

CEOS



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Committee on Earth Observation Satellites

Understanding Earth from

Since the dawn of time, the Earth has been a planet in constant change. Humanity has been subject to these changes, often without understanding what was happening or knowing how to predict what would happen next. With an increasing global population and greater pressure on resources, we need to understand how the Earth's systems of land, air, water and life interact to make life possible, and to understand how humans may be impacting these systems.

Understanding a planet as complex as Earth clearly requires a global effort. In 1984, as scientists were beginning to frame the critical questions that needed to be answered, several spacefaring nations created the **Committee on Earth Observation Satellites, CEOS**, to coordinate internationally all civil space-borne missions designed to observe and study our planet.

Overview

The **Committee on Earth Observation Satellites (CEOS)** was created in 1984, in response to a recommendation from a Panel of Experts on Remote Sensing from Space, under the aegis of the Economic Summit of Industrialised Nations Working Group on Growth, Technology and Employment. This group recognized the multidisciplinary nature of satellite Earth observation and the value of coordination across all proposed missions.

Purpose

CEOS coordinates civil spaceborne observations of the Earth. Participating agencies strive to address critical scientific questions and not to plan satellite missions which unnecessarily overlap each other. **CEOS** has three primary objectives in pursuing this goal:

- to optimize benefits of space-borne Earth observations through cooperation of its Members in mission planning and in development of compatible data products, formats, services, applications and policies;
- to serve as a focal point for international coordination of space-related Earth observation activities;
- to exchange policy and technical information to encourage complementarity and compatibility of observation and data exchange systems.

Participants

Members

Governmental organizations that are international or national in nature and are responsible for a civil space-borne Earth observations program currently operating, or at least in Phase B or equivalent of system development, will be eligible for membership in **CEOS**.

Associates

1) Governmental organizations that are international or national in nature and

currently have a civil space-segment activity in Phase A/pre-Phase A or equivalent of system development, or a significant ground-segment activity that supports **CEOS** objectives.

- 2) Other existing satellite coordination groups and scientific or governmental bodies that are international in nature and currently have a significant programmatic activity that supports **CEOS** objectives.

CEOS and G8 Summit / Earth Observation Summit

In the G8 Summit held in Evian, France, in June 2003, science and technology for sustainable development was taken up as one of key topics. A G8 action plan, which was adopted in this summit, recognized the importance of strengthening international co-operation on global observation.

To effect this action plan, the First Earth Observation Summit was held in Washington DC, USA, on July 31st and adopted the Declaration which needs to support;

- 1) Improved coordination of strategies and systems for observations of the Earth and identification of measures to minimize data gaps, with a view to moving toward a comprehensive, coordinated, and sustained Earth Observation system or systems;
- 2) A coordinated effort to involve and assist developing countries in improving and sustaining their contributions to observing systems, as well as their access to and effective utilization of observations, data and products, and the related technologies by addressing capacity-building needs related to Earth Observations;
- 3) The exchange of observations recorded from in situ, aircraft, and satellite networks, dedicated to the purposes of this Declaration, in a full and open manner with minimum time delay and minimum cost, recognizing relevant international instruments and national policies and legislation; and
- 4) Preparation of a 10-year Implementation Plan, building on existing systems and initiatives, with



Photo of the participants of Earth Observation Summit II held in Tokyo, Japan (Center: Japanese Prime Minister Junichiro Koizumi)

the Framework being available by the Tokyo ministerial conference on Earth observations.

The ad hoc Group on Earth Observations (GEO) was established in order to undertake the extremely important task of developing a 10-Year Implementation Plan for Earth Observations. Countries and international organizations - including CEOS - are discussing how to establish a comprehensive, co-ordinated, and sustained Global Earth Observation Systems of Systems (GEOSS) in the framework of GEO.

On April 25th, 350 ministers and high-ranking officials from 43 countries and the European Commission, and 25 organizations - including CEOS - met for the Second Earth Observation Summit in Tokyo, Japan. The Communiqué and the Framework Document for a 10-year Implementation Plan were adopted at the Summit.

Based on this Framework Document, GEO is now working to develop the Implementation Plan, which will be adopted in the Third Earth Observation Summit, to be held in Brussels in February 2005. In the discussion of GEO, satellite Earth observations are recognized as a major contributor to the GEO process. Therefore, it is expected that CEOS can make a significant contribution to the GEO initiative.

