

Integrating and Modernizing Global Ocean Data and Services for the Benefit of the Maritime Community



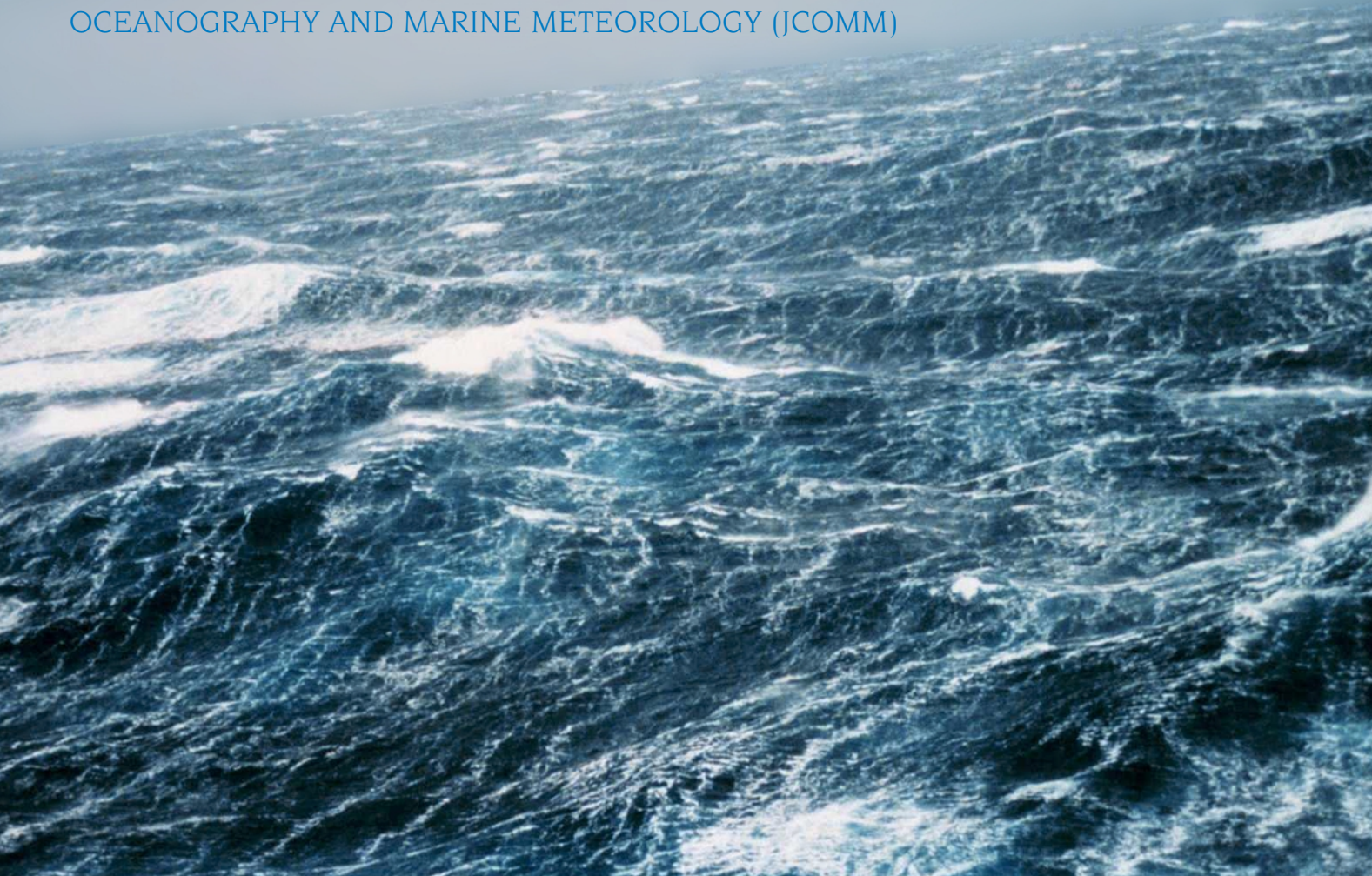
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IOC



THE JOINT WMO/IOC TECHNICAL COMMISSION FOR
OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)





