ICOS OTC November 2022 Newsletter

Welcome to the November 2022 issue of the ICOS Ocean Thematic Centre newsletter. It has been a very busy 6 months, we would like to thank all in the team for their hard work.

The OTC is a support structure that aims to help the MSA stations make better measurements, archive their data securely in international databases, advocates for their work and assists with helping them to get funded.

We divide our work programme into 5 ‘Work-streams’ which we discuss with the MSA chairs, present to the ICOS General Assembly in autumn and then create a report on in Spring. Updates on the work streams are the five items below:

1. General Management
2. Data Management/Data Production
3. Network co-ordination, training and development
4. Projects and International (external) co-operation.
5. Other Activities

Contents

Leadership and Management

As a reminder the Leadership and Management work-stream consists of Richard Sanders in Bergen and Andrew Watson in Exeter. They have recently been joined by Nicole Dalton in Exeter and Ryan Weber in Bergen who work on administrative and financial parts of the programme.

Our major focus is on helping the stations to access sustainable funding streams for their work which we undertake in a variety of ways. These include:
1) Direct support for station funding renewals, we are happy to write letters of support if required and (although we have never done this) speak directly to your funding agencies if that would be helpful.
2) Assistance with EU research proposals. There are a variety of Horizon Europe calls suitable for the MSA and we have expertise in writing key components of these and a range of funded activities that can contribute to MSA led efforts.
3) Advocating in international fora to try to improve the general environment for stations. Current areas include engagement with a JPI Oceans action on Ocean Carbon Capacities (Ocean Carbon Capacities | JPI Oceans (jpi-oceans.eu)), leading a UN Decade Ocean Observing co-design exemplar on the Ocean C cycle, engagement with the IOCCP Surface Ocean pCO_2 task team (Towards a global strategy for monitoring of Surface Ocean CO_2 - collaboration between G7 FSOI and IOCCP= and the WMO Greenhouse Gas initiative (WMO International Greenhouse Gas Monitoring Symposium | World Meteorological Organization).

We aim to meet the MSA face to face at least once a year and on line more frequently, reporting to the MSA chairs on a regular basis, to also issue a newsletter twice a year and to represent Ocean ICOS at the ICOS RICOM (Research Infrastructure Committee). Our work is supported by station contributions, national funding from the UK and Norway and a variety of EU grants.

Station Labelling

Labelling is the process by which stations formally demonstrate the quality of their working practices and data. The labelling work-stream is led by Ingunn Skjelvan in NORCE who has extensive experience of assisting a wide range of stations with this key action based on running her own line on the Norwegian Research Vessel GO Sars. During winter and spring 2022, OTC worked with several stations to get them through the labelling process. If you have questions around this don't hesitate to get in touch

At the General Assembly (GA) in May, the DE-SOOP Atlantic Sail was accepted as an ICOS Class 1 station, while the IT-FOS W1M3A was accepted as an ICOS Class 2 station.

Currently, we have completed validation of the IT-FOS Miramare, and we expect it to be accepted as an ICOS Class 2 station at the GA in November.

The work with helping the stations through labelling is ongoing and we are currently focusing on two of the SOOP lines and two of the FOS stations.

Training and Station Support

Training and Station Support is led by Tobias Steinhoff who works half time at NORCE in Bergen, as well as running an ICOS line across the Atlantic from his base in Kiel.

We offer a wide range of training experiences to ICOS Ocean members including:
1) dedicated training courses at MSA meetings (with the next one being on the Quince Software in Paris 07. – 09. Dec 2022)
2) by supporting summer schools lead by other organisations
3) by station visits.

In 2023 we are supporting the IOCCP training course focused on sensors, and the ICOS Summer school focused on a broad range of GHG issues and the SOLAS summer school dealing with biological, physical and chemical processes between the atmosphere and the ocean, more information on both is at the end of this newsletter.

Tobias also aims to help stations with practical matters such as choice of equipment, standards and installations. In 2021 Tobias led the ICOS pCO_2 inter-comparison at VLIZ in Ostend which assessed the performance of a wide range of p CO_2 systems in support of a community wide drive to improve data quality. He also supports the ICOS calibration

laboratory in its delivery of standard gases to stations and keeps an eye on the ICOS stock of standard tanks and regulators.

