NEAR-GOOS – THE NORTH EAST ASIAN REGIONAL GLOBAL OCEAN OBSERVING SYSTEM: AN OVERVIEW

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Abstract

The Global Ocean Observing System and one of its regional programmes, the North East Asian Region GOOS (NEARGOOS) is introduced. GOOS is an innovative approach to integrate existing and newly to be developed monitoring and observing systems into a global network that will allow effective use of a large variety of ocean and meteorological data for the immediate benefit of society. GOOS has begun with pilot projects to test the operation of the GOOS in specific regions. GOOS is a collaborative effort of IOC, WMO, UNEP and ICSU.

NEARGOOS is being implemented by China, Japan, the Republic of Korea and the Russian Federation. It is intended to provide an operational demonstration of the usefulness of a regional observing system in the achievement of its own specific goals and as a pilot project for other parts of the world. The regional seas of the North East Asian Region have been chosen for this because of the available capacities of the countries involved to collect and exchange oceanographic data in real or near real time. The region is one of the most densely and frequently surveyed areas in the world. The oceanographic data for NEARGOOS are temperature, salinity, currents, waves, sea-level, dissolved oxygen, nutrients and other hydrographic elements.

I. INTRODUCTION

For those who are less familiar with the Intergovernmental Oceanographic Commission, first a short introduction of our mother organization. The IOC was established in 1960 as an intergovernmental body within UNESCO with the purpose of: Promoting marine scientific investigations and related ocean services, with a view to learning more about the nature and resources of the oceans.

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IOC is the only UN organization fully devoted to marine research, ocean services and related training, education and mutual assistance. In its over 35 years of existence, IOC has supported many programmes of scientific research of great relevance to international environmental policy. These have covered the full range of ocean sciences and have involved development and application of a rich variety of ocean technologies. In recent decades, as nations have focused their attention on improved environmental and resource management, IOC has also increased its efforts in monitoring, assessment, capacity building and technical assistance.

Today, IOC focuses on four major themes:

1. **International oceanographic research programmes** that aim to improve our understanding of critical global and regional ocean processes and their relationship to sustainable development and management of ocean resources.
2. **Co-ordinating a Global Ocean Observing System** to provide the information needed for:
    - Ocean and Atmospheric Forecasting
    - Ocean and coastal zone management by coastal nations
    - Research into global environmental change
3. **Educational and training programmes and technical assistance** essential for marine research and systematic observations of the global ocean and its coastal zone, especially in developing countries.
4. **Efficient and widespread sharing of ocean data** from research, observation and monitoring.

IOC has a little secretariat of some 20 professional staff in UNESCO Paris. There are two Regional Secretariats, one in Cartagena, Colombia for the wider Caribbean, and one in Bangkok, Thailand for some 20 member countries in the Western Pacific Region.

IOC started with a regional programme in the Western Pacific in 1965. The first project involved the so-called Kuroshio Project, with 12 countries participating in and supporting joint research into this current which flows from the tropic Pacific northward via the East China Sea towards the North Western Pacific.

II. THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

The Global Ocean Observing System (GOOS) is a scientifically based, international programme to collect and disseminate ocean data and products, for the long term, for the primary goal of practical benefits to society.

a. GOOS is conceived as:

1. **a sustained, co-ordinated international system for gathering data** about the oceans and seas of the Earth
2. **a system for processing such data**, with other relevant data from other domains, to enable the generation of beneficial analytical and prognostic environmental information services,

3. **and the research and development** on which such services depend for their improvement.

III. OBJECTIVE OF GOOS

The objective of GOOS is to ensure global, permanent, systematic observations adequate for forecasting climate variability and change; for assessing the health or state of the marine environment and its resources, including the coastal zone; and for supporting an improved decision-making and management process, one which takes into account potential natural and man-made changes in the environment and their effects on human health and resources.

