

EUROPEAN COMMISSION Executive Agency for Small and Medium-sized Enterprises (EASME)

Department A - COSME, H2020 SME and EMFF Unit A3 - EMFF

#### Agreement number: EASME/EMFF/2015/1.2.1.1/SI2.709624

Project Full Name: Monitoring the Ocean Climate Change with Argo

# **European Maritime and Fisheries Fund (EMFF)**

# MOCCA

# D3.3.2 Description of the at sea monitoring procedure (revised)

Circulation:	CO: Confidential, only for members of the consortium (including the Commission Services)			
Lead partner:	Euro-Argo ERIC Central Infrastructure			
Contributing partners: Authors: Quality Controllers: Version: Reference	BSH, BODC, OGS Romain Cancouët, Sylvie Pouliquen Grigor Obolensky 1.0 D3.3.2 Description of the at sea monitoring procedure			
Date:	(revised)_v1.0.docx 01.10.2017			

European Research Infrastructure (2014/261/EU)





#### ©Copyright 2016: The MOCCA Consortium

#### Consisting of:

Organisation/Natural person	Represented by	Statute	Contributing entities <sup>1</sup>
Euro-Argo ERIC	N/A	Coordinator	N/A
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
The Kingdom of Norway	IMR	Observer	N/A
The Republic of Poland	IOPAN	Observer	N/A

This document may not be copied, reproduced, or modified in whole or in part for any purpose without written permission from the MOCCA Consortium. In addition to such written permission to copy, reproduce, or modify this document in whole or part, an acknowledgement of the authors of the document and all applicable portions of the copyright notice must be clearly referenced.

All rights reserved.

This document may change without notice.

#### **Document History**

Version <sup>2</sup>	Issue Date	Stage	Content and Changes
0.1	01.03.2017	Draft	Initial document creation
0.2	29.06.2017	Draft	Revision
0.3	01.08.2017	QC	For internal quality control
1.0	01.10.2017	Final	Final version for submission

<sup>&</sup>lt;sup>1</sup> As indicated in the "Technical and Scientific description of the Euro-Argo ERIC" July 2013 attached to the Euro-Argo Statutes.

<sup>&</sup>lt;sup>2</sup> Integers correspond to submitted versions.



# **Table of Contents**

1.	INTRO	DDUCTION						
2.	TIMEI	TIMELINE6						
3.	DESCI	RIPTION OF THE TOOL	7					
	3.1. A	CCESS PLATFORM						
	3.1.1.	Main information	8					
	3.1.2.	Detailed information						
	3.1.3.	Technical parameters						
	3.2. A	CCESS DASHBOARD						
	3.2.1.	Active floats table						
	3.2.2.	All floats table						
	3.2.3.	Dead and deployed floats						
	3.2.4.	Fleet status						
	3.2.5.	Fleet age						
	3.2.6.	Functional monitoring						
4.	TECH	NICAL ALERTS	28					
	4.1. St	UMMARY						
	4.2. C	ONFIGURATION FILE FOR ALERTS						
	4.3. E	XAMPLE OF ALERTS TRIGGERED FOR MOCCA FLOATS						
5.	ROAD	MAP	34					
	5.1. B	UG REPORT	35					



# **Table of Figures**

	5
FIGURE 2: LIST OF ACTIVE ARGO FLOATS AND ACCESS TO PLATFORM OR DASHBOARD WEBPAGES.	7
FIGURE 3: FLOAT WEBPAGE - MAIN TAB WITH BASIC METADATA, DATA GRAPHS AND MAP.	8
FIGURE 4: FLOAT WEBPAGE - MAIN TAB WITH MAP INSET FOLDED AND REORGANISATION OF DATA GRAPHS.	9
FIGURE 5: PLOT OF CTD PROFILES OF A SPECIFIC CYCLE AND DATA EXPORT.	. 10
FIGURE 6: FLOAT WEBPAGE - DETAILED INFORMATION TAB WITH ALL METADATA ORGANISED INTO CATEGORIES	. 11
FIGURE 7: FLOAT WEBPAGE – DETAILED INFORMATION TAB WITH SOME METADATA SUB-CATEGORIES UNFOLDED. THE	
STANDARDIZED METADATA FIELD IS DESCRIBED ON MOUSE-OVER	. 11
FIGURE 8: FLOAT WEBPAGE - DETAILED INFORMATION TAB WITH MISSION CONFIGURATIONS. EACH PARAMETER THAT H	AS
CHANGED ACROSS FLOAT LIFE IS LISTED IN THE TABLE (ROW), AND THE CORRESPONDING VALUE FOR EACH CYCLE	OR
GROUP OR CYCLES (FIRST ROW) IS DISPLAYED (COLUMN).	. 12
FIGURE 9: EXISTING DEPLOYMENT SHEET VERSIONS AT CORIOLIS DATA CENTRE (TOP) AND EXAMPLE OF A MOCCA ARY	VOR
IRIDIUM DEPLOYMENT SHEET WITH METADATA CATEGORIES (BOTTOM)	. 13
FIGURE 10: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB.	. 13
FIGURE 11: STANDARD ARGO MISSION CYCLE PHASES.	. 14
FIGURE 12: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH DESCENT TO PARK GRAPHS UNFOLDED	. 15
FIGURE 13: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH DRIFT GRAPHS UNFOLDED.	. 15
FIGURE 14: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH DESCENT TO PROFILE GRAPHS UNFOLDED	. 16
FIGURE 15: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH PROFILE DRIFT GRAPH UNFOLDED.	. 16
FIGURE 16: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH ASCENT TO SURFACE GRAPH UNFOLDED	. 17
FIGURE 17: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB WITH SURFACE PRESSURE OFFSET CORRECTION AND BATTE	ERY
VOLTAGE.	. 17
FIGURE 18: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB FOR DATA TRANSMISSION. EXAMPLE FOR A MOCCA ARG	OS
TRANSMISSION WITH THE COMPARISON BETWEEN EMITTED AND RECEIVED FRAMES (LEFT) FOR DIFFERENT	10
MEASURING PHASES. THE TRANSMISSION TIME ON SURFACE FOR EACH CYCLE IS ALSO MONITORED (RIGHT)	. 18
FIGURE 19: FLOAT WEBPAGE – TECHNICAL PARAMETERS TAB FOR DATA TRANSMISSION. EXAMPLE FOR A MOUCA ARG	05
MESSAGES THAT HAVE A COOD CPC	10
FIGURE 20: FLOAT WERDAGE_ TECHNICAL DADAMETERS TAR FOR GPS DOSITIONING	10
FIGURE 21. FI FOR TO ASHROADD - LISTING	20
FIGURE 22: FI FET DASHBOARD – LISTING: SELECTION OF COLUMN FIELDS	. 20
FIGURE 23: FI FET DASHBOARD – LISTING WITH ALERTS	21
FIGURE 74' FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS	22
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE.	. 22
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE FIGURE 26: FLEET DASHBOARD – STATUS	. 22 . 23 . 23
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION	. 22 . 23 . 23 . 23
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION	. 22 . 23 . 23 . 24 . 24
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION	. 22 . 23 . 23 . 24 . 24 . 24
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE.	. 22 . 23 . 23 . 24 . 24 . 25 . 26
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS.	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS FIGURE 32: FLAG MISSINGCYCLE LOGICAL ALERT	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT. FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT.	. 22 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 30: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL,	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT. FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT. FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL, FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT. FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT. FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL, FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS.	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT. FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT. FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL, FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS. FIGURE 35: FLAG_PARK_IMMERSIONDRIFTOUTTOLERANCE_LOGICAL AND FLAG_IRREGULARDRIFT_LOGICAL	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30
<ul> <li>FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS.</li> <li>FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE.</li> <li>FIGURE 26: FLEET DASHBOARD – STATUS</li></ul>	. 22 . 23 . 23 . 24 . 24 . 25 . 26 . 27 . 30 . 30 . 31
FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS. FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE. FIGURE 26: FLEET DASHBOARD – STATUS FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE. FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS. FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT. FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT. FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL, FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS. FIGURE 35: FLAG_PARK_IMMERSIONDRIFTOUTTOLERANCE_LOGICAL AND FLAG_IRREGULARDRIFT_LOGICAL ALERTS. FIGURE 36: FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND	. 22 . 23 . 23 . 24 . 24 . 24 . 25 . 26 . 27 . 30 . 30 . 31 . 32
<ul> <li>FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS.</li> <li>FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE.</li> <li>FIGURE 26: FLEET DASHBOARD – STATUS</li> <li>FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION</li> <li>FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION</li> <li>FIGURE 29: FLEET DASHBOARD – PROFILE LENGTH DISTRIBUTION</li> <li>FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE</li> <li>FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS.</li> <li>FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT.</li> <li>FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT.</li> <li>FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL,</li> <li>FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND</li> <li>FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 36: FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND</li> <li>FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND</li> <li>FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND</li> <li>FLAG_PROFILEMMERSIONDRIFTOUTTOLERANCE_LOGICAL AND</li> <li>FLAG_PROFILEMAXPRESSUREANOMALY_LOGICAL ALERTS.</li> </ul>	22 23 24 24 25 26 27 30 30 31 32 32
<ul> <li>FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS.</li> <li>FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE.</li> <li>FIGURE 26: FLEET DASHBOARD – STATUS</li> <li>FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION.</li> <li>FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION</li> <li>FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION</li> <li>FIGURE 30: FLEET DASHBOARD – FUNCTIONAL MONITORING TABLE.</li> <li>FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS.</li> <li>FIGURE 32: FLAG_MISSINGCYCLE_LOGICAL ALERT.</li> <li>FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT.</li> <li>FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL,</li> <li>FLAG_DESCENTTOPARK_STABILIZATIONPROBLEM_LOGICAL AND</li> <li>FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 35: FLAG_PARK_IMMERSIONDRIFTOUTTOLERANCE_LOGICAL AND</li> <li>FLAG_PROFILEMAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 36: FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND</li> <li>FLAG_PROFILEMAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 37: FLAG_ATPROFILEDEPTH_DRIFTOUTTOLERANCE_LOGICAL ALERT.</li> </ul>	22 23 24 24 25 26 27 30 30 31 32 32 33
<ul> <li>FIGURE 24: FLEET INDEX TABLE WITH BASIC METADATA AND ACTIVE/DEAD STATUS.</li> <li>FIGURE 25: FLEET DASHBOARD – NUMBER OF DEPLOYED AND DEAD FLOATS IN A TIMELINE.</li> <li>FIGURE 26: FLEET DASHBOARD – STATUS</li> <li>FIGURE 27: FLEET DASHBOARD – AGE DISTRIBUTION</li> <li>FIGURE 28: FLEET DASHBOARD – CYCLE DISTRIBUTION</li> <li>FIGURE 29: FLEET DASHBOARD – CYCLE DISTRIBUTION</li> <li>FIGURE 30: FLEET DASHBOARD – FONCTIONAL MONITORING TABLE.</li> <li>FIGURE 31: FLEET DASHBOARD – GANTT CHART WITH MAIN ALERTS.</li> <li>FIGURE 32: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT.</li> <li>FIGURE 33: FLAG_MISSINGVERTICALPROFILE_LOGICAL ALERT.</li> <li>FIGURE 34: FLAG_DESCENTTOPARK_TOOFAST_LOGICAL,</li> <li>FLAG_DESCENTTOPARK_MAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 35: FLAG_PARK_IMMERSIONDRIFTOUTTOLERANCE_LOGICAL AND</li> <li>FLAG_PROFILEMAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 36: FLAG_DESCENTTOPROFILE_TOOFAST_LOGICAL AND</li> <li>FLAG_PROFILEMAXPRESSUREANOMALY_LOGICAL ALERTS.</li> <li>FIGURE 37: FLAG_ATPROFILE_DOPTH_DRIFTOUTTOLERANCE_LOGICAL ALERTS.</li> <li>FIGURE 37: FLAG_ATPROFILE_DOPTH_DRIFTOUTTOLERANCE_LOGICAL ALERTS.</li> <li>FIGURE 37: FLAG_ATPROFILEDEPTH_DRIFTOUTTOLERANCE_LOGICAL ALERTS.</li> <li>FIGURE 37: FLAG_ATPROFILEDEPTH_DRIFTOUTTOLERANCE_LOGICAL ALERTS.</li> </ul>	22 23 24 25 26 27 30 30 31 32 32 33 33



