



**Learn how to use
ocean observation
data from Argo, CTD
and more!**

Delivery 1:

28 and 29 March 2022
13:00 – 16:00 BST (GMT +1)

Delivery 2:

6 and 7 April 2022
00:00 – 03:00 BST (GMT +1)

Using R to analyse and interpret ocean observational data

The Commonwealth Blue Charter Champion of the Ocean Observation Action Group invites those with an interest in analysing and interpreting oceanographic data to learn how to easily use free software to transform publicly available oceanographic data into ocean information for various applications.

Day 1 of the workshop will include a brief introduction (~30 minutes) to highlight oceanographic data and the research questions they inform, and a dedicated focus on teaching researchers and students how to analyse a variety of data from multiple ocean observation technologies.

Day 2 of the workshop will focus on accessing and analysing long-term, large spatial coverage data from the Argo program.

Using R to analyse and interpret ocean observational data

Background:

Oceanographic data are key to understanding the state of the ocean, predicting changes and ensuring continued sustainable use. Ocean observation programs can inform critical research questions and policy and management decision-making (e.g., fisheries management, marine spatial planning, regional carbon budget verification, and forecasting changes in weather and climate). A variety of technology can be used to observe the ocean and address research and societal questions.

The Argo Program, supports a fleet of robotic floats that have been measuring continual, real-time temperature, salinity, and pressure in the upper 2000 m of the ocean for more than 20 years. A successful example of instrumentation that has provided foundational long term ocean data, this program has evolved to include *Biogeochemical Argo* floats that measure pH, oxygen, nitrate, chlorophyll, suspended particles, or downwelling irradiance, and *Deep Argo* floats that can read temperature, salinity, and pressure, and oxygen down to 6000 m.

While these various technologies provide many streams of useful data, each instrument type records data differently, stores data in varying formats, and contains different information which poses a challenge to end-users interested in applying the data to their specific needs. While Argo data are publicly available for download and use, specialized knowledge of oceanographic data formats, as well as the sensors and float behaviour, are required to understand the data files and how to extract and use data to address specific questions.

Workshop Description:

This workshop, spread over two half days, is designed for those with an interest in learning how to analyse and transform publicly available oceanographic data into information for various applications. It will provide 1) a brief overview of the importance of oceanographic data and the research questions they can inform; and 2) training on how to use available tools to address barriers of accessing and analysing oceanographic data using R, a free interactive coding software.

Using real-life examples, the training offers hands-on experience for participants to use the R packages 'oce' and 'argoFloats' to easily analyse oceanographic data from various source and instruments, including Argo. This training aims to provide participants with the skills necessary to answer specific questions relevant to their research or positions, as well as a brief demonstration of the importance of oceanographic data and the possible application in resource management.

Prerequisites

- Basic knowledge of R
- Internet connection suitable for video conferencing
- Access to Zoom
- Access to Windows, Linux or Mac desktop or laptop
- Access to RStudio installed on your computer

Key points:

- Approximately 20 participants per class
- Workshop completed via Zoom
- Workshop completed using RStudio
- Interactive with ability to ask physical scientist for coding help

Day One – Introduction and learning the oce R package (~ 3 hours)

Audience: Individuals with limited experience wanting to effectively analyse oceanographic data in RStudio.

Introduction (~0.5 hours):

- Commonwealth Blue Charter Ocean Observation Action Group
- Barriers associated with turning ocean observation data into ocean information:
 - Ability to analyse a variety of oceanographic data
 - Access to long-term, large spatial data

'oce' package (~2.5)

- Reading oceanographic data (emphasis on CTD data)
- Access to data
- Seawater equation of state
- Extensive support for object metadata
- Specialized oceanographic plots (e.g. TS plots, profile plots, etc.)
- Easier mapping (especially projections)
- Data quality flags
- Real world problem: Is the ocean warming near Bermuda?

Day two - Learning the argoFloats R package (~2 hours)

Audience: Individuals with limited experience wanting to effectively analyse Argo float data in RStudio

argoFloats package (2 hours)

- Current resources for Argo
- Ongoing challenges with access to Argo data
- Real world problem: Is the ocean warming near Australia?