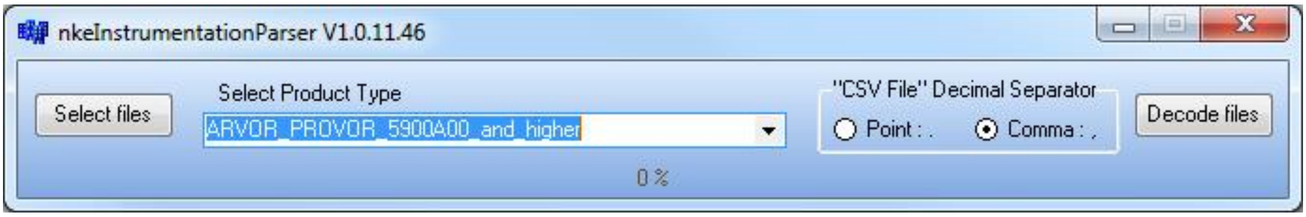
Again, we suggest to use the Coriolis tools and technical expertise from partners (float experts) and enhanced them. We could then benefit from the Coriolis data organisation (database etc.) that is behind and derive accurate and quicker indicators.

4. AT SEA MONITORING USING THIRD-PARTY TOOLS

ERIC technical team is also using third-party tools to monitor the MOCCA floats deployed. These are software distributed by the float manufacturer (NKE) and tools from telecommunications provider (CLS).

4.1. nkeInstrumentation Parser

Satellites messages sent by the float after its deployment and after each cycle can be decoded by this software, producing several easy-access Excel files that gather floats metadata, data and technical messages.



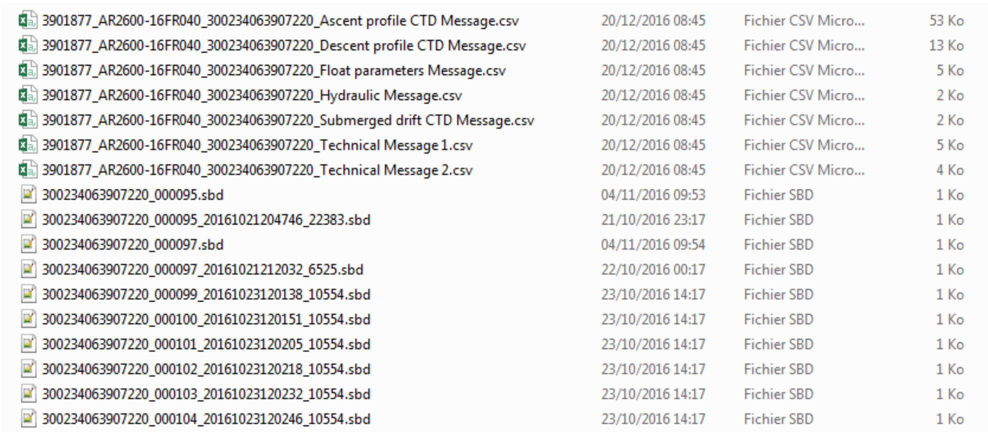


Figure 11: nkeInstrumentation Parser (top) and Excel decoded files (left).

These files were closely examined by the ERIC and sent on board to the deployment team within few hours after float launch. This allows quick access to float state of health.

This at sea monitoring was very useful for the MOCCA floats: rectification of float parameters have been performed (for instance modification of float ascending profile depth if the float was deployed in shallower seas) and quick diagnosis on float integrity allowed corrective actions, for instance when one of the float deployed in the Caribbean sea entered in end-of-life mode right after deployment (most probably because of very high temperature on the boat deck).