WORLD
METEOROLOGICAL
ORGANIZATION



INTERGOVERNMENTAL
OCEANOGRAPHIC
COMMISSION OF UNESCO

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JCOMM's GLOBAL MANDATE

encompasses

1. MARINE METEOROLOGICAL AND OCEANOGRAPHIC OBSERVATIONS

Planning and coordinating the acquisition, exchange and management of observations, involving:

- *Over 6 000 volunteer vessels reporting weather and surface oceanographic conditions;*
- *Up to 120 volunteer vessels reporting subsurface temperature and salinity profiles;*
- *More than 1 400 drifting buoys reporting weather and surface oceanographic conditions;*
- *Hundreds of moored ocean data buoys reporting weather and oceanographic conditions;*
- *10–20 volunteer vessels making radiosonde (upper air) observations at sea;*
- *Around 400 tide gauge stations measuring and reporting sea level;*
- *Global partners such as satellite remote sensing agencies and the Argo programme;*
- *Distributed data archives managed by National Oceanographic Data Centres (NODCs), and World Data Centres (WDCs), Specialized Oceanographic Centres (SOCs) and Responsible National Oceanographic Data Centres (RNODCs) established as designated data centres for specific data types.*

2. MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES

Planning and coordinating the preparation and dissemination of marine meteorological and oceanographic products and services, involving:

- *A global network to produce/issue weather, sea ice, sea state and other bulletins;*
- *A global network to prepare/issue oceanographic products;*
- *Global information dissemination/telecommunication mechanisms;*
- *Development/implementation of new ocean products and services.*

3. CAPACITY BUILDING

Planning, coordinating and undertaking related capacity building initiatives, involving:

- *Analysing national and regional needs for education/training and technology transfer;*
- *Developing projects aimed at enhancing national and regional capacities;*
- *Supplying technical publications, guidance materials, expert lecturers and trainers;*
- *Conducting workshops.*

Prior to 1999, marine meteorological and oceanographic observations, data management and service provision programmes were internationally coordinated by two separate bodies – the World Meteorological Organization (WMO), through its Commission for Marine Meteorology (CMM), and UNESCO's Intergovernmental Oceanographic Commission (IOC). While enhancing safety at sea remained the primary objective of marine forecast and warning programmes, requirements for data and services steadily expanded in volume and breadth during the preceding decades. Other applications, such as coastal area management, optimization of commercial fishing activities, ship routing, off-shore resource exploration and development, pollution prevention and clean-up and, most recently, climate modelling and prediction, became increasingly important. Moreover, many of these applications required observational data sets and predicted products for both the oceans and the overlying atmosphere.

Responding to these interdisciplinary requirements necessitated the development of ever-closer working relationships between oceanographers and marine meteorologists. This was reflected at the global level by growing collaboration between IOC and WMO in organizing and coordinating ocean data

acquisition, data management and provision of related services. The increasingly close relationship between the two agencies' operational activities in the oceans culminated when the Thirteenth WMO Congress (May 1999) and the 20th IOC Assembly (July 1999) formally agreed that a new Joint WMO/IOC Technical Commission for Oceanography and Marine

Meteorology (JCOMM) should be established. This new body brought together the marine meteorological and oceanographic communities in a common global forum charged with overall responsibility for worldwide marine meteorological and oceanographic services and their supporting observational and data management programmes.

THE JCOMM VISION

JCOMM coordinates, regulates and manages a fully integrated marine observing, data management and services system that uses state-of-the-art technologies and capabilities, is responsive to the evolving needs of all users of marine data and products, and includes an outreach programme to enhance the national capacity of all maritime countries.

What is JCOMM?

As formally constituted, JCOMM is an intergovernmental body of experts that provides the mechanism for international coordination, regulation and management of oceanographic and marine meteorological observing, data management and services systems. The creation of this Joint Technical Commission results from a general recognition that worldwide improvements in coordination and efficiency may be achieved by combining the expertise and technological capabilities of WMO and IOC.

JCOMM has a mandate to prepare both regulatory and guidance material for WMO Members and IOC Member States related to marine observing systems, data management and the design and delivery of meteorological and oceanographic services. In its formal sessions, the Commission acts as a final review body for activities, proposals and recommendations prepared by a substructure of working groups, expert teams and rapporteurs. JCOMM, in turn, prepares and submits formal recommendations for actions to its governing bodies – WMO and IOC (of UNESCO) – for consideration, endorsement and, ultimately, for implementation by the appropriate agencies of maritime countries and other responsible bodies. It is, in other words, the single global coordinating and reporting body for the full range of current and future operational data collection and service provision activities related to these disciplines.

