

## Editorial

# A NEW ERA FOR OCEAN OBSERVATION

**O**ceanography and oceanographic observation are at a critical stage. A new era beckons, with observations implemented globally and fully integrated to serve a broad range of requirements (see also the Ocean Theme, IGOS Bulletin No. 1). However, like the migrating wildebeest forging the river, the ocean community must resolve to act with common and agreed purpose, not with a piece-meal and haphazard approach.

The OceanObs '99 Conference held in Saint Raphael, France, 18-22 October, sought the consensus needed for this step, addressing the collective needs of both research and operational oceanography. The Conference was bold in its vision and goals, successfully developing a broadly based and sound scientific rationale for the establishment of a sustained system. Practical El Niño forecasts, research on climate variability, climate change, and ocean and marine forecasts were prominent among in the rationale.

The Conference was purposefully structured to encourage consideration of, and agreement on, the value of a multi-purpose, integrated system. This value was evident in many areas, for example in the wide application of altimeter and wind vector measurements and in the many considerations of complementary data streams.

The Conference explicitly considered issues of cost and returns on investment. Highest priority was attached to those elements that were perceived to be reliable, efficient and sustainable, from the perspective of delivering both short and long-term value for the investment. Proven methodologies were preferred to emerging or potential techniques.

Remote sensing has become a mature technology for collecting regular, global observations. Sea surface temperature, surface wind vectors, surface wave height and surface topography can all be measured with reliability from space. The Conference agreed that for a global system such capacity is fundamental. Consistent with the IGOS Ocean Theme study, continuity was seen as a major issue. A plenary round-table discussion highlighted the need to develop effective strategies for the transition of proven experimental techniques into a sustainable, operational mode.

Somewhat surprisingly, sea surface temperature emerged as an important future issue. In order to meet requirements, a more effective integration of available data must be achieved.

A multi-faceted, robust *in situ* network must also be implemented, in part as a complement to, and calibration for, remotely sensed data, but also for its own intrinsic value in various applications. The primary contributions include

- The tropical Pacific ENSO Observing System and its mooring array;
- The global array of profiling floats, Argo, returning around 100,000 profiles of temperature and salinity annually;



**Neville SMITH,**  
Chair, OOPC  
Chair, GODAE Steering Team

- A global surface drifter array and surface and subsurface networks operated from voluntary observing vessels;
- Surface and subsurface reference sites, such as provided by sea level stations and fixed-point deep measurements;
- Hydrographic measurements targeting the carbon cycle and the deep ocean circulation; and
- Acoustic tomography in selected high latitude regions.

These contributions would be supported by a program of dedicated enhancements in areas of high priority, for example PIRATA in the tropical Atlantic.

The development of a new paradigm for oceanography was one of the major achievements of the Conference. Free and wide availability of all data and products will now be the norm, not the exception. Significant challenges remain for many aspects of data and information management but none are regarded as insurmountable obstacles to progress.

While the focus of the Conference was on measurement networks, all participants recognized the

fundamental importance of models and data assimilation to the progress, prosperity and evolution of the observing system. The new paradigm is fashioned around the use of models to interpret and exploit data and to develop products that encourage wide adoption and value-adding.

The degree of unanimity achieved by the Conference exceeded expectations, yet there is clearly much work remaining, both in terms of detail and in terms of enacting the recommendations. However the ocean

community can look forward with some confidence to an era of great prospect and opportunity, and also one of enhanced responsibility. For oceanography and climate at least, the Integrated Global Observing Strategy is now being realized.

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# Terrestrial Carbon Observation Initiative (TCO)

*An accurate understanding of the global carbon cycle is central to informed decisionmaking on climate change. The UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol have acknowledged the importance of terrestrial systems as carbon sinks and sources and provide a basis for developing emission trading credits that involve substitution and carbon sequestration in forests and potentially in other ecosystems.*

by Jeff Tschirley, Josef Cihlar, Scott Denning et Rene Gommès<sup>1</sup>

Other international agreements such as the Convention on Biological Diversity and the Convention to Combat Desertification also have direct interest in carbon - both the vegetative and sub-soil components.