-----DESCENT TO PROFILE DEPTH-----								
descent start time (h)	0	0	0	0	18.7167	0	0	18.7167
End of descent time (h)	0	0	0	0	4	0	0	3.66667
Number of valve actions in descent	0	0	0	0	7	0	0	7
Number of pump actions in descent	0	0	0	0	0	0	0	0
Max pressure in descent to profile (dbar)	0	0	0	0	2014	0	0	2011
-----DRIFT TO PROFILE PHASE-----								
Number of entrance in drift target range	0	0	0	0	1	0	0	1
Number of re-positioning in profile stand-by	0	0	0	0	0	0	0	0
Number of valve actions in drift to Profile	0	0	0	0	0	0	0	0
Number of pump actions in drift to Profile	0	0	0	0	0	0	0	0
Minimum pressure in drift to Profile (dbar)	0	0	0	0	2009	0	0	2010
Maximum pressure in drift to Profile (dbar)	0	0	0	0	2021	0	0	2014
-----ASCENT PHASE-----								
Ascent start time (h)	0	0	0	0	5.76666	0	0	5.78333
Time at end of ascent (h)	0	0	0	0	12	0	0	12.0167
Number of pump actions in ascent	0	0	0	0	14	0	0	13
-----GENERAL INFORMATIONS-----								
Float time : Hour	20	20	21	21	12	0	0	12
Float time : Minute	47	47	20	20	1	0	0	2
Float time : Second	34	34	20	20	29	0	0	29
Float time : Day	21	21	21	21	23	0	0	2
Float time : Month	10	10	10	10	10	0	0	11
Float time : Year	16	16	16	16	16	0	0	16
Pressure sensor offset (two's complement coded) (cbar)	0	0	0	0	-4	0	0	1
Internal pressure (mbar)	600	600	580	580	585	0	0	585
Batteries voltage at Pmax (V)	10.4	10.4	10.4	10.4	9.7	15	15	9.7
RTC state indicator (normal=0 failure=1)	0	0	0	0	0	0	0	0
Coherence problem counter	0	0	0	0	1	0	0	0
Dissolved oxygen sensor state (0=Ok 1=Pb 2=None)	2	2	2	2	2	0	0	2
-----GPS DATA-----								
GPS latitude (°)	40	40	40	40	40	0	0	43
GPS latitude (minutes)	41	41	41	41	40	0	0	32
GPS latitude (minutes fractions (4th))	1248	1248	3256	3256	2777	0	0	6596

Figure 12: Excel technical message decoded

4.2. iridium and Argos communications analysed by the ERIC

Float communications were carefully monitored in order to check that the float is transmitting as expected (depending on float communication type and configuration set by the ERIC). **MOCCA float deployment, end-of-life mode, date since last ascent etc. were monitored using the communication summaries** provided by CLS.

WMO	Serial number	IMEI	Total koctet	Remarks	févr-16	mars-16	avr-16	mai-16	juin-16	juil-16	août-16	sept-16	oct-16	nov-16
3901885	AI2600-16FR048	300234062480660	12911				6011	6900						
3901891	AI2600-16FR054	300234062481670	12611				5711	6900						
3901916	AI2600-16FR079	300234062483850	12911				4811	8100						
3901914	AI2600-16FR077	300234062488880	12911				4811	8100						
3901905	AI2600-16FR068	300234062489830	12911				4811	8100						
3901845	AR2600-16FR008	300234063600090	115200						6300	21600	21600	21900	21600	22200
3901850	AR2600-16FR013	300234063600100	46866	Passage 1000pts nov2016					2400	5400	5400	5400	5466	22800
3901868	AR2600-16FR031	300234063600110	48678					7500					18678	22500
3901869	AR2600-16FR032	300234063600120	26140					7500						18640
3901880	AI2600-16FR043	300234063600210	15011				7511	7500						
3901942	AI2600-16FR085	300234063600230	11711						5111		6600			
3901897	AI2600-16FR060	300234063600240	26711				19511	7200						
3901839	AR2600-16FR002	300234063601100	121200						10800	22200	21900	22200	21900	22200
3901896	AI2600-16FR059	300234063601210	26711				19511	7200						
3901902	AI2600-16FR065	300234063601220	12911				4811	8100						
3901939	AI2600-16FR082	300234063601230	12011						5411		6600			
3901892	AI2600-16FR055	300234063601240	12611				5711	6900						
3901847	AR2600-16FR010	300234063602100	33768										11217	22551
3901840	AR2600-16FR003	300234063602110	136800					6300	21900	21900	21600	21600	21600	21900

Figure 13: Monthly follow-up of float communications analysed by the ERIC (koctets)

