ARGO ONLINE SCHOOL

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Document Reference

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Work Package title	**Euro-Argo RISE visibility: communication and dissemination towards user's community**
Lead Institute	**IEO (Instituto Español de Oceanografía)**
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Comments	**COVID-19 was an unprecedented situation that prevented the initially proposed objectives from being achieved. Following approval by the PO, the deadline for the Argo Online School is postponed to December 2021.**
Accepted by	**Claire Gourcuff**

Document History

Version	Issue Date	Author	Comments
1.0	13th Dec 2021	All lead authors	First version
1.1	21th Dec 2021	All lead authors	Final version with inputs from partners

EXECUTIVE SUMMARY

This deliverable is related to Task 7.2 of the WP7 of the Euro-Argo RISE and its aim is the creation of an Argo Online School (AOS) to teach the basic foundations to use and understand the Argo program. The need for an online tool for Argo, with similar structure than the now popular Massive Online Open Courses, is due to the complexity and volumen of the technical documentation associated with the Argo data. Given the amount of data gathered by the Argo network of floats, the associated documentation has grown considerably and can be overwhelming. In that sense, the AOS does not attempt to describe and teach all the details of the Argo program and its data, since the Argo documentation is available for a deeper learning, and the AOS does not pretend to be a library or Application Programming Interface to ease Argo data access.

The AOS is a set of videos, animations and hands-on python driven jupyter notebooks designed to make the Argo program accessible for high school or graduate students in any discipline, with no prerequisites. The AOS is organised into three main sections: 1. The Argo Program, that describes the basic concepts of the program, 2. The Argo Data that describes how the data is organised and 3. Using the Argo data, that uses the knowledge of the previous sections and python driven jupyter notebooks to teach how to use the data. Finally, a quiz section is included for auto evaluation.

The AOS has been designed to have the possibility to be expanded following the implementation of new features in the Argo program.

TABLE OF CONTENT

1 Introduction

What is the Argo Online School and why do we need the Argo Online School?

Access to open education is a fundamental requirement to share knowledge and contribute to keeping everybody educated. In the early 1990s, several schools were offering online-only courses, taking full advantage of the Internet and providing education to people who previously would not have been able to access education for various reasons. Technological advances also helped educational establishments to reduce the costs of distance learning, savings that would also be passed on to students, helping to bring education to a wider audience. Today's "online learning" or "e-learning" platforms constitute a powerful learning tool so that everybody can enrich their lives through expanded knowledge.

The Argo community has always been aware of the difficulties of users to manage the complex and large datasets from the Argo network. While extensive information on Argo's data management was always provided through user manuals, the complexity of the documentation left some room for enhancing the knowledge transfer. The main uncertainties for users were mainly focused on obtaining the Argo data, its processing and the generation of products to interpret the information contained in the datasets. Once this need was identified, Euro-Argo wanted to take advantage of the potential of e-learning platforms to offer all kinds of resources to users and thus promote - improve access and use of Argo data. In this way, the Argo Online School (AOS) is defined as an e-learning tool based on an interactive environment similar to other popular Massive Online Open Courses, as the one offered by private platforms such as Udacity or FutureLearn.

Objectives

The Argo online School (AOS) aims to teach the basic foundations for understanding and using Argo data. The AOS does not attempt to show everything about the Argo program, since the Argo documentation is available for deeper learning. The AoS does not pretend to be a library or Application Programming Interface to ease Argo data access, since with that purpose has been designed Argopy (A python library for Argo data beginners and experts, https://github.com/euroargodev/argopy) or ArgoVis (Argovis: A Web Application for Fast Delivery, Visualization, and Analysis of Argo Data, https://argovis.colorado.edu/), among others.

The AOS is a set of videos and hands-on python driven jupyter notebooks, designed to be accessible for high school or graduate students in any discipline, with no prerequisites. Specifically it offers:

- An overview of the Argo program and an assessment of the need for Argo.
- A description of how the Argo data is organised.
- A description of how to access the Argo data.
- A description of the main characteristics of the Argo data format: the netCDF.
- A review of the main characteristics of the quality controls used: Real-Time and Delayed-Mode.