GOOS will provide information about the present and future states of seas and oceans and their living resources, and on the role of the oceans in climate change. Its foundations are in place, and the existing states of scientific knowledge, technical capability, and current operational systems point to the need for incremental, progressive implementation now. In fact, implementation has begun, based on the integration of previously separate existing observing systems.

a. Why are existing systems not sufficient?

Many regular observations of the ocean are done by research programs with limited funding, limited duration, and limited objectives. Other regular observations are made by operational agencies for specific, long-term purposes but are in limited parts of the world ocean, typically have only sparse coverage, and usually concentrate only on the upper ocean and sense a limited set of variables. The requirements of the customers of GOOS demand global coverage, including the polar regions, and scientifically designed, robust, cost-affordable, long-term, routine, and systematic observations. The existing systems are an excellent start, but cannot do the job being demanded of them.

GOOS begins by utilizing and sustaining existing systems, then by refining and expanding those systems within the framework of international, scientific planning, and then tries to initiate new activities. Tide gauges are an example of the former; the Tropical Atmosphere Ocean (TAO) array, set up to monitor El Niño events in the equatorial Pacific, is an example of a system that needs to transition to operational implementation; fluorometers and acoustic zooplankton sensors on moored buoys are an example of something GOOS might do by utilizing the synergism between buoys for weather prediction and as platforms for ecological sensors for habitat monitoring.

GOOS was created by the IOC Assembly in 1991 in response to the desire of many nations to improve management of seas and oceans, and to improve climate forecasts, for both of which it is necessary to establish observations dealing with physical, chemical and biological aspects of the ocean in an integrated way. Agenda 21 specifically calls for GOOS to be developed to meet the needs of coastal states for sustainable development of seas and oceans.

GOOS will be implemented by nations working together. GOOS supporters are now in the process of convincing operational, research and aid agencies that implementation of GOOS can deliver worthwhile benefits for them and those they

serve, at a reasonable level of risk which makes investment worthwhile. It is hoped that governmental authorities and international agencies will be persuaded that if the guidance is followed, a coherent effective global system will result, to provide the services they require and wish to encourage and sponsor. A first step will be the contribution of appropriate existing local and regional systems to GOOS by individual nations or groups of states. Equally important at this point in time is the enhancement of support for the GOOS infrastructure, which is enabling GOOS to happen.

GOOS is being designed through four main scientific and technical modules to meet the needs of user communities with interests in (i) coastal seas; (ii) living marine resources; (iii) the health of the ocean; and (iv) climate change. It is being implemented in five parallel phases: (1) planning; (2) pilot or demonstrator projects; (3) incorporation of existing systems, adapted as needed; (4) gradual operational implementation of the global scale system, e.g. by the addition of new activities and facilities; (5) continued assessment and improvement in individual aspects and in the entire system. Most activity to date has been focussed on phases 1, 2, and 3. There are major pilot projects in Europe (EuroGOOS), the N.E.Asian Region (NEAR-GOOS), the USA, and the equatorial Atlantic (PIRATA - Pilot Research Array (of buoys) in the Tropical Atlantic); new regional programmes are being developed in the Mediterranean (MedGOOS), the western Indian Ocean (WIOMAP - Western Indian Ocean Marine Applications Project) and the Pacific islands (PacificGOOS). Existing observing systems have been pulled together to form the GOOS Initial Observing System.

b. What is the economic significance of GOOS?

A significant proportion of world economic activity and a wide range of services, amenities and social benefits depend on wise use of the sea. For many countries, marine resources and services provide 3-5% of their Gross National Products (GNP). For a few countries, the proportion is much higher. In the technically developed Group of Seven' countries, marine resources and services contribute, on average, 5% of GNP or about $600 billion per annum (1991). The vast majority of all international trade is carried by sea, with 3.5 billion tonnes of cargo transported in ships. By the year 2020, it is probable that 75% of the world's population will live within 60 km of sea coasts and estuaries. World production of offshore oil and gas was worth $135 billion in 1990, amounting to 20% of world hydrocarbon production. The world fish catch is 80-90 million tonnes/year, amounting to some 20% of the total human consumption of animal protein and worth approximately $70 billion. Wetland and other shoreline areas are extremely important breeding and spawning areas for many species of fish and other organisms and yet, globally, over 50% of such areas have already undergone severe environmental degradation. Expected growth in population with the attendant pressure on natural resources, suggests that the economic significance of the oceans is more likely to increase than to decline, as will the need for its sustainable use. Economic analyses suggest that the costs and benefits of operating GOOS are likely to be similar to those of the World Weather Watch, an analogous system that underpins all weather forecasting.