What are the specific roles and responsibilities of JCOMM?

The parent bodies for JCOMM – WMO and IOC (of UNESCO) – have assigned responsibility to the Commission for matters relating to:

- “The further development of the observing networks in the world’s oceans and seas, including the development, coordination, maintenance and ongoing evaluation and improvement of global marine meteorological and oceanographic observing systems and supporting communications facilities to meet the needs of the IOC and WMO Programmes*;
- The implementation of data management systems to meet the needs of real-time

operational services and the global observing systems;

- The delivery of products and services including guiding, assisting and encouraging national and international analysis centres, in cooperation with other appropriate bodies, to prepare and deliver the data, products and services needed by both operational and scientific user communities, monitoring of the use of observations and products and suggesting changes to improve their quality**;
 - The provision of capacity building support to WMO Members and IOC Member States, analysing their needs for education and training, technology transfer and implementation support related in JCOMM’s areas of responsibility; supplying technical publications, guidance materials, expert lecturers and trainers and conducting workshops as required to meet these needs; and developing projects aimed at enhancing countries’ capacity to participate in and benefit from WMO and IOC marine meteorological and oceanographic programmes; and
 - Assisting in the documentation and management of the data in international systems, developing cooperative arrangements with the various data management bodies of IOC, ICSU [International Council for Science], and WMO to ensure the archiving and easy availability to users of comprehensive, quality-controlled and well-documented data sets of real-time and delayed mode data to meet their needs.”
- Clearly, JCOMM fills a number of essential roles where marine meteorological and oceanographic observational and service provision programmes and services are concerned.

*In particular, the Global Ocean Observing System (GOOS), the Global Climate Observing System (GCOS) and the World Weather Watch (WWW).

**Special emphasis is placed on safety-related products and services contributing to the Global Maritime Distress and Safety System (GMDSS).

*The nine current members of the Management Committee include four meteorologists, four oceanographers and one polar region expert.

JCOMM is organized into four major Programme Areas supported by specialized teams of experts

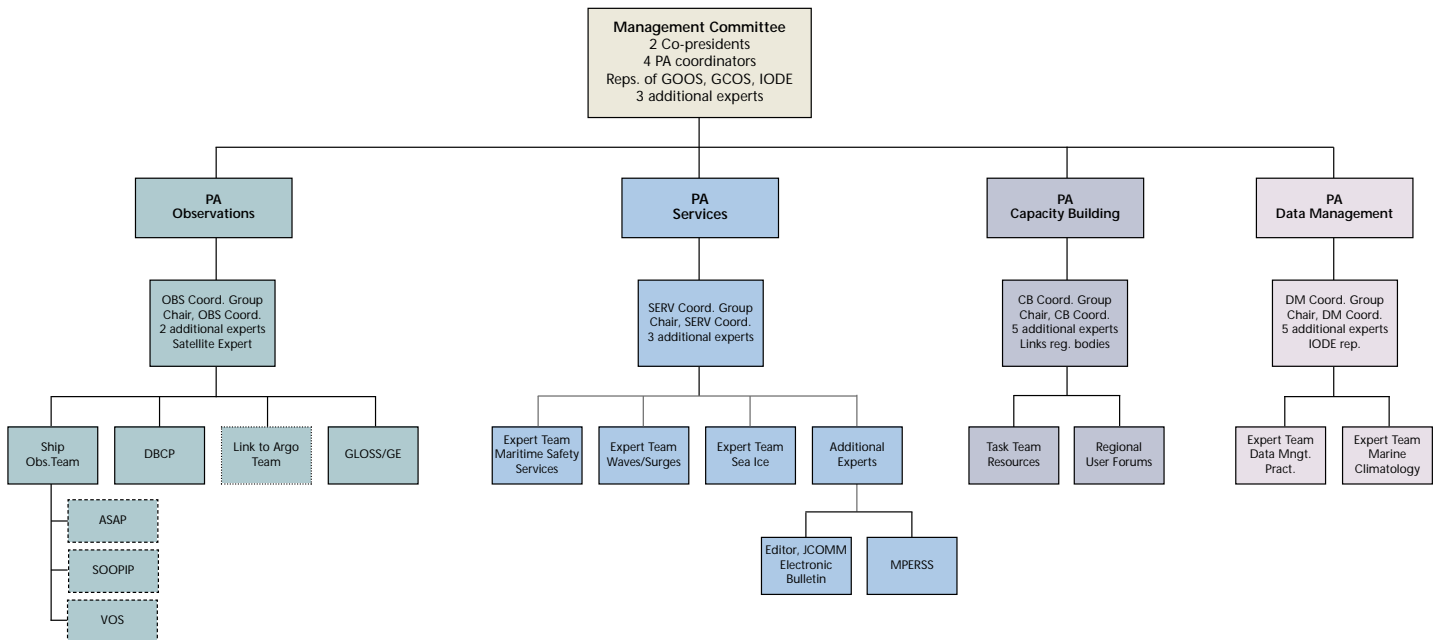
How is JCOMM organized?

