



**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)**

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### **MOCCA**

#### **D4.4.9 Provide support for the DMQC of Argo data to national programmes**

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Circulation:	PU: Public
Lead partner:	British Oceanographic Data Centre
Contributing partners:	National Oceanography Centre
Authors:	Matthew Donnelly, Kamila Walicka, Clare Bellingham
Quality Controllers:	Romain Cancouët, Sylvie Pouliquen
Version:	1.0
Reference	D4.4.9 Provide support for the DMQC of Argo data to national programmes_v1.0
Date:	20.08.2020

**Euro-Argo ERIC**  
European Research Infrastructure  
(2014/261/EU)





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## Document History

Version <sup>1</sup>	Issue Date	Stage	Content and Changes
0.1	10.07.2020	Draft	Initial document creation
0.2	07.08.2020	Draft	Revision
0.3	11.08.2020	QC	For internal quality control
1.0	20.08.2020	Final	Final version for submission



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## 1. INTRODUCTION

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This document describes the support provided by Delayed-Mode Quality Control (DMQC) operators at the British Oceanographic Data Centre (BODC), which is part of the National Oceanography Centre (NOC), in support of national programmes that either do not have a DMQC capability or that had a significant backlog of Argo floats requiring DMQC. This need became apparent during meetings of the international Argo Data Management Team, and was agreed as an important focus during the 1<sup>st</sup> European Delayed-mode QC Workshop in 2018. This effort builds on the training of a new generation of DMQC operators at BODC due to a gradual change in the composition of the BODC Argo Team. In this context, DMQC specifically refers to the at-sea assessment of Argo floats equipped with conductivity (for salinity), temperature and depth (derived from pressure) sensor packages - known as CTDs – operating as part of the ‘core’ Argo mission down to depths of 2000 m.

DMQC support was offered to any national programme requiring assistance, especially those in the Southern Ocean where BODC has significant physical oceanography expertise. The demand was low and so BODC focused on supporting the UK and Irish Argo programmes, data for which are managed by the BODC Argo Data Assembly Centre (DAC) function.

As a result of the training of a new generation of DMQC operators at BODC, a total of 303 non-MOCCA funded floats and 38,765 profiles have been through DMQC, resulting in BODC having one of the best rates of DMQC amongst Argo DACs.

## 2. DMQC ANALYSIS IN BODC

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The strategy adopted to deliver the support to national programmes focused on ensuring a high-quality approach and the progressive enhancement of expertise. This involved upgrading to the most updated DMQC software, adopting the latest reference databases and extensive training for new DMQC operators in BODC: Matt Donnelly, Kamila Walicka and Clare Bellingham. This was achieved firstly through internal training, passing on knowledge from the previous DMQC operator Justin Buck, after which followed close collaboration between BODC Argo operators with the international DMQC community (e.g. France, Germany, USA and Canada) through workshops, dedicated training visits, remote mentorship and intensive engagement on reviewing current best practices (covered in other reports).

The DMQC analysis has been undertaken on floats deployed in five different regions: the North Atlantic, the South Atlantic, the Southern Ocean, the Indian Ocean and a small number of floats in the Pacific Ocean. In some of the regions, such as the Pacific Ocean, this was the first time BODC had undertaken DMQC in the region. The analysis has been undertaken in separate batches for each of these regions, with floats that had already ceased functioning and those with a large number of profiles being prioritized. This approach provided the opportunity to gain a deeper understanding of the regional oceanography in each region, the variability in float behaviour over time, and the challenges this raises in DMQC.

This work has resulted in a significant improvement in the total amount of delayed-mode profiles delivered by BODC compared with available real-time mode data. Although BODC was undertaking DMQC at the time, December 2018 is the approximate low-point, when only c. 45% of profiles hosted at BODC were available in delayed-mode (Figure 1). The most recent statistics provided by Ifremer, from June 2020, shows that BODC had delivered 76 % of delayed-mode data (Figure 2) from all available data at the DAC.

A combination of the strong focus on comprehensive training provided to BODC Argo team members and the diverse experience of DMQC ensures future sustainability in providing DMQC analysis and regular delivery of Argo data in delayed mode to the Argo Global Data Assembly Centres (GDACs).

