

Welcome to the now: How to handle EOV Inorganic Carbon data in respect to the Sustainable Development Goals and the FAIR Data Management Principles

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Some data simply does not meet the criteria for mainstream (often physical) oceanographic data but the demands on how to make it available, perform higher level QC, achieve near real-time (NRT) data products are rising in times of the Agenda 2030 of the United Nations and their Sustainable Development Goals (SDG) where one target (14.3) addresses the Essential Ocean Variable Inorganic Carbon - on top data has to follow the FAIR data management principles. How do adopt new data flows, implement new tools and procedures into established scientific communities?

EOV Inorganic Carbon observations collected from instruments at sea are typically processed by individual PIs before being submitted to data centres and other data archives. Often this work is done on an ad hoc basis using unpublished self-built software and published in unique formats. This leads to lacks in data flow and data availability in respect to SDG target submissions and NRT data availability. Inconsistent data treatment and delivery, lacks of reproducibility are hindering/impeding the Interoperability and Reusability of the FAIR principles since much work is needed to convert data formats while effective re-use of the data is challenging with lacking enriched metadata and details about data processing. If measurements are processed using open source, fully documented standard tools, all data can be traced fully back to source and reassessed if necessary.

The European Research Infrastructure ICOS (Integrated Carbon Observation System) aims at increasing the fundamental understanding of the marine, atmospheric and ecosystem carbon cycle, it's underlying processes and verify the effectiveness of policies aiming to reduce greenhouse gas emissions. Within the marine part of ICOS, the Ocean Thematic Centre is developing QuinCe, an browser-based tool for uploading, processing, quality control and publication of data from underway pCO₂ systems on ships, moorings and SailDrones. Data from the instruments can be uploaded directly in any text format, where it will be standardised and processed using algorithms approved by the community. PIs can perform full quality control of the data following SoPs and best practices, which is recorded and then sent to the ICOS Carbon Portal and SOCAT (Surface Ocean CO₂ Atlas) project for publication where it is used for decision making and informs the annual Global Carbon Budgets of the Global Carbon Project and can be submitted to the SDG 14.3 target: "average marine acidity measured at an agreed suite of representative sampling stations".

Where data is transmitted directly from ship, mooring or SailDrone to shore, QuinCe processes, quality controls and publishes Near Real Time data to the ICOS Carbon Portal and to Copernicus Marine Environmental Services (CMEMS) as soon as it is received with no human intervention, greatly reducing the time from measurement to data availability and is the baseline for the CMEMS Carbon NRT data product.

All quality control decisions recorded with justifications, so the veracity of all data points can be assured by end users. Standardized vocabularies and metadata formats are compliant with the United Nations Sustainable Development Goal methodology 14.3.1 methodology are applied in the system or will be implemented in 2020.

This contribution will highlight the challenges and achievements of the global marine biogeochemistry community of how to implement new tools, data from new platforms (e.g. SailDrone) and work flows

for the Agenda 2030 and submission number 128: 'Ensuring data reproducibility from sensor to publication for ocean observations' will follow up details on how to use the tool QuinCe for interested parties.