



June Newsletter

Welcome to the quarterly newsletter from the ICOS Ocean Thematic Centre. Never has the importance of quantifying ocean C uptake been more important. Our mission is to support the 20+ ICOS ocean stations (Figure 1) to deliver the data we need to better quantify the oceans role in carbon cycling.

Achievements

A selection of new ICOS Ocean publications can be found at the bottom of this newsletter. Please send us more with a brief piece of text describing the main results - it's great to see ICOS Oceans data being published.

A great paper published on the ICOS RI website discusses how COVID-19 has affected our atmosphere. 'Finding a hair in the swimming pool: The signal of changed fossil emissions in the atmosphere'. <https://www.ios-cp.eu/event/917>.

Events

The next MSA meeting will be held virtually on 25th and the agenda and meeting link will be sent nearer the time.

The 4th ICOS Science Conference

Due to Covid-19 the science conference will be organised virtually from 15-17th September 2020. There's an exciting ocean session in prospect!

1st ICOS OTC pCO₂ instrument inter-comparison workshop will be held between 28. June - 11. July 2021

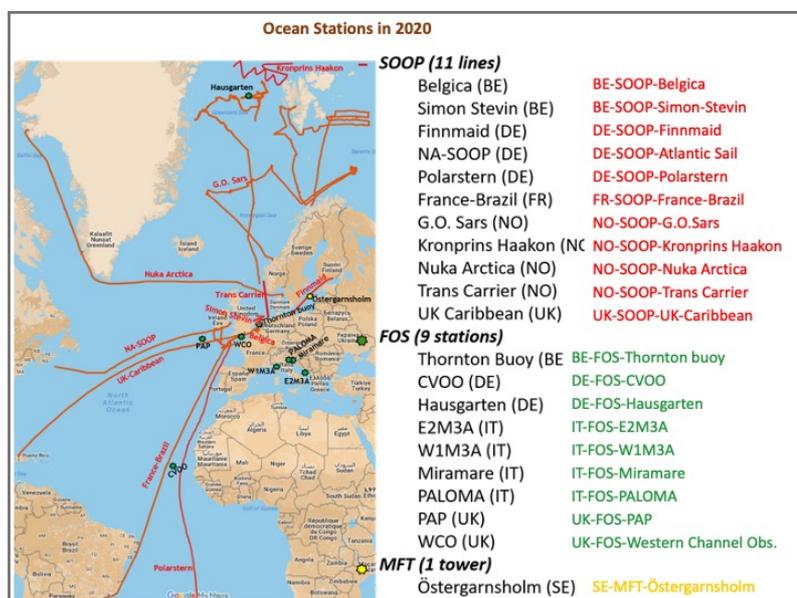


Figure 1. Map of the ICOS oceans station network.

The Ocean Thematic Centre is jointly operated between four institutions in Norway and the UK. Our head office is in Bergen, Norway and other elements in Exeter and Southampton in the UK. We have our own dedicated website at: <https://otc.icos-cp.eu/>

Our main funding comes from the Research Council of Norway and the Natural Environment Research Council, UK. All of our documents can be found on the ICOS Head Office Nextcloud server. Contact us for more details on how to access this.

We have a work programme which we deliver each year that we develop with the chairs of the Monitoring Station Assembly, Sue Hartman (NOC) and Thanos Gkritzalis (VLIZ), the fora that represents the station network, and ICOS Head Office. There is flexibility in our work programme so please get in touch with us to discuss your needs, either via the work stream leads listed on page 2, or via the ICOS OTC project officer, Jess Thorn (J.L.Thorn@exeter.ac.uk), and don't forget to follow us on twitter at @OTCCO2 for the latest news.



Other News

The latest ICOS Handbook has been released and can be found on the ICOS website. It provides a comprehensive overview of the ICOS research infrastructure. It also describes the impacts of ICOS and the process for a country to participate in this research infrastructure: <https://www.icos-cp.eu/resources/reports-and-documents>

You can also request from the ICOS communications team hard copies. Contact Katri Ahlgren at ICOS Head Office for further details.

