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Technical Report on Scoping of Operational Oceanography

Summary. This Technical Report on Scoping Operational Oceanography was prepared by IOC Officers, including Frederico Antonio Saraiva Nogueira and Javier Armando Valladares, in response to IOC XXVI/Decision 4.7. WMO defines a useful differentiation between research and operational activities. Operational oceanography has several meanings throughout the marine literature, but nearly all agree that it is the basis for forecasts. Activities which involve observations, to provide services continuously are differentiated from marine science research as operational. An agreement upon the term "Operational Oceanography" is needed to differentiate it from Marine Science Research with a view to improve the articles 246, 248 and 249 of UNCLOS, to include operational activities.

An Introduction – Science motivation

Those who sail, trade, make observations, research, and defend their national interests in political, economic, social and environmental issues, are perfectly aware of the importance of the oceans. Issues relating to the oceans are vital for life on Earth.

Understanding oceanographic processes and their interactions with the atmosphere, biosphere, cryosphere and the mainland are required for the development of the human being. But even though we are in the 21st century our knowledge about the seas and oceans is rather limited. Future challenges, like climate change, cannot be assessed, nor can reasonable mitigation measures be taken without oceanographic data.

The origins of the IOC lay in the era of short duration, ocean measurement campaigns, designed to elucidate ocean processes and verify scientific theories. Today the world expects ocean services to deliver on the promise of continuous forecasts of the state of the ocean environment. The knowledge needed for such forecasting capability cannot be obtained from research activities which are restricted in duration and project oriented. Scientific research has to be based on and supplemented by operational long-term ocean observations to provide analyses, predictions and other information products.

Clearly there exists a difference between research and operational activities. But neither of them are defined in any Convention. To avoid ambiguity our meteorology colleagues defined a clear difference between research and operations for meteorology activities and data policy in the Resolution 40 of the WMO (XII GC 1995).

Part XIII on UNCLOS rules on Marine Scientific Research (MSR), but nothing is mentioned about a definition. Operational Oceanography is ignored in the convention.

Some definitions about Operational Oceanography are:

- *“Operational Oceanography can be defined as the activity of systematic and long-term routine measurements of the seas and oceans and atmosphere, and their rapid interpretation and dissemination. Important products derived from operational oceanography are:*
 - *nowcasts providing the most usefully accurate description of the present state of the sea including living resources*
 - *forecasts providing continuous forecasts of the future condition of the sea for as far ahead as possible*
 - *hindcasts assembling long term data sets which will provide data for description of past states, and time series showing trends and changes”*
- EUROGOOS Website
- *“Operational oceanography includes a routinely collection, interpretation and presentation of data from the ocean and atmosphere with the purpose of:*
 - *Giving a reliable description of the actual conditions of the sea including its living resources*
 - *Providing prognoses for the future developments of the conditions in the sea*

- *Establishing a marine database from which time series and statistical analysis can be obtained for descriptions of trends and changes in the marine environment including consequences for the living conditions in, on and around the sea.”*

BOOS Plan, Buch and Dahlin 2000

- *“Monitoring and forecasting of the ocean physics, biogeochemistry and ecosystems”*

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- *“...“operational” often implies concepts that include, but are not limited to, a sustained effort beyond the normal grant-funded process study; technologies that are sufficiently robust that they do not require the original developer to operate the system or quality control the results; and quality-controlled, real-time data or derived-products that are distributed to the broader scientific community and the public...”*

Glenn, S. et al. – Oceanography – 2004

- *“Definition. Naval Oceanography consists of three principal efforts: the operational oceanography program (meteorology, oceanography, hydrography, astrometry, and precise time and time interval) under the sponsorship of the Chief of Naval Operations; the ocean science program under the sponsorship of the Chief of Naval Research; and, under various sponsors other generally related activities such as ocean engineering, deep ocean technology, deep submergence operations, salvage, diving, diving biomedicine, and environmental satellites...”*

SECNAV INSTRUCTION 5430.79B, OP-006,14W.1986

In a general view Operational Oceanography could also be associated with Ocean Observation as a basis for forecasts: natural hazards, accidents offering environment protection and better conditions for the management of marine resources.

In the late 1980s, IOC/UNESCO together with WMO, UNEP and ICSU set up a global ocean observing system (GOOS) as part of a Global Earth Observation System of Systems (GEOSS).

The political support for establishing GOOS came from the Second World Climate Conference (1990), and from the United Nations Conference on Environment and Development in 1992 (UNCED, also known as “Earth Summit” or Rio Conference). However, no convention underpins GOOS and GOOS continues to depend on strong long-term commitments and financial support from individual Member States.

From the beginning of GOOS some members expressed the view that an enabling protocol or convention amongst governments was necessary to facilitate needed participation and financial support.

The on-going development of GOOS has made more evident the relationship between Ocean Observations and Climate and Meteorology, and made obvious the need to establish and maintain a system for, validating, making accessible and distributing high quality operational data.

In earlier times researchers were accustomed, following usual MSR practices, to keep their data hidden away until they had worked it up, but in operational conditions the timely, free and unrestricted exchange of and access to data is essential.

As an operational system the Argo project (a global array of 3,000 profiling floats), an important contribution to the open ocean GOOS module, should be fully consistent with UNCLOS. However, a specific problem was identified as the floats, though deployed on the high seas, may drift into waters under national jurisdiction, where the question of whether their data collection is an operational activity or part of marine scientific research has caused controversy. The differentiation of operational from research within territorial waters has implications for the continued freedom of sharing Argo data globally.

It is worth noting that disclosure of the oceans as an essential source of resources for humanity must be among the goals of any scientific or observational programme.