# **1. INTRODUCTION**

This document defines MOCCA at sea monitoring procedures defined 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 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 requirement 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.

The present document is describing the major revision of Coriolis webpages performed in 2017, that now fulfil the monitoring objectives of Euro-Argo for the MOCCA fleet.



# **2. TIMELINE**

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 followon their floats after deployment. It was described in the first version of this deliverable and thus not repeated here.

Then **user requirements concerning technical monitoring** were collected from questionnaire and meetings (2016). It was decided at the Management Board in October 2016 to **enhance the Coriolis existing tools** for at sea monitoring.

At the beginning of 2017 the ERIC technical team organised a **review of actions with Coriolis** Data Centre, and a **proof of concept** was presented to the Management Board in March 2017. During spring 2017 a massive work was undertaken by the **computer team at Ifremer for both visualisation and programming**, driven by the **specifications** of ERIC team. Corrections of existing alerts were made, new alerts were defined and implemented into the data flow.

In June 2017, a **first version of the new at sea monitoring website was released**, addressing many new features and allowing effective monitoring of the MOCCA fleet. **The tool will be presented at the Euro-Argo User Meeting in Paris in July 2017**, and feedbacks will be collected for further improvements.

Some corrections and evolutions are currently implemented and another website release is planned in December 2017 and early 2018.

The tool is available at <a href="http://www.ifremer.fr/argoMonitoring/">http://www.ifremer.fr/argoMonitoring/</a>

<u>NOTE</u>: the tool has been specially designed and tested for MOCCA fleet (NKE Arvor floats 2016); some of the functionalities will work for other float versions, other not. It is scheduled under Euro-Argo coordination to extend the tool to all the European floats.



# **3. DESCRIPTION OF THE TOOL**

The Coriolis tool for at sea monitoring of Argo floats is first displaying the list of WMO numbers of active (or all) floats. The tool is divided into 2 parts:

- a **platform** webpage that details a single float, with metadata, data graphs, a map and plots of main technical parameters,
- a **dashboard** that allows the monitoring of a set of floats.

							Platfo	rm Code	ACCESS PLAT	FORM
	liat						Group	Code	ACCESS DASH	
FIOal	. LISI									
ACTIVE	ALL									
Active										
ATLANTIC	OCEAN (1110)	INDIAN OCEAN (	809) PACIFIC	OCEAN (1927)						
1900954	<u>1900957</u>	<u>1901204</u>	<u>1901210</u>	<u>1901251</u>	<u>1901268</u>	<u>1901272</u>	<u>1901273</u>	<u>1901293</u>	<u>1901294</u>	<b>^</b>
<u>1901295</u>	<u>1901296</u>	<u>1901297</u>	<u>1901298</u>	<u>1901304</u>	<u>1901305</u>	<u>1901313</u>	<u>1901314</u>	<u>1901324</u>	<u>1901361</u>	
<u>1901365</u>	<u>1901385</u>	<u>1901415</u>	<u>1901453</u>	<u>1901481</u>	<u>1901491</u>	<u>1901495</u>	<u>1901501</u>	<u>1901504</u>	<u>1901520</u>	
<u>1901529</u>	<u>1901530</u>	<u>1901531</u>	<u>1901533</u>	<u>1901538</u>	<u>1901539</u>	<u>1901540</u>	<u>1901563</u>	<u>1901597</u>	<u>1901598</u>	
<u>1901600</u>	<u>1901601</u>	<u>1901602</u>	<u>1901603</u>	<u>1901616</u>	<u>1901617</u>	<u>1901618</u>	<u>1901619</u>	<u>1901620</u>	<u>1901621</u>	
<u>1901622</u>	<u>1901623</u>	<u>1901624</u>	<u>1901626</u>	<u>1901627</u>	<u>1901628</u>	<u>1901629</u>	<u>1901632</u>	<u>1901637</u>	<u>1901638</u>	
<u>1901639</u>	<u>1901641</u>	<u>1901642</u>	<u>1901644</u>	<u>1901646</u>	<u>1901647</u>	<u>1901650</u>	<u>1901651</u>	<u>1901654</u>	<u>1901655</u>	
<u>1901657</u>	<u>1901660</u>	<u>1901661</u>	<u>1901665</u>	<u>1901667</u>	<u>1901668</u>	<u>1901670</u>	<u>1901672</u>	<u>1901675</u>	<u>1901681</u>	
<u>1901683</u>	<u>1901685</u>	<u>1901687</u>	<u>1901688</u>	<u>1901689</u>	<u>1901694</u>	<u>1901703</u>	<u>1901704</u>	<u>1901708</u>	<u>1901710</u>	
<u>1901711</u>	<u>1901712</u>	<u>1901713</u>	<u>1901714</u>	<u>1901716</u>	<u>1901717</u>	<u>1901718</u>	<u>1901719</u>	<u>1901720</u>	<u>1901721</u>	
<u>1901722</u>	<u>1901727</u>	<u>1901728</u>	<u>1901730</u>	<u>1901731</u>	<u>1901732</u>	<u>1901733</u>	<u>1901784</u>	<u>1901785</u>	<u>1901806</u>	
<u>1901807</u>	<u>1901814</u>	<u>1901815</u>	<u>1901816</u>	<u>1901817</u>	<u>1901818</u>	<u>1901819</u>	<u>1901820</u>	<u>1901822</u>	<u>1901824</u>	
<u>1901825</u>	<u>1901826</u>	<u>1901827</u>	<u>1901828</u>	<u>1901829</u>	<u>1901830</u>	<u>1901832</u>	<u>1901833</u>	<u>1901836</u>	<u>1901849</u>	
<u>1901854</u>	<u>1901855</u>	<u>1901856</u>	<u>1901857</u>	<u>1901859</u>	<u>1901860</u>	<u>1901861</u>	<u>1901863</u>	<u>1901865</u>	<u>1901866</u>	
<u>1901867</u>	<u>1901868</u>	<u>1901869</u>	<u>1901870</u>	<u>1901881</u>	<u>1901882</u>	<u>1901883</u>	<u>1901884</u>	<u>1902060</u>	<u>1902061</u>	
<u>1902062</u>	<u>1902063</u>	<u>1902064</u>	<u>1902065</u>	<u>1902066</u>	<u>1902067</u>	<u>1902068</u>	<u>1902069</u>	<u>2902178</u>	2902402	
<u>3900309</u>	<u>3900310</u>	3900384	3900385	<u>3900559</u>	<u>3900560</u>	3900654	3900764	<u>3900772</u>	<u>3901017</u>	
<u>3901037</u>	<u>3901038</u>	<u>3901039</u>	<u>3901040</u>	<u>3901041</u>	<u>3901042</u>	<u>3901043</u>	<u>3901062</u>	<u>3901063</u>	<u>3901064</u>	
<u>3901089</u>	<u>3901105</u>	<u>3901106</u>	<u>3901108</u>	<u>3901109</u>	<u>3901110</u>	<u>3901111</u>	<u>3901112</u>	<u>3901113</u>	<u>3901114</u>	
<u>3901116</u>	<u>3901211</u>	<u>3901219</u>	<u>3901220</u>	<u>3901221</u>	<u>3901222</u>	<u>3901223</u>	<u>3901224</u>	<u>3901225</u>	<u>3901226</u>	
<u>3901227</u>	<u>3901228</u>	<u>3901229</u>	<u>3901230</u>	<u>3901236</u>	<u>3901237</u>	<u>3901238</u>	<u>3901239</u>	<u>3901240</u>	<u>3901241</u>	
<u>3901242</u>	<u>3901492</u>	<u>3901496</u>	<u>3901497</u>	<u>3901498</u>	<u>3901499</u>	<u>3901500</u>	<u>3901501</u>	<u>3901502</u>	<u>3901503</u>	
<u>3901504</u>	<u>3901505</u>	<u>3901506</u>	<u>3901507</u>	<u>3901509</u>	<u>3901510</u>	<u>3901511</u>	<u>3901512</u>	<u>3901513</u>	<u>3901514</u>	
<u>3901515</u>	<u>3901516</u>	<u>3901519</u>	<u>3901520</u>	<u>3901521</u>	<u>3901522</u>	<u>3901523</u>	<u>3901524</u>	<u>3901525</u>	<u>3901526</u>	
<u>3901527</u>	<u>3901528</u>	<u>3901529</u>	<u>3901532</u>	3901533	3901534	<u>3901535</u>	<u>3901588</u>	3901589	<u>3901590</u>	
<u>3901591</u>	<u>3901592</u>	<u>3901593</u>	<u>3901594</u>	<u>3901595</u>	<u>3901596</u>	<u>3901598</u>	<u>3901601</u>	<u>3901602</u>	<u>3901603</u>	
3901604	3901605	3901606	3901607	3901608	3901609	3901610	3901611	3901612	3901619	
<u>3901620</u>	3901621	3901623	3901625	3901626	3901627	3901628	3901838	3901839	3901840	
3901841	3901842	3901843	3901844	3901845	3901846	3901847	3901848	3901849	3901850	
3901851	3901852	3901853	3901854	3901855	3901856	3901857	3901858	3901859	3901860	
3901861	3901862	3901863	3901864	3901865	3901866	3901867	3901868	3901869	3901870	
3901871	3901872	3901873	3901874	3901875	3901876	3901877	3901878	3901879	3901880	-