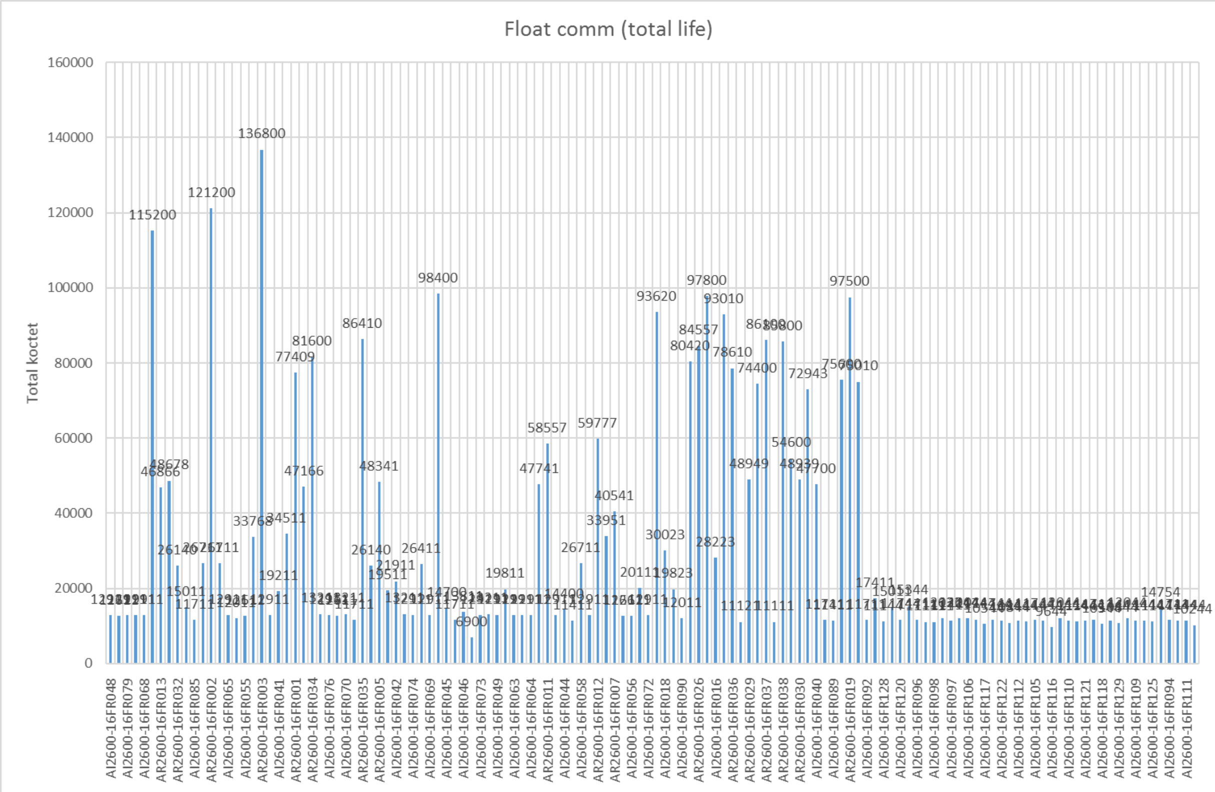


Figure 14: Total amount of data transmitted by a float across its life. Lower values correspond to float not been deployed (but tested in the pool) and higher values to the first MOCCA floats deployed.