CEOS History

Plenary	Year	Venue	Host				
1st Plenary	1984	Washington, DC, USA	NOAA	11th Plenary	1997	Toulouse, France	CNES
2nd Plenary	1986	Frascati, Italy	ESA	12th Plenary	1998	Bangalore, India	ISRO
3rd Plenary	1988	Ottawa, Canada	CSA	13th Plenary	1999	Stockholm, Sweden	EUMETSAT
4th Plenary	1990	Sao José dos Campos, Brazil	INPE	14th Plenary	2000	Rio de Janeiro, Brazil	INPE
5th Plenary	1991	Washington, DC, USA	NASA/NOAA	15th Plenary	2001	Kyoto, Japan	MEXT/NASDA
6th Plenary	1992	London, UK	BNSC	16th Plenary	2002	Frascati, Italy	ESA
7th Plenary	1993	Tsukuba, Japan	STA/NASDA	17th Plenary	2003	Colorado Springs, USA	NOAA
8th Plenary	1994	Berlin, Germany	DARA	18th Plenary	2004	Beijing, China	MOST/NRSCC
9th Plenary	1995	Montreal, Canada	CSA	19th Plenary	2005	London, UK	BNSC
10th Plenary	1996	Canberra, Australia	CSIRO	20th Plenary	2006	(TBD), Argentina	CONAE

CEOS ACTIVITY

CEOS Plenary

Currently, 23 space agencies along with 21 other national and international organizations participate in CEOS planning and activities. Participating agencies meet in Plenary annually, with activities and coordination occurring throughout the year in the Secretariat, four permanent working groups and ad hoc working groups as necessary. The Plenary reviews progress on the various projects and activities being undertaken within CEOS. The Chair of CEOS rotates at the annual Plenary. The CEOS Chair for 2004 is the National Remote Sensing Center of China (NRSCC). And in 2005, the British National Space Centre (BNSC) will undertake CEOS Chairmanship.



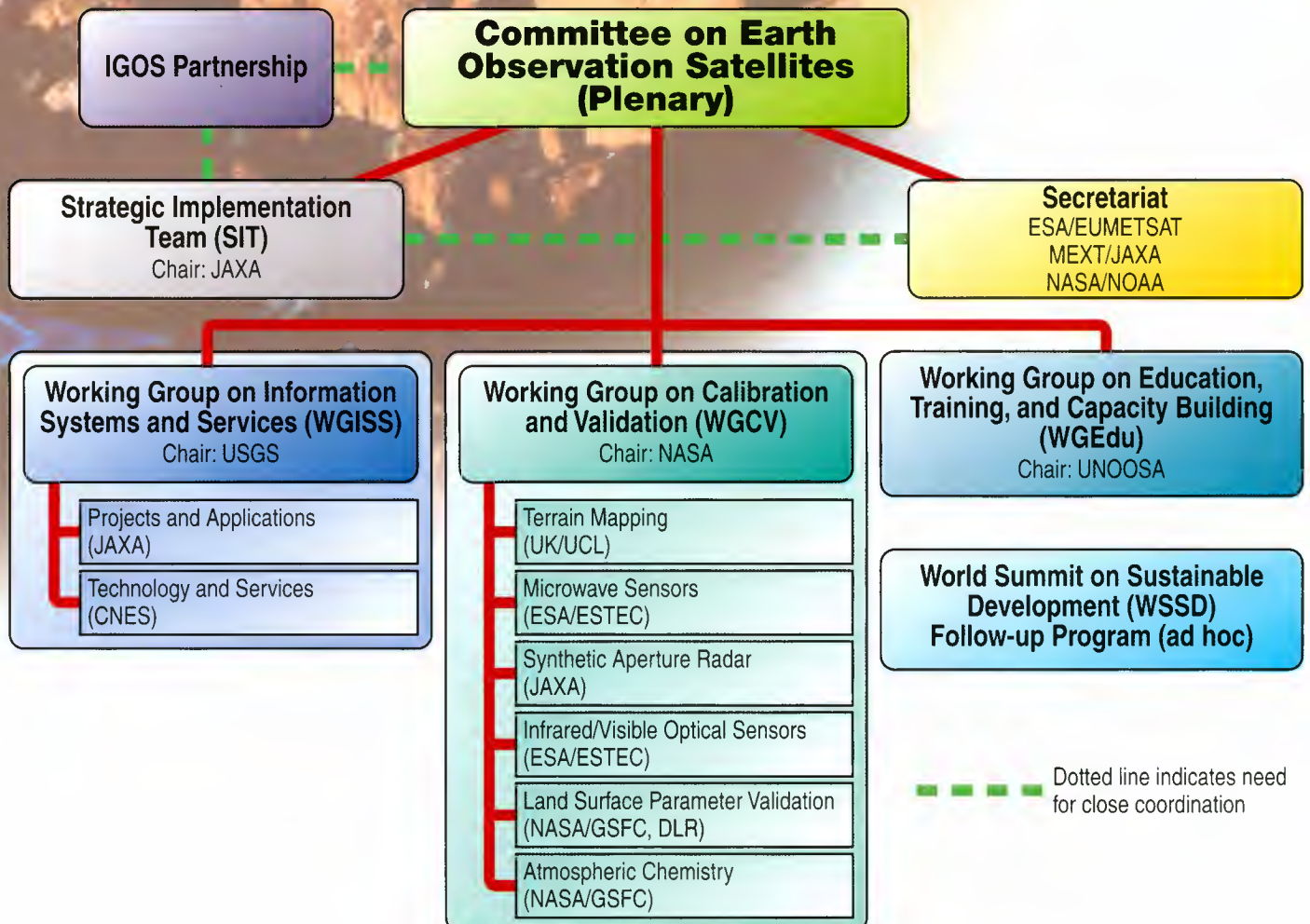
Participants of the 2003 CEOS Plenary in Colorado Springs