Website Updates

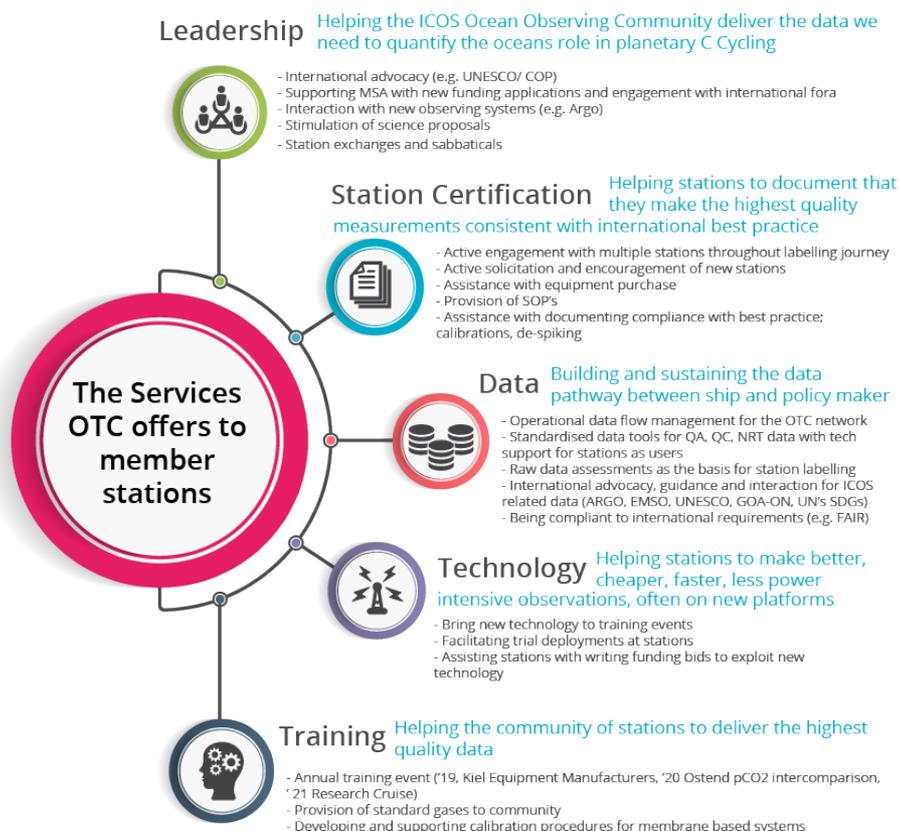
Check out our website for a statement describing the external partnerships we'd like to build to deliver our work programme. This is key in the context of the EU Green Deal and Horizons Europe calls which we expect to use to support the development of the station network.

New Stations

Congratulations to DE-SOOP Polarstern who will be officially labelled later this year and also to NO-KPH who have just had their labelling paperwork approved.

Welcome to the Swedish Tavastland station which recently joined ICOS RI and also to the Polish and Spanish ICOS Oceans members who we hope to formally greet at the next face to face MSA meeting.

The ICOS OTC work programme



1. Advocating for more operational funding support for stations (lead: Richard Sanders, Bergen and Andrew Watson, Exeter). See the next page for details on the new funding initiative we have recently launched.
2. Helping stations to meet internationally accepted best practice standards, a process we refer to as labelling (lead: Ingunn Skjelvan, Bergen).
3. Helping stations develop the data processing pathways they need to supply their data to international databases (lead: Benjamin Pfeil, Bergen). Our QUINCE software is available for you to test and use in your data uploads with support available at the end of an email link.
4. Horizon scanning new technologies that can help make faster, cheaper, more accurate measurements on low costs, low energy platforms (lead: Socratis Loucaides, NOC, Southampton). There are some amazing technologies out there which we want to bring to the ICOS network as fast as possible.
5. Helping stations to make better measurements via organising annual training events, providing standard gases and developing calibration solutions for membrane stations (lead: Tobias Steinhoff, Bergen). The next face to face event is the pCO₂ intercomparison, delayed from this year to 2021. We are planning a data processing workshop this autumn and to work with IOCCP and SOLAS in delivering their training programmes.

Other News

Station Labelling: At the MSA meeting in Southampton in March 2019, the MSA voted to accept an update of the station labelling requirements, based on the two main aims for ICOS: a) to quantify air-sea CO₂ fluxes and b) to assess variability and drivers. The document articulating the new labelling requirements can be found on the OTC website (<https://otc.icos-cp.eu/sites/default/files/2020-05/icos%20Ocean%20Station%20Labelling%20Step%202%20v6.pdf>)

Near realtime data delivery: We are pleased to announce that NRT data is now flowing to the ICOS carbon portal from the Saildrone mission, linking ICOS RI Atlantic stations. Contact us if you'd like to take advantage of the NRT capacity we now have running.

MApCO₂ system: The MApCO₂ system, which previously was produced by Battelle Memorial Institute under the name "Seaology", is now available from the company Sensors & Systems Solutions, LLC. in Ohio, USA. The system operates from a surface buoy where it measures CO₂ in the sea surface and the atmosphere using IR technology. More information is found in Sutton et al. 2014 (doi:10.5194/essd-6-353-2014).

We save all information and files onto the ICOS Nextcloud Fileshare at: <https://fileshare.icos-cp.eu/s/xMXc5fJPXqLLcaA>.

Find us on Twitter: @OTCCO2

Contact us via email: contact-otc@lists.icos-ri.eu

OTC publicity materials: We have an OTC flyer that outlines who we are what services we can offer. Perfect for distributing at meetings and conferences. You can access it on the OTC website. We launched it at the OTC downhill at Ocean Sciences in San Diego and got great feedback.

Funding: We are well aware that one of the major issues the stations face is secure funding: it's tough enough delivering world class climate relevant data on secure funding, much harder in an uncertain funding climate. We have taken the decision to launch a major initiative with our stakeholders to transform the funding situation for stations away from piecemeal ad-hoc station funding into an operational phase. Our 'Ocean Carbon Observations Task Group' is led by the OTC with input from the GCP, IOCCP, GCP and others. The aim is to have a unified voice and a communications strategy plan in place, to allow us to speak to external stakeholders and funding agencies about the importance of ocean observations and the work you all do, and to express the urgent need for sustainable, long term funding.