- Step-by-step instructions on data access, processing, and product generation, through the execution of commands based on a programming language.

2 AOS Factsheet

Title	Argo Online School (AOS)
Version	1.0 - December 2021
Content	3 Lessons > 25 sections
Level	High school or graduate students
Language	English
Subscription	Free
Platform selection & web hosting	Euro Argo web page: https://www.euro-argo.eu/argo-online-school GitHub: https://github.com/euroargodev/argoonlineschool

Version

This deliverable is the first version (v1.0) of the AOS, however, in the way that it has been designed, as long as the Argo program continues to grow, the AOS could be updated.

Content

The AOS offers dynamic and engaging content that would attract users' attention. Several formats have been carefully chosen to facilitate the learning process of users: texts, images, animations, videos and quizzes.

All content is divided into 3 lessons. Lessons 1 and 2 are aimed at users with minimal or no knowledge of the Argo network, therefore no prerequisites are needed. Lesson 3 is intended for advanced users, as it requires basic programming skills in python. However, lesson 3 is duly explained step by step, to facilitate the transition of users coming from lessons 1 and 2. To date, the three lessons contain a total of 25 sections. All the sections have been carefully designed to be connected with the rest of the lessons.

Level

The target audience of the AOS are high school or early graduate students. The programming content included in Lesson 3 provides an ideal opportunity to support students in technical or science schools

Language

Since English is the main language for science communication, all the content of the AOS has been developed in English. However, the files containing the English subtitles of the videos will be delivered to the rest of the Argo community partners who are interested in creating translated versions into different languages.

Subscription

As a product of the Argo community, the AOS follows the same philosophy in terms of data access. To guarantee barrier-free learning, the information and data provided in the AOS is available in open access to the public free of charge, therefore no subscription is required. The AOS is accessible through the web page of Euro-Argo (https://www.euro-argo.eu/argo-online-school), but all the content that builds up the web page is hosted in the github repository of Euro-Argo: https://github.com/euroargodev/argoonlineschool.

Platform selection and web hosting

During the design of the AOS, an inventory of private companies that offer e-learning platforms was carried out. Several companies were contacted to host the Argo Online School, including OpenUpEd, OpenEdx, Edx, EduOpen, FutureLearn, Udacity, Imoox and Coursera. As they were private companies, they all required compensation in return, either in the form of an annual fee of up to € 5,000 or requirements such as continuous content creation. In some cases, in addition, the hosting, maintenance and support of the AOS had to be done separately. Ultimately, two of the companies declined to offer the AOS as a free e-learning course. Unfortunately The Ocean Teacher Academy is not designed to include the hand-ons component of the AO, and therefore the only alternatives that met the requirements for the AOS was to host it at the Euro-Argo web site.