Minister Xu Guanhua, China
2004 CEOS Chair

In November 2004, Minister Xu Guanhua will chair the 18th CEOS Plenary in Beijing. Around the Plenary, NRSCC is planning a Symposium to commemorate the 20th Anniversary of CEOS, as well as a Workshop and Exhibition on Earth Observation Technology and Applications.

CEOS Structure



CEOS Secretariat

A permanent Secretariat provides most of the coordination between plenary sessions and is maintained by

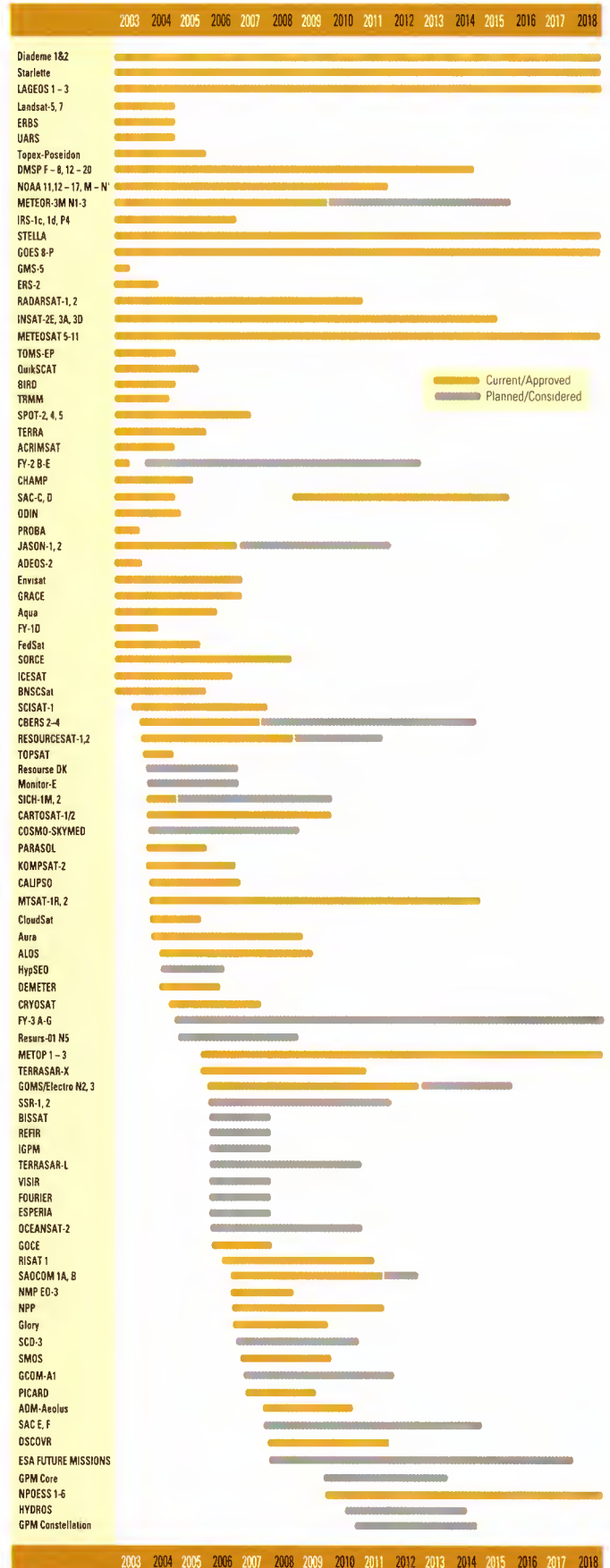
- the European Space Agency (ESA),
- the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT),
- the National Aeronautics and Space Administration (NASA), jointly with
- the National Oceanic and Atmospheric Administration (NOAA) of the United States, and
- the Ministry of Education, Culture, Sports, Science and Technology (MEXT) jointly with the Japan Aerospace Exploration Agency (JAXA).