Technology

The Technology Workstream is led by Socratis Loucaides in the UK National Oceanography Centre. The aim is to introduce MSA members to a wide range of technologies that will allow them to make ocean C observations faster, cheaper and more accurately with lower energy and environmental imprints. This work is primarily funded by external research grants with the MSA being able to operate as early adopters of these new technologies. The major focus of his personal efforts is the development of lab on a chip sensors but the technology portfolio supported via the RI development grant GEORGE includes autonomous vehicles, commercial off the shelf systems and standard operating procedures.

Data

The data work-stream is led by Steve Jones at the University of Bergen and has 2 broad objectives. Firstly, to assist stations with the routine QC of their data and its submission to the ICOS Carbon Portal and SOCAT and secondly to maintain and develop a bespoke software tool Quince to assist with data submissions.

Capital Investments

We are looking to invest in a mobile pCO_2 system coupled to a depth sampling system that could be transferred from station to station. We see this as being primarily suitable for calibration of the Fixed Ocean Stations who generally use membrane sensor detectors but it could also be useful as a spare system or to work on new vessels for short periods of time. We aim to try and make this available by late 2023.

Grants

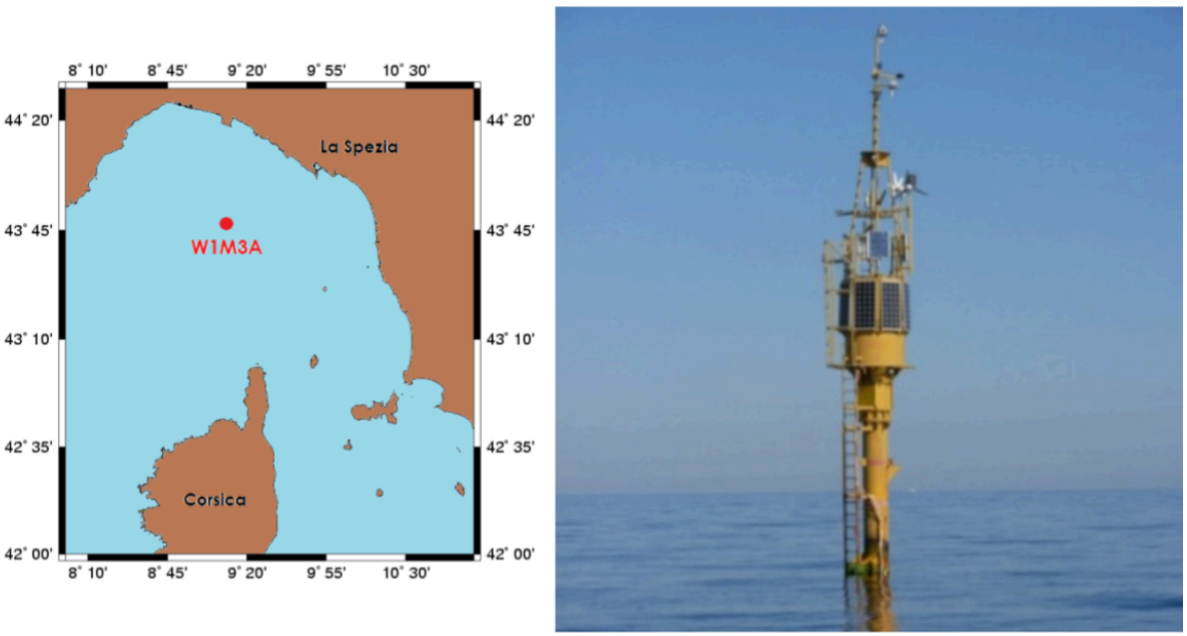
As mentioned above we are active in EU grants in order to support MSA members both directly and by conducting Ocean C cycle research that elevates the importance of ocean C cycle science. Current actions include working to reconcile data and model based estimates of ocean carbon uptake, helping groups outside Europe with observing system design and implementation and bringing some of the skills from ICOS to support GOSHIP, the network of

hydrographic sections that supports deep ocean CO_2 observations and building new technology to support station operations. We are happy to share expertise from these grants in proposals led by MSA members, where it is useful.