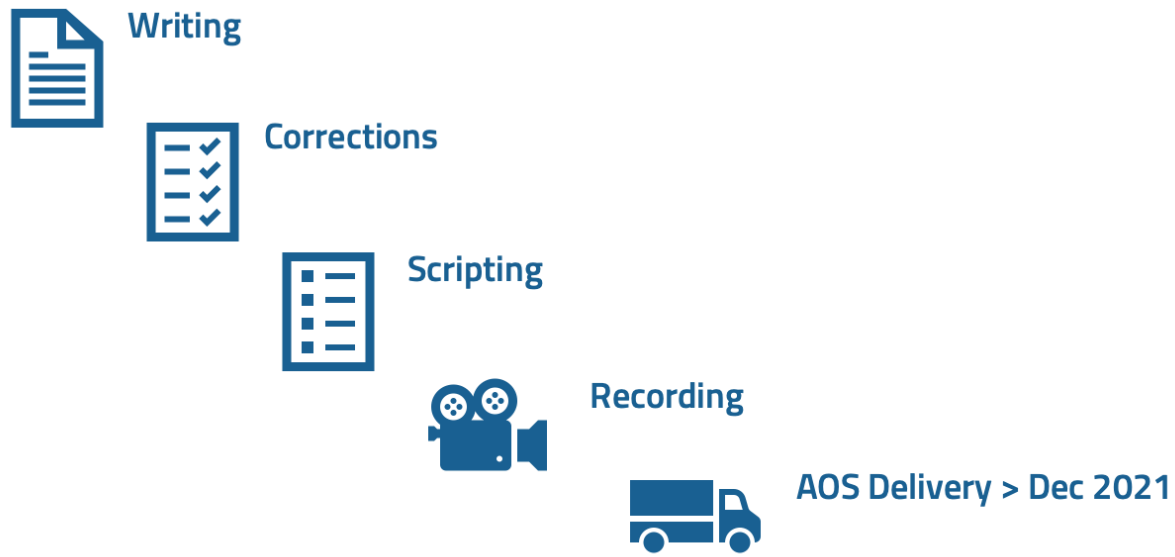
The AOS has been developed using Jupyter-Notebooks and Jupyter-Book, two open source projects that allow editing control in a clear and easy way, and also permits web-based interactive development environments that contain code, visualisations, and texts. It is widely used for data science, statistical modelling, machine learning, …. The hosting is provided by Euro-Argo, and the raw code that builds up the AOS is hosted in the official Euro-Argo account on GitHub.

3 Design

Strategy

The creation of the AOS was done by phases. The first one consisted of writing the content based on all the information about Argo, both in the different official websites and in the technical documents. The second consisted of a correction phase in which the WP7 partners actively participated. In addition, a proofreading service supported IEO to ensure the consistency of the AOS content. In the third phase, the entire programming part of the AOS was developed. The fourth phase consisted of recording the AOS content in video format. Under the direct guidance of IEO, a professional with experience in the audiovisual field took care of the set-up, the recordings and the editions, both of the

videos themselves and of the animations. Government and health restrictions caused by COVID-19 significantly affected this phase of development of the AOS, having to postpone deadlines on several occasions. Finally all the content was organized.



The AOS interface (Fig. 1) is accessed through https://www.euro-argo.eu/argo-online-school and is comfortable, intuitive, clear and compatible through a smartphone

At the top of the interface there are three icons (1): the first one makes it possible to work with full-screen mode. The second one allows access to the repository on GitHub, where all the elements used in the development of the AOS are located, and finally, the third icon offers the option of downloading all the content displayed on the screen as .pdf documents.

On the left side of the screen, there is a vertical banner (2) where all the content of the AOS is organised. Through drop-down buttons (4), the lessons will show the different sections contained in them after a simple click. The AOS offers the possibility of taking a total of 2 quizzes on lessons 1 and 2, which are the most descriptive lessons. In this way, the user has the opportunity to self-evaluate the learning process carried out during their course in the AOS. Lastly, Jupyter Notebooks offers a fast keyword finder by default. In this way, any keyword that the user enters the box (3) will be related to the content of the AOS.