The CEOS Secretariat is chaired by the current CEOS host agency in support of the Plenary. In addition, to ensure the expeditious conduct of business, the past and the forthcoming CEOS chair will be included in the CEOS Secretariat. The Secretariat will prepare and distribute the minutes for the Plenary meetings, serve as a point-of-contact for external organizations interacting with CEOS, maintain and update the CEOS/WMO Database and Handbook (<http://www.eohandbook.com>) on mission planning and user requirements, produce other periodic publications such as the CEOS Newsletter and Annual Report, ensure communications among members between meetings, report at each Plenary session on its activities and the status of action items from previous Plenary meetings and perform other tasks as assigned by the CEOS Plenary. The Plenary guides the work of the Secretariat, with CEOS Member points-of-contact serving as a steering committee in between Plenary sessions.



EUMETSAT

Earth Observation Satellite Programs



Source: EO Handbook 2002

CEOS WORKING GROUPS

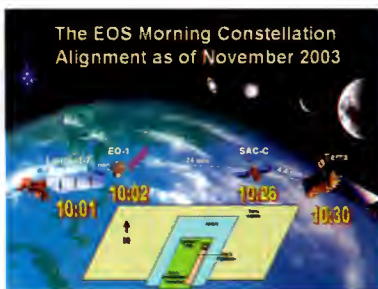
Working Group on Calibration and Validation (WGCV)

The objectives of the WGCV are to enhance coordination and complementarity, to promote international cooperation and to focus activities in the calibration and validation of Earth observations for the benefit of CEOS Members and the international user community. WGCV addresses issues relating to sensor system calibration/validation as well as validation of geophysical parameter/derived products. A major emphasis of these activities is to enable reliable comparison and synergistic use of information across the global gamut of Earth observing systems in support of IGOS partners objectives. In addition the WGCV interacts with WGISS on issues of common interest through the participation in the WGISS Test Facility (WTF) and periodic joint WGISS/WGCV Plenary sessions. The WGCV meets in Plenary session approximately every nine months and each of the six subgroups meets at least annually, frequently in conjunction with calibration/validation workshops or discipline oriented meetings.

The subgroups of WGCV are as follows:

- Terrain Mapping (U.K./U. College)
- Microwave Sensors (ESA/ESTEC)
- Synthetic Aperture Radar (JAXA)
- Infrared/Visible Optical Sensors (ESA/ESTEC)
- Land Surface Parameter Validation (NASA/GSFC, DLR)
- Atmospheric Chemistry (NASA/GSFC)