Figure 2: List of active Argo floats and access to platform or dashboard webpages.

The tool is using the Coriolis database managed by the Coriolis DAC.



# 3.1. Access platform

One can access a specific platform (Argo float) webpage by clicking on its WMO (e.g. 3901864) number from the main page or through the following address: <u>http://www.ifremer.fr/argoMonitoring/float/3901864</u>



Figure 3: Float webpage - main tab with basic metadata, data graphs and map.

#### 3.1.1. Main information

The "main information" tab displays the most important float metadata with:

- WMO number and link to the JCOMMOPS/AIC webpage
   <u>http://www.jcommops.org/board/wa/InspectPtfModule?ref=3901864</u>
- Float serial number, type of float, transmission system, owner and sensors available
- Deployment information
- Float stations and cycles performed

The map inset can be displayed or not, and shows the float stations positions with cycle number and date. The bathymetry and coastline layers are available on the background.





Figure 4: Float webpage - main tab with map inset folded and reorganisation of data graphs.

CTD data graphs (static) are presented, with for instance sections charts of Temperature and Salinity over time and pressure, overlayed profiles or T/S diagram. Plots of individual profiles open in a popup when clicking of the cycle number.





Platform Code

-loat	3901864	+-
MAIN INFORM	Cycle Float 3901864, Cycle #17 ×	
PR_LAUNCH_D 08/09/2016 22:	Exports : Ascending profiles in Netcdf in Ascii	
Cycles Acti	Station dates Ascending profile : 16/02/2017 11:51:00 Ascending profile : 16/02/2017 11:51:00	
Active	Station graphs Ascending profile Enat 33001864, Cycle #17 ×	
Data	0.00 Coriolis data centre 26/06/2017	
T/S Dia	0.25 Float 3901864, Cycle #17, 16/02/2017 11:51:00, A Float 3901864, Cycle #17, 16/02/2017 11:51:00, A Sea temperature - degree, Celuius Practical salinity - psu 0.50	
Argo f	250 0.75 - 500 - 5	
-96 scale Idegree	1.00	
a nys y anteadar 2	1,50	7,26
80 0 84.5	2,00 - Coriolis data centre 26/06/2017 L5 L00, A	7 12:05:00*
	Corrolis dat 50 Float 3901864, Cycle 75 1.0 5 5 50	Dis aster
Section	n g g 555 oat 3902864 between 09/09/2016 and 16/06/2017 Argo float 3901864 between 09/09/2016 and 16/06/2017	
	100 km	ar and

Figure 5: Plot of CTD profiles of a specific cycle and data export.

#### 3.1.2. Detailed information

The "detailed information" tab displays the all the metadata available. It is hierarchized with categories:

- Float that contains general information and identification fields,
- Deployment information, •
- Float configuration at the beginning of the mission, and now also the settings that have changed • across float life with for instance iridium commands.
- ٠ Activity that shows the cycle data and plots of each individual technical parameter.

Each category is divided into sub-categories with for instance Mission Configuration or Mission Technical parameters. One can unfold any sub-category to display the desired information.



				Platform Code	ACCESS PLATFORM
Float 390	1864				≡ - +
MAIN INFORMATIONS	TECHNICAL PARAMETERS	DETAILED INFORMATIONS			
Float			-		
🕀 ARGO Project Inform	ation				
Platform Information	I				
⊕ Sensors					
Physical parameters					
Deployment					
Deployment Informa	tion				
Float Configura	ation				
Hission Configuration	n Parameters				
Mission Technical Par	rameters				
Acceptance					
Mission Programmin	g Remarks				
Activity					
Activity					
Technical Parameters	5				

Figure 6: Float webpage - detailed information tab with all metadata organised into categories.

				Platform Coo
Float 390	1864			
MAIN INFORMATIONS	TECHNICAL PARAMETERS	DETAILED INFORMAT	TIONS	
Name CTD_CNDC	Maker SBE	Model SBE41CP	Serial number 8102	
Physical parameters				
Deployment • Deployment Informa	ation			
Float Configur	ation n Parameters			
Mission Technical Pa	rameters			
PRCFG_Surf_valve_max_duration 800		PRCFG_Depth_valve_max_volume 11		PRCFG_Depth_pump_max_duration 290
PRCFG_Asc_pump_max_duration 720		PRCFG_Surf_pump_duration 30000		PRCFG_Gap_order_go_delta_pres
PRCFG_Max_pressure 2100		PRCFG_Surf_valve_start_pressure		PRCFG_Descent_start_pressure
PRCFG_Gap_order_delta_position		PRCFG_Grounded_volume 36		PRCFG_Grounded_waiting_pres 200
PRCFG_Gap_order_keep_delta_pres		PRCFG_Descent_speed 25		PRCFG_Imm_increment_pressure

Figure 7: Float webpage – detailed information tab with some metadata sub-categories unfolded. The standardized metadata field is described on mouse-over.



			Platfor	m Code	ACCESS PLATFORM
Float 3901964					: - +
MAIN INFORMATION TECHNICAL PARAMETERS DETAI	LED INFORMATION				
Mission Technical Parameters at deployment					
€Acceptance					
Mission Programming Remarks					
OMission Configurations					
Cycles #	1	2	3,4,5,6,7,8,9,10,1 2,13,14,15,16,17, 18,19,20,22,23,24 ,25,26,27,28,29,3 0,32,33,34	11,21,31	35
CONFIG_CycleTime_hours	50.5	240	24	24	240
CONFIG_DescentToParkPresSamplingTime_seconds	10	D	0	0	0
CONFIG_Direction_NUMBER	3	1	1	1	1
CONFIG_InternalPressureCalibrationCoef2_NUMBER	-216.25	-216	-216	-216	-216
CONFIG_ParkPressure_dbar	1000	1000	300	300	300
CONFIG_ProfilePressure_dbar	2000	2000	300	2000	2000

Figure 8: Float webpage – detailed information tab with mission configurations. Each parameter that has changed across float life is listed in the table (row), and the corresponding value for each cycle or group or cycles (first row) is displayed (column).

**Metadata information is hierarchised according to the relevant deployment sheet** (available at Coriolis) **for a specific float version**. To date a dozen of deployment sheets are available for most recent float versions of Arvor, Apex and Nova floats.

