



Breakout Workshop:

Ocean Carbon from Space

Co-Chairs:

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Scope and Goals

Quantifying the ocean carbon budget and understanding how it is responding to anthropogenic forcing is a major goal in climate research. It is widely accepted that the ocean has absorbed around a quarter of CO₂ emissions released anthropogenically, and that the ocean uptake of carbon has increased in proportion to increasing CO₂ emissions. Yet, our understanding of the pools of carbon in the ocean, the processes that modulate them, and how they interact with the land and atmosphere, is not satisfactory enough to make confident predictions of how the ocean carbon budget is changing. Improving our understanding requires a holistic and integrated approach to ocean carbon cycle research, with monitoring systems capable of filling the gaps in our understanding. Satellite observations can play a major role in this.

The proposed breakout workshop will form part of the second 'Ocean Carbon from Space' workshop organised by the European Space Agency (ESA) and relevant projects funded through their Ocean Science Cluster and Climate Office. The workshop is planned as a hybrid event with an online component in the weeks leading up to the IOCS (3 days), a plenary sessions at IOCS (0.5 day) and the proposed breakout workshop at IOCS (2.5 hours). We aim to bring together the scientific community to address major gaps, challenges and opportunities in ocean carbon research and to move towards an integrated approach to provide the best possible characterisation of the ocean carbon budget from satellite observations and further the understanding of its variability in space and time. This will provide insight into how satellite observations can aid in the assessment of the ocean carbon budget in a climate context and provide useful information to evaluate and improve climate models, with relevance for high-level policy activities.

For the breakout workshop at IOCS, we propose to address those topics that emerge from the second *Ocean Carbon from Space* workshop, with a specific focus on actionable recommendations for the international research community and space agencies.

Key Questions

1. How can we improve observations through algorithm development and validation, including uncertainty estimation and climate-quality datasets? What are the gaps, challenges and opportunities in our observing system?
2. How can we understand better the physical and biological processes that underpin the ocean carbon cycle and address the impact of climate change, including extreme events, on the ocean carbon cycle?
3. How can we close the ocean (and global) carbon budget and ensure that satellite observations are used for high-level policy to inform climate mitigation and adaptation strategies, including the global stocktake?

While we have identified three key topics above, we anticipate further topics may be highlighted during the second 'Ocean Carbon from Space' workshop. We also note that we look for community consensus, and welcome additional input from other proposals on the topic of Carbon & Climate that may have been submitted to IOCS.