WGCV Website: <http://wgcv.ceos.org>



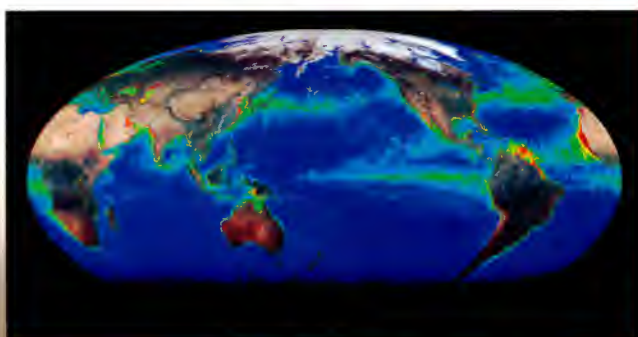
The NASA/CONAE Morning Constellation, formation flying over common ground targets at closely spaced equatorial crossing times as shown below, provides opportunities to compare observations made with a variety of satellite observing systems against each other and contemporaneously obtained ground measurements. CEOS member Observing systems include: NASA's MODIS, ETM+, EO-1 ALI and Hyperion; Japan's ASTER; and CONAE's SAC-C MMRS and GOLPE instrument suites.

Working Group on Information Systems and Services (WGISS)

The scope of WGISS is to provide a framework for addressing the long-term needs of both data and service providers. As such, WGISS addresses all activities related to the capture, description, processing, access, retrieval, utilization, maintenance, archiving and exchange of space borne Earth Observation (EO) data and supporting ancillary data and information, enabling improved interoperability and interconnectivity of information systems and services, combining space borne EO data with in-situ data.

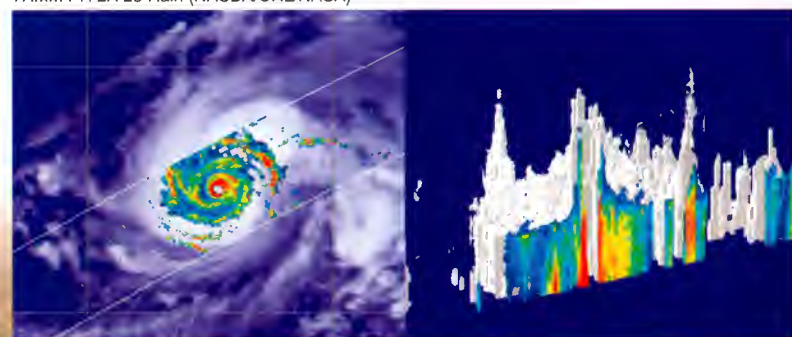
To maximize the impact and benefit of WGISS activities, the working group will coordinate with other CEOS elements, non-CEOS agencies and organizations, including governmental and non-governmental organizations that have interests, resources and networks supporting EO data development and exchange. This broad scope is intended to foster the close interdisciplinary coordination, and the focus and integration, which are necessary for WGISS to act as a forum that is capable of implementing practical solutions.

WGISS Website: <http://wgiss.ceos.org>



GLI ocean primary productivity (JAXA)

TRMM PR 2A 25 Rain (NASDA/CRL/NASA)



Horizontal Cross Section of Rain at 2.00km Height

3D Rain Structure

Working Group on Education, Training, and Capacity Building (WGEdu)

The Working Group on Training, Education, and Capacity Building (WGEdu) was established as an *ad hoc* group in 1999 and became a standing group of CEOS in 2003. The priorities of this group are to (a) provide for the timely integration and refresh of Earth observation data, information and techniques into education and training programmes; (b) promote a growing cadre of specialists in Earth observation who can address the environmental issues and develop expanded practical applications of Earth observation data and information; (c) underscore the relevance of Earth observation for policy and decision-making and where appropriate (d) contribute to capacity building efforts, particularly in developing countries and countries with economies in transition. This effort is supported in-kind by member CEOS agencies and associates and undertaken in partnership with many different agencies.

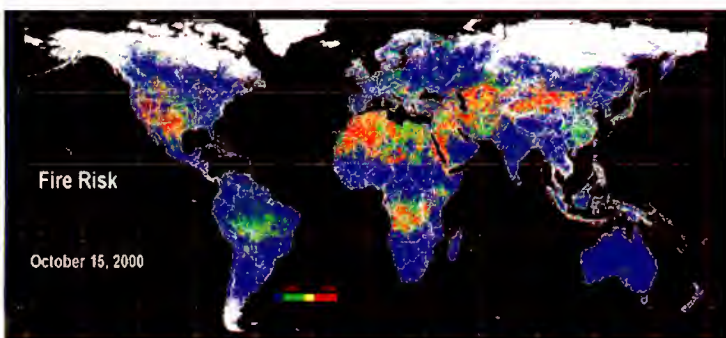
Some of the present priority activities include the development of; an Earth Observation education and training web discovery portal; a series of mechanisms to ensure that satellite data is made available easily and inexpensively for educational purposes; and new and expanded partnerships to coordinate, promote and advance our common goals.