Nom	Modifié le	Туре	Taille
_VersionsLogiciellesFlotteursArgo_20160707.xlsx	07/07/2016 18:05	Feuille de calcul	21 Ko
TEMPLATE_1_V4.51_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	105 Ko
TEMPLATE_2_V5.9_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	115 Ko
TEMPLATE_3_V4.42_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	116 Ko
TEMPLATE_4_V5.7_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	116 Ko
TEMPLATE_5_V5.41_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	103 Ko
TEMPLATE_6_V4.52_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	108 Ko
TEMPLATE_7_V5.61_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	111 Ko
TEMPLATE_8_V4.53_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	105 Ko
TEMPLATE_9_V4.54_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	112 Ko
TEMPLATE_10_V5.43_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	104 Ko
TEMPLATE_101_Apex_Argos_CTD_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	90 Ko
TEMPLATE_201_V1.0_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	94 Ko
TEMPLATE_202_V2.0_20160712.xlsm	13/07/2016 11:54	Feuille de calcul	99 Ko



	5·ở·🔓 =				TEMPLATE_8	_V4.53_20160712.xlsm	n - Excel	Romain CANCOUET, Euroarg
Fichi	er Accueil Insérer Mise	en page Formule	es Données Révision Affichage	Développeur Foxit PDF	♀ Dites-nous ce que vou			
<b>f</b>	& Couper	Calibri -		envoyer à la ligne automatiquemer	nt Standard	-		Normal_Feuil1 Normal_Feuil2
Coller	E Copier *	675.	( ) · A · = = = = = = = = = = = = = = = = =	rionner et centrer . T		.00 Mise en forme	Mettre sous forme	Normal Insatisfaisant Insérer Supprimer Format
*	🚿 Reproduire la mise en forme	• • • ·		sionna et centre	=, yo ,o .	conditionnelle	<ul> <li>de tableau *</li> </ul>	v v v Effacer v
	Presse-papiers 🕞	Police	G Alig	nement	G Nombre	Fg.		Styles Cellules
D32	▼ : × √ f <sub>s</sub>	DEPLOY_MISS	ION					
	_		-					
_ A 1 ~	B SECTION Y	C DIMLEVEL V	D KEY Y	E		F DEFAULT VALUE	G UNIT V	H SHORT NAME *
5 8	ARGO PROJECT INFORMATION	1	PLNAME	VALUE	V. Thierry	DEFAULT VALUE	Unit 1	Name of the Principal Investigator of the float
6 8	ARGO PROJECT INFORMATION	1	PROJECT_NAME		RREX ASFAR			Name of the project which operates the profiling float
7 8	ARGO PROJECT INFORMATION	1	FLOAT_OWNER		IFREMER			The owner of the float (may be different from the data centre and operating institution)
8 8	ARGO PROJECT INFORMATION	1	OPERATING_INSTITUTION		IFREMER			The operating institution of the float (may be different from the float owner and data centre)
10 8	PLATFORM INFORMATION	1	PLATEORM FAMILY		FLOAT			Category of instrument
11 8	PLATFORM INFORMATION	1	PLATFORM_TYPE		ARVOR			Type of float
12 8	PLATFORM INFORMATION	1	WMO_INST_TYPE		844			Instrument type from WMO code table 1770
13 8	PLATFORM INFORMATION	1	PLATFORM_MAKER		NKE			Name of the manufacturer
14 8	PLATFORM INFORMATION	1	BATTERY_TYPE		Lithium			Describes the type of battery packs in the float
16 8	PLATFORM INFORMATION	1	ARGOS PROGRAM		2412			Areas program number
17 8	PLATFORM INFORMATION	1	FLOAT SAIL ID		14AR62			Float sail ID
18 8	PLATFORM INFORMATION	1	FLOAT_SERIAL_NUMBER		OIN-014-AR-62			Float serial number
19 8	PLATFORM INFORMATION	1	CONTROLLER_BOARD_TYPE_PRIMARY		1535			Describes the type of controller board
20 8	PLATFORM INFORMATION	1	CONTROLLER_BOARD_SERIAL_NO_PRIMARY		C134239_0027			The serial number for the primary controller board
21 8	PLATFORM INFORMATION	1	WMO_NUMBER		6901723			Float WMO number
22 8	PLATFORM INFORMATION	1	BLUETOOTH NUMBER		2014.05.27			Float Argos Id (decimal)
24 8	PLATFORM INFORMATION	1	FIRMWARE VERSION		5605A07			Float firmware version
25 8	PLATFORM INFORMATION	1	STANDARD_FORMAT_ID		102003			Standardised format number as described in the online reference table:
26 8	PLATFORM INFORMATION	1	MANUAL_VERSION		60-17-001			Float manual version date or number
27 8	PLATFORM INFORMATION	1	FIRMWARE_CHECKSUM					Firmware checksum (copy of PRE_DEPLOY_FIRMWARE_CHECKSUM parameter value)
28 8	PLATFORM INFORMATION	1	CORIOLIS_DECODER_VERSION		9.53			Coriolis decoder version
30 8	DEPLOYMENT CHECKS	1	DEPLOY VISUAL CHECK		OK		1	Comment after visual inspection of the float
31 8	DEPLOYMENT CHECKS	1	DEPLOY_BALLAST_CHECK		OK			Comment after visual inspection of the ballast
32 8	DEPLOYMENT INFORMATION	1	DEPLOY MISSION	1	RREX 2015			Deployment mission name (cruise name)
33 8	DEPLOYMENT INFORMATION	1	DEPLOY_SHIP	I	N/O Thalassa			Deployment ship name
54 8	DEPLOYMENT INFORMATION	1	DEPLOY_OPERATOR_NAME		Leizour / Le Reste			Name of the operator in charge of the deployment
36 9	DEPLOTMENT INFORMATION	1	DEPLOY_PROFILE_DONE		01/09/2015 12:00:00			CID or XBI profile done during deployment (yes/no)
37 8	DEPLOYMENT INFORMATION	i	DEPLOY FLOAT INTERNAL CHECK		N/A			Comment on float internal checks (valve and pump actions, argos transmission check)
38 8	DEPLOYMENT INFORMATION	1	DEPLOY_TIME		01/09/2015 13:00:00			Deployment time ( dd/mm/yyyy hh:mm )
39 8	DEPLOYMENT INFORMATION	1	DEPLOY_LATITUDE		58° 33' N			Deployment latitude (dd®mm,mm N/S or dd®mm'ss® N/S)
40 8	DEPLOYMENT INFORMATION	1	DEPLOY_LONGITUDE		30" 10' 48" W			Deployment longitude (ddd*mm,mm E/W or ddd*mm'ss* E/W)
41 8 42 0	DEPLOYMENT INFORMATION	1	DEPLOY_BUDYANCY		N/A			Buoyancy description
43 8	DEPLOYMENT INFORMATION	1	DEPLOY_METHOD		N/A			Deployment method (release box, mandar, expendable cardboard, etc)
44 8	DEPLOYMENT INFORMATION	1	DEPLOY SHIP SPEED		N/A			Ship speed (kts)
45 8	DEPLOYMENT INFORMATION	1	DEPLOY_WIND_SPEED					Wind speed (Beaufort)
46 8	DEPLOYMENT INFORMATION	1	DEPLOY_SEA_STATE					Sea state (calm, smooth, slight, moderate, rough, very rough, high, very high, phenomenal)
47 8	DEPLOYMENT INFORMATION	1	DEPLOY_BATHYMETRY		1822			Bathymetry at deployment position (m)
48 8 49 0	DEPLOYMENT INFORMATION	1	DEPLOY_NB_DAYS_UNTIL_FIRST_ASCENDING_PROFILE	Specific ASEAR deployment	0 from con bottom (monring)			Number of days until the first ascending profile (copy of the PM2 parameter value)
8				VALIDATION				Intracemented as comment on the deployment
50								
51 8	SENSOR INFORMATION	1	SENSOR		CTD_PRES			Sensor name
52 8	SENSOR INFORMATION	1	SENSOR_MAKER		SBE			Sensor manufacturer
53 8	SENSOR INFORMATION	1	SENSOR_MODEL		SBE41CP			Sensor model
55 8	SENSOR INFORMATION	2	SENSOR_SEK/AL_NUMBER		CTD TEMP			Sensor sename
		· *	-		CID_ILMI			Nervan nerre

Figure 9: Existing deployment sheet versions at Coriolis data centre (top) and example of a MOCCA Arvor iridium deployment sheet with metadata categories (bottom).

#### 3.1.3. Technical parameters

The "technical parameters" tab is a brand-new feature of Coriolis website enhancement that shows a set of graphs dedicated to the technical monitoring of a float. Again, it was specifically designed for MOCCA Arvor float versions but could be extended to other float types with specifications from the technical experts.

The main technical parameters for the monitoring of MOCCA floats were defined by the ERIC Office, Coriolis deployment and data centre teams and Ifremer engineering department that have a great knowledge of NKE Arvor floats behaviour.

-loat 3901851	: +
MAIN INFORMATION TECHNICAL PARAMETERS DETAILED INFORMATION	
⊕Descent to Park	
⊕Drift	
⊕Descent to profile	
⊕Profile drift	
⊕Ascent to surface	
⊕Positioning	
⊕Data Transmission	
⊕Other tech parameters	

Figure 10: Float webpage – technical parameters tab.



It concerns:

- Float hydraulic and repositioning behaviour with for instance number of pump or solenoid valve actions during the different phases of float cycle (descent to park, drift etc.),
- Data transmission
- Positioning
- Battery voltage
- Surface pressure offset corrections

The graphs are displayed into categories corresponding to the different phases of float cycle:



Figure 11: Standard Argo mission cycle phases.