Structure and interface style

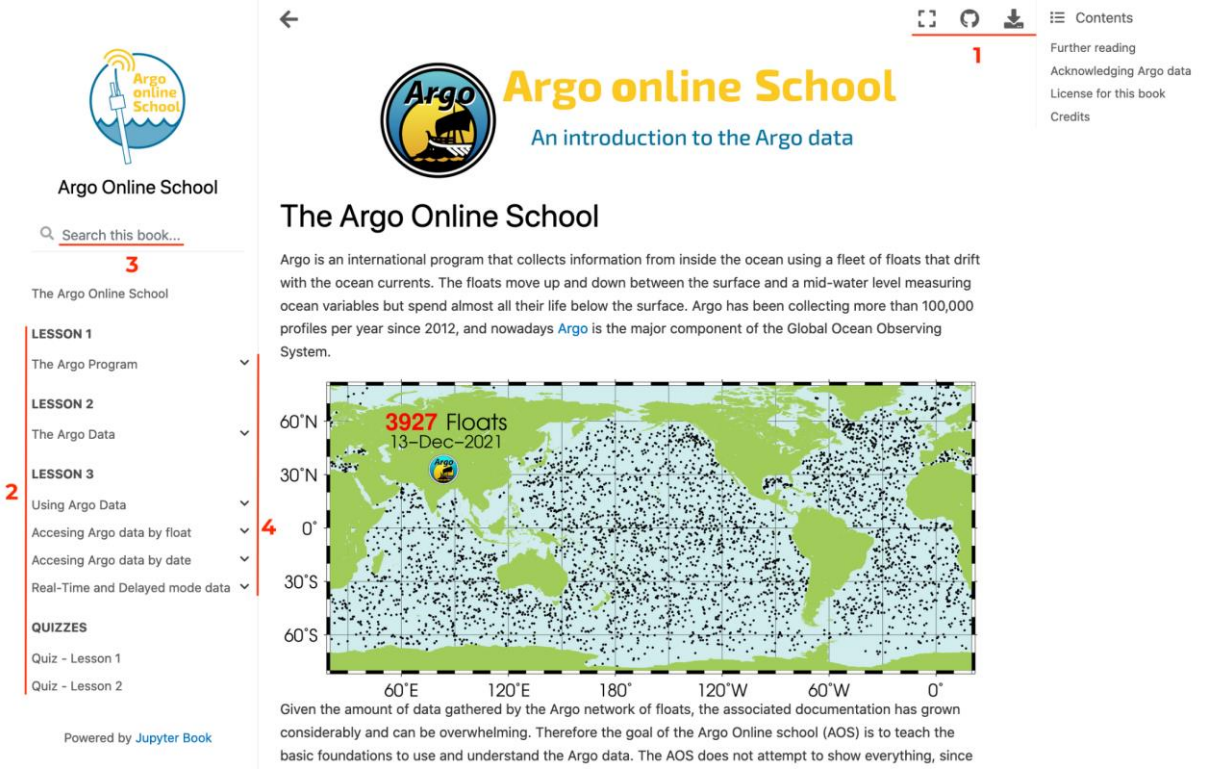


Fig 1. Front page of the Argo Online School (AOS)

The videos and animations (Fig 2.) can be accessed through the vertical banner (2) drop-down buttons (4) for lessons 1 and 2, with a summary of the text described in the videos, and links to the Argo documentation if the user wants a more in detail explanation.