WGEdu Web site:

<http://www.acrors.ait.ac.th/ceos/>



SPOT(Australia), (CNES 2002)



Fire Risk (NOAA)

CEOS WSSD Follow-up Programme

The CEOS WSSD Follow-up Programme was successfully launched at the 16th CEOS Plenary in November 2002. The goal of this programme is to coordinate the WSSD-related activities of CEOS Members and Associates so that space-based technologies are maximized to achieve the sustainable development goals outlined in the 2002 WSSD Plan of Implementation. Specifically, CEOS' WSSD Follow-up Programme goals are focused on five specific areas (or modules) where the benefits of satellite and space technology were specifically highlighted in the Plan of Implementation. They include:

Module-1: Education, Training, and Capacity Building

Module-2: Water Resources Management

Module-3: Disaster Management and Conflicts

Module-4: Climate Change

Module-5: Global Mapping, GIS, and Land Cover Change

WSSD Follow-up Programme Web site:

<http://ceoswssd.noaa.gov/>

CEOS Ad Hoc Team on Utilization

The Ad Hoc Team on Utilization was created in 2003 to encourage and facilitate the increased use of space data, products, and services. The team was charged with developing recommendations on improvements in data utilization for CEOS consideration based on an extensive consultation and study process. The main emphasis of the case studies focused on situations where the desired outcome is a sustained capability rather than increasing the number of short-term users. The team completed a report on the various case studies, which included the primary findings of the study and several principles to encourage the use of satellite remote sensing. In the report, the team proposed a set of CEOS Data Utilization Principles and Recommendations based on the case studies. These principles and recommendations were adopted at the 2003 Plenary, and the ad hoc team was disbanded.

Ad hoc Team on Utilization Web site:

<http://www.ceos.org/utilization>



CEOS INVOLVEMENT IN IGOS

Integrated Global Observing Strategy IGOS Partnership (IGOS-P)

CEOS has become one of the Partners of an Integrated Global Observing Strategy (IGOS), primarily in fulfilment of its own set of objectives and to derive greater benefit from both operating and planned observing systems. IGOS-P intends to unite the major satellite and ground-based systems for global environmental observations and monitoring of the atmosphere, oceans, land and life. It is a strategic planning process, involving a number of Partners, that links research, long-term monitoring and operational programmes - as well as data producers and users - in a structure that helps determine observation gaps and identify the resources to fill observation needs. Implementation of the IGOS is organized around themes of common interest to the Partners. Through working together, CEOS agencies are in a position to plan their Earth observation programmes with the minimum of unnecessary overlap and to devise joint strategies for addressing serious gaps in their observation capabilities. CEOS has also embarked on the IGOS-P initiative to link its activities with complementary observation programmes. The goal of this initiative is to develop a comprehensive strategy for enhanced levels of support to scientific, operational and research communities.

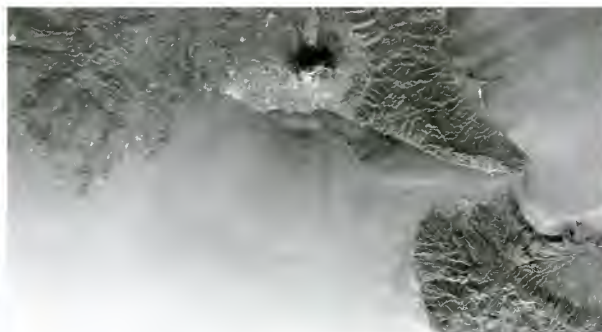
Strategic Implementation Team (SIT)

The CEOS Strategic Implementation Team (SIT) was created in 1996 to advance the involvement of CEOS in the development of IGOS-P. The SIT is comprised of CEOS Member Principals with the authority to commit agency support to initiatives as they unfold. The SIT's objective is to define, characterize, and develop the vision for CEOS participation in IGOS, to define and coordinate the space component of IGOS, and to address, with the relevant IGOS Partners, the interface between the space component and the in situ component. The SIT works with the IGOS themes, through discussion of the themes' progress in defining their space observation need. The Chairman of CEOS may also call upon SIT to examine other items of CEOS business which require advancing between Plenary sessions. In 2003 and 2004, SIT assisted the theme teams in finalizing their reports for the IGOS-P. SIT was able to assist five themes in gaining formal approval by IGOS-P and moving into implementation phase. The approved theme teams included: Coral Reef (subtheme), Global Carbon Cycle, Global Water Cycle, Geohazards, and Atmospheric Chemistry.

As a result, SIT encouraged the space agencies to make firm commitments to provide the space observations defined in the approved reports.



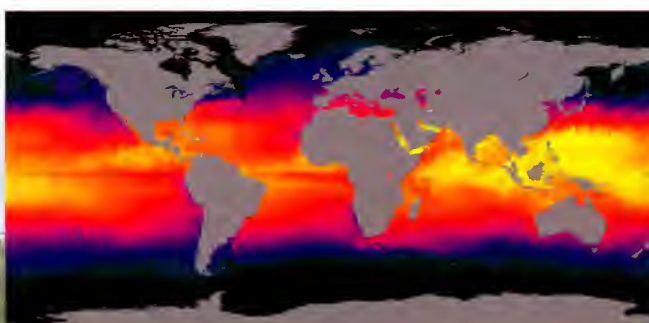
Upper-air Observation by radiosonde (balloon)



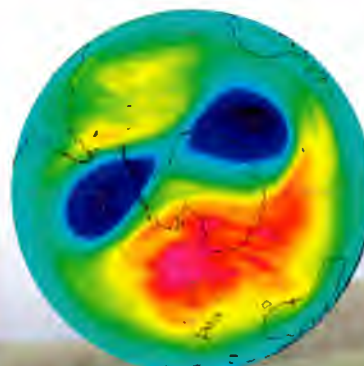
an ASAR image of Sicily (ESA)



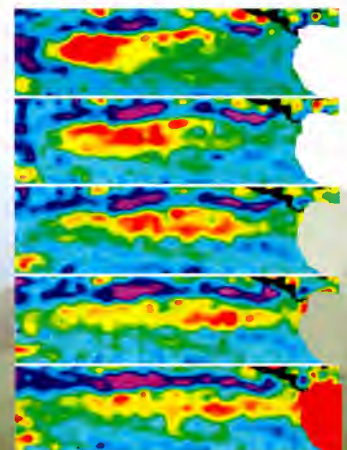
Understanding ground truth measurements in Tibet



Sea surface temperature (NASA)



Antarctic ozonehole (KNMI/ESA)



El Niño's arrival (NASA/CNES)

History of the IGOS Partnership

IGOS-P was created in 1998 to further the definition, development and implementation of the IGOS. The Partnership currently consists of CEOS, FAO, GCOS, GOOS, GOS/GAW, GTOS, ICSU, IGBP, IGFA, IOC, UNEP, UNESCO, WCRP and WMO. Moreover, it is open to new partners who are willing and able to commit to the implementation of IGOS. IGOS-P provides a continuing mechanism to oversee the IGOS process with meetings arranged among the partners twice a year.

THE IGOS PARTNERSHIP

An agreement among the partners for the definition, development and implementation of an integrated global observing strategy

Implementation of IGOS through "Themes"

The IGOS "themes" were developed to include the observing activities of all Partners, and provide a coherent focus for the definition and implementation of IGOS. Both the IGOS Partnership and CEOS endorsed the theme approach and decided to pursue the implementation of IGOS through the themes below.

IGOS Themes in Implementation

- Ocean Theme
- Integrated Global Carbon Observation Theme (IGCO)
- Integrated Global Water Cycle Observations Theme (IGWCO)
- Geo-hazards Theme
- Atmospheric Chemistry Theme (IGACO)
- Coastal Theme/Coral Reef Sub-theme

IGOS Themes in Preparation:

- Land Theme
- Cryosphere Theme

Further CEOS Contributions to IGOS-P

- IGOS Brochure

In order to answer the questions, "What is the IGOS Partnership and the Theme Developments?", MEXT/JAXA has produced the IGOS brochure since July 1999. This publication gives an overview of the Partnership and the work of its Theme teams. The latest version of the IGOS brochure (2003) is available from:

