

CEOS ANNUAL REPORT **Special Biennial Edition**

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**Committee on Earth Observation Satellites Annual Report
(Special Biennial Edition: 2000 and 2001)
Published by National Aeronautics and Space Administration
on behalf of CEOS
Editor: Leslie Kay**

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Foreword

From 1991 until 1999, NASA, on behalf of the Committee on Earth Observation Satellites (CEOS), published an annual Consolidated Report that provided an overview of the history, purpose and accomplishments to date of CEOS and its working groups. CEOS is now in its eighteenth year, and it is no longer practical to publish the contents of the Consolidated Report on an annual basis, as a large portion was organizational and historical in nature. Therefore, in 2001, CEOS launched a home page (<http://www.ceos.org>) that now serves as a central information point. The CEOS home page provides information on CEOS history, activities, structure, products, and services. Copies of key documents such as the CEOS Terms of Reference, back issues of the Consolidated Report, the CEOS Newsletter, the CEOS Brochure, and minutes from Plenary and other meetings can be obtained there.

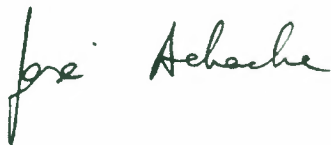
This publication marks the inaugural edition of the CEOS Annual Report. The CEOS Annual Report will convey the main highlights, activities, and accomplishments of CEOS during the previous year. Historical information and other details will be retained on the CEOS Web site. Because no report was issued in 2000, this inaugural edition of the CEOS Annual Report is a special biennial version, covering both the years 2000 and 2001. Future editions will be annual.

Both 2000 and 2001 were busy years for CEOS, which focused many of its efforts toward the continuing development of the Integrated Global Observing Strategy (IGOS). Most notably, CEOS continued to be an active Partner within the IGOS Partnership. CEOS made its Strategic Implementation Team a permanent body within its structure, thereby signaling CEOS's strong commitment to the IGOS process. Space agencies have also made notable progress in implementing the recommendations of the IGOS Oceans Theme Report.

Credit for CEOS's many accomplishments lie with all Members and Associates and their colleagues within their organizations whose work and continuous support advance the objectives of CEOS. This Report encapsulates these accomplishments in 2000 and 2001, the tireless efforts of so many. It is, therefore, our pleasure to launch this edition of the CEOS Annual Report.



Ghassem R. Asrar
Associate Administrator for Earth Science
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José Achache
Chairman, CEOS (2002)
Director of Earth Observation Programmes
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CEOS Objectives

The Committee on Earth Observation Satellites (CEOS), established in 1984, is charged with coordinating international civil spaceborne missions designed to observe and study planet Earth. Comprising 43 space agencies and other national and international organizations, CEOS is recognized as the major international forum for the coordination of Earth observation satellite programs and for interaction of these programs with users of satellite data and information worldwide. CEOS works on the principle of “best efforts” contributions and is managed through a permanent Secretariat, Plenary Meetings and a number of Working Groups. The CEOS Chairmanship rotates annually among its Members.

The goals of CEOS are to:

- Optimize the benefits of spaceborne Earth observations through cooperation of its Members in mission planning and in the development of compatible data products, formats, services, applications and policies;
- Aid both its Members and the international user community by *inter alia* serving as the focal point for international coordination of space-related Earth observation activities, including those related to global change;
- Exchange policy and technical information to encourage complementarity and compatibility among spaceborne Earth observations systems currently in service or development, and the data received from them; issues of common interest across the spectrum of Earth observations satellite missions are addressed.

For More Information

For detailed information about CEOS, its history, activities and structure, visit the CEOS Web site:
<http://www.ceos.org>

Major Meetings and Events

2000

February	16th WGCV Plenary (Bangalore, India)
March	Revised CEOS Brochure published
May	10th WGISS Plenary (Canberra, Australia)
June	7th SIT meeting (Geneva, Switzerland) 5th IGOS Partnership Meeting (Geneva, Switzerland)
August	1st CEOS WGEdu Meeting (Dehardun, India)
September	11th WGISS Plenary (Ispra, Italy)
October	17th WGCV Plenary (Gaithersburg, USA)
November	8th SIT meeting (Rio de Janeiro, Brazil) 6th IGOS Partnership Meeting (Rio de Janeiro, Brazil) 14th CEOS Plenary (Rio de Janeiro, Brazil)

2001

January	IGOS Ocean Theme Final Report published
May	9th SIT meeting (Paris, France) 1st CEOS Review Team meeting (Paris, France) 12th WGISS Plenary (Sioux Falls, USA)
June	7th IGOS Partnership Meeting (Paris, France) 18th WGCV Plenary (Frascati, Italy)
July	Revised CEOS Brochure published
September	2nd WGEdu meeting (Frascati, Italy)
November	15th CEOS Plenary (Kyoto, Japan) 7th IGOS Partnership Meeting (Kyoto, Japan)

Major Initiatives

Over the past several years, CEOS has been striving to maximize its interface with and contributions to the Integrated Global Observing Strategy (IGOS) Partnership (IGOS-P). IGOS is now a major focus for program harmonization efforts for CEOS Members, and CEOS is a committed Partner to the process.