The Saildrone mission: We know from talking to you that stations operating membrane based pCO₂ systems have significant issues monitoring drift during long deployments. Sending autonomous systems with on board gas standard the stations to validate these systems is one potential solution, alongside the development of new sampling and calibration technologies. We decided to address this issue by teaming up with Saildrone in the mission ATL2MED which has been going on since October 2019.

The aims of this mission are to study eddies of West Africa and to validate the carbon measurements of fixed stations along the route from Cape Verde to Trieste. Since 2019, the two unmanned vehicles (USV) have been sampling eddies the Atlantic Ocean, and waters close to the MONIZEE station off Portugal. They have also studied mesh and sub-mesoscale variability around the Balearic Islands, monitored turtle routes in the west Mediterranean, measured air-sea flux between France and Corsica, and monitored the waters close to the Aeolian Islands with underwater volcanic CO₂ emissions.

So far, the USV's have collected data to validate carbon measurements at the ICOS stations CVOO and W1M3 and the non-ICOS stations ESTOC and DYFAMED. In the next month, E2M3A, Paloma and Miramare will be monitored. Keep an eye on the Saildrone website more details.

Carbon dioxide measurements on Polarstern during the MOSAiC expedition in the Arctic Ocean.

The German ship of opportunity FS Polarstern (DE-SOOP Polarstern) is an oceanic ICOS platform. The ship is currently icebound in the central Arctic Ocean where she will drift from east to west during October 2019 to September 2020. This is the largest and most comprehensive Arctic expedition ever: MOSAiC - Multidisciplinary driving Observatory for the Study of Arctic Climate. The mission of MOSAiC is a breakthrough in understanding the Arctic climate system and we are super excited to see the data!

Recent Papers

This is a short non comprehensive overview of recent ICOS-Oceans relevant papers. We always like to hear about new research that uses ICOS station data so if you'd like to use this forum to publicise your work then please get in touch!

Tobias Steinhoff, the OTC lead on training and station support found time to lead a paper in the *Frontiers in Marine Science* Special Issue that published the proceedings of the 2019 OceanObs' meeting in Hawaii. It's a great overview of the network, the way it operates and its relevance to end users.

Steinhoff, T et al., (2019) Constraining the Oceanic Uptake and Fluxes of Greenhouse Gases by Building an Ocean Network of Certified Stations: The Ocean Component of the Integrated Carbon Observation System, *ICOS-Oceans*. <https://doi.org/10.3389/fmars.2019.00544>

Vas Kitidis, the PI of the Plymouth Marine Laboratory Western Channel Observatory recently lead a landmark paper in *Nature Scientific reports* focussed on the carbon budget of the N Sea in 2015. It combines data from a large fraction of the North Sea ICOS Oceans network and from a special one-off survey of the North and Irish Seas supported by the UK Natural Environment Research Council and merges these with satellite information in what must be one of the largest efforts of its type in recent years. The headline message that outgassing in estuaries compensates for uptake in the shelf seas pump suggests that a future important focus for research is likely to be the outer estuary plume zone where we have rather few observations.

Kitidis, V et al., (2019) Winter weather controls net influx of atmospheric CO₂ on the north-west European shelf. *Scientific Reports* volume 9, Article number: 20153 <https://doi.org/10.1038/s41598-019-56363-5>

Sue Hartman, the PI of the PAP site ICOS station and vice chair of the MSA recently lead a key paper focussed on collating over 1500 samples for nutrient and carbonate chemistry measurements over the NW European continental shelf in 2014-5. The level of variability they document was unprecedented and as a result of their efforts we now have a really comprehensive description of how this key shelf sea environment operated in the mid 2010's.

Hartman, S. E., et al., (2019) Seasonality and spatial heterogeneity of the surface ocean carbonate system in the northwest European continental Shelf *Progress in Oceanography* (177), 101909 <https://doi.org/10.1016/j.pocean.2018.02.005>

Finally, Vlad Macovei, a graduate student working with Sue Hartman in NOC who is now at HZG in Hamburg merged data from 3 different RIs (ICOS, EMSO and Argo) to give us an unprecedented time series of uptake estimates from the NE Atlantic. CO₂ uptake from the atmosphere increased over the observing period, despite biological processes being relatively constant.

You can read more here:

Macovei, V et al., (2020) Impact of physical and biological processes on temporal variations of the ocean carbon sink in the mid-latitude North Atlantic (2002–2016) *Progress in Oceanography* (180) 102223 <https://doi.org/10.1016/j.pocean.2019.102223>.

The next issue of the newsletter will be published in late September 2020. Things we plan to cover include a report from the ICOS Science Conference and an update on actions agreed at the MSA meeting in late June 2020. However, we are looking for articles from the community. Have you been on a cruise, published a paper, hosted a station exchange or summer school that you could tell us about? Or would you like to write a profile of your station? Please send text and images directly to Jess Thorn.