JCOMM has a current membership of approximately 250 experts, with most national delegations comprising roughly equal numbers of oceanographers and marine meteorologists. It is co-chaired by a meteorologist and an oceanographer, reflecting its integrated responsibilities for meteorological and oceanographic programmes. Under the overall direction of a Management Committee* chaired by the co-presidents, the Commission is organized into four Programme Areas – Observations, Data Management, Services and Capacity Building. Each Programme Area is, in turn, managed by a Coordinator, with support from a small coordination group and with specific activities being undertaken by designated teams or panels of experts. The establishment of these four

Programme Areas is intended to facilitate the delivery of JCOMM's mandated responsibilities by subdividing them into logical and coherent groupings, as outlined below.

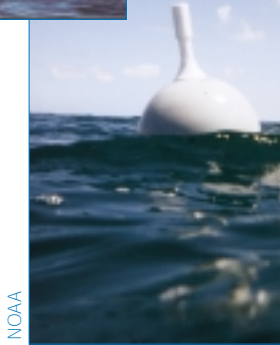
1. *The Observations Programme Area* is primarily responsible for the development, coordination and maintenance of moored buoy, drifting buoy, ship-based and space-based observational networks and related telecommunications facilities. It also monitors the efficiency of the overall observing system and, as necessary, recommends and coordinates changes designed to improve it. It has inherited lead responsibility for a number of important and well-established observational programmes, which are managed by bodies that now report through JCOMM. In particular:

- The Ship Observation Team (SOT) coordinates the Voluntary Observing Ship (VOS)





The Data Buoy Cooperation Panel coordinates the worldwide deployment and operation of moored and drifting data buoys



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Observations from volunteer vessels make a major contribution to marine meteorological and oceanographic services and to advancing scientific knowledge of the world's oceanic regions

programme, the Automated Shipboard Aerological Programme (ASAP) and the Ship-of-opportunity Programme (SOOP). VOS ships volunteer to take surface meteorological and surface oceanographic observations while ASAP vessels acquire upper-air observations over data-sparse ocean areas by means of automated radiosonde systems. All of these data are relayed on WMO's Global Telecommunication System (GTS) in real time for use in preparing weather forecasts and are subsequently archived in global data centres. Similarly, the SOOP involves volunteer merchant and scientific ships whose officers have been trained to acquire oceanographic measurements using one or more scientific instruments such as expendable bathythermographs (XBTs) and thermo-salinographs.

These data are also exchanged on the GTS, assimilated into operational ocean models and later, in more complete form, archived in designated data centres.

- The Data Buoy Cooperation Panel (DBCP) addresses the requirements for real-time and archived data from drifting and moored data buoys, coordinates buoy deployments in the world's oceans and provides a forum for the exchange of information on buoy technology, communications systems and applications of buoy data.
- The Global Sea-level Observing System (GLOSS) oversees the operation of a worldwide network of tide gauge stations in support of both operational activities and studies of sea-level variations and global climate. Its activities encompass the operation of a GLOSS Core Network and

Right: *The worldwide network of tide gauges provides measurements that assist coastal navigation and are vitally important to nations threatened by rising sea levels; far right: Observations from moored platforms in the tropical oceans are needed to monitor and predict seasonal and interannual variations in climate such as El Niño events; bottom: The development of robotic, profiling buoys has revolutionized oceanographers' ability to observe conditions within the ocean depths*

Proudman Oceanographic Laboratory



NOAA



regional observing networks, provision of tide gauge measurements for satellite altimeter calibration, supply of information to scientific groups such as the Intergovernmental Panel on Climate Change (IPCC) and the preparation of training and outreach materials.

- The Tropical Moored Buoy Implementation Panel (TIP) was established in 2001 to coordinate moored buoy observations from all the tropical oceans. It developed from the Tropical Atmosphere Ocean (TAO) array of moored platforms, deployed under the international Tropical Ocean and Global Atmosphere Programme (TOGA) to monitor El Niño events.

Argo is an innovative pilot programme that uses sophisticated, robotic, diving floats to collect ocean temperature/salinity profiles.

These submarine floats are capable of acquiring profiles to a depth of 2 000 m and also supply information on ocean currents. They surface every 10 days and transmit their observations via satellite for real-time distribution on the GTS. Over 500 Argo floats are now operating and this number is expected to grow to around 3 000 floats by the year 2005. As it moves beyond the pilot stage, Argo will eventually become a key component of the operational integrated ocean observing system coordinated through JCOMM.

The assignment to JCOMM of overall responsibility for the preceding observational activities clearly brings a new level of integration to these ongoing programmes. Consequently, it significantly advances the day when a fully integrated ocean observing system will be in place – one that provides easy access to detailed observations of the temporal and



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spatial structure of the oceans and overlying atmosphere through a single window.

2. The Services Programme Area deals with the provision of marine meteorological and oceanographic services around the globe. Consequently, it facilitates and supports the delivery of the most visible outputs of the world's marine meteorological and oceanographic organizations. These include warnings of gales, storms, severe tropical weather systems such as typhoons, hurricanes and tropical cyclones and other hazardous phenomena, information on sea ice conditions and other products disseminated through the Global Maritime Distress and Safety System (GMDSS) in response to requirements established under the SOLAS* Convention. The continuing provision of safety-related weather and oceanographic services is an absolutely fundamental priority of JCOMM and of its Services Programme Area. Reflecting this priority:

- The Programme's Expert Team on Maritime Safety Services coordinates, monitors and reviews arrangements for GMDSS and related services provided in support of safety at sea;
- Its Expert Team on Wind Waves and Storm

Surges advises on scientific and operational aspects of wind-wave and storm surge forecasting, coordinating with other JCOMM groups, scientific and technical bodies to ensure that the latest advances are incorporated into operational practice;

- Its Expert Team on Sea Ice performs similar functions where sea ice is concerned and oversees the operations of the Global Digital Sea Ice Data Base; and
- A designated rapporteur is the focal point for services provided under the WMO Marine Pollution Emergency Response Support System (MPERSS) to promote development of pollution response support capabilities on a worldwide basis and to provide advice on techniques and systems available to agencies charged with combating marine pollution emergencies.

While enhancing marine safety will continue to be a fundamental emphasis, JCOMM was established in recognition of the diversified needs of a broadening community of clients who require information on the ocean environment for other purposes (see examples in box on page 10). Consequently, the identification of needs for

Left: Warnings of gales, storms, tropical cyclones and other hazards are disseminated via the GMDSS and provide a vital service to mariners; centre and right: Wind waves and storm surges present hazards to navigation and can result in catastrophic damage along coasts

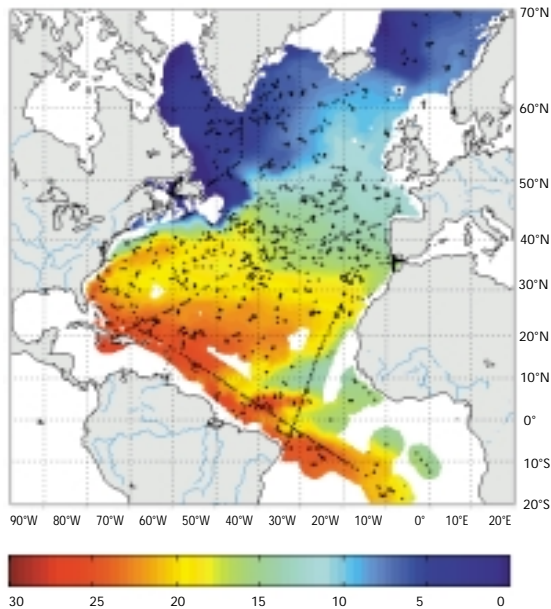
**The requirements of the International Convention for the Safety of Life at Sea (SOLAS) have, historically, underpinned the development of marine meteorological services.*

The development and delivery of new ocean products and services will be a future priority of JCOMM

*Metadata are data about data such as information on instrumentation, observing programmes, data formats, etc.

**The IOC's International Oceanographic Data and Information Exchange programme.

Temperature analysis (°C) Depth 100 m 31 07 2002



new ocean services and the development of such services are also a high priority for JCOMM. In recognition of these newer requirements, a Task

Team on the Development of Ocean Services is being established within the JCOMM Services Programme Area. It is expected that the development and implementation of new ocean-related products will grow into a major activity in future years as JCOMM moves towards the integrated provision of weather and oceanographic services.

3. The JCOMM Data Management Programme Area, as its name suggests, addresses the quality assurance, archiving and provision of access to marine meteorological and oceanographic data and related metadata*. Most marine meteorological and oceanographic data are currently held in IODE** and WMO data centres with differing data storage and management systems operating on a variety of computer platforms. However, as discussed earlier, some clients require highly integrated marine data flows that include meteorological, oceanographic and physical and non-physical data. The ultimate aim of JCOMM is to meet the needs of all users by developing and implementing a fully integrated data management system able to deliver

Right: *Planning and coordinating meteorological and oceanographic support to pollution prevention and clean-up operations on the high seas is an important responsibility of JCOMM;*
far right: *JCOMM coordinates the delivery of sea ice products and services to facilitate maritime operations in high latitudes*

Marine nationale française



Meteorological Service of Canada



high-quality data spanning the complete spectrum of marine meteorological and oceanographic observations. At the same time, JCOMM has inherited responsibility for several established data management programmes. These include:

- The WMO Marine Climatological Summaries Scheme that facilitates the international exchange, quality control and archiving of marine climatological data and the publication of marine climatological summaries. These data are archived at a number of data centres around the world, including the US National Climatic Data Center (the World Data Centre).
- The Global Digital Sea Ice Data Bank that is intended to be a consolidated sea-ice archive with the US National Snow and Ice Data Center and the Russian Arctic and Antarctic Research Institute as the main data centres.
- The Global Temperature-Salinity Profile Programme*, GLOSS and Data Buoy Cooperation Programme with both real-time data and delayed-mode data being acquired, quality controlled and stored in designated data centres.

Consequently, JCOMM is faced with the necessity of maintaining important ongoing programmes while, at the same time, moving towards more integrated data management. Two teams have been established under the general direction of the Programme Area Coordination Group to assist in addressing this dual responsibility. The Expert Team on Marine Climatology is tasked with ensuring the continued coordination and regulation of the management of marine climatological data and the provision of advice on the applications of these data.

Applications of information on the “state of the ocean”

- Today’s increasingly sophisticated ocean-atmosphere computer models* require coherent observations of atmospheric and oceanic parameters for their initialization and validation;
- Observations and predictions of the thermal structure of the oceans are used to optimize commercial fishing operations;
- Geophysical surveys at sea are affected by weather, sea-state, near-surface cross-currents and water temperature and salinity conditions, necessitating observed and predicted information on all of these factors;
- As undersea drilling occurs in ever deeper waters, the physical characteristics of the water column become very important, adding to the limitations imposed by surface conditions;
- Underwater acoustic transmission of outputs from transducers and the functioning of underwater telephones and location devices are affected by variations in ocean temperature and salinity, necessitating observations and predictions of these variables.

* These models provide the scientific basis for the prediction of future global climate in the face of increasing atmospheric concentrations of greenhouse gases. They also reinforce hopes for useful monthly to seasonal weather forecasts, with potentially immense benefits to society.

The second team, the Expert Team on Data Management Practices, has been charged with the forward-looking role of developing, promoting and implementing best practices in ocean data management.

Establishment of a fully integrated data management system will require increasing coordination of data sources, development and implementation of international standards and protocols for database management and processing software, and the utilization of a modern, highly compatible infrastructure of computer hardware and advanced communication technologies. It will result in the creation of

*Coordinated jointly by JCOMM and the IOC’s IODE programme.

JCOMM will assist countries to enhance their capacities in marine data collection, data management and provision of marine meteorological and oceanographic services

J.-P. Gaucher/Météo-France



a distributed JCOMM data system or what has been called a “Virtual Oceanographic Data Centre”. This will encompass IODE, WMO and other centres interacting with each other and performing their functions in strict accordance with agreed rules and protocols. The orchestration of this ambitious process of integration across a distributed, worldwide system clearly presents a major challenge for JCOMM’s Data Management Programme Area. To this end, it plans to offer expertise to assist other groups in specifying and implementing their respective data management systems to ensure that these will fit readily into a coherent global system.

4. The Capacity Building Programme Area has as its focus the provision of assistance to countries to enhance their capabilities in ocean data collection and management and in the provision of marine services. Building capacity is a high priority activity directed at ensuring that maritime nations can not only contribute meaningfully to JCOMM’s various programmes but also gain optimum benefits from the global system. The Programme Area will, therefore, arrange or deliver training, facilitate transfer of technology, assist in providing equipment and

work closely with the capacity building programmes of donor countries and other United Nations agencies.

The JCOMM capacity building strategy is a straightforward one – to first determine national and regional needs and then address identified deficiencies in knowledge, skills, observing and telecommunications systems, data management and services. The implementation of this strategy will, however, necessitate carefully targeted initiatives, the pursuit of mutual cooperation and the aggressive development of partnerships with national governments, donors and international organizations.

Communications and outreach – vital pillars for success

Effectiveness in communicating the availability of data and services to potential clients is as fundamental to the success of JCOMM and its members as the actual delivery of the products themselves. In consequence, JCOMM is devoting continuing efforts to the dissemination of information on its various programmes, activities and initiatives to the broader client community around the world. To sensitize the marine community of the vital role that JCOMM now plays in operational oceanography and marine meteorology, and to provide easy access to updated information on its programmes, meetings and reports, a JCOMM Internet portal has been activated at:

<http://www.jcomm.net/>

An operationally oriented JCOMM *in situ* Observing Platform Support Centre (JCOMM-OPS) has also been established, to provide direct technical support to operational observational system components such as Argo, SOOP,

the VOS and ocean data buoys, as well as associated satellite data collection systems. The JCOMMOPS web site address is:

<http://www.jcommops.org/>.

It can also be reached by a link from the JCOMM portal. A JCOMM Electronic Products Bulletin has been initiated as a complementary initiative, accessible from the JCOMMOPS site. The Electronic Bulletin contains a variety of scientific products relating to the state of the ocean. It is intended that new products of potential interest to a substantial audience will be posted in the Bulletin as they are developed.

Future directions for JCOMM

Over the coming decades, JCOMM will continue to ensure the integrity of its current marine programmes, constantly striving to improve products and services. At the same time, its cross-disciplinary nature provides the essential scientific and technological breadth needed to encourage and support the delivery of new and more integrated ocean programmes and services that are responsive to the needs of

clients. In recognition of the uneven global development of ocean-related scientific and technological capacity, JCOMM will, moreover, continue to pursue capacity building initiatives to ensure that all maritime countries can benefit from and contribute meaningfully to marine data collection and service provision programmes.

JCOMM is increasingly challenged by requirements to collect a wider range of data from the oceans and the overlying atmosphere in order to support climate modelling, prediction of seasonal and interannual atmospheric and oceanic phenomena, and to provide various specialized or applied services to marine transportation, engineering, offshore resource development, fisheries and other sectors. It is equally challenged in moving towards the development of a highly integrated, yet geographically distributed, global data management and archiving system that addresses the complete spectrum of ocean-related data. In the coming years, JCOMM will strive to meet these challenges, in collaboration with other organizations and the scientific community.

CONCLUSION

In summary, the establishment of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) represents a major milestone in the development of marine meteorological and oceanographic data acquisition and management programmes and in the delivery of related services. For the first time, these programmes and services are being directed and coordinated in an integrated manner by a single intergovernmental body, one that brings together the combined strengths of the meteorological and oceanographic communities and their parent institutions. JCOMM's future will be built upon the synergy created by this combination of expertise and resources as it strives to integrate and modernize marine data collection and services for the benefit of the world's maritime user community.

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