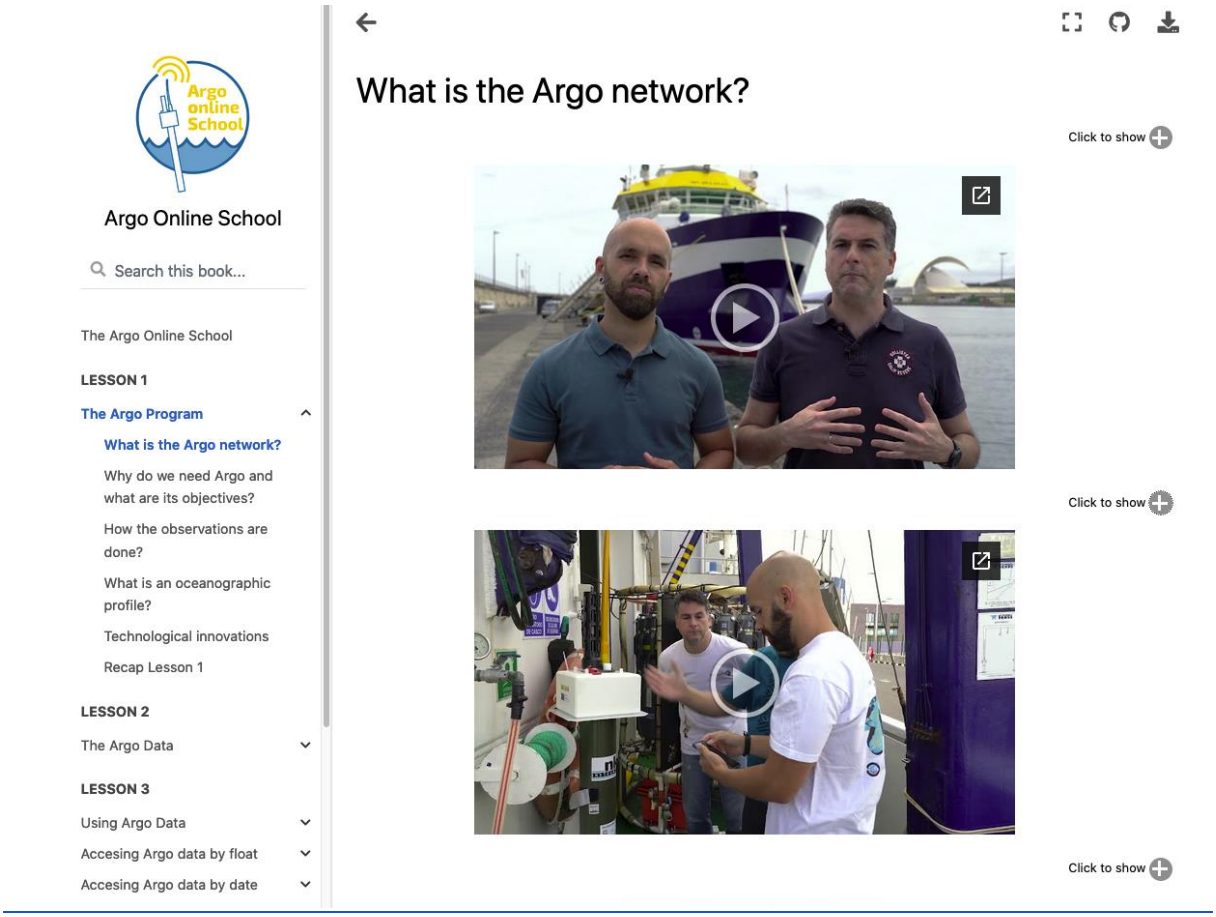


Fig 2. Easy access to video content (by clicking in the video, a preview is provided)

Programming

While lessons 1 and 2 are fully descriptive with video and animations, lesson 3 provides a more hands-on environment (Fig 3). The aim of the AOS is not only to teach about the Argo program, but to improve their use of the data also, through programming with recommendations and exercises. In this way, it helps the user to face future science programming scenarios in a complete way. Access to data, its processing and obtaining information through the interpretation of graphs, are the most common demands of users who want to handle Argo data.

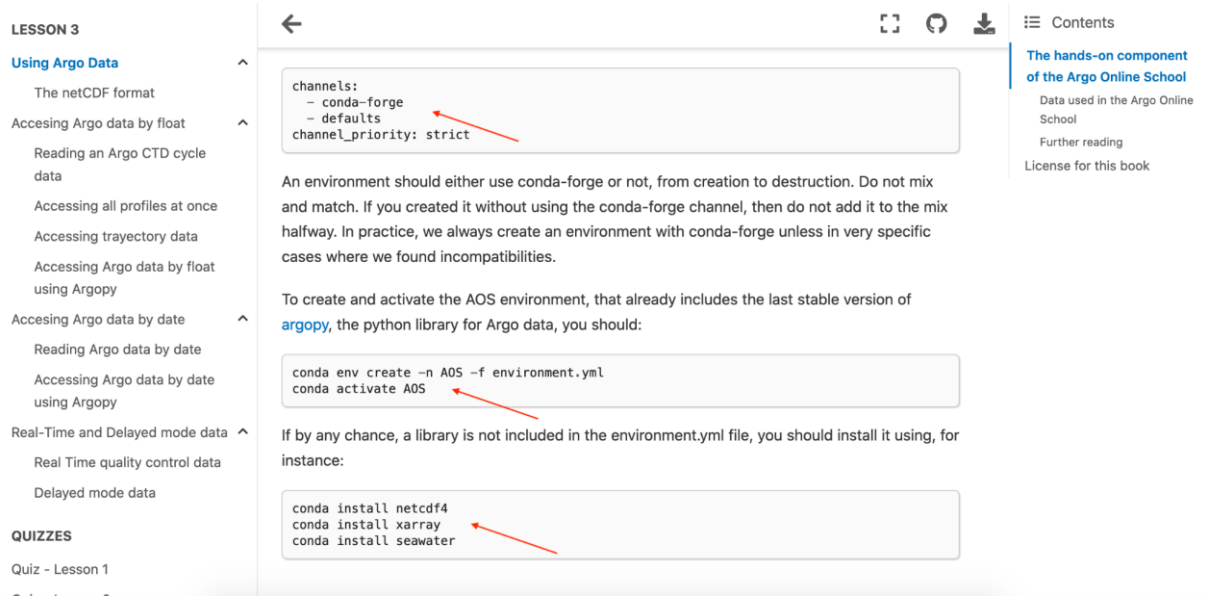


Fig 3. AOS set up for the hand-ons component in lesson 3.

The basic recommendations and instructions for configuring the hand-on section of the AOS are also provided (Fig 3.), whether the user wants to work online or if they want to work on their local computer. Specific libraries and packages are recommended to guarantee the correct functioning of the AOS. A complete section is dedicated to explaining the main characteristics of the format chosen by the Argo community, the netCDF format (Fig 4.). Through the execution of a few simple commands, the user will easily understand the netCDF format to handle Argo data efficiently.

After these preliminary considerations, in the following sections in lesson 3, the user is guided to learn how to access Argo data through FTP and HTTP sites, in addition to processing them to obtain information (Fig. 5). Two full sections are devoted to the possible ways to access Argo data, by date and by float. Given its importance, an entire section is also devoted to quality control of Argo data, both in Real-Time and in Delayed-Mode (Fig 6.). In this way, the user will know how to correctly interpret the different quality flags assigned to the Argo data and thus choose the data according to their convenience.

Additionally to the data access using FTP and HTTP, there are sections where the access to the data is done using the argopy library (https://argopy.readthedocs.io/) developed also in the framework of EA-RISE.

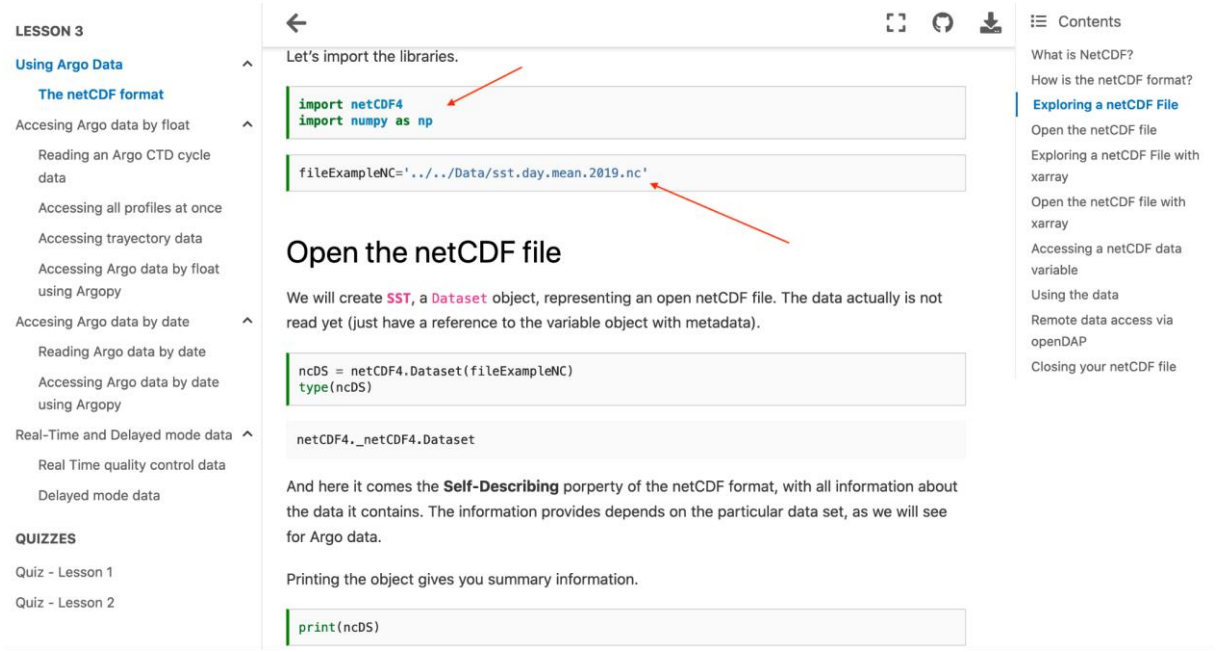


Fig.4. How to handle the netCDF format

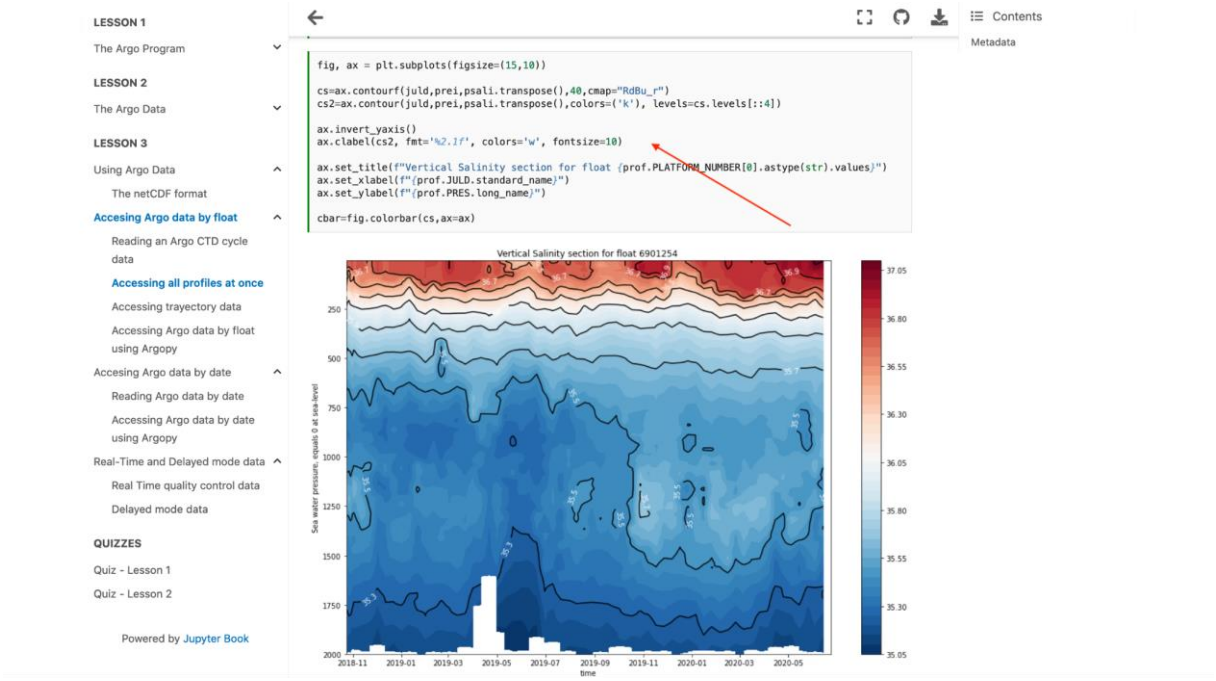


Fig.5. Argo data collection and processing.

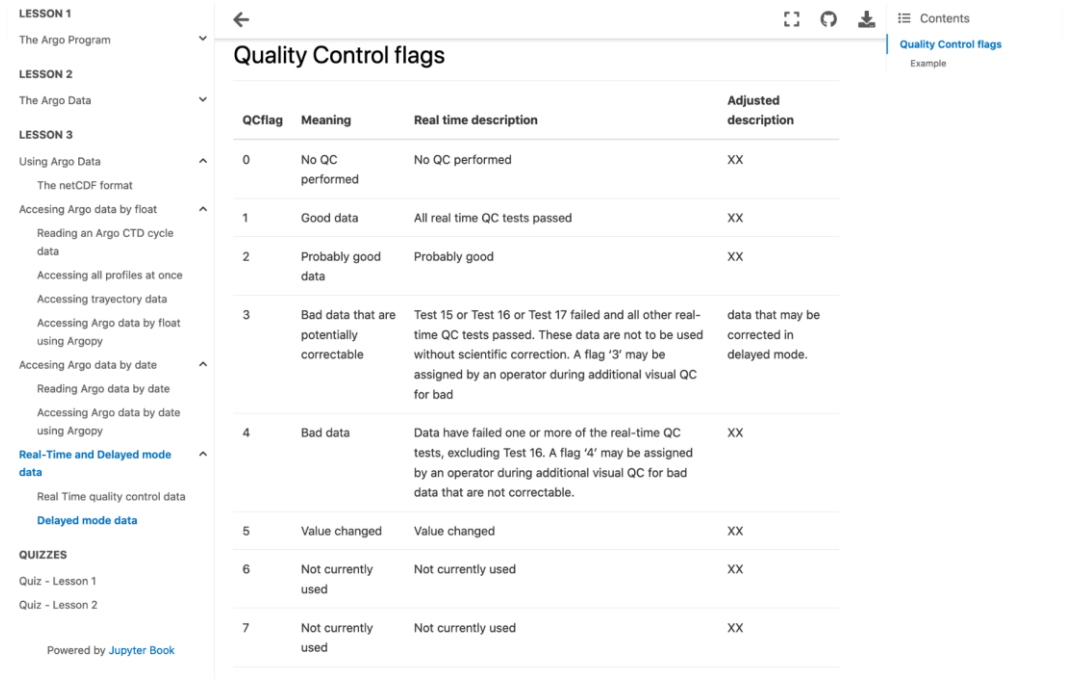


Fig.6. Quality control flags in Real-Time and Delayed-Mode

4 Conclusion and perspectives

The Argo Online School addresses an existing need for the Argo community to better communicate on the Argo programme and how its invaluable dataset can be used for various applications. The School was presented at the ***2nd Ocean Observers Workshop*** on November 29th 2021 https://bit.ly/3pUChmJ and at the ***22nd Argo Data Management Team*** meeting https://bit.ly/3e39rLL on December 10th 2021, with a very good reception from the attendees. This new tool will be advertised by Euro-Argo but also within the international Argo community and should help to grow the community of Argo data users. Moreover, it will also promote other tools developed within Euro-Argo RISE e.g. the Euro-Argo Data Selection tool (see D7.14) or the *argopy* library (developed within WP2).

Perspectives

This first version of the AOS contains the basic content to understand and use the actual Argo observing system, however, in the way it has been designed, it is possible to update it to show the newest aspects of the Argo network. For instance, in the future it may be easily updated to include the new management of data from biogeochemical floats, or the description of the algorithms that allow Argo floats to operate under ice; or the way to access the different configurations of the Argo floats that operate in energetic regions such as the boundary currents; or update to show the latest advances in terms of sensors such as the incorporation of the new RBR sensors in the standard Argo floats.