International Organisation of Ocean Programs—Making a Virtue of Necessity

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When faced with the needs of climate prediction, a sharp contrast is revealed between existing networks for the observation of the atmosphere and for the ocean. Even the largest and longest-serving ocean data networks were created for their value to a specific user (usually with a defence, fishing or other maritime purpose) and the major compilations of historical data have needed extensive scientific input to reconcile the differences and deficiencies of the various sources. Vast amounts of such data remain inaccessible or unusable. Observations for research purposes have been generally short lived and funded on the basis of single initiatives. Even major programs such as FGGE, TOGA and WOCE have been driven by the dedicated interest of a surprisingly small number of individuals, and have been funded from a wide variety of temporary allocations. Recognising the global scale of ocean observations needed for climate research, international cooperation and coordination is an unavoidable necessity, resulting in the creation of such bodies as the Committee for Climatic Changes and the Ocean (CCCO), with the tasks of:

(i) Defining the scientific elements of research and ocean observation which meet the needs of climate prediction and amelioration.
(ii) Translating these elements into terms of programs, projects or requirements that can be understood and participated in by individual nations and marine agencies.
(iii) The sponsorship of specialist groups to facilitate the definition of research programs, the implementation of cooperative international activity and the dissemination of results.

It cannot be presumed that the governments of various nations have a preexisting interest in climate prediction, and there certainly exist wide differences between countries in the organisation and sponsorship of marine science and marine monitoring. Many countries need guidance on the best way in which they can participate and gain benefit from international programs and there is a widely expressed need for training and rudimentary assistance in getting national marine programs underway, which at times is difficult to reconcile with the interests of the more experienced international participants.

Possibly the greatest challenge in the implementation of the systems for global and long-term acquisition of ocean climate data will be to place on a firmer and more permanent financial footing the national contributions to a global network, to a level comparable (in organisational if not financial terms) with the World Weather Watch. This problem has many facets, some of them being:

1. Since the need for the network is perceived to be 'scientific' and not in the service of defence commercial advantage or operational necessity it is very difficult for ocean monitoring activities to be regarded as an ongoing, national 'operational' need in the same sense as meteorology. They are and will remain within the management and budget portfolios of national research activity. Furthermore in some countries this activity is partitioned in several departments such as commerce or education, whose central interests are directed to more urgent perceived priorities. Also, budgets are granted through a scientific review process so that monitoring activities have to be couched in terms of scientific project objectives.
2. Although in the short-term the highest priority need in ocean data is physical data for the validation of climate models, there exists a parallel need for chemical data for the description of trace constituent budgets, deep ocean circulation parameterisation and for the development of models for biological feedback and climatic impact on ocean productivity. There may also be a strong socially-driven demand for base-line and time series information on near shore physical, chemical and biological indicators. Therefore the meteorological observational networks which are very comprehensively organised through WWW are not necessarily ideal for oceanographic data requirements since they lack the linkage to non-physical disciplines.
3. The experience of TOGA and WOCE has demonstrated that large scale international activities can be very successfully promoted if couched in terms of a coherent scientific program. The creation of scientific and implementation plans and the convening of scientific meetings provides an effective focus for the definition of national activities, the promotion and sponsorship of these activities by governments and granting bodies and a platform for the recognition of individual scientists.

   At this stage it is not clear if an observing system program such as the Global Ocean Observing System has an appeal which will accrue the same benefits. In the absence of an ongoing national framework for sponsorship of new ocean monitoring activities, it will be difficult for scientists at national level to press for involvement, yet the interest of active scientists and their participation at international fora is central to the success and quality of the system. Indeed to a large extent the advocacy of a GOOS is, at national level, in the hands of people who have very little to do with in the practical implementation of the system and its subsequent operation, namely the climate modellers and climate analysts.
4. Apart from scientists there will be substantial manpower and technical resource implications in the creation of GOOS. Such a system requires trained manpower that is presently in short supply, and a high degree of technical backup, not to mention ships and automated acquisition and data transmission systems. The scale of enlargement over existing experimental networks such as the TOGA Subsurface network is enormous and it cannot be assumed that the task is simply a process of 'scaling up'.
5. In practice the likely scenario is that existing oceanographic agencies will gradually acquire the 'secure' resources to implement long-term observing activities, but the responsibility for these activities will strain existing infra-

structure. In some countries resources might be 'liberated' by military wind-down if political strings can be pulled.

6. It will be essential that data management systems established to cope with ocean monitoring be standardised in access and procedure, efficient, economical and above all accessible to national users at a wide range of levels of sophistication. For the principal suppliers of such systems such as the USA it must be assumed a priori that a 'user-pays' framework is not the way to go.