c. Who are the beneficiaries?

Direct potential beneficiaries of GOOS will include the managers of coastal defences, ports and harbours, fishing and fish farming, shipping, offshore industry, and recreation. Indirect beneficiaries, through climate forecasting based on ocean observations, will include the suppliers on land of food, energy, water and medical supplies (e.g. for epidemics of malaria like those associated with El Niño events).

IV. NEAR-GOOS

The NEAR-GOOS pilot project covers North East Asian seas. It focuses initially on developing data exchange between its partners, and on building the user community. In the future it will develop a numerical modelling and forecasting capability. The initial focus is primarily on physical data.

At present, four countries participate in the NEAR-GOOS project, those being: China, Japan, the Republic of Korea and the Russian Federation. It is important to realize that these four countries represent different political systems, different levels of scientific and technological capabilities and different economic settings. Against this background, the NEAR-GOOS was set-up. The project started its operation in early 1996.

NEAR-GOOS has progressed primarily in the contribution and exchange of oceanographic data. In the initial phase, the oceanographic data collected in the data bases include temperature, salinity, current, winds and waves, all of which come from oceanographic observations carried out but the participating countries using moored buoys, drifting buoys, towers, coastal stations, research vessels, voluntary ships and remote sensing satellites, reported through the Global Telecommunication System and the Internet.

The NEAR-GOOS system revolves around two data systems. The first one is the Real Time DataBase (RTDB) which is established for the daily mapping of the sea conditions. The second one is the Delayed Mode Data Base (DMDB) which has been established to collect, distribute and maintain the delayed mode data for the use of NEAR-GOOS users. Real time data, which are more than 30 days old, are transferred to the Delayed Mode DataBase. The Japan Meteorological Agency (JMA) and the Japan Oceanographic Data Center (JODC) respectively host the databases. In addition, the contributing countries have set up their own National DataBases through which the data are available. Only the Russian Federation has so far been unable to set up its own Internet site. Their data are sent to Japan instead. The principle underlying the NEAR-GOOS databases is that they are accessible, free of charge, to all users who are interested in obtaining the data and/or ready to contribute their data to the data bases. The users of data are actively encouraged to contribute their own data to the system. A NEAR-GOOS Co-ordinating Committee with two members of each participating country has been set up to supervise the implementation of NEAR-GOOS. The NEAR-GOOS Co-ordinating Committee meets annually.

In the first two years of operation, the project has achieved the signing of an Intergovernmental Agreement on an Open Data Policy and further improvements in the mechanism of co-operation and co-ordination at both regional and national levels, the number of users and data contributors and overall awareness of the system.

In the near future, emphasis is going to be placed on a more opened data policy, more contributors of data and products, more parameters (for instance, dissolved oxygen, nutrients, fluorescence, etc.), quality control and quality assurance, and improved co-operation and co-ordination among and within the respective countries.

In view of its overall co-ordinating role in putting into operation the global ocean observing system, it is not surprising that IOC strongly recommends countries to start or enhance ocean monitoring systems because this is called for by Agenda 21. Multi-instrumented buoy systems collecting meteorological and ocean data at the same time are an appropriate and cost-effective way forward.

SEAWATCH is one of the systems that countries can use to do marine monitoring. Although it is known to be technically good, it carries no particular IOC or GOOS recommendation. Potential users need to examine it on its merits in relation to other such systems to see if it will do what a particular country wants.