### Percentage of **DM** and **RT** files by DAC

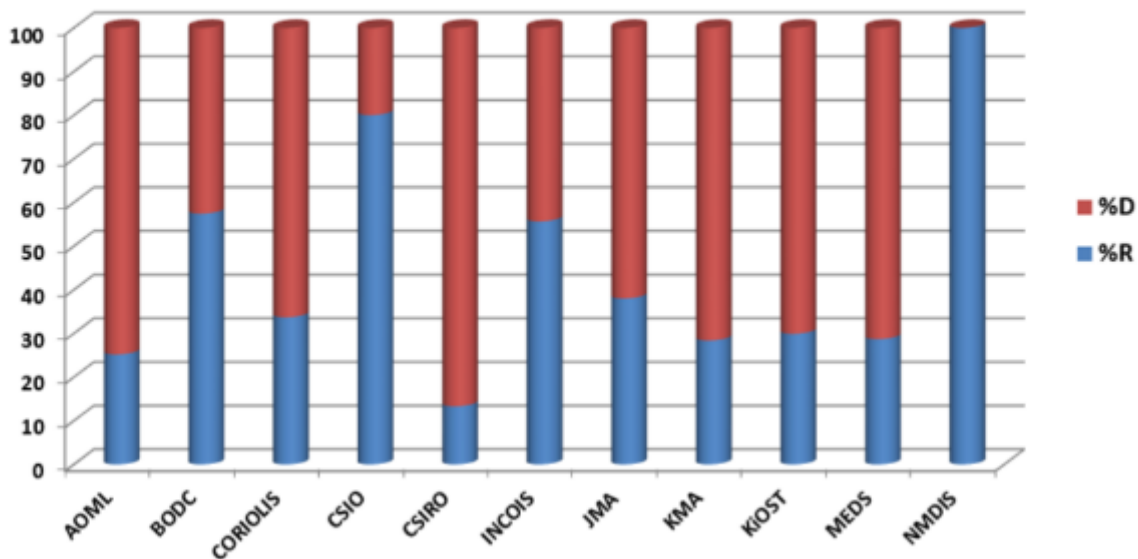


Figure 1: Percentage of delayed mode (%D) and real-time files (%R) by DAC distributed by Ifremer ([Anomalies Argo Profiles December 2018](#)).

### Percentage of **DM** and **RT** files by DAC

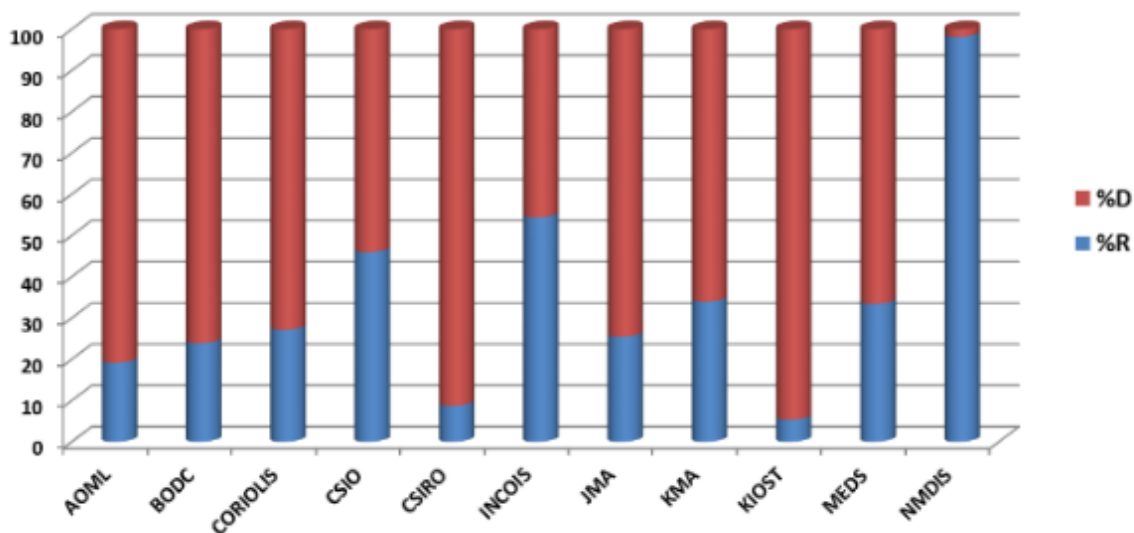


Figure 2: Percentage of delayed mode (%D) and real-time files (%R) by DAC distributed by Ifremer ([Anomalies Argo Profiles June 2020](#)).



### 3. FUTURE

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As a result of the MOCCA project, BODC is well placed to maintain a sustainable pace of core Argo delayed-mode quality control into the future, including continuing to perform DMQC on MOCCA floats for the rest of their operational life beyond the end of the MOCCA project itself. This effort will be funded alongside other DMQC through UK national capability funding from the Natural Environment Research Council (NERC).

The extensive experience of DMQC of floats across the North Atlantic, South Atlantic, Southern Ocean and Indian Ocean provides BODC with a firm foundation for undertaking DMQC on other elements of the Argo mission. Firstly, BODC is building upon the DMQC of core Argo data (CTD to 2000 m) by taking a key coordinating role in developing the ability to quality control deep Argo CTD data down to 6000 m. A report on progress on this as part of the EU H2020 Euro-Argo RISE project has recently been released. Further, BODC's broad oceanographic experience provides the base from which to develop quality control capabilities for the biogeochemical Argo mission which includes oxygen, pH, nitrate, irradiance, chlorophyll-*a* and particle backscatter. As BODC operates across the spectrum of Argo missions (core, deep and BGC), it can provide perspectives and insights to help steer each mission towards the Argo 2020 vision: a global, full-depth, multidisciplinary array. Future development in these areas is being pursued through both the EU H2020 project Euro-Argo RISE and UK national capability funding.