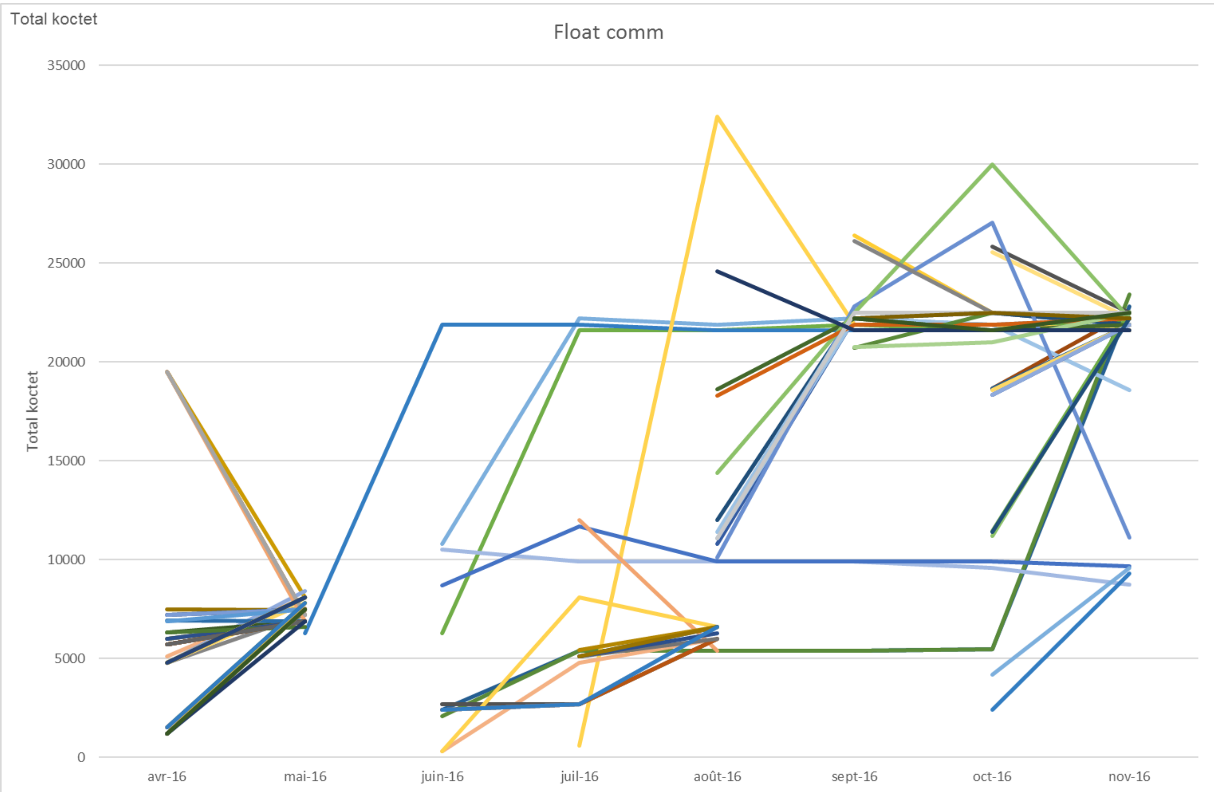


Figure 15: Monthly float data consumption. Spikes correspond to float deployment (higher volume of messages) or floats located in shallower areas (thus transmitting less CTD data points on the vertical). One can see the batch of floats configured to measure 1000 CTD points (monthly volume around 22000 koctet) and the other with 120 CTD points (monthly volume around 1000 koctet).

4.3. Float telecom provider (CLS) tools - ArgosWeb

MOCCA floats using Argos communication (20 out of 150) **are also monitored by the tools provided by CLS**. ERIC can access to the latest messages transmitted in near-real time, and display the position and trajectory of each platform on a map:

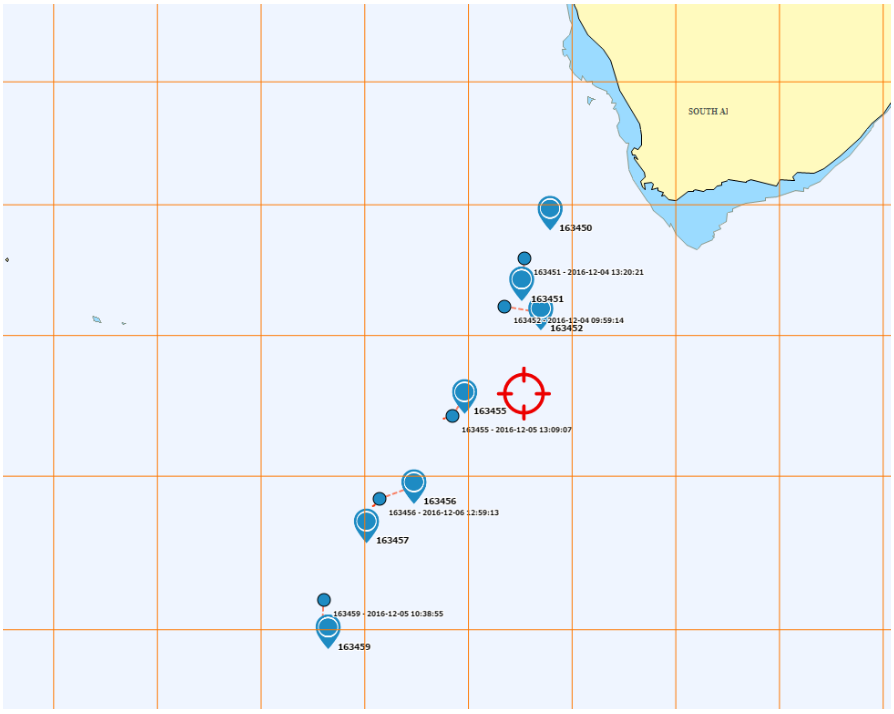
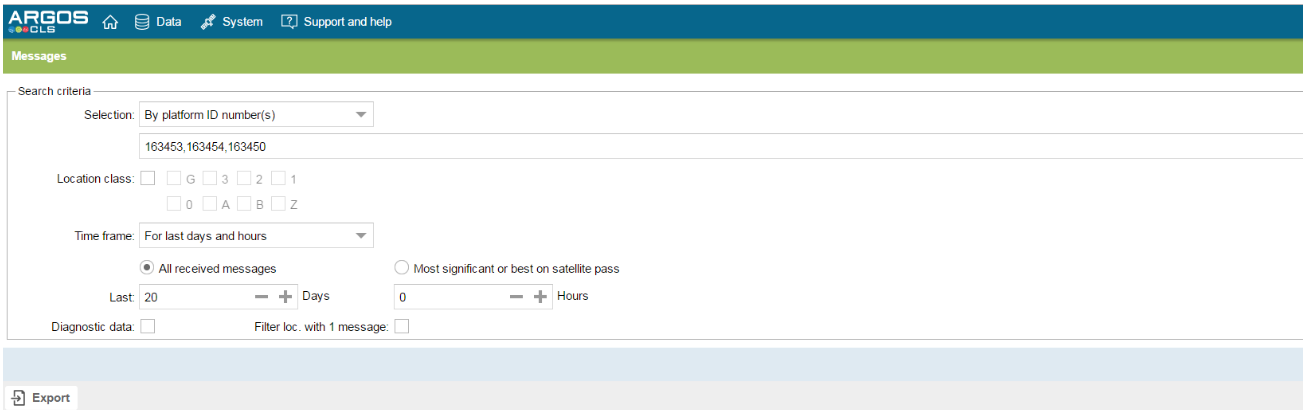


Figure 16: ArgosWeb tools for cartography (top) and data download (bottom)



Platform ID No.	Platform	Prg No.	Pass dur. (s)	Msg Date	Sat.	Alarm	Format name	Loc. date	Longitude	Latitude
163450		6127	354	2016-12-13 10:18:48	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:18:15	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:17:30	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:16:55	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:16:10	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:15:33	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:14:50	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:14:16	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	354	2016-12-13 10:13:29	MA	N	FORMAT TEMPL...	2016-12-13 10:13:52	13.93663	-35.31458
163450		6127	638	2016-12-13 09:34:49	MB	N	FORMAT TEMPL...	2016-12-13 09:25:12	13.95032	-35.30807
163450		6127	638	2016-12-13 09:34:14	MB	N	FORMAT TEMPL...	2016-12-13 09:25:12	13.95032	-35.30807

5. FIRST AT SEA MONITORING RESULTS

We present here the first results of at sea monitoring of the MOCCA floats using the tools and procedures describes in the document.