In the light of the above, at its Fourth meeting (Stockholm, November 1999), the Integrated Global Observing Strategy Partners (IGOS-P) approved terrestrial carbon as a theme for which a systematic global observation program should be developed under the leadership of the Global Terrestrial Observing System (GTOS). The Partners also called for TCO to be closely linked to the IGOS Oceans theme of which carbon is an element.

To consolidate and systematise global observations for terrestrial carbon, there is first a need to agree on the observation and modelling requirements; to harmonise the main projects and activities that can contribute to a global observing system; and to identify gaps and ensure their resolution. GTOS has initiated the 'Terrestrial Carbon Observation Initiative' (TCO) to achieve these objectives.



Vegetation image - 2/12/2000 - color composite (B3,B2,B0) showing intense fire activity South of Lake Chad.

The scope of TCO is characterized by emphasis on the current (at the time of observation) spatial distribution of the sources and sinks in terrestrial components of the biosphere; long-term, global observation; and products for seasonal, annual, interannual, and decadal periods. Thus, it encompasses the terrestrial and associated atmospheric parts of the carbon cycle.

A number of actions have already been taken to ensure rapid and efficient progress in developing TCO. At least three meetings will be held during 2000 to address terrestrial carbon observations. They include:

■ 8-11 Feb 2000, Ottawa. TCO initial workshop (GTOS lead with input and support from IGBP) to review and synthesise existing plans and specifications for terrestrial carbon observation schemes; and to prepare a "straw man" framework as input to the May 00 meeting.

■ 22-25 May 2000, Azores, Portugal. Joint GTOS and IGBP workshop to draft a framework/plan for an integrated approach to studying the terrestrial carbon cycle: observations, process studies, models and to prepare a TCO report for the IGOS partners group meeting in June 2000.

■ 16-20 Oct 2000, University of New Hampshire, USA. Major conference oriented towards the IGBP synthesis with inputs on the observation side from GTOS.

Additional activities are planned that will lead to a proposal for terrestrial observation to be presented to the 6<sup>th</sup> IGOS-P meeting (November 2000) and steps have been taken to ensure that the necessary organizational mechanisms are in place. These include:

■ A TCO steering group to advise on the scientific and coordination aspects of TCO. Among its initial tasks will be the planning for the February meeting and setting up the mechanism for planning the May meeting.

■ A TCO *ex officio* group to ensure that the necessary policy and planning coordination on terrestrial carbon issues takes place.

Initially, TCO will focus on determining the spatial distribution and temporal trends of terrestrial carbon sources and sinks, i.e. net primary productivity (NPP), net ecosystem productivity (NEP), and net biome productivity (NBP), all measured as mass of carbon per unit area per year.

The longer term vision is to establish an operational network of frequent observations and computer models, aimed at documenting and understanding the present state of the terrestrial component of the global carbon cycle in order to support policy formation at the national and inter-governmental levels.

Terrestrial carbon is an excellent example of the benefits of an Integrated Global Observing Strategy. Collaboration among the observing systems, the international scientific research community, UN organizations and the space agencies create an opportunity for addressing and important science and policy issue that could not be achieved in any other way. The TCO Prospectus is available from the GTOS Secretariat.

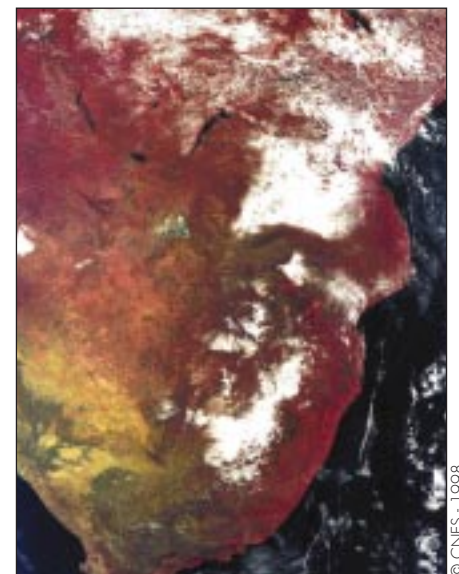


Image of South Africa from Vegetation Instrument (B3,B2,B0).