Meet a station: IT-FOS-W1M3A

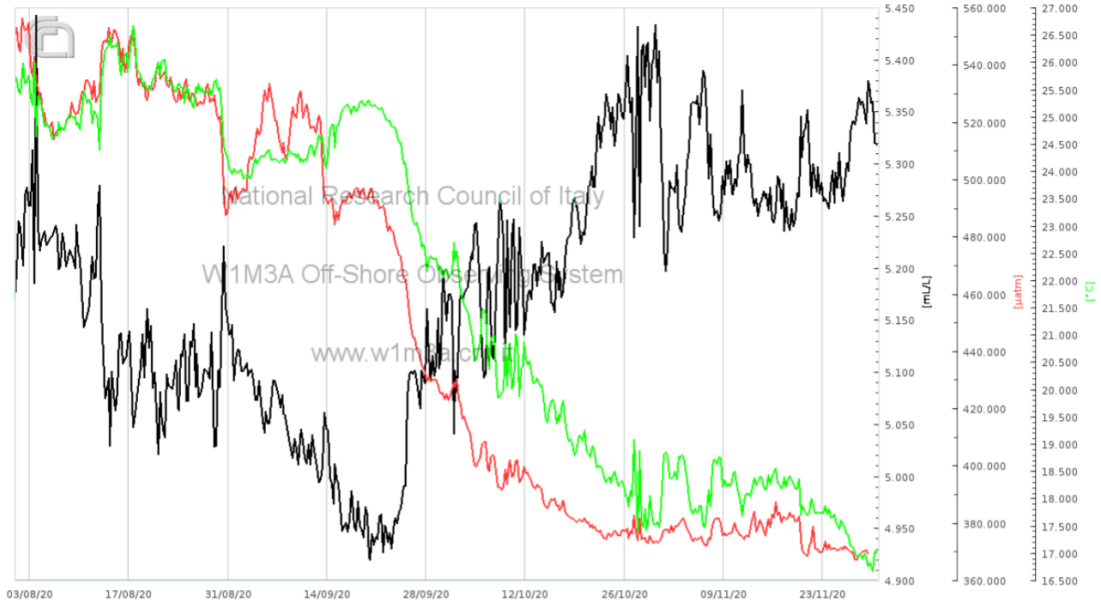
The IT-FOS W1M3A is an offshore fixed platform moored in the North Western Mediterranean Sea on a deep-sea bed of 1200 m and 80 km far from the coast, managed by Dr. Roberto Bozzano and Dr. Sara Pensieri of the National Research Council of Italy - Institute for the study of the anthropic impacts and sustainability in the marine environment the CNR-IAS.

The observatory is constituted of a spar buoy and a subsurface mooring line. The overall structure of the main buoy is 50 m long, of which about 36 m is the length of the submerged part and 12 tons is the total weight in air, whereas the mooring is 2 km long. The scientific payload consists of meteorological sensors installed on the upper mast of the buoy and oceanographic probes clamped both along the main body of the buoy and on the mooring line. Specifically, on the trellis are installed a pyranometer, a pyrgeometer, a quantum sensor, a thermo-hygrometer, a 2D sonic anemometer, a barometer and a weather station which doubles some measurements and include rainfall. Along the buoy body and on the mooring line CTDs to measure temperature and conductivity are installed at different depths.



Position (left) and view at sea (right) of the IT-FOS W1M3A.

At a nominal depth of 6 meter, the sea water carbon package dedicated to ICOS related measurements is installed. It is composed of a proCV by ProOceanus to measure pCO_2, coupled with a CTD model SBE16 plus CTD equipped with a SBE43 dissolved oxygen sensor and a Wetlab FLNTUS for chlorophyll-a and turbidity estimates. The measurements of pCO_2 at the W1M3A site began on 2011 with one of the first prototype of CO_2-PRO by ProOceanus, but only in the most recent years the quality of the measurements required by ICOS was accomplished thanks to 1) the installation of a modern proCV by ProOceanus on the buoy, that allows for a measurements every two hours and 2) periodic visits to the site with the oceanographic vessel Dallaporta managed by CNR to acquire water sample by Niskin bottles needed to perform analytical measurements of pH, to obtain estimates of total alkalinity by means of acid-base titration and dissolved oxygen through Winkler method. The data are processed through QUINCE and sent to the carbon portal and to SOCAT directly by the OTC.
The time series of the data acquired by the pCO_2package during summer and fall 2020 is given below.



Time series of sea temperature (green line), pCO_2 (red line) and dissolved oxygen (black line) data acquired during summer and fall 2020.

Coastal carbonate system variability along an active lava-seawater interface.

By David González-Santana, J. Magdalena Santana-Casiano, Aridane G. González and Melchor González-Dávila* of the Instituto de Oceanografía y Cambio Global (IOCAG), Universidad de Las Palmas de Gran Canaria (ULPGC), 35017, Las Palmas de Gran Canaria, Spain.

Terrestrial and oceanic sub-aqueous volcanisms have the potential to introduce environmentally important chemical species to both the atmosphere and to the seawater through lava-water interactions, venting acid-rich fluids and fluids rich in alkalinity and CO_2. The Canary Archipelago comprises seven main intraplate volcanic islands located in the eastern Atlantic Ocean and built on oceanic crust of Jurassic age (Fig. 1). From the 16th to 20th centuries, 12 confirmed inland volcanic eruptions have taken place. During this century, in 2011, a submarine eruption took place in the southern flank of El Hierro island (Santana Casiano et al., 2013 http://dx.doi.org/10.1038/srep01140). More recently, a new sub-aerial eruption began on September 19th 2021, on Cumbre Vieja edifice, La Palma Island (Fig. 1). It lasted 85 days of eruptive activity reaching the proximities of a coastal cliff area 7 km away in only three events (see pictures). In a recent publication in Frontier in Marine Sciences (González-Santana et al., 2022, https://doi.org/10.3389/fmars.2022.952203) we presented the effects of the lava-seawater interaction on the carbon dioxide (CO_2) system during the 13 visits to the affected area and the amount of acids generated and the CO_2 exchange with the atmosphere of the Cumbre Vieja volcano during the most anomalous studied event on November 12th. The affected area, part of a protected marine area, was also very special one, both before and after the eruption finished, characterized by anomalous low salinity, low pH and high CO2 and inorganic carbon concentrations related to diffusive CO_2 gas emissions through submarine groundwater discharges (SGD). The presence of SGD in other parts of La Palma island have been also described previously by our group (González-Delgado et al., 2021, https://doi.org/10.5194/bg-18-1673-2021).

During the eruption, the amount of acid injected into the lava-seawater interface during November 12th was, on average, 0.31 µmol kg-1 to the 0.9 km2 of seawater with a depth of 6 m at the front that reduced to a few tens of cm at a distance of 1300 m. The average pH was 7.6 for a total of 2.7·106 m3 seawater (Fig. 2).

Figures

Figure 1. Map of the Canary Islands (A), the volcanic island of La Palma (B) (Ocean Data view images, Schlitzer, 2021) with indication of (C) the inland area affected by the 2021 eruption and the two formed deltas. The southern delta was formed after lava arriving on September 28th and November 10th while the northern delta was formed after November 22nd.

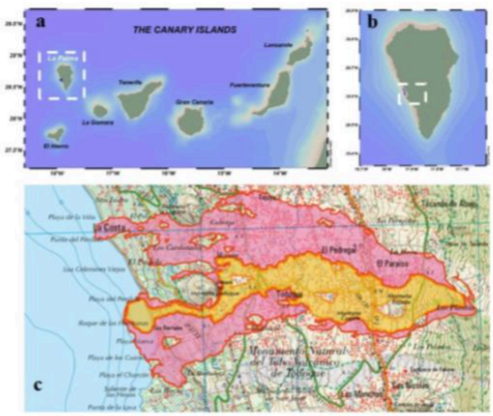
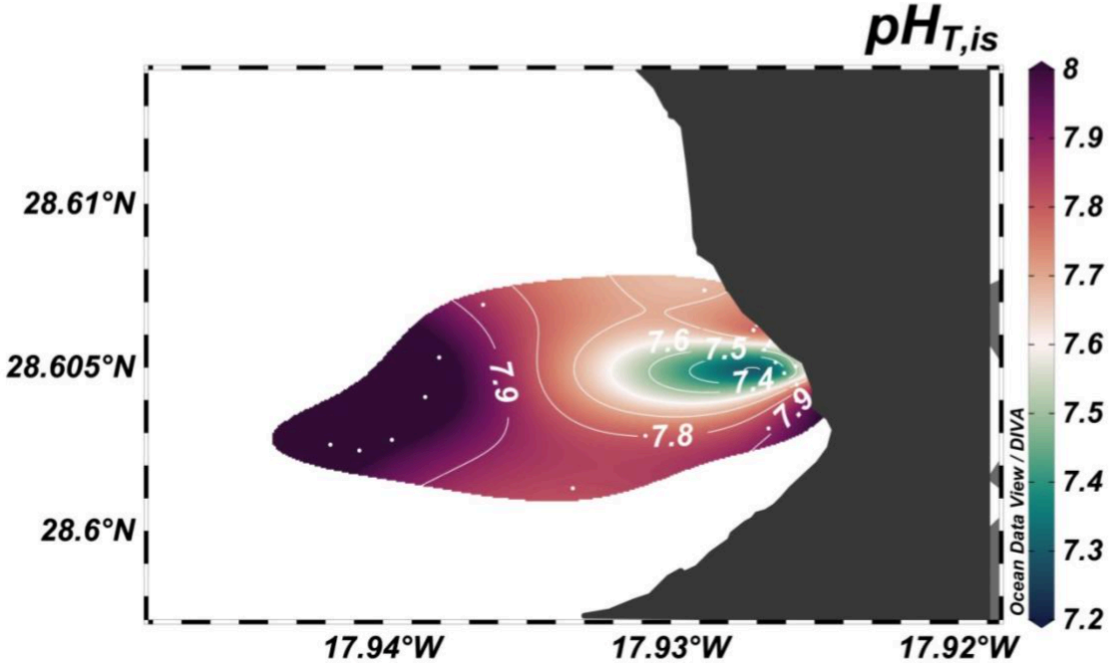
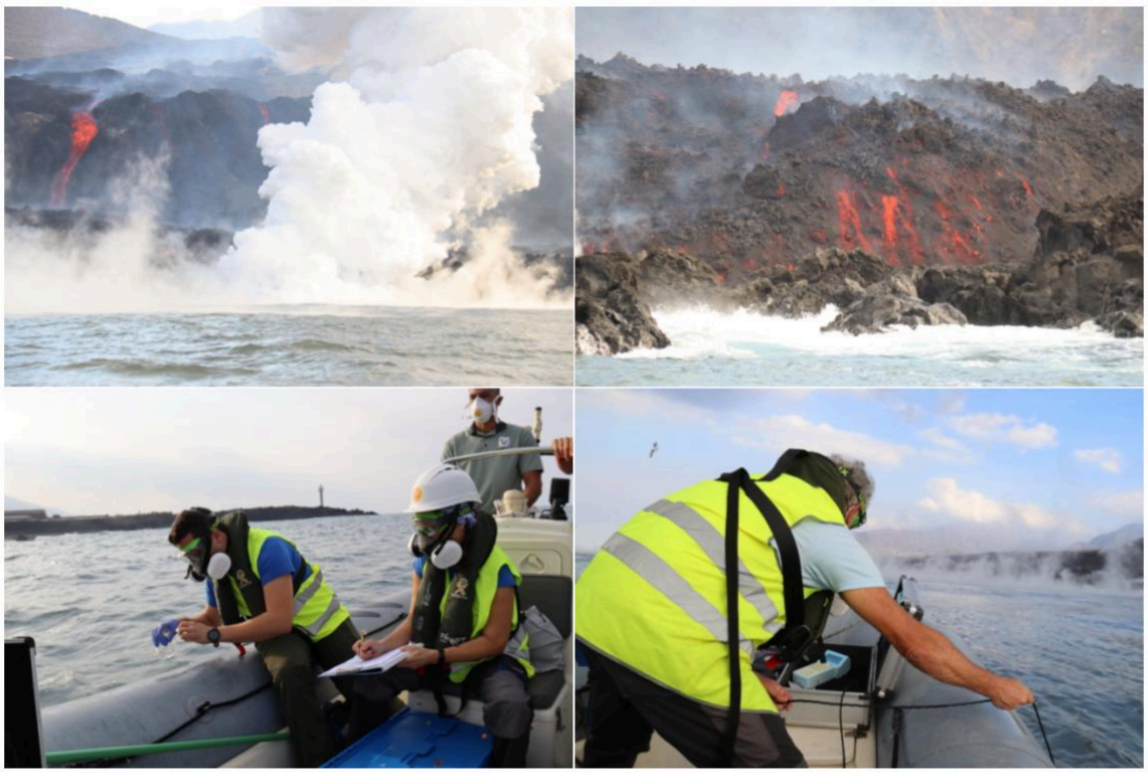


Figure 2. Surface plot of $pH_{T,is}$ at the south delta during November 12th, two days after the second lava-seawater event took place.



Even when the data indicated no or very low CO_2 addition to the seawater, the decrease in pH and the increase in temperature produced an increase in fCO_2 reaching over 5000 µatm at the warmest station on November 12th, 2021, with a computed flux of 2 Tons of CO_2 for the affected 0.9 km^2. During the shallow submarine volcano in the El Hierro Islands, the volcanic discharges of acids and CO_2, increased the pCO_2(pH,CT) to values as high as 155,000 µatm with maximum computed values reaching 223,400 µatm. During the week November 4th to 9th 2011, a flux of CO_2 of $5x10^4$ T d^{-1} was computed for the affected area, showing the different impacts between sub-aerial and oceanic surface sub-oceanic volcanism on the biogeochemical processes.

Pictures at the water interface-lava interaction.



Announcements

We would like to congratulate Peter Landschützer who has been appointed as the new research director at VLIZ.

Within his new job, Peter will continue with CO_2 measurements, in close collaboration with the researchers from MPI-M and the VLIZ ICOS team.

Vacancies

A 2 year position in VLIZ for an ICOS research engineer is available. Click on the link below for full details:
https://www.vliz.be/en/vacancy/2022-10-24-vliz-recruits-research-engineer-icos.

Please disseminate this to any persons you might think will be interested and mention that they can contact Thanos Gkritzalis (thanos.gkritzalis@vliz.be) for any additional information.

A research engineer position at Uppsala University has become available please click on the below link for further information:

https://www.uu.se/en/about-uu/join-us/details/?positionId=559710

Events

17th ICOS ERIC General Assembly 22-23 November 2022, Madrid

Tuesday 22 November
09:00- 12:00 SAB & RI COM (Participants: Scientific Advisory Board, RI COM, GA chairs, Head Office staff)
12-13:00 Lunch
13:00-16:30/17:00 Information Day (Participants: all welcome)
17-18 SAB closed session tbc (Participants: SAB members only)
19:30 Dinner – venue tba (Participants: all welcome)

Wednesday 23 November
09:00- 16:30/17:00 General Assembly meeting (Participants: General Assembly, SAB, FIN COM Chair, EAB Chair, GA Advisors, Invited guests/New country representatives, Head Office staff)

MSA Meeting and Workshop 6-9 December 2022, Paris

MSA meeting takes place in Paris at Sorbonne University from 6th December (noon) to 07. December (noon).
The workshop will start after the lunch break on 7th December until lunch on 9th December.
To book please fill out the below form:
https://forms.office.com/r/fpcXiLa2m1

ICOS Summer School 2023

ICOS will organise the 6th edition of the ICOS Summer School. It will be held at Hyytiälä forest field station in Finland from 24 May until 2 June 2023. Application is open until 1 December 2022

For more information visit
https://www.icos-cp.eu/event/1219

IOCCP-ICOS OTC Training course on biogeochemical sensors 2023

We are thrilled to announce that IOCCP and ICOS OTC (Integrated Carbon Observation System Ocean Thematic Centre) are organising a 14-day international training course on "Instrumenting our ocean for better observation: a training course on a suite of biogeochemical sensors." The course will be held on June 5-18, 2023 at the Sven Lovén Center for Marine Infrastructure, in Kristineberg, Sweden. Application process will open in mid-December 2022.

For more information visit
www.ioccp.org/index.php/training

Applications for the SOLAS Summer School 2023 are open!

The SOLAS Summer School is a regular, international event with the goal to provide the multidisciplinary air-sea interaction background to the next generation of Earth System scientists. The next in-person School will take place in June 2023 at the Ocean Science Centre Mindelo on Cape Verde.

To apply for the in-person Summer School 2023, please use the provided form. The application form should be returned as PDF to solas-school@geomar.de by 25 November 2022, and successful candidates will be contacted by the end of January 2023.

Please send an email to solas-school@geomar.de, if you have any questions or need further assistance regarding the Summer School.

The EGU meeting in Vienna, Austria & Online runs from | 23–28 April 2023

Session OS4.7: **Ships-of-Opportunity: A valuable tool for sustained ocean observations** Convener: Vlad Macovei[ECS] | Co-conveners: Meike Becker[ECS], Ute Schuster, Susan Hartman, Yoana Voynova