

Transforming Ocean Science: Fostering a Network for Cooperative Science Research on Commercial Ships (Science RoCS)

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ABSTRACT

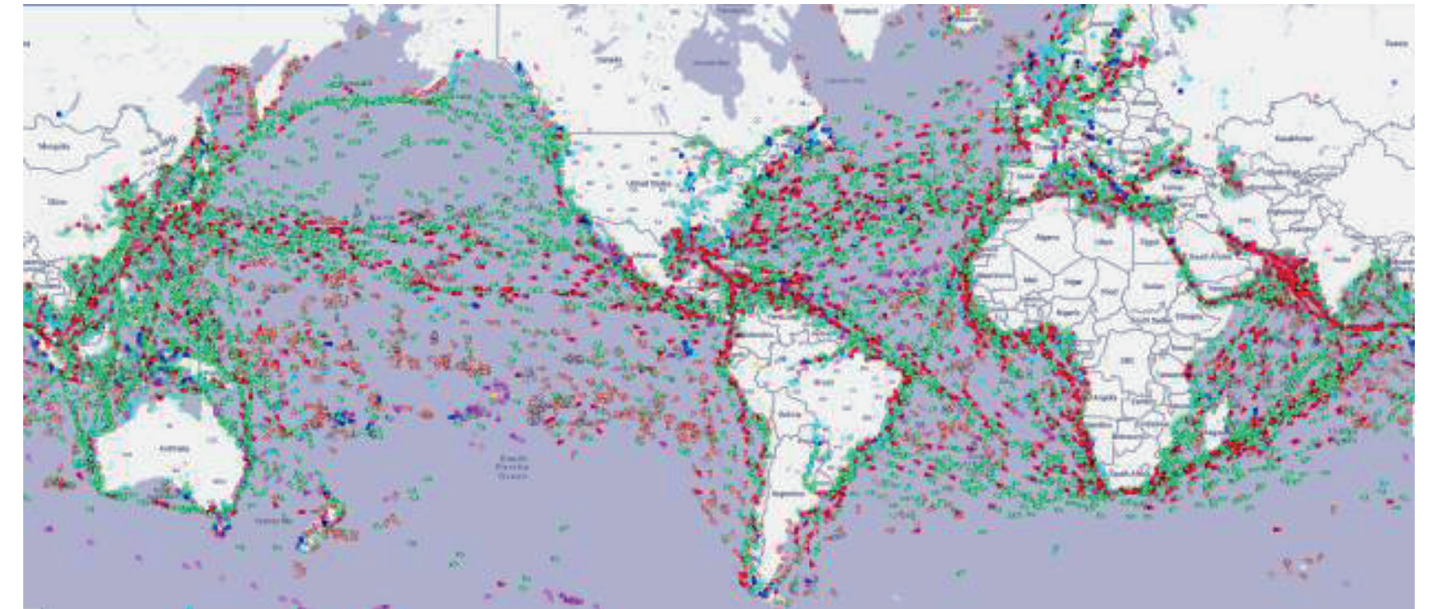
Our goal is to transform ocean science through industry partnerships with commercial shippers, creating “integrated observing platforms” with a global reach that will revolutionize the science community’s ability to characterize variability in ocean physics, chemistry, and biology across spatial and temporal scales. For the past 100+ years, oceanographers have been able to directly access just a fraction of the global ocean. With only a few dozen research vessels worldwide versus more than 50,000 commercial vessels in operation today, and industry eager to participate in ocean science, the environment is brimming with opportunities. We envision a future where commercial vessels are, as a matter of course, designed and built with a suite of scientific sensors to measure water properties and currents, as well as chemical and biological parameters optimized for a vessel’s trade route to address societally relevant questions, with the data disseminated broadly to all stakeholders. Targeted collaborations between science and commercial shippers have existed for decades and the foundation has been laid. Now it is time to build on this experience by using the science community’s vast network, relationships, and expertise in sensor technology and science to make data collection on commercial ships the new norm.