<sup>1</sup> - Respectively affiliated with: the Global Terrestrial Observing System, the Canadian Space Agency, Colorado State University, and the Food & Agriculture Organization of the UN.



# THE SIT- Moving IGOS Forward Toward Implementation

*In October 1995 at the 10th Plenary Meeting of the Committee on Earth Observation Satellites (CEOS) in Montreal, Canada, a significant event took place at an evening session when representatives of the international Earth observations community held an ad hoc meeting to discuss the potential for an integrated approach to global observations from space.*

*Since that time, the CEOS member agencies have worked, together with other Partners, in an unprecedented way to establish the Integrated Global Observing Strategy (IGOS). Initial implementation approaches and formulation of the implementation strategy for the space component was, and continues to be, vested in the Strategic Implementation Team (SIT) of CEOS.*

by Robert S. WINOKUR, Chair SIT, Nov 98-Nov.99, currently Vice-President, Consortium for Oceanographic Research and Education - USA

**R**ecently, the 13th CEOS Plenary recognized the important role the SIT has played to date in moving the IGOS forward. It was also agreed to continue the SIT for at least another year to work with the IGOS Partners, the member agencies and specific themes to facilitate implementation of the space component of IGOS.

Even with the progress made to date, much work remains to complete a full fledged integrated strategy and to advance to an integrated system at some time in the future. IGOS and the work of the SIT represent a paradigm shift by CEOS and the IGOS Partners. It represents a new way of doing business by the international Earth observations community. In the four years since the ad hoc session in Montreal, IGOS has progressed from a discussion topic to acceptance of the promise and basis to enhance international efforts in Earth observations. It has already produced new levels of interactions and concerted effort for a common purpose among space agencies, along with increasing the visibility for satellite remote sensing as a part of a global observing system.

However, the work of the SIT is not yet done as it is an important element in shaping IGOS for the future. Decision-making for international Earth observations is complex due to the large funding requirements, the need to provide continuity of operations, and the necessity to meet national and international user needs, both for research and operations. In building for the future we should consider past programs, the Earth observation systems of today, and the needs of tomorrow. IGOS provides an organizing principle and strategic planning

process for the system of tomorrow. Approval of the Ocean Theme and the Carbon Cycle Theme to move ahead is just the beginning for IGOS and the SIT. The potential for new themes, such as Disaster Applications, is strong and will keep the process moving.

Nonetheless, there are a number of issues that must be addressed. The role of the SIT in obtaining commitments by the space agencies for implementation is fundamental to moving ahead. Without commitments for implementation, CEOS agencies cannot move toward fulfilling the promise of an IGOS. Also, there is considerable work that must be done to integrate the space component with in situ systems. Finally, planning should begin on data and information management for the future. Admittedly, these are difficult issues, but now is the time to move ahead.

The SIT provides a forum to advance IGOS and has shown how the space agencies can work together to support comprehensive pilot projects and new themes. IGOS itself is still evolving, but is providing a mechanism for governments to work together to promote the sharing and more effective use of resources during a time when there is pressure to provide data and information to address critical science and policy issues on a global scale. I am pleased to have been a part of IGOS from the first meeting in Montreal to chairing the SIT. The new chair of the SIT, Jean-Louis Fellous, CNES, has set an agenda that will build on the progress of the past four years, but to do so will require national commitments as a matter of priority in order to implement an international global observing strategy.

## WHAT IS

**T**he Integrated Global Strategy unites the major satellite and surface based systems for environmental observations of the atmosphere, oceans and land.

- It is a strategic planning process to identify the current resources to fulfill observation needs and to determine observation gaps.
- It intends to cover all forms of data collection and is based on the recognition that must be user driven.