On the technical graphs, the x-axis represents always the cycle number of the float and the y-axis one or several technical parameters values for each cycle. Each parameter can be selected or unselected and the related values are displayed on mouse-over.



#### **Descent to Park**

The graphs display the maximum pressure values reached during this float phase, together with the number of pump and valve actions. Usually the float does not need to start the pump during this phase. The number of valve actions performed at surface to make the float sink is also represented, and we can see on Figure 12 that it is higher for the first 2 cycles and then the float "learns" about its buoyancy behaviour in the water column and adjust this number more closely.



Figure 12: Float webpage - technical parameters tab with Descent to Park graphs unfolded.

#### Drift

The graphs display the minimum, maximum and representative pressure values reached during this float phase, together with the number of pump and valve actions (during drift phase) and the number of float repositions. One can see on Figure 13 a yellow background for cycle 2, that corresponds to an alert defined when the float is repositioning during the drift phase. Alerts will be detailed later on in this document on section 4.



Figure 13: Float webpage - technical parameters tab with Drift graphs unfolded.



#### **Descent to Profile**

The graphs display the maximum pressure values reached by the float during this phase, together with the number of pump and valve actions. Usually the float does not need to start the pump during this phase. One can see on Figure 14 that the information "Grounded" is also shown when the float declared itself as stranded for this cycle.



Figure 14: Float webpage - technical parameters tab with Descent to Profile graphs unfolded.

#### Profile drift

The graph displays the number of repositions, valve/pump actions and minimum/maximum pressure values.

Float 3901864			Platform C	ode ACCESS PLATFOR
MAIN INFORMATIONS       TECHNICAL PARAMETERS       DETAILED INFORMATIONS            Descent to Park             Difit             Descent to profile             OProfile drift             Profile drift	Float 3901864			+
<ul> <li>Descent to Park</li> <li>Drift</li> <li>Descent to profile</li> <li>Profile drift</li> </ul>	MAIN INFORMATIONS	PARAMETERS DETAILED INFORMATIONS		
⊕ Drift     ⊕ Descent to profile	⊕Descent to Park			
Obscent to profile	⊕Drift			
OProfile drift  Profile drift - Hydraulic actions Coriolis data centre - 09/09/2016 20:00:00  3  2  3  2  3  2  3  3  3  4  3  5  5  5  5  5  5  5  5  5  5  5  5	⊕Descent to profile			
0         0         0         0         0         0           3000         2         4         6         10         12         14         16         18         20         22         24         26         28         0         0           NUMBER, RepositionsAt/PolicDeptic, COUNT         •	⊖Profile drift	Profile drift – Hydraul Coriolis data centre - 09/09/2 0 (fig) 2000 2 4 6 8 10 12 14 16 18 • NUMBER, ValveActionsDuringPr • NUMBER, ValveActionsDuringPr	lic actions 1016 20:00:00 3 2 2 2 2 2 2 2 2 2	

Figure 15: Float webpage - technical parameters tab with Profile Drift graph unfolded.



#### Ascent to surface

The graph displays the minimum and maximum pressure values together with the number of pump actions required to reach the surface from the profile pressure.



Figure 16: Float webpage - technical parameters tab with Ascent to surface graph unfolded

#### Other tech parameters

The **surface pressure offset correction** and the **battery voltage** when the pump is started at the profile pressure are represented. Jumps and drifts can thus be monitored easily.



Figure 17: Float webpage – technical parameters tab with surface pressure offset correction and battery voltage.



#### Data transmission

The data transmission graphs are different depending on the transmission system used: Argos or iridium. For iridium new technical parameters had to be defined, decoded by the Coriolis data centre and implemented in the TECH\_AUX part of the data flow.

• The **completeness of the transmission** for CTD data and parameter, hydraulic and technical messages can be monitored. As a general rule of thumb, the number of frames or messages emitted by the float is compared to the number of frames or messages received by the data centre. The CTD messages are divided into specific measuring phases (descending profile, park, ascending profile, near surface, in air etc.) of the float if applicable. The number and names of parameter, hydraulic and technical messages are likewise specific to a float version.



Figure 18: Float webpage – technical parameters tab for data transmission. Example for a MOCCA Argos transmission with the comparison between emitted and received frames (left) for different measuring phases. The transmission time on surface for each cycle is also monitored (right).

- The **surface transmission time** (defined as the time difference between first and last transmitted float messages assigned to the cycle) is plotted to monitor potential variations across float life.
- The data transmission quality (ARGOS only) can be assessed by the ratio between the number of messages received and the number of these messages that pass the CRC (cyclic redundancy check). It gives an indication on the presence of electronic noise for ARGOS transmission.
- The satellite coverage (number of messages received per time unit) will also be monitored for ARGOS.





Figure 19: Float webpage – technical parameters tab for data transmission. Example for a MOCCA Argos transmission with the ratio between the number of received messages and the number of received messages that have a good CRC.

#### Positioning

Information on **GPS performances** (so only for floats equipped with it, e.g. MOCCA Arvor iridium) will be collected: the time required to obtain a GPS fix and the validity of this fix.



*Figure 20: Float webpage- technical parameters tab for GPS positioning.* 

#### Alerts

Alerts are defined by the technical team monitoring the floats, based on thresholds, trends etc. on one or combination of these technical parameters. This will be further detailed in section 4 of the document.



## 3.2. Access dashboard

The other part of the Coriolis website concerns the monitoring of a fleet, i.e. a group of floats. Currently a fleet is identified by its "group code", which in Coriolis database regroups a list of floats identified by their WMO number.

The group code of MOCCA fleet (130 NKE Arvor iridium and 20 NKE Arvor Argos) is 632.

#### 3.2.1. Active floats table

The first tab of the dashboard is a **listing of all active floats** in a specific group code. A link to each individual float webpage (see section 3.1) is provided. **Basic float information** (serial number, transmission identification, float version, data centre) and **key information of the last cycle decoded** is presented. Column fields can be user-selected.

							Group Code	AC	CESS DASHBOARD
Mon	itoring	g At Sea						Dasł	board
🤻 0 tł	his week	🎗 0 this month	8	0 this year	오 0 this w	/eek	<b>9</b> 0 this month	<b>9</b> 78 this y	/ear
86 floats - 8 FLOAT MO	86 active on 13/ DNITORING	06/2017 FLOAT STATUS FLOAT	AGE	FUNCTIONAL MON	IITORING				
Real Providence	oat Status								
WMO	IMEI/Argos	Serial #	Float	DAC	Last Tx	Last Cycle #	Battery	Alert	Last cycle Pmax(dbar)
<u>3901838</u>	360309	AR2600- 16FR001	ARVOR	IF	20/06/2017 11:35:00	30	10.4		1979
<u>3901839</u>	360110	AR2600- 16FR002	ARVOR	IF	21/06/2017 11:35:00	37	10.5	0	1908
<u>3901840</u>	360211	AR2600- 16FR003	ARVOR	IF	24/06/2017 11:39:30	38	10.4		1990
<u>3901841</u>	360611	AR2600- 16FR004	ARVOR	IF	17/06/2017 11:40:00	32	10.5		2034
<u>3901842</u>	360411	AR2600- 16FR005	ARVOR	IF	17/06/2017 11:47:00	26	10.4		2031
<u>3901843</u>	360809	AR2600- 16FR006	ARVOR	IF	18/06/2017 11:45:00	26	10.5		1977
<u>3901844</u>	360911	AR2600- 16FR007	ARVOR	IF	22/06/2017 11:46:00	26	10.4		2005
<u>3901845</u>	360009	AR2600- 16FR008	ARVOR	IF	22/06/2017 11:53:00	37	10.4		2034
<u>3901846</u>	360910	AR2600- 16FR009	ARVOR	IF	19/06/2017 17:51:00	25	10.4		2026
<u>3901847</u>	360210	AR2600- 16FR010	ARVOR	IF	21/06/2017 20:51:00	25	10.3		1983
						Page:	1 <b>v</b> Rows per page:	10 🔻 1 - 10 0	of 86 < >

Figure 21: Fleet dashboard – listing

These key parameters have been defined by the deployment team and from the answers to the questionnaire issued in 2016:

- date, time and number of the last cycle decoded
- battery voltage
- maximum pressure of the last profile
- grounding flag for the last cycle
- alert flags for the last cycle



🎗 0 this week	🎗 0 this mo	onth	0 this year	오 0 this we	eek
floats - 86 active on 13/06	/2017				
FLOAT MONITORING FL	OAT STATUS	FLOAT AGE	FUNCTIONAL MON	ITORING	
Serial #					
🗩 Float					
DAC	Serial #	DAC	Last Tx	Last Cycle #	Battery
Last Tx	AR2600- 16FR001	IF	20/06/2017 11:35:00	30	10.4
Last Cycle #	AR2600- 16FR002	IF	21/06/2017 11:35:00	37	10.5
Last Mission update	AR2600- 16FR003	IF	24/06/2017 11:39:30	38	10.4
	AR2600-	IF	17/06/2017	32	10.5
<u>3901842</u> 360411	AR2600- 16FR005	IF	17/06/2017	26	10.4
	10111005		11.47.00		

Figure 22: Fleet dashboard - listing: selection of column fields

One can sort the floats by any column, allowing to see the floats that have low battery voltages or that grounded during last cycle. Some alerts have been defined on key parameters. The float row is then coloured in red (alert) or orange (warning), or an info mark is displayed.