Vision and Potential Transformative Impact

We envision an integrated approach to observation of the global ocean on a regular and long-term basis in partnership with the shipping industry as an essential component of the Global Ocean Observing System (GOOS). The challenge here for Science Research on Commercial Ships (Science RoCS) is threefold: fostering cooperation between the shipping industry and the scientific community at a level that will be transformative for societally relevant ocean science; promoting cross-disciplinary ocean science by simultaneously collecting multiple data streams near the air/sea interface (via meteorological sensors and the ship’s seawater intake) and within the water column (via acoustic sensors and deployment of autonomous sensors); and spurring a technological revolution in observational oceanography by developing new turnkey, maritime-industry-appropriate scientific equipment. The resulting freely distributed data will be a fundamental resource for understanding the climatic state and health of our planet and will also provide systematic ground truth information about the state of the ocean surface and lower atmosphere to interpret and assess remotely sensed data and numerical model output. This transformative impact will be bolstered by cooperation of those within the scientific community—comprising scientists, engineers, data managers and research vessel operators—as well as close coordination with commercial vessel operators and federal funding agencies.



Science RoCS Commercial Collaborator Vessel, Wallenius Wilhelmsen.



Worldwide vessel traffic: 55,000 commercial vessel vs. orders of magnitude fewer research vessels. Credit: <https://www.marinetraffic.com>, screen shot.

Realizable, With Connections to Existing U.S. Scientific Infrastructure, Technology Development, and Public-Private Partnerships

The global shipping industry is undergoing a technological revolution and is showing a growing commitment to good stewardship of our oceans. Motivated by the emerging opportunities, an ad hoc group from the science community—comprising scientists and engineers from academic and federal institutions, as well as data managers and vessel operators from the oceanographic research fleet—is working to actualize the vision of the OceanScope Report, which was presented at OceanObs ’09 and reaffirmed at OceanObs ’19 (http://www.scor-int.org/Publications/OceanScope_Final_report.pdf). This cross-institutional group seeks to expand grassroots efforts within the science community and to cultivate connections with a shipping industry eager to cooperate. Building on the science community’s successful cooperation with several shipping companies, the group is contacting additional potential industry partners with ties to international shipping consortia, identifying commercial routes of scientific interest, compiling information about state-of-the-art sensor technology and data dissemination, entraining stakeholders, and identifying potential avenues for federal funding for scientific infrastructure.

Scientific/Technological Sectors Engaged Outside of Traditional Ocean Sciences

Working in partnership with industry to collect and disseminate large oceanographic datasets will entrain three sectors within global shipping: vessel owners/operators, manufacturers of marine instrumentation, and developers of vessel data management systems. Preliminary meetings with ship owners to discuss installing scientific equipment on existing vessels and including instruments in new builds is being met with enthusiasm and has highlighted the possibility of using the ships’ communications bandwidth to send near-real time scientific data from ship to shore, further leveraging the technology that is already in use in the ships’ high-tech vessel management systems.

Opportunities for International Participation and Collaboration

Leveraging the regular, repeated, global routes occupied by commercial vessels will provide an unprecedented opportunity for global in-situ data collection and global participation in ocean science. Commercial ships regularly transit regions far beyond the practical reach of research vessels. Inspired by the framework of the academic research fleet of vessels and building on their experience obtaining permissions to operate within countries’ exclusive economic zones (EEZs), Science RoCS will greatly expand the fraction of the ocean that is accessible to oceanographic researchers and will provide universal access to the data.

Develops Global Capacity and Encourages the Development of the Next Generation of Ocean Scientists, Engineers and Technologists

For these “integrated observing platforms” to be truly transformative and build global capacity, we will ensure that measurements are disseminated broadly and freely to all stakeholders, guided by four foundational principles of FAIR data—Findability, Accessibility, Interoperability, and Reusability (F.A.I.R.). Successful partnerships between shippers, sensor developers, equipment manufacturers, and data managers must ensure that the data are accessible without need for proprietary (often expensive) software. To build capacity among ocean scientists and stakeholders from coastal countries that do not have access to regular seagoing research operations, the “integrated observing platforms” will also include routes to address questions of regional interest.

We encourage anyone inspired by these efforts to reach out to Science RoCS. We welcome your input and participation!

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Science RoCS is the future and it’s starting now, join us! 🚢