CCCO has now been in existence for 13 years as a joint committee of ICSU/SCOR (representing the scientific interest in the Oceans) and IOC (the UNESCO intergovernmental framework within which international marine activity is conducted). It is composed of 14 senior members of the oceanographic community and its subsidiary bodies involve renowned climate scientists. In that time it has participated in a remarkable transition in international oceanography that has witnessed the creation of the TOGA program, now two-thirds through its implementation, and the commencement of WOCE. Ironically although CCCO was the prime mover in the creation of these, the most active elements of the WCRP through the '80s, steps have recently been taken to place these programs under the sole control of the JSC of the WCRP, with the participation of an 'executive group' of CCCO delegates. In my opinion one of the important elements in the success of CCCO has been its ocean panels which have provided a very effective form for active scientists in the three ocean basins to facilitate the implementation of the TOGA and WOCE programs. The CCCO has also sponsored or jointly sponsored with JSC/WCRP many other working groups and activities including the Ocean Observing System Development Panel (OOSDP).

The terms of reference of the OOSDP are:

(i) To formulate the conceptual design of a long-term systematic observing system monitor, describe, and understand the physical and biogeochemical properties that determine ocean circulation and the seasonal to decadal climate changes in the ocean, and to provide the observations needed for climate predictions.

(ii) To cooperate as appropriate with the planners of other scientific or operational programmes related to climate and climatic change and to collate relevant data requirements and observing system specifications.

(iii) To liaise with responsible scientific institutions and agencies, including environmental administrations and space agencies, to attempt to ensure the compatibility of the proposed global ocean observing system development programme with the long-term plans of these organizations.

These terms of reference reflect some of the concerns mentioned earlier, recognising of the need for active scientific involvement and accommodation of the existing and varied means by which national networks might be developed for the creation of a Global Ocean Observing System.

Unlike the atmosphere, the ocean is subject to territorial control, so the International Oceanographic Commission is inextricably involved in the implementation of such a worldwide system. Within the existing structures and subsidiary bodies of IOC, the CCCO carries the mandated responsibility for the scientific development of the system, and this is one of its main tasks now that TOGA and WOCE are underway. It is also examining possibilities for future oceanographic program related to oceanic variability not likely to be accommodated within the WCRP, and carries primary responsibility for IOC advice on various international initiatives relating to the oceanic interests in global climate change, impacts and response, including IPCC.

Like all such bodies, CCCO is dependent on vectored national sponsorship and the willing participation of its eminent membership. Unlike most it aims to span the space between what has traditionally been a scientific discipline for individual scientists and a vast and complex inter-governmental network. Unlike meteorology, international oceanography cannot rely on traditionally strong international disciplinary networks and statutory organisations. All this has to be created in response to the weight of global public demand, a demand which has yet to develop a coherent voice.

A Global Ocean Observing System will not be created out of the will of individual academic scientists. It will not emerge spontaneously from concerted intergovernmental pressure. While its needs might be articulated by climate scientists who have the ear of national government, it will not be they who bring about its implementation. Indeed the scale of the task demands some moderation of the imagination of such scientists. Creation of GOOS will depend upon constructive application of new facilities and techniques applied to prosaic tasks such as data management. It will depend on new sources of funds that separate oceanographic research and monitoring functions worldwide and it will depend on an ongoing critical scientific evaluation of the design of the system itself. It will also depend on a conviction of the value of GOOS by the major agencies on which the task of implementation must inevitably fall. For all of this there is needed a medium for scientific planning, for facilitating interaction, cooperative arrangements and information flow, for endorsement and assistance through the major international and intergovernmental bodies of ICSU, IOC and WMO. This CCCO has the mandate to provide.

Postscript

In early March, shortly after the presentation of this paper, the Executive Council of IOC elected to replace CCCO with a Scientific and Technical Advisory Committee for GOOS, and also created an (intergovernmental) IOC Committee for GOOS. The module of GOOS concerned with 'climate monitoring assessment and prediction' has much in common with the 'Ocean Observing' element of the Global Climate Observing System (GCOS) being jointly developed by WMO, IOC, ICSU and UNEP. These two components represent an important bridge between GOOS

and GCOS and it was agreed shortly afterwards that they both be developed as a single unit by OOSDP. It appears therefore that the structures are largely in place for at least the international and intergovernmental development of Ocean Observations in relation to the monitoring and prediction of climate. This will facilitate links at national level between meteorological agencies and oceanographic agencies for the coordination of effort towards integrated ocean observation. Nevertheless the importance of involving and arousing the interest of practising oceanographic researchers should not be overlooked, and most of the cautionary remarks in the foregoing paper remain valid.