<http://www.igospartners.org>

- IGOS Bulletin

CNES has produced the IGOS Bulletin since September 1999 in order to introduce IGOS and its development worldwide. The IGOS Bulletin is published biannually and found at the same web site:

<http://www.igospartners.org>



IGOS Theme Reports

CEOS Members (Status as of 2004)

Members (23) Location

ASI	Agenzia Spaziale Italiano	Italy
BNSC	British National Space Centre	U.K.
CAST	Chinese Academy of Space Technology	China
CNES	Centre National d'Etudes Spatiales	France
CONAE	Comision Nacional de Actividades Espaciales	Argentina
CSA	Canadian Space Agency	Canada
CSIRO	Commonwealth Scientific and Industrial Research Organization	Australia
DLR	Deutsche Zentrum für Luft- und Raumfahrt	Germany
EC	European Commission	Europe
ESA	European Space Agency	France
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites	Germany
INPE	Instituto Nacional de Pesquisas Espaciais	Brazil
ISRO	Indian Space Research Organization	India
KARI	Korea Aerospace Research Institute	Korea
MEXT / JAXA	Ministry of Education, Culture, Sports, Science and Tecnology / Japan Aerospace Exploration Agency	Japan
NASA	National Aeronautics and Space Administration	USA
NOAA	National Oceanic and Atmospheric Administration	USA
NRSCC	National Remote Sensing Center of China	China
NSAU	National Space Agency of Ukraine	Ukraine
ROSHYDROMET	Russian Federal Service for Hydrometeorology and Environmental Monitoring	Russia
RASA	Russian Aviation and Space Agency	Russia
SNSB	Swedish National Space Board	Sweden
USGS	US Geological Survey	USA

Associates (21)

CCRS	Canada Centre for Remote Sensing	Canada
CRI	Crown Research Institute	New Zealand
OSTC	Federal Office for Scientific, Technical and Cultural Affairs	Belgium
GCOS	Global Climate Observing System	Switzerland
GISTDA	Geo-Informatics and Space Technology Development Agency	Thailand
GOOS	Global Ocean Observing System	France
GTOS	Global Terrestrial Observing System	Italy
ICSU	International Council for Science	France
IGBP	International Geosphere-Biosphere Programme	Sweden
IOC	Intergovernmental Oceanographic Commission	U.S.
IOCCG	International Ocean Colour Coordinating Group	Canada
ISPRS	International Society for Photogrammetry and Remote Sensing	U.S.
NSC	Norwegian Space Centre	Norway
SAC / CSIR	Satellite Applications Centre / Council for Scientific and Industrial Research	South Africa
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific	Thailand
UNEP	United Nations Environment Programme	Kenya
UNESCO	United Nations Educational, Scientific, and Cultural Organization	France
FAO	United Nations Food and Agriculture Organization	Italy
UNOOSA	United Nations Office for Outer Space Affairs	Austria
WCRP	World Climate Research Programme	Switzerland
WMO	World Meteorological Organisation	Switzerland

CEOS Documents and Services:

- Annual Report
http://www.ceos.org/pages/annual_reports.html
- Brochure
<http://www.ceos.org/pages/brochure#brochure>
- Catalog Interoperability Protocol (CIP)
<http://www.op.dlr.de/ceos/ics/index.html>
- CD-ROM: Resources in Earth Observation
<http://ceos.cnes.fr:8100/>
- CD-ROM: Changing the Face of the Earth
<http://www.ceos.org/pages/pub.html#appcd>
- CEOS Website
<http://www.ceos.org>
- CEOS/WMO database
<http://alto-stratus.wmo.ch/sat/stations/SatSystem.html>
- Data Exchange Principles
<http://www.ceos.org/pages/pub.html#exchange>
- Earth Observation Handbook
<http://www.eohandbook.com/>
- Five Year Plan
http://www.ceos.org/pdfs/Five_Year_Plan.doc
- International Directory Network (IDN)
<http://gcmd.gsfc.nasa.gov/ceosidn/>
- Interoperable Catalogue System(ICS)
http://ceos.esrin.esa.it/CINTEX_Task_Team_Revised.html
- Newsletter
<http://www.ceos.org/pages/newsletter.html>
- Virtual CEOSnet
<http://wgiss.ceos.org/ceosnet.html>



For More information, please visit the CEOS Website:
<http://www.ceos.org>

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