× 0	this week	🎗 0 this mo	onth	0 this year	• 0 this v	week	0 this month	<b>?</b> 78 this year	
86 floats	- 86 active on 1	3/06/2017							
FLOAT N	IONITORING	FLOAT STATUS	FLOAT AGE	FUNCTIONAL MON	ITORING				
🗞 Fl	oat Status								
WMO	IMEI/Argos	Serial #	DAC	Last Tx	Last Cycle #	Battery	Alert 🛧	Last cycle Pmax(dbar)	Last cy
<u>3901848</u>	360811	AR2600- 16FR011	IF	31/05/2017 11:57:20	74	10.4	A	649	
<u>3901839</u>	360110	AR2600- 16FR002	IF	21/06/2017 11:35:00	37	10.5	0	1908	G
<u>3901864</u>	390529	AR2600- 16FR027	IF	26/06/2017 12:06:30	28	10.4	0	1384	G
<u>3901872</u>	360409	AR2600- 16FR035	IF	21/06/2017 12:10:00	31	10.3	0	1966	G
<u>3901902</u>	360122	AI2600- 16FR065	IF	26/06/2017 09:04:20	18	10.2	0	338	G
3901838	360309	AR2600- 16FR001	IF	20/06/2017 11:35:00	30	10.4		1979	
<u>3901840</u>	360211	AR2600- 16FR003	IF	24/06/2017 11:39:30	38	10.4		1990	

Figure 23: Fleet dashboard – listing with alerts

#### Specification of alerts in the dashboard listing

- Row coloured with the colour of the most serious alert,
- Bold font for the fields that trigged the alerts,
- For a complete description of the alerts, see section 4.

Basically, an **alert** is triggered if the float has no decoded data since more than its cycle period (i.e. the float is not on surface as expected), or the battery is usually low, or the float is in end-of-life mode.

A **warning** is trigged if the float has not reached its target profile pressure or is declared as grounded but it is doubtful given the bathymetry in the area.

An info is trigged if the float was grounded.



Field	Alert (colour red)	Warning (colour orange)	Info (no colour)
Last Tx	اf FLAG_MissingVerticalProfile_LOGI CAL = 1		
Last cycle Pmax (dbar)		اf FLAG_ProfileMaxPressureAnomal y_LOGICAL = 1	
Last cycle minV (volts)	اf FLAG_VoltageDrop_LOGICAL = 1		
End of life	EOL		
Last cycle grounded		G (grounded) if FLAG_Traj-Grounded_LOGICAL = 1 & FLAG_FalseGrounding_LOGICAL = 1	G (grounded) if FLAG_Traj-Grounded_LOGICAL = 1

Table 1: Specification of alerts in the dashboard listing. See flags description is section 4 of the document.

This table allows the day-to-day monitoring of a fleet, with possible major alerts encountered.

#### 3.2.2. All floats table

This table is an index of all floats present in the fleet. It gather main metadata (identification, last transmission date, launch date, DAC etc.) and the status (active in green, dead in red) of each float:

ACTIVE FLO	ATS ALL F	LOATS FLEET ST	ATUS FLEET AG	E FUNCTIONAL MC	ONITORING					
<b>(Q</b> )										
Status 个	WMO	IMEI/Argos	Serial #	Platform Model	Last Tx	Launch Date	Last Cycle #	Decod	er Versio	n
*	<u>3901848</u>	360811	AR2600- 16FR011	ARVOR-I - 2016 - Argo Italy	31/05/2017 11:57:20	04/06/2016 16:32:00	74	5.43		
×	<u>3901863</u>	390230	AR2600- 16FR026	ARVOR		12/08/2016 08:51:00	37	5.43		
×	<u>3901902</u>	360122	AI2600- 16FR065	ARVOR		16/12/2016 22:00:00	27	5.43		
Ę	<u>3901838</u>	360309	AR2600- 16FR001	ARVOR	28/09/2017 11:48:30	23/08/2016 09:41:00	40	5.43		
Ę	<u>3901839</u>	360110	AR2600- 16FR002	ARVOR		25/06/2016 09:07:00	46	5.43		
Ę	<u>3901840</u>	360211	AR2600- 16FR003	ARVOR-I - 2016 MOCCA BSH - AR2600-16FR003	02/10/2017 11:36:30	29/05/2016 21:28:00	49	5.43		
¥	<u>3901841</u>	360611	AR2600- 16FR004	ARVOR	05/10/2017 11:27:30	31/07/2016 09:09:00	42	5.43		
۶.	<u>3901842</u>	360411	AR2600- 16FR005	ARVOR	05/10/2017 11:43:30	08/10/2016 15:55:00	35	5.43		
Ţ	<u>3901843</u>	360809	AR2600- 16FR006	ARVOR	26/09/2017 11:48:30	09/10/2016 07:40:00	36	5.43		
ç	<u>3901844</u>	360911	AR2600- 16FR007	ARVOR	30/09/2017 11:42:00	13/10/2016 19:13:00	35	5.43		
×					F	Page: 1 🔻	Rows per page: 10	▼ 1 - 10 of 105	<	>

Figure 24: Fleet index table with basic metadata and active/dead status.

#### 3.2.3. Dead and deployed floats

The top banner of the page presents the number of dead (in red) or deployed (in green) floats within the fleet during last week, month and year. The WMO numbers of the concerned floats (and link to individual float page) is provided on mouse-over.





Figure 25: Fleet dashboard – number of deployed and dead floats in a timeline.

#### 3.2.4. Fleet status

The status page is presenting the percentage of active and inactive floats within the fleet.



Figure 26: Fleet dashboard – status

The JCOMMOPS/AIC website if offering a lot of general statistics so this tab will not be much more developed to avoid the duplication of information.

Desirable evolutions in December 2017 or 2018:

- Small table with basic statistics: number of performed profiles, float with maximum number of profiles
- → Pie chart with composition of the fleet by float type or version or satellite transmission etc.

#### 3.2.5. Fleet age

The age tab is presenting a histogram of the number of floats that achieved a certain amount of cycles. Dead (in red) and active (in green) floats are distinguished.



Figure 27: Fleet dashboard - age distribution

The percentage of floats that achieved a certain amount of cycles is presented in the following graph. Active (green) and dead (red) floats are presented in two curves, together with the total (all).



Figure 28: Fleet dashboard – cycle distribution



Then we have the distribution of floats according to length classes. Each length class represents the vertical distances of all profiles measured by the float.



Figure 29: Fleet dashboard - Profile length distribution



#### 3.2.6. Functional monitoring

This tab is designed for **monitoring the set of floats according to predefined alerts**. First at **table** is summarizing all alerts encountered within the fleet, sorted by categories and sub-categories. These alerts are the ones that were also visible on the technical graphs (yellow background) of a float webpage (see section 3.1.3). It concerns hydraulic behaviour of the float, data transmission, positioning or CTD flags. Alerts are **divided in categories**, and for hydraulic in sub-categories according to different float cycle phases.

In this table on can click on the alert name to see the WMO numbers (and link to float webpage) of the floats that are subjected to the alert. There is also a **counter** that gives the **number of floats** (within the fleet) and associated percentage that presented the alert. The counter gives also the **number of cycles** and **percentage** within the fleet that are subjected to the alert.

Monitoring At Sea			Dashboard
FLOAT MONITORING FLOAT STATUS FLOAT AGE FU	NCTIONAL MONITORING		
		NB FLOATS (% <u>)</u>	NB CYCLES (%)
⊕ INFO		22 (25.58%)	9 (0.44%)
FLAG_MissingCycle_LOGICAL		14 (16.28%)	0 (0%)
⊕ FLAG_MissingVerticalProfile_LOGICAL	of the alert	9 (10.47%)	9 (0.44%)
FLAG_VoltageDrop_LOGICAL		0 (0%)	0 (0%)
DATA TRANSMISSION		0 (0%)	0 (0%)
FLAG_CtdDataTransmissionIncomplete_LOGICAL		0 (0%)	0 (0%)
FLAG_ParameterDataTransmissionIncomplete_LOGICAL		0 (0%)	0 (0%)
FLAG_TechnicalDataTransmissionIncomplete_LOGICAL		0 (0%)	0 (0%)
FLAG_HydraulicDataTransmissionIncomplete_LOGICAL	umber of floats (representing %	0 (0%)	0 (0%)
FLAG_SatelliteCoverageProblem_LOGICAL	the fleet) that triggered this	0 (0%)	0 (0%)
FLAG_PercentageMessagesGoodCRC_LOGICAL	art	0 (0%)	0 (0%)
PLAG_UNUSUALITANSMISSION TIME_LUGICAL dl		0 (0%)	0 (0%)
		0 (0%)	0 (0%)
		0 (0%)	0 (0%)
		81 (94.19%)	776 (37.89%)
Descent to Park		59 (68,60%)	234 (11,43%)
3901838 3901839 3901840 3901841 3901844 390 845 3901847 39( 3901858 3901862 3901863 3901866 3901868 390 869 3901871 39( 3901882 3901883 3901885 3901886 3901889 3901890 3901891 39( 3901903 3901904 3901905 3901907 3901908 3901909 3901918 39( 3901930 3901931 3901935 3901937	01848 3901849 3901850 3901853 3901856 3901857 01874 3901877 3901878 3901879 3901880 3901881 01892 3901893 3901894 3901900 3901901 3901902 01919 3901920 3901925 3901927 3901928 3901929	56 (65.12%)	162 (7.91%)
⊕ FLAG_DescentToPark_StabilizationProblem_LOGICAL		56 (65.12%)	179 (8.74%)
		56 (65.12%)	220 (10.74%)
① Drift		66 (76.74%)	292 (14.26%)
		66 (76.74%)	291 (14.21%)
⊕ FLAG_IrregularDrift_LOGICAL	mber of cycles (representing %	23 (26.74%)	52 (2.54%)
Descent to Profile     Of	the whole fleet cycles) that	73 (84.88%)	430 (21.00%)
⊕ FLAG_DescentToProfile_TooFast_LOGICAL	gered this alert	62 (72.09%)	254 (12.40%)
⊕ FLAG_ProfileMaxPressureAnomaly_LOGICAL		24 (27.91%)	177 (8.64%)
<u>Profile Drift</u>		25 (29.07%)	75 (3.66%)
		1 (1.16%)	1 (0.05%)
⊕ FLAG_FalseGrounding_LOGICAL Number of floa	ts (or cycles) and % that	25 (29.07%)	74 (3.61%)
⊕ стр triggered_at_leas	st one of the alerts in the $\rightarrow$	58 (67.44%)	198 (9.67%)
⊕ FLAG_InvalidPressure_LOGICAL category (idem for	or sub-categories)	2 (2.33%)	6 (0.29%)
	<b>.</b> .	57 (66.28%)	183 (8.94%)
		55 (63.95%)	193 (9.42%)