To date in the AIC (Argo Information Centre) we have 83 MOCCA floats declared in the database. 47 floats are operational (deployed and distributing data). The "oldest" float is 200 days old and the average float age is 56 days. **The following statistics and figures were generated from the AIC**:

Float sample size	83
% Operational Floats	56.63
Oldest Platform (Days)	200
Average Age (Days)	56
Median Age (Days)	49
Average Dist. Per Float (Km)	11
Average Cycles Per Float (Km)	6
% Failed Deployments	0
% Blacklisted	1.2
Total observations	544
DM observations	0

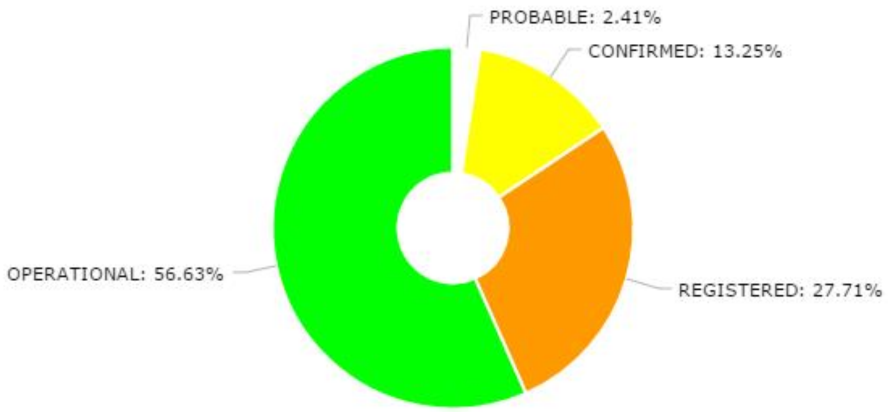


Figure 17: MOCCA float distribution by status

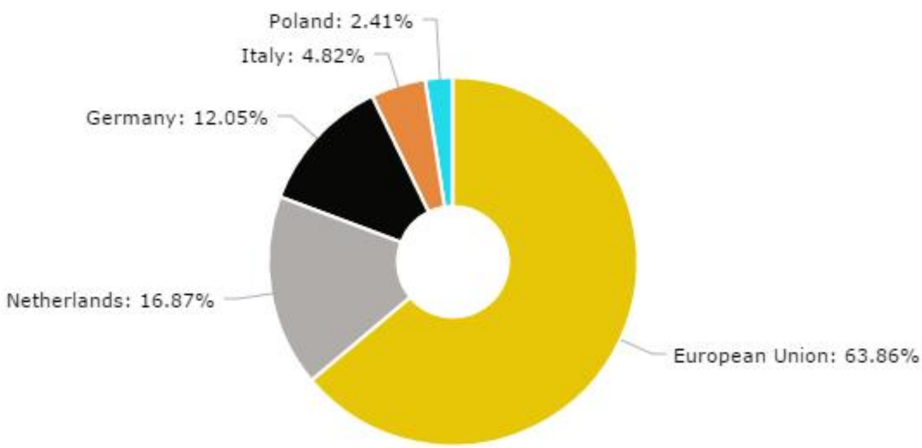


Figure 18: MOCCA float distribution by country (national financing and EU funding)