2000—CEOS Leadership of the IGOS Oceans Theme Team

Since the inception of the IGOS Partnership in 1998, CEOS has been an active Partner within IGOS-P on a range of issues, including leadership, structure, meeting schedules and the development of themes. In 2000, a major CEOS contribution to the continuing development of IGOS was its leadership of the Oceans Theme Team and the publication of the Oceans Theme Team report. The IGOS Partnership recognized the need for converging existing efforts to develop a global observing strategy for the oceans. It also recognized that the advanced state of the oceanography community's studies of observation needs presented a unique opportunity to develop such a strategy. It, as a result in 1999, created its first Theme Team, focused on oceans. Throughout 2000, the Team developed a strategy for the creation of an observing system for oceans that serves both the research and operational oceanographic communities as well as a wide range of users of marine data and information (such as scientists, policy-makers, port and coastal zone managers, the tourism industry, the fisheries and aquaculture industry, the shipping and offshore mining industries, and the general public). With the publication of the Oceans Theme Team report in January 2001, the leadership of the Team was turned over to the Global Ocean Observing System (GOOS), another IGOS-P Partner, for implementation of the strategy.

2001—CEOS Review Team

Recognizing the continuing rapid evolution of the IGOS Partnership (IGOS-P) and the need for improved interfaces between CEOS and IGOS-P, the 14th CEOS Plenary in November 2000 created the CEOS Review Team. The scope of the Review Team's activities were to conduct a review of the mechanism by which CEOS contributes to and implements IGOS-P themes; to address the Strategic Implementation Team (SIT), its mandate, membership and future status; and to evaluate the implications of its recommendations on the overall CEOS structure and activities.

In 2001, the Review Team dedicated itself to its task. To gather important viewpoints and background, it undertook a series of interviews and solicited comments and inputs from CEOS Principals, Associates, other colleagues in agencies associated with CEOS and IGOS-P, and other external experts. Based on these interactions and its own internal discussions throughout 2001, the Review Team drafted a report which recommended that 1) CEOS remain a "best efforts" organization; 2) CEOS remain an active, but independent Partner of IGOS-P; 3) the ad hoc SIT become a permanent body of CEOS (see pages TBD for further details); 4) the CEOS Chairman and the SIT Chairman be the official CEOS representatives to IGOS-P; 5) CEOS should work with the other Partners in IGOS-P regarding issues such as meeting schedules and management structure; 6) the SIT Chairman report to the CEOS Plenary on all IGOS-P and theme-related activities; 7) the CEOS Plenary must continue to deal with all CEOS activities; and 8) the 15th CEOS Plenary renew the mandate of the Review Team for another year to address the full range of activities and structures within CEOS and to develop a new CEOS strategic plan.

The 15th Plenary adopted the above recommendations.

Strategic Implementation Team

The CEOS Strategic Implementation Team (SIT) was created in 1996 to advance the involvement of CEOS in the development of the Integrated Global Observing Strategy (IGOS). The SIT is comprised of CEOS Member Principals with the authority to commit agency support to initiatives as they unfold. The SIT's remit is to define, characterize and develop the vision for CEOS's participation in IGOS, to define 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.

2000

In 2000, the SIT conducted two meetings. SIT-7 was held in Geneva, Switzerland, in June. The objective of the meeting was to discuss several issues with a view toward more effective conduct of business and the status of SIT vis-à-vis CEOS. SIT recommended that CEOS Members move out expeditiously to implement the IGOS Ocean Theme Team Report, although the Team was finalizing the final version. Space agencies have already made significant commitments, and the Report continues to provide a solid basis to analyze and remedy the deficiencies, gaps and overlaps. Implementation of the Ocean Theme is led by GOOS. With regard to the status of the Carbon Cycle Theme, SIT discussed the need to balance Terrestrial Carbon portion with the Ocean Carbon portion. SIT encouraged CEOS agencies to respond to formulated requirements for satellite data in support of the Coordinated Enhanced Observation Period (CEOP).