Concerns about operational oceanography

There is no definition accepted by consensus stating what Operational Oceanography is. Of course, it is based on science, but unlike scientific research we do not pick up a phenomenon to study, to explain, to define its causes, consequences, its relationship with other phenomena and so on. Briefly: Knowledge is the justification of MSR, while Services justify the Operational Oceanography. Operational services monitor understood phenomena, which have evident implications for our day-to-day lives, and we wonder what will be their future behaviour. In other words we need to give continuity to the observational process (measure) and forecast the phenomenon. Further, we need to do it continuously. Then we get to some key words: “observe”, “continuously”, “services” that could mean “Operational”. The desired effect is “forecast” and bringing services to coastal communities. The side products are different kinds of information, more knowledge, more questions and consequently: new services, more research and more science. Weather and tidal forecasts are the best examples of phenomena that common citizens experience.

In spite of common needs for observations, there are some differences in managing research and operational data. Operational oceanographic data must be:

- Timely (real or near real time);
- Collected in a systematic manner;
- Based on latest technology developments in measurement and communication;
- Useful for forecasts, between 0 and 10 days, to provide for safety and protection of life, property and environment.

Operational Oceanography also means the transition from surveys made in small or medium scale by small teams of scientists in charge of projects with research purposes (MSR) to a sustainable observation network handled by interdisciplinary and interagency programmes with coordinated management. Operational Oceanography must provide ocean services that contribute to societal benefits: sustainable development; the proper use of ocean resources; prevention and protection from ocean-related hazards; and, safeguarding human life at sea.

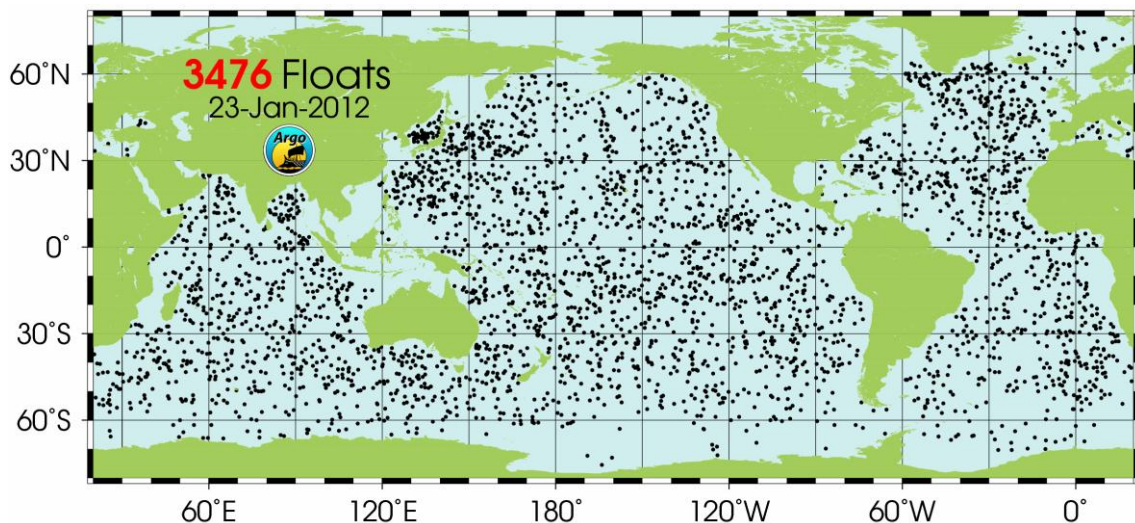
The resources of the sea should be used in a rational and sustainable manner based on scientific and technological knowledge. We would like to call attention to three key words quoted in paragraphs above: “important”, “sustained” and “rational.” Under the purely semantic point of view, “important” is what adds value to something, “sustained” keeps the same status in time scale, and “rational” stands for the use of reason or reasoning.

The concepts mentioned above can be linked, realistically, in a sequence of cause and effect, where each step can be split into other sequences. To demonstrate to society the importance of the sea, it is necessary to create a rationale associated with benefits from the sea, improving the quality of life, and identifying which hazards may be avoided or mitigated by an effective implementation of an efficient observation network. The use of the sea must necessarily be sustainable because once depleted of a resource, the sea may not recover. The use must be rational, otherwise, it will hardly be sustainable.

The actual implementation of GOOS and other Operational Oceanography programmes under the IOC umbrella may indirectly contribute to the increase in maritime awareness by offering products and services of interest to the population.

According to the booklet organized by IOC Ocean Observations and Services Section (OOS), “monitoring and observing the global oceans requires an international effort and broad cooperation”. This is the main reason why IOC, WMO, UNEP and ICSU “sponsor and manage the Global Ocean Observing System (GOOS) to provide a coordinated approach to development of observation technologies; rapidly and universally disseminate data flows and delivery of marine information; to inform and aid marine management and decision makers; and to increase the appreciation of the general public of our changeable oceans”.

If we want to include all our community (oceanographers) in a common task to improve the management of sciences and services in the ocean, we should include Operational Oceanography under the rules of UNCLOS. According to the Chair’s Statement in the 26th IOC Assembly “While there are provisions for Marine Scientific Research in the Convention on the Law of the Sea, the huge technological developments of the past decades in measuring instruments and communications has allowed the incorporation of concepts not covered until the eighties of the twentieth century, such as real-time observations, the possibility of the global modelling of ocean and climate phenomena, autonomous and expendable instruments that can reach remote and, until recently, inaccessible areas.” The IOC Assembly, by Resolution XXVI-4, decided to “re-establishes the open-ended intersessional working group” on the ABE-LOS, and gave IOC/ABE-LOS a “good new and short task” to try to improve the articles 246, 248 and 249 of UNCLOS, to include operational activities.



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