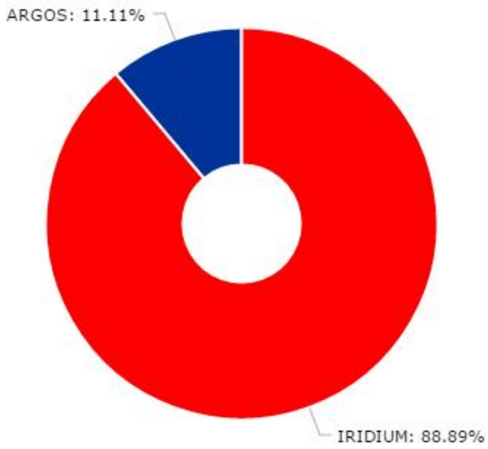


Figure 19: MOCCA float distribution by telecom type

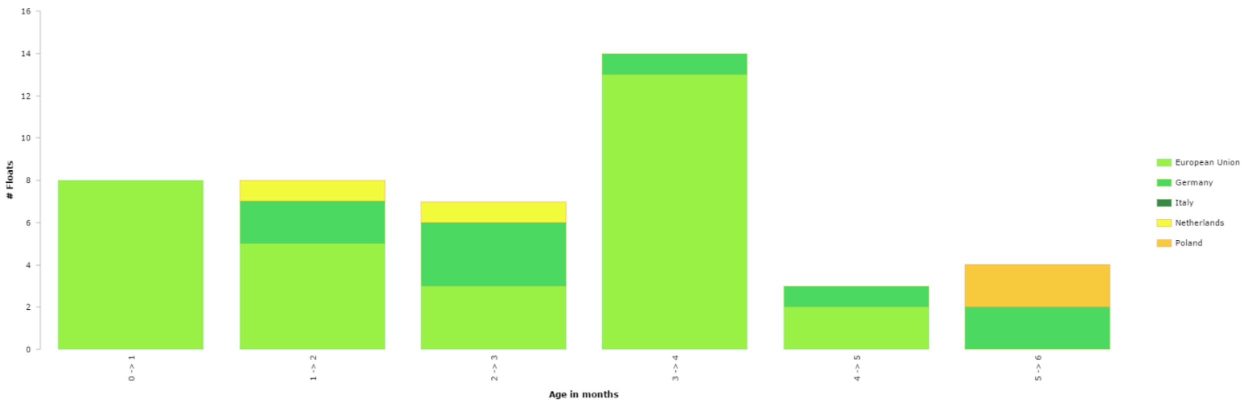


Figure 20: MOCCA float age distribution by country

In terms of observations we have **currently 544 MOCCA float observations** (= CTD profiles). The data is distributed to the GDAC within 24 hours after each float cycle, except for the very first cycles where it takes some times to set up the metadata and data.

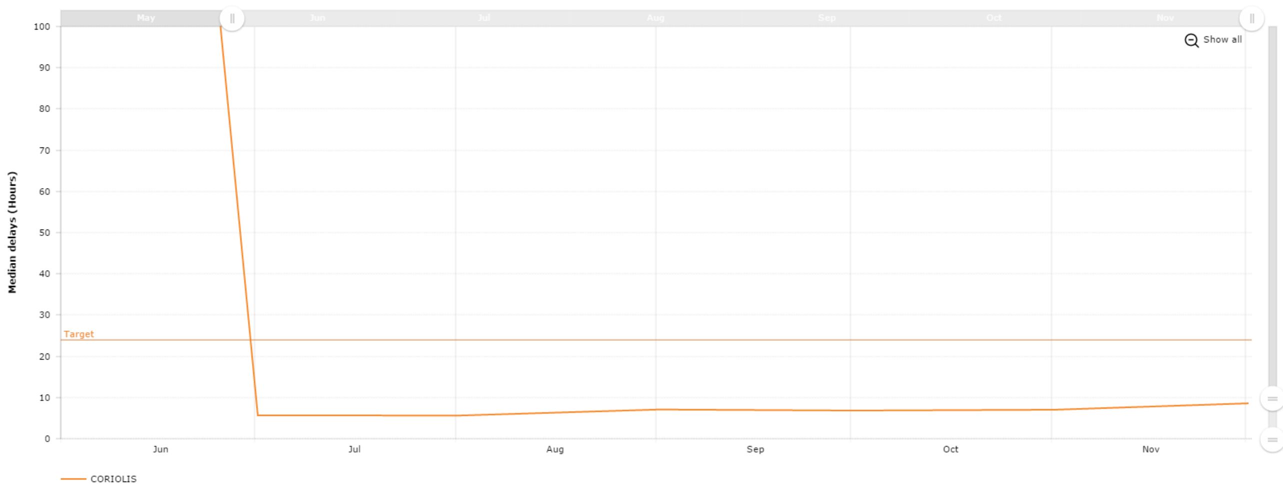


Figure 21: MOCCA monthly median delays at Coriolis GDAC in 2016

6. CONCLUSION

At sea monitoring of MOCCA floats is well under way. A review of existing tools has been made by the ERIC and some tools are already in use (Coriolis, AIC, provider and manufacturer software). A survey has been issued among Euro-Argo and MOCCA partners to gather current practices and further needs. This will be used in the coming months to enhance the Coriolis tools, especially concerning functional and technical monitoring with the setup of dashboards and alerts based on identified key float parameters.

Monthly and/or annual float health behaviour report will be prepared by the ERIC and in-depth analysis with national float experts will be carried out on case of major failures.

To date the MOCCA fleet is working very well and only 1 float has CTD measurement problems. As it is still functional ERIC will try to recover the float in the spring or summer 2017 to investigate the problem.