## IGOS ?

- It represents the convergence of interests from several partners: the G3OS and their sponsors, coordinating the in situ component, CEOS, which has taken the lead in developing the space component; and the global change research programmes and research funding agencies, which will help increase scientific understanding.

for further information, refer to:  
<http://www.igospartners.org>





# ICSU AND IGOS

*The International Council for Science brings together natural scientists in wide ranged international scientific endeavours. It comprises 98 National Members (represented by their Scientific Research Councils or Science Academies), 26 international single-discipline Scientific Unions and 28 Associates which are involved in major international, interdisciplinary initiatives. Thanks to this unique membership and activities, ICSU has a role to play within IGOS at several levels.*

Most environmental observations have historically been collected by scientists as part of their research programmes, and as a result, the ground based and remotely sensed capabilities have problems with global coverage and continuity. As one of the sponsors of the three global observing systems, of four global change programmes which collect and use such observations, IGBP, WCRP, IHDP, DIVERSITAS and of other relevant scientific initiatives (e.g. SCOR, the Scientific Committee on Oceanic Research, SCDR, Special Committee on Disaster Reduction), ICSU endeavours to facilitate the collaboration within the "ground-based" community and between this ground-based community and the satellite systems in a number of ways:

- ICSU has and will continue its support of the global observing systems and their collaboration, especially with respect to their work with the UN-Framework Convention on Climate Change. A resolution asking ICSU members to become involved in the preparation of the national report on observation activities requested within the context of this Convention (COP5), was voted at the last General Assembly of ICSU in Cairo in September 1999.
- ICSU will continue informing its national members and unions about this important work, and encourage their



involvement in the process.

- ICSU also facilitates the collaboration between some of the global observing systems and its research programmes.
- The global observing systems are developing very fast and global observations, such as a network to measure carbon sinks and sources, are essential to the science performed in the global change programmes.

Another area important for both IGOS and ICSU is that of data and information. IGOS will need to provide increasing support for the development of widely shared policies concerning data access and exchange which will allow a wider availability and use of the collected observations. ICSU, as a spokesman of the scientific community, continues playing a role in establishing principles that will encourage the free flow of data and information for scientific purposes. Programmes and initiatives within the ICSU family include CODATA, the Committee on Data and Technology, the ICSU panel on World Data Centers, ICSTI, the International Council for Scientific and Technical Information, and FAGS, the Federation of Astronomical and Geophysical Data Analysis Services.

*Anne LARIGAUDERIE  
Chargée des Sciences Environnementales - ICSU*

## News

### Result from COP5

The Fifth Session of the Conference of the Parties (COP-5) to the UNFCCC was held in Bonn in November, 1999. On behalf of the global observing systems for climate, and in response to the requests from COP-4, GCOS provided detailed guidance aimed at assisting Parties in reporting to COP, as required, on their participation in global climate observing systems. GCOS also presented results on the adequacy (or lack thereof) of some of the

current systems and suggested, *inter alia*, the approach of holding regional workshops aimed at identifying the capacity-building needs of developing countries and to develop specific proposals to overcome deficiencies. COP-5 responded favourably by formally adopting the GCOS guidance as that to be used by Parties in preparing their reports on systematic observation, due in 2001. It also encouraged GCOS to organize the suggested regional workshops, to continue to report on deficiencies in observing systems, and to facilitate the establishment of an

intergovernmental process for identifying priorities for action to improve global climate observing systems and options for their financial support.

### IGOS WORKSHOP

A Panel discussion on "the IGOS approach and its benefits for Science" will take place in Warsaw, Poland, at 33<sup>rd</sup> COSPAR Assembly on July 19, 2000, with participation of CEOS and SIT Chairs, and representatives of GCOS, WCRP and IGBP.

## Meeting Calendar

	Feb	Mar	Apr	May	Jun	2000 Jul	Aug	Sept	Oct	Nov	Dec
<b>IGOS Partners</b>					▲ Geneva					▲ Brazil	
<b>G3OS Sponsors</b>					▲ Geneva						
<b>TCO</b>	▲ Ottawa			▲ Azores					▲ New Hampshire		
<b>CEOS</b>										▲ Brazil	
<b>SIT</b>		▲ Cape Town			▲ Geneva					▲ Brazil	
<b>Others</b>		▲ IRSE South Africa				▲ COSPAR Warsaw				▲ COP 6	