Figure 30: Fleet dashboard – functional monitoring table



Below the table a **Gantt-like chart displays a synoptic view of the alerts for the whole fleet**. The y-axis represents the WMO float number and the x-axis the cycle numbers. A **colour-coded round indicates if the float triggered one or several alerts for a specific cycle**. The platform number, cycle number and names of triggered alerts are displayed on mouse-over.



The following colours are applied to the round, depending on the gravity of the alerts:

- Green: no or minor alerts triggered
- Yellow: "warning" triggered
- Red: "alert" triggered

In case there are several alerts, the round is in the colour of the most "serious" alert. The name, description and type of every predefined alert is described in the next section.

<u>NOTE</u>: following the presentation of the tool to partners in July 2017 and taking into account feedbacks, the Gantt chart is now only presenting major alerts for better readability.



# **4. TECHNICAL ALERTS**

#### 4.1. Summary

The following table summarizes the alerts defined for the Coriolis at sea monitoring website. Alerts are sorted by categories and sub-categories. They have been specifically designed for the MOCCA fleet but some could be used to other float versions.

Alert name	Description	Warning Info
	INFO	
FLAG_MissingCycle_LOGICAL	A cycle is missing	Alert
FLAG_MissingVerticalProfile_LOGICAL	Float ascent time was later than expected	Alert
FLAG_VoltageDrop_LOGICAL	The float experienced a voltage drop	Alert
DAT	A TRANSMISSION	
FLAG_CtdDataTransmissionIncomplete_LOGICAL	All CTD data have not been received	Warning
${\sf FLAG\_ParameterDataTransmissionIncomplete\_LOGICAL}$	All parameter messages have not been received	Warning
${\sf FLAG\_TechnicalDataTransmissionIncomplete\_LOGICAL}$	All technical messages have not been received	Warning
${\sf FLAG\_HydraulicDataTransmissionIncomplete\_LOGICAL}$	All hydraulic data have not been received	Warning
FLAG_SatelliteCoverageProblem _LOGICAL	Jump in number of Argos messages received per time span	Warning
FLAG_PercentageMessagesGoodCRC_LOGICAL	Percentage of Argos messages received with good CRC is less than a threshold	Warning
FLAG_UnusualTransmissionTime_LOGICAL	Transmission time more than a threshold or with sudden jump	Warning
	POSITIONING	
FLAG_TimeGpsFix_LOGICAL	Time required to obtain a GPS fix is more than a threshold	Warning
TECH_FLAG_GPSValidFix_LOGICAL	No GPS valid fix	Alert
	HYDRAULIC	
Ľ	Descent to Park	
FLAG_DescentToPark_TooFast_LOGICAL	The float started the pump <u>(more than a threshold)</u> during its descent	Warning
FLAG_DescentToPark_StabilizationProblem_LOGICAL	The float experienced a stabilization defect during this phase	Warning
$FLAG\_DescentToPark\_MaxPressureAnomaly\_LOGICAL$	The float did not reach the target park pressure	Warning
	Drift	
FLAG_Park_ImmersionDriftOutTolerance_LOGICAL	The float measured out of the target pressure ranges for this phase	Warning
FLAG_IrregularDrift_LOGICAL	The float repositioned itself during this phase (more than a threshold)	Warning
De	escent to Profile	
FLAG_DescentToProfile_TooFast_LOGICAL	The float started the pump (more than a threshold) during its descent	Warning
FLAG_ProfileMaxPressureAnomaly_LOGICAL	The float did not reach the target profile pressure	Warning



Projne arijt	
The float repositioned itself during this phase (more than a threshold)	Warning
The float detected a grounding which is suspicious given the bathymetry in the area (more than a threshold)	Warning
СТD	
The percentage of good pressure values in the profile in less than a threshold	Info
The percentage of good temperature values in the profile in less than a threshold	Info
The percentage of good salinity values in the profile in less than a threshold	Info
	The float repositioned itself during this phase (more than a threshold) The float detected a grounding which is suspicious given the bathymetry in the area (more than a threshold) <b>CTD</b> The percentage of good pressure values in the profile in less than a threshold The percentage of good temperature values in the profile in less than a threshold The percentage of good salinity values in the profile in less than a threshold

Table 2: Description of alerts for MOCCA at sea monitoring.

These alerts are used in the functional monitoring tab of the dashboard (see section 3.2.6), with the alert table counters, and in the Gantt-like chart with colour-coded rounds for each specific cycle of a float. They are also used in the technical graphs of a float webpage (see section 3.1.3), with a **yellow/red background displayed** in the graph corresponding to the alert definition, when possible.

#### 4.2. Configuration file for alerts

The alerts defined above are computed based on technical parameters of Argo float data, on external parameters such as bathymetry, or on data produced by the Coriolis DAC. They are **stored in the Coriolis database** alongside the technical data of each float.

Some of the alerts are trigged based on a threshold or are using an input parameter. In order to allow flexibility in the computation of alerts, Coriolis at sea monitoring is using a **configuration file** that can be modified easily. Each threshold or input needed in the computation of an alert can be **edited for a specific float type and specific decoder version** (Coriolis data centre info). For instance, MOCCA Argos floats (PROVOR\_4.52) may have **different thresholds** than MOCCA iridium floats (PROVOR\_5.43) or APEX etc. There is always a default value. These can be enhanced with inputs from float type experts within Euro-Argo.

Here is an example of the configuration file (ASCII text file) for some alerts:

```
#* FLAG DescentToPark TooFast LOGICAL
our %NUMBER_PUMP_ACTIONS_DURING_DESCENT_TO_PARK_LIMIT =(
                       "PROVOR_4.52" =>2,
#
                       "PROVOR 5.43" =>2,
#
                       "PROVOR 5.44" =>2,
#
                       "default" =>2);
#* FLAG DescentToPark StabilizationProblem LOGICAL
our %NUMBER_DESCENT_TO_PARK_ENTRIES_IN_PARK_MARGIN_LIMIT
# "PROVOR 4.52" =>3,
                                                            = (
                       "PROVOR_5.43" =>3,
#
                       "PROVOR_5.44" =>3,
#
                       "default" =>3);
#* FLAG_DescentToPark_MaxPressureAnomaly_LOGICAL
#*FLAG TechnicalDataTransmissionIncomplete LOGICAL
our %FLOAT VERSION TECHNICAL DATA TRANSMISSION
("PROVOR 4.52"
=>["TECH NUMBER TechnicalMessage1Received COUNT", "TECH NUMBER TechnicalMessage2Received COUNT"]),
("PROVOR 5.33"
=>["TECH NUMBER TechnicalMessage1Received COUNT", "TECH NUMBER TechnicalMessage2Received COUNT"]),
("PROVOR 5.34"
```

=>["TECH\_NUMBER\_TechnicalMessage1Received\_COUNT", "TECH\_NUMBER\_TechnicalMessage2Received\_COUNT"]);



# 4.3. Example of alerts triggered for MOCCA floats

We detailed below some examples of alerts triggered for the MOCCA fleet. It is more understandable to see the alerts on the respective technical graph of the float webpage.

#### FLAG\_MissingCycle\_LOGICAL

A red background is present on all graphs for cycle 19 since the float skip this cycle: it was under ice.



Figure 32: FLAG\_MissingCycle\_LOGICAL alert.

#### FLAG\_MissingVerticalProfile\_LOGICAL

This alert is visible in the dashboard with a red row. The float has no decoded data since 31/05/2017. This float is considered as dead.

Mon	itoring	g At Sea						Dashbo	oard
🞗 0 tl	his week	🎗 0 this month	8	0 this year	<b>Q</b> 0 this	week	• 0 this month	<b>9</b> 78 this year	
86 floats - 8 FLOAT MC	86 active on 13	<b>/06/2017</b> FLOAT STATUS FLO/	AT AGE	FUNCTIONAL MON	IITORING				
R FI	oat Status								
WMO	IMEI/Argos	Serial #	Float	DAC	Last Tx 个	Last Cycle #	Last Mission update	Next Tx	Battery
<u>3901848</u>	360811	AR2600- 16FR011	ARVOR	IF	31/05/2017 11:57:20	74			10.4

Figure 33: FLAG\_MissingVerticalProfile\_LOGICAL alert.

#### FLAG\_VoltageDrop\_LOGICAL

This alert will be visible in the dashboard status table and on the battery voltage graph of the concerned floats. We do not have example for now.



#### FLAG\_DescentToPark\_TooFast\_LOGICAL

This alert is triggered when the float performs more than 1 (user selectable) pump actions during the descent to park phase. It means that the float sunk too fast.



Figure 34: FLAG\_DescentToPark\_TooFast\_LOGICAL, FLAG\_DescentToPark\_StabilizationProblem\_LOGICAL and FLAG\_DescentToPark\_MaxPressureAnomaly\_LOGICAL alerts.

#### FLAG\_DescentToPark\_StabilizationProblem\_LOGICAL

This alert is quite similar to FLAG\_DescentToPark\_TooFast\_LOGICAL, but is using the number of entries in park margin given by the float. It reflects a default of stabilization at the end of its descent to park pressure.

#### FLAG\_DescentToPark\_MaxPressureAnomaly\_LOGICAL

This alert is not using the technical messages of the float but the maximum depth of the trajectory data for the descent to park phase. This depth must be in the range of the target park pressure (usually 1000 m)  $\pm$  30 dbar (technical threshold of the float). One can see that it is triggered at cycle 19 in Figure 34.

#### FLAG\_Park\_ImmersionDriftOutTolerance\_LOGICAL

This alert is visible in the 2 graphs of the drift phase. It is triggered when the minimum or maximum park pressure of the trajectory data is not within the range of the target park pressure (usually 1000m)  $\pm$  (technical threshold of the float).

#### FLAG\_IrregularDrift\_LOGICAL

This alert is triggered when the float performs more than 1 (user selectable) repositioning during the drift phase. One can see on Figure 35 that the float started the pump and valve on cycle 12, and only the pump on cycles 2 and 5 (because the float was too deep).



#### -loat 3901859



Figure 35: FLAG\_Park\_ImmersionDriftOutTolerance\_LOGICAL and FLAG\_IrregularDrift\_LOGICAL alerts.

#### FLAG\_DescentToProfile\_TooFast\_LOGICAL

This alert is visible when the float started the pump during the descent to profile pressure. It means the descent was too fast. This alert is triggered several times on the left graph of Figure 36.



Figure 36: FLAG\_DescentToProfile\_TooFast\_LOGICAL and FLAG\_ProfileMaxPressureAnomaly\_LOGICAL alerts.

#### FLAG\_ProfileMaxPressureAnomaly\_LOGICAL

The alert is triggered when the maximum pressure of the descent to profile trajectory data is not within the range of the target profile pressure (usually 2000 m) +/- 30 dbar (technical threshold of the float). It is visible on the 2 graphs of Figure 36 for cycles 31 and 34.

#### FLAG\_AtProfileDepth\_DriftOutTolerance\_LOGICAL

The alert is triggered when the float performed depth corrections during the profile drift, waiting for ascent.



MAIN INFORMATIONS	TECHNICAL PARAMET	ERS	DETAILED INFORMATIONS
Descent to Park			
Drift			
⊕Descent to profi	e		
⊖Profile drift		0 (sangp) 2400 3600	Profile drift - Hydraulic actions Coriolis data centre - 01/09/2016 19:00:00

Figure 37: FLAG\_AtProfileDepth\_DriftOutTolerance\_LOGICAL alert.

#### FLAG\_FalseGrounding\_LOGICAL

The alert false grounding concerns cycles where the float declares itself (in the technical message) as grounded, but bathymetry in the area is deeper that the maximum pressure of the profile trajectory data. A threshold of 100 m is taken but is probably too low given the poor accuracy of the bathymetry file and the approximation of the geographic position of the float when drifting. It will be raised to 300 m.

Moreover, the label "Grounded" is placed under the maximum pressure data of each float phase if the float declared itself as grounded during this particular phase. The label is red in case alert false grounding is raised.



Figure 38: FLAG\_FalseGrounding\_LOGICAL alert.

**FLAG\_InvalidPressure\_LOGICAL, FLAG\_InvalidTemperature\_LOGICAL and FLAG\_InvalidSalinity\_LOGICAL** We do not have example for the moment.



# **5. ROADMAP**

The needs for **global statistics are well-addressed by JCOMMOPS on the AIC** website. Within MOCCA, ERIC is willing to work with AIC to propose new KPIs whenever new requirements arise. ERIC will also work with AIC to improve accuracy of statistics: for instance, to reflect true float life (recoveries, different cycle schemes etc.).

There was a strong need for enhancing available tools for **technical and functional monitoring of the floats**. The major **update of Coriolis at sea monitoring website within MOCCA** in June 2017 covers almost all requirements identified by the questionnaire and during meetings with Euro-Argo partners. For the moment, it is specifically dedicated to the MOCCA fleet but many functionalities will work for the remaining of the European fleet.

The tool now enables:

- Presentation of essential float metadata
- Detail on all float metadata classified into understandable categories
- Visualisation of main technical parameters with predefined alerts on the graphs. This is a major improvement and will facilitate the analysis of float behaviour and the identification of failures if any. In the past, a lot of data preparation and formatting was needed to be able to understand the float status concerning main technical parameters.
- Warning/notification system if mal-function is detected
- Detect early failures
- Corrective actions from deployment teams
- Implementation of dashboards/status tables for the whole fleet

The AIC and the Coriolis at sea monitoring tool will be used to quickly:

- Report on the case of early failure of a float
- Report on the behaviour of a fleet

A generic monthly report on the fleet could be issued and in-depth analysis of the end-of-life could be performed once a float is dead.

The tool has been presented at the Euro-Argo meetings (Management Board, User Workshop etc.) in July 2017, Paris. Feedbacks were collected and will drive further developments of the tool to enhance functionalities and monitor the European fleet.

Desirable features have been already identified:

- Access to data improvement
- All (BGC, APEX etc.) floats handling
- Use of external information: observations colocalised with more accurate bathymetry and weather conditions at that time
- Corrections and minor evolutions of the current version of the website



### 5.1. Bug report

In order to facilitate feedbacks from users, or report on bugs, a button enables the notification of a message to the technical people developing the website and the ERIC Office.

Float	List		Group C	Group Code		
ACTIVE	ALL			_		
ATLANTIC OCEAN (1126) INDIAN OCEAN		INDIAN OCEAN (792	Bug Report	x		
1900954	1901204	1901268		01295	1901296	1901297
1901298	1901305	1901313		01385	1901386	1901411
1901415	1901453	1901481	First Name (required)	201520	1901529	1901530
1901533	1901538	1901539		901600	1901601	1901602
1901603	1901616	1901617	Family Name (required)	01622	1901623	1901624
1901626	1901627	1901628		01641	1901642	1901644
1901646	1901647	1901650		901660	1901661	1901665
1901667	1901668	1901670	Email (required)	01685	1901687	1901688
<u>1901689</u>	<u>1901694</u>	<u>1901703</u>		01712	<u>1901713</u>	<u>1901714</u>
1901716	<u>1901717</u>	<u>1901718</u>		01727	<u>1901728</u>	<u>1901730</u>
<u>1901731</u>	<u>1901732</u>	<u>1901733</u>	Feedback (required)	01814	<u>1901815</u>	<u>1901816</u>
<u>1901817</u>	<u>1901818</u>	<u>1901819</u>		<u>901826</u>	<u>1901827</u>	<u>1901828</u>
<u>1901829</u>	<u>1901830</u>	<u>1901832</u>		01855	<u>1901856</u>	<u>1901857</u>
<u>1901859</u>	<u>1901861</u>	<u>1901863</u>		<u>01869</u>	<u>1901870</u>	<u>1901882</u>
<u>1901883</u>	<u>1901885</u>	<u>1901886</u>	li li	<u> 202062</u>	<u>1902063</u>	<u>1902064</u>
<u>1902065</u>	<u>1902066</u>	<u>1902067</u>	Please copy the characters (required)	<u>200309</u>	<u>3900310</u>	<u>3900384</u>
3900385	<u>3900559</u>	<u>3900560</u>		<u>)01039</u>	<u>3901040</u>	<u>3901041</u>
3901042	<u>3901043</u>	<u>3901062</u>		<u> 201106</u>	<u>3901108</u>	<u>3901109</u>
<u>3901110</u>	<u>3901111</u>	<u>3901112</u>	28d v 6	<u>901219</u>	<u>3901220</u>	<u>3901221</u>
3901222	<u>3901223</u>	<u>3901224</u>		<u>201229</u>	<u>3901230</u>	<u>3901236</u>
3901238	<u>3901239</u>	<u>3901240</u>		<u>901497</u>	<u>3901498</u>	<u>3901499</u>
<u>3901500</u>	<u>3901501</u>	<u>3901502</u>	Send	<u>201507</u>	<u>3901509</u>	<u>3901511</u>
<u>3901512</u>	<u>3901513</u>	<u>3901514</u>		<u>201521</u>	<u>3901522</u>	<u>3901523</u>
3901524	<u>3901525</u>	<u>3901526</u>	_	<u>201533</u>	<u>3901535</u>	<u>3901588</u>
<u>3901589</u>	<u>3901590</u>	<u>3901591</u>		<u> 201596</u>	<u>3901597</u>	<u>3901598</u>
ă 🖌						

*Figure 39: Bug report within the website.*