SIT-8 was held in Rio de Janeiro, Brazil, in November 2000. SIT discussed further adoption of the Ocean Theme Team Report, reports on the terrestrial and atmospheric aspects of the Carbon Cycle and Integrated Global Carbon Observations, a potential proposal on geophysical and geological hazards, and a report on CEOS agencies' contributions to CEOP. SIT focused its discussions on its role within IGOS as the coordinator of the space component and its mid and long term evolution. SIT recognized that the rapidly evolving IGOS situation called for a thorough review of the history and progress of IGOS and its implications in terms of CEOS structure. These discussions became the basis for the charge given to the CEOS Review Team by the 14th Plenary in November 2000.

2001

In 2001, SIT conducted one meeting. SIT-9 was held in Paris, France, in May. The meeting mainly focused on the space component of the IGOS Themes. Regarding the Ocean Theme, the rapid response of CEOS Members to the challenges put forward in the Ocean Theme Team Report demonstrated the strength of the CEOS best efforts policy. As such, SIT highlighted the efforts made by several CEOS Members for follow-on, operational continuity and future missions in the areas of various oceanographic measurements. Regarding the Integrated Global Carbon Observation Theme (IGCO), SIT endorsed the theme proposal and recommended its adoption by the IGOS Partnership, again expressing the need for balance between the ocean and terrestrial components. SIT also agreed to provide space agencies responses within 12 months after approval of the report by the IGOS Partnership. SIT also recommended approval of a proposal for an Integrated Global Atmospheric Chemistry Observation Theme (IGACO) and expressed interested in a potential theme in Integrated Global Water Cycle Observations (IGWCO). However, SIT emphasized the need to interface any IGWCO theme with other themes, such as the Ocean and Carbon themes. Again, SIT encouraged space agencies to respond to requirements expressed by CEOP in an appropriate and timely manner.

In 2001, the 15th Plenary decided to make the SIT a permanent working group and invited Dr. Tillmann Mohr of EUMETSAT to take the chair for two years. Prior to this decision, SIT had existed on a series of annually renewed mandates. The decision was made based on a key recommendation by the CEOS Review Team, led by the CEOS Chairman at the direction of the 14th Plenary, and underscores the impor-

tance with which CEOS approaches its commitment to the IGOS Partnership. The Review Team was charged with looking at the way CEOS operates in general and how best to interface with the IGOS Partnership in particular. See page 5 for further details.

SIT retains its name but is now operating under a new set of provisional Terms of Reference, which will be revisited at Plenary 16 in November 2002:

The CEOS Strategic Implementation Team will:

- (a) For each IGOS P approved Theme, seek commitments to cover the needs of the Theme, and monitor the realization of the commitments (this will constitute the major part of the SIT work);*
- (b) When a Theme has reached Implementation stage, ensure that there is an appropriate Space component representative in each Theme's Implementation Team. This representative will report regularly to the Chairman of the SIT, and will look to him for support in carrying out CEOS commitments;*
- (c) Act as a focal point for all IGOS-P related matters of interest to CEOS. The Chairman will keep the CEOS Chairman regularly informed and briefed, particularly in connection with IGOS-P meetings, where the CEOS Chairman and the Chairman of SIT will be the formal CEOS representatives;*
- (d) Report to CEOS Plenary on IGOS-P matters requiring discussion or decision by CEOS Plenary, and arrange for appropriate action to be taken.*
- (e) Develop, implement and review strategies for outreach and education on IGOS-P issues relating to CEOS;*
- (f) Work to achieve greater synergy between the research satellite and operational satellite communities in building upon proven research instrumentation to develop future generation operational monitoring capabilities.*

Participation is open to all CEOS Members who have made, or intend in the near future to make, a contribution to an IGOS-P Theme or other IGOS-P activity. The Chairman may invite observers as appropriate.

Representatives to SIT should be mandated by the organization they represent to make commitments at or shortly after meetings, in order to facilitate the implementation process.

The SIT Chairman will be elected by the CEOS Plenary for a two-year term, (possibly open to extension). The SIT Chairman will be a senior Space agency official, from a different agency than the CEOS Chairman. The SIT Chairman will also serve as the CEOS Vice-Chairman for IGOS-P Affairs and be a member of the CEOS Secretariat.

The Chairman will arrange meetings of SIT as needed to strategically address Space agency commitments to IGOS Themes - once those Themes reach a mature stage of development, and to address implementation of such commitments. The Chairman will convene the meetings at a time and place which will facilitate the participation of as many interested and active representatives as possible. In each case the Chairman will provide an agenda in good time prior to the meeting, so that representatives may elect to limit their participation to meetings where they have a direct interest. In addition, the Chairman will, as needed, pursue inter-sessional contacts with SIT Member Principals and work together with the CