

An Arctic Ocean observing system as a part of a global Framework for Ocean Observing

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Why observe the Arctic Ocean?

The Arctic is dominated by oceans and coasts. The region is warming at roughly twice the global average rate, with a dramatic reduction in summer sea ice extent as one of the clearest indicators of this trend. Physical and biological processes are being transformed across the entire region, while climate feedback mechanisms in the Arctic's changing atmospheric and oceanic dynamics impact at global scales.

Change in the Arctic Ocean environment is also leading to a wealth of interconnected social transformations. Exploratory shipping through new routes is taking place, and oil and gas exploration growing. The Joint IOC-WMO Technical Commission for Oceanography and Marine Meteorology (JCOMM) responded by creating five new areas of responsibility for provision of maritime safety services in the Arctic.

With industrial development, increasing numbers of people are migrating to the Arctic. The region's indigenous peoples are stepping up their efforts to gain control over the developments taking place in their territories, while maintaining their cultural continuity. Meanwhile, conservationists are increasingly highlighting the need to protect the fragile Arctic environment.

Vulnerability in the Arctic Ocean is therefore increasing. Its environment and peoples are under growing stress from climate change. Industrial infrastructure and shipping create further pressures, while simultaneously being at risk themselves in this often hostile ocean.

Never has accurate information been more important, yet at present we know very little about the Arctic Ocean. Critical physical processes are poorly understood, ecosystems remain unstudied and undiscovered, and indigenous voices go unheard. This lack of knowledge thwarts efforts to detect, predict or manage the interrelated physical, biological and social impacts of climate change, and posing a strong barrier to sustainable development. There is a strong requirement for a coordinated observing system for the Arctic Ocean and its coasts, to provide baseline data and ensure sustained monitoring.

A Framework for Ocean Observing for the Global Ocean Observing System

A key recommendation from the OceanObs'09 (www.oceanobs09.net) Conference held in Venice in September 2009 was for international integration and coordination of interdisciplinary ocean observations. The Conference was sponsored by many

international and national ocean agencies, and attended by representatives of ocean observation programs worldwide. Based on impressive agreement among the many groups at the Conference and their strong desire to work collectively, the sponsors commissioned a Task Team to develop an integrated framework for sustained ocean observing.

The Task Team's objective was to use lessons learned from the successes of existing ocean observing efforts and outline a Framework that can guide the ocean observing community as a whole to establish an integrated and sustained global observing system – one that includes ocean physics, biogeochemistry, and ocean biology and ecosystems, and addresses the variables to be measured, the approach to measuring them, and how their data and products will be managed and made widely available to modeling efforts and a wide range of users. Achieving this step-change in ocean observing will require internationally accepted processes and expanded collaboration.

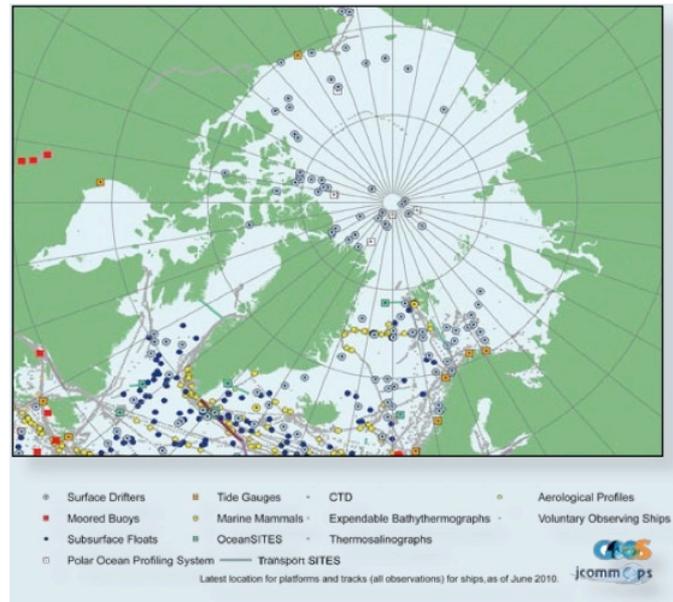
The Framework and its coordination processes are organized around “essential ocean variables (EOVs),” rather than by specific observing system, platform, program, or region. Implementing new EOVs will be carried out according to their readiness levels, allowing timely implementation of components that are already mature, while encouraging innovation and formal efforts to improve readiness and build capacity. Systems engineering approaches provide a common language and consistent handling of requirements, observing technologies, and information flow among different, largely autonomous observing elements linked in a collaborative Framework.

The IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS) adopted this Framework as guidance for its work in a reform of its governing structures applied in 2012. This Framework based on broad community collaboration will improve communications and data sharing across the community; result in faster and better-coordinated information to support both research and societal needs; contribute to capacity building and enhancement of ocean observations in developing countries; increase confidence and support among sponsoring and funding entities; and foster innovation and scientific discovery.

Why apply this Framework to the Arctic?

The Arctic poses particular imperatives for sustained ocean observations, as well as a particular technical and political environment. A sustained Arctic Ocean observing system will have to respond to these particular technical challenges, and be coordinated by scientific and social stakeholders in the region. It will have to respond to locally as well as globally-driven requirements, coordinate observing networks exclusive to the Arctic as well as those that project into the Arctic, and develop scientific and actionable information products for local and global audiences. It will have to be funded by the research and operational institutions of many nations working in the Arctic.

Application of the Framework for Ocean Observing in designing the coordinating structures of a sustained Arctic Ocean observing system would ease coordination with a global system. GOOS, global science, and global society would benefit from increasing observations of the Arctic environment. And Arctic stakeholders would benefit from the global observing systems that project into the region, as well as the distillation of best practices from other observing systems, while responding to the unique challenges observing the Arctic Ocean.



The observing networks coordinated by GOOS and JCOMM already project partly into the Arctic Ocean.

References

This white paper draws on the following documents:

A Framework for Ocean Observing. By the Task Team for an Integrated Framework for Sustained Ocean Observing, UNESCO 2012, IOC/INF-1284 rev., doi: 10.5270/OceanObs09-FOO

Bates, P. and K. Alverson, 2010. Why Monitor the Arctic Ocean? Services to society from a sustained ocean observing system, GOOS brochure: ioc-goos.org/WhyMonitorArctic