



MASTS-SFC Saltire Emerging Researcher Scheme (MASTS-SERS)

Final Report

MASTS in association with the Scottish Funding Council supported the Saltire Emerging Researcher Scheme, which represented an important and exciting opportunity for Post Graduate Researchers (PGR) and Early Career Researchers (ECR) to engage in substantive collaboration with colleagues from Europe (EA, EEA and EFTA countries).

The scheme aimed to promote mobility between Scotland and European research partners with the aim of strengthening existing, and seeding future, research relationships. Participants are expected to demonstrate the impact of their exchange through the publication of novel research work, the formation of new collaborations and project/ funding submissions, and the dissemination of their results.

As your exchange has now come to a close, we ask that you reflect on the exchanges and provide a report by filling in the form below. The reports will need to demonstrate the potential benefits of the grant for both the recipient and their collaborators. Please return this within four weeks of completing your exchanges to masts@st-andrews.ac.uk. When you do so, you are agreeing that your answers may be used to promote the activities of MASTS, including being used on the website and social media channels.

Please note that MASTS may also contact you, the participants, and/or your supervisors to gather additional post-exchange impact information. This information must be provided on request.

Contact information

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Host name	University of Bergen (UiB)
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Exchange overview

Title	Seeding collaboration to characterise the chemical and optical properties of organic carbon in Arctic glaciomarine systems
Start date	28/03/2022
End date	28/08/2022
Project location(s)	University of Bergen, Norway Lurefjorden (fieldwork)

Abstract (max 300 words)

Provide a brief summary of the exchange using language accessible to a non-specialist. Describe what the exchange objectives were, the activities that were carried out, and the subsequent outcomes. This may be published on the MASTS website.

The exchange generated new knowledge, provided new insights and promoted technological innovation for new methodologies to monitor organic carbon in fjord systems. The aim of this project was to analyse the chemical (e.g. labile and refractory) and optical properties (e.g. absorption and fluorescence) of Organic Carbon (OC) and related biogeochemical variables (e.g. Coloured Dissolved Organic Matter (CDOM), Chla) of a fjord system. Optical satellite images for assessing organic carbon (POC, CDOM) and Chla are being processed to upscale the observations. The results obtained will inform the need to improve Earth Observation (EO) methods for monitoring organic carbon in high latitude optically complex systems.

During the exchange, the UiB provided training (marine safety and field techniques). It also allowed the PhD to join an expedition and gain expertise in analysing marine organic carbon such as particulate and dissolved organic carbon and CDOM. The expedition was conducted in Lurefjorden, a particular fjord system where little interchange of water masses with the open ocean take place, and a high presence of CDOM. The amount of CDOM is so high that the water is dark, causing changes in the fjord's community. Therefore, this system was an ideal scenario to study organic carbon's chemical and optical properties, as well as its potential environmental implications in a warmer world.

This exchange has already delivered a poster presentation at an international conference (Cryosphere 2022, Reykjavik, Iceland). A manuscript in preparation and a potential research proposal to conduct fieldwork in the Archipelago of Svalbard. It also generated interest from our host institute (UiB) to organise the visit of a PhD student to the University of Stirling. Moreover, the experience and involvement in Arctic matters, allowed the PhD student to join activities with Arctic research groups such as the flagships of Ny-Alesund's research station, and groups from other latitudes such as Chile.

Impact (max 600 words)

Please demonstrate the impact of your exchange from your perspective, and that of your exchange partner. Describe what the wider benefits of the exchange were to you as participant, your own and host institutions, and the wider community.

The benefits of the exchange were wider than expected. The participation on a three day cruise in mainland Norway exposed me to a new multidisciplinary team, and new field techniques that enriched my previous knowledge and experience (e.g. coordination of field activities, and new optical instruments and techniques). The field work not only had a impact on professional aspects, but the

activities fostered a relationship of trust and friendship with the UiB team, with large benefits for future collaborations. Moreover, we discussed about supporting satellite image processing and lab analysis (e.g., analysis for particulate organic carbon and fluorescence) at the University of Stirling, since the UiB does not have at the moment the possibility to conduct analysis of this nature. The latter, will highly benefit some of the activities and projects of the University of Bergen. In addition, a PhD student is likely to visit the University of Stirling to gain experience and new knowledge on satellite images processing and analysis.

The UiB provided, together with the infrastructure and support for a successful exchange, a dataset from another fjord system in mainland Norway. The latter is key since these data will allow the comparison of fjord systems from south to north (e.g., the Antarctic Peninsula to mainland Norway). In our knowledge, there is no study yet assessing organic carbon chemical and optical properties in glaciomarine systems from the Antarctic to Sub-Arctic regions, therefore, this will be the first manuscript reporting OC variability from southern to northern regions.

In terms of the benefits to the wider community, the results presented at the international conference Cryosphere 2022 gained the attention of the audience. Above all to a research group working on black carbon in the Antarctic and Patagonia. The head of the research team showed interest in collaborating in the near future, opening new opportunities to broaden our research to other latitudes. Moreover, the lack of presentations related to organic carbon in glaciomarine systems made more evident the urgency to address this topic in polar and sub-polar regions. Above all due to the potential impacts that the latter will have at higher trophic levels (e.g., fisheries) threatening food security and economy in a warmer world for local communities and beyond. Finally, during the poster discussions at Cryosphere 2022, an initiative was initiated by a group of female early career scientists to elevate the voice and work of women scientists in the polar research community, with emphasis on underrepresented (black, latin and LGBT+). The activities will be focused on the visibility of polar research by female scientists within the polar community.

Outputs (max 300 words)

Has this exchange resulted in clear outputs, such as the generation of a proposal, research results, or publication? Please provide brief details here. Do any of these outputs have relevance to larger programmes such as the UN SDGs, Blue Economy Action Plan etc?¹

The exchange resulted in four clear outputs:

1. Poster presentation at an International Conference – Cryosphere 2022: the results presented at the event generated deep interest from research groups from Chile and the United States. Potential collaborations with Chile working on organic and black carbon in the Antarctic and Patagonian glaciomarine systems.
2. Data set in progress on organic carbon in glaciomarine systems to contribute to open data bases. The data will contain chemical and optical properties of organic carbon in polar and sub-polar regions (Antarctica, Patagonia, mainland Norway).

¹ All successful applicants will be expected to represent, promote and formally acknowledge the sponsors (MASTS, SFC & Scottish Government) during the course of their project and in any subsequent related outputs. All research outputs and any material used publicly must carry the funders' logos. The following acknowledgement should be used in all publications resulting from this funding. ["This work received funding from the Scottish Funding Council Saltire Emerging Researcher Scheme and the MASTS pooling initiative (The Marine Alliance for Science and Technology for Scotland) and their support is gratefully acknowledged. MASTS is funded by the Scottish Funding Council (grant reference HR09011) and contributing institutions"]

3. Preparation of a manuscript on the properties of organic carbon in polar and sub-polar regions. A paper in process reporting the results from the exchange and data from the Antarctic and Patagonia is expected to be submitted by the end of November this year.
4. New potential research proposal with the University of Bergen implementing improved approaches (e.g., sampling strategy and atmospheric correction) to assess the implications of glacial melting and darkening of Norwegian fjords and beyond.

The Future (max 300 words)

How do you plan to ensure a sustainable collaboration in the longer-term and maximise opportunities and impact in the future? How will you carry forward the benefits now the exchange has been completed? Please outline five concrete plans for future collaboration as a result of your exchange.

1. Work on a manuscript on organic carbon in polar and sub-polar regions. The preparation of the manuscript will ensure a close collaboration for the coming months. Moreover, the data provided by the UiB will allow further work related to bio-optics and satellite product validation. The latter will maintain the momentum securing a sustainable collaboration with the UiB.
2. Preparation of a proposal for the Research Council of Norway to get ground data in Svalbard for satellite data validation. The common interests between the UiB and the University of Stirling to assess carbon fluxes will ensure a longer-term collaboration. The latter through innovative proposals to continue the efforts for the implementation of better approaches to assess organic carbon fluxes in highly impacted polar and sub-polar areas by climate change, such as Svalbard.
3. Continuous projects to improve EO methods for assessing organic carbon in Norwegian fjords, potentially applicable to other regions such as Patagonia. This collaboration highlighted the need to broaden the observations in areas economically important such as Patagonia, and other fjords in Norway. The latter will improve our knowledge on the potential consequences of higher concentrations of organic carbon on fisheries and activities such as aquaculture, both key for Scotland and Norway.
4. Visit of a PhD student. Potential visit of one of UiB's PhD students at the University of Stirling to work on satellite image processing and analysis. This will strengthen the collaborations and will generate new opportunities for other PhD students at UiB to visit the University of Stirling.
5. Involvement with flagships of the Ny-Alesund Research station. This network supports activities around Kongsfjorden, which will be of great importance to the UiB and the University of Stirling for future research. The latter will ensure a platform to rely on for bigger projects in the near future.

Any further comments (max 500 words)

Please use this space to provide any additional comments. These may include, but are not limited to; what you would do differently if you could take the exchange again; what contingency measures you had to use (if any); details of any unexpected benefits or problems; any significant variations in costs;

I would like to add that I'm deeply grateful for this great opportunity. I'm more than convinced that the outcomes of this life-time experience will remain for the coming years, perhaps for my entire professional career. Below you will find photos of the field activities, and the fantastic UiB research group.





Figure 2. Field work activities at Lurefjorden, Norway.

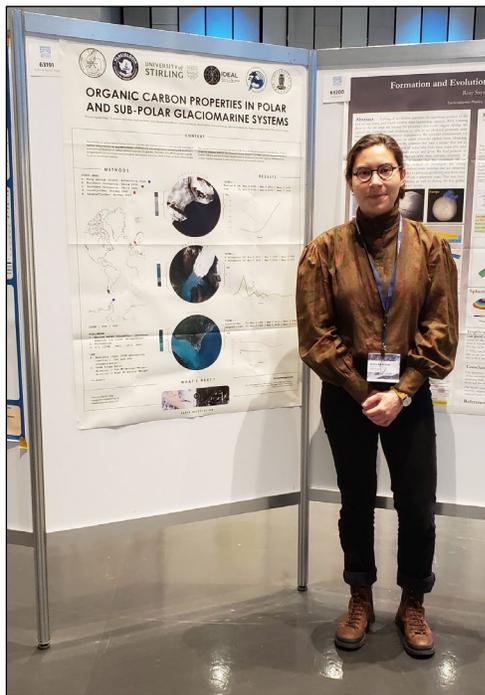


Figure 3. Poster presentation at the Cryosphere Conference 2022, Reykjavik, Iceland.



Figure 3. About 30 researchers from 8 countries working on the nutrient cycle in Ny-Ålesund and beyond in Orvieto, Italy, to share knowledge and create network across the disciplines.

Final expense report

Item Number	Description	Cost per Unit	Number of Units	Total Amount (£)
1				
2				
3				
4				
Add more rows if needed				
Total				
In-kind contributions				
In-cash contributions				
Grand Total (Total requested from scheme + In-kind + Cash)				