

Call to secure a resilient global supply of certified reference materials for the seawater carbonate system

We, the Scientific Steering Group of the International Ocean Carbon Coordination Project of the Scientific Committee on Oceanic Research (SCOR) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and the Biogeochemistry Expert Panel of the Global Ocean Observing System (GOOS), recognise the urgent need to secure a resilient, sustainable, and globally coordinated supply of certified reference materials for measurements of the seawater carbonate system.

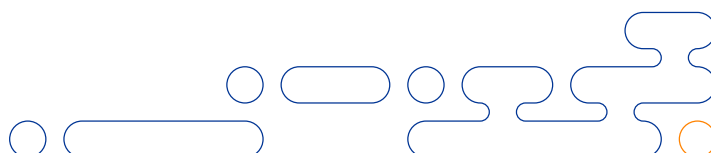
The ocean absorbs more than one quarter of annual anthropogenic CO₂ emissions ([Friedlingstein et al., 2026](#)). Accurately determining the magnitude, trend, and variability of this uptake is essential for closing the Global Carbon Budget, understanding changes in the climate system, and supporting major scientific assessments, including those of the Intergovernmental Panel on Climate Change (IPCC).

Achieving these objectives depends on measurements of the seawater carbonate system that are traceable and comparable across laboratories, observing programmes, regions, and decades. Reference materials provide the common measurement basis needed to achieve this comparability ([Dickson, 2010](#)). They are essential for monitoring ocean acidification and broader changes in the marine carbon cycle, and for evaluating emerging marine carbon dioxide removal approaches.

For decades, the global ocean carbon observing community has relied on the leadership and sustained commitment of the Scripps Institution of Oceanography (SIO), USA, as the principal global producer and distributor of seawater carbonate system reference materials. This effort has enabled the development of globally comparable ocean carbon observations and represents a foundational contribution to international ocean carbon science and observing. The community recognises and deeply values this long-standing leadership and commitment.

However, reliance on a single provider creates a structural vulnerability. An interruption affecting production, specialised personnel, institutional funding, stock availability, or international distribution could constrain access for laboratories and observing programmes worldwide. The COVID-19 pandemic demonstrated how production and supply chains can be disrupted and highlighted the risks associated with dependence on a single source ([Catherman, 2021](#)). While the sustained effort of the current provider is widely recognised and has been instrumental in supporting the community, the current single-provider model is not fully aligned with established metrological principles and modern certification practices, which emphasise redundancy, traceability, and independent verification.

In addition, long transport distances and customs-related procedures and costs already disproportionately affect laboratories in distant or resource-constrained regions. These constraints affect not only the reliable availability of materials, but also equitable access and, ultimately, the quality and geographical coverage of global ocean carbon observations.



Why action is needed now

Demand for high-quality ocean carbon observations is increasing as monitoring of ocean carbon uptake, ocean acidification, and potential marine carbon dioxide removal expands. Growing ship-based, fixed, and autonomous observing networks, including GO-SHIP, Argo, OceanSITES, and ICOS, are generating more geographically distributed measurements that require consistent calibration, validation, and quality assurance. Wider efforts to strengthen greenhouse gas observation, such as the World Meteorological Organization's Global Greenhouse Gas Watch, are likely to increase this demand further.

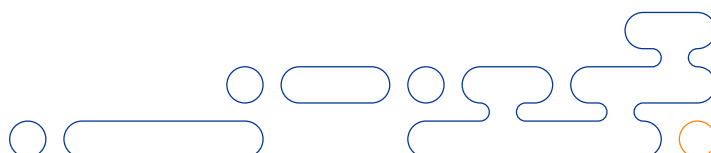
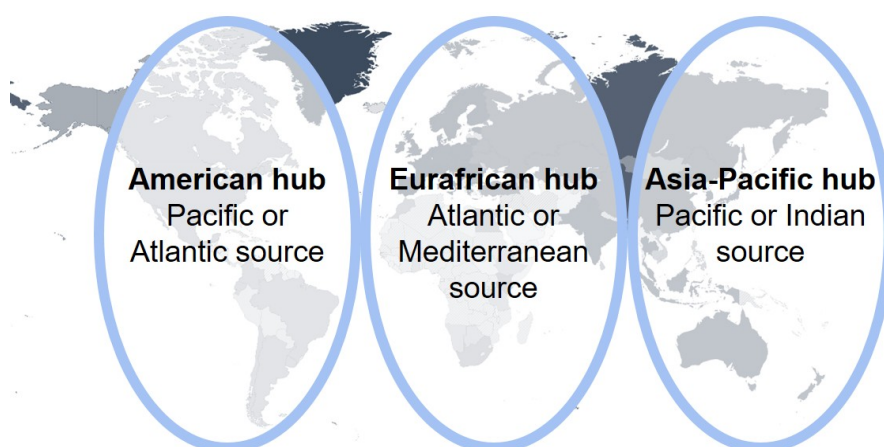
Meeting this growing demand and supporting the transition from predominantly research-driven observation towards sustained operational ocean observing services require reliable underlying measurement infrastructure, including the production, certification, and distribution of reference materials.

Global momentum

International bodies are already recognising the need for action. The Intergovernmental Oceanographic Commission of UNESCO (IOC) warns that without stronger, coordinated investment, ocean observing systems, and the climate services they enable, remain at risk. The G7 Future of the Seas and Oceans Initiative has committed to enhanced, sustained global ocean observation, while the G20's Ocean20 Engagement Group calls for inclusive, equitable access to ocean data and infrastructure. COP28's ocean carbon accounting commitments under the Paris Agreement and ISO standards for ocean carbon monitoring further underscore the need for a globally coordinated supply of certified reference materials. These commitments require operational foundations, of which a globally coordinated supply of certified reference materials is a cornerstone.

Towards a distributed framework

We therefore support the development of a globally distributed framework of coordinated regional reference material production and distribution hubs. A system involving major hubs, for example across the Americas, Europe/Africa, and Asia-Pacific ([García-Ibáñez and Easley-Vidal, 2025](#)), would substantially improve resilience, continuity, accessibility, and long-term sustainability while preserving global interoperability and traceability.



These efforts would complement SIO's long-standing role, ensuring harmonisation and certification in collaboration with national metrology institutions around the globe.

Encouragingly, initiatives are already emerging. In Europe, the oceanographic and metrology communities have begun coordinating around the creation of a European hub for the production, certification, and distribution of seawater carbonate system reference materials. Recent work under the JPI Oceans Ocean Carbon Capacities initiative has demonstrated both the feasibility and urgency of establishing such a distributed regional framework ([García-Ibáñez et al., 2025](#)). These efforts build upon existing European expertise and infrastructures, including ICOS, EuroGO-SHIP, and national metrology institutes connected through the European Metrology Network on Ocean and Climate Observations, and align with the new OceanEye Initiative by the European Commission. However, despite strong scientific engagement and readiness within the community, sustained long-term support and funding mechanisms have not yet been secured to support the transition from planning to operational implementation.

Beyond Europe, there are also promising developments in other regions. Activities in Japan on multiparametric standard seawater and broader oceanographic reference material development demonstrate the growing international expertise and interest in this field. Future initiatives, such as China's upcoming OceanObs Cycle may provide further opportunities to establish globally distributed capabilities and partnerships.

Call to action

We call upon national governments, funding agencies, intergovernmental organisations, and regional and international ocean observing programmes to provide sustained long-term financial support and coordinated international governance for the production, certification, and distribution of seawater carbonate system reference materials. By securing their long-term availability through a resilient global framework, we can safeguard the integrity, comparability, and continuity of global ocean carbon observations and the climate services that depend on them.

The IOCCP Scientific Steering Group in close collaboration with the JPI Oceans Knowledge Hub on Ocean Carbon Capacities and the European Metrology Network for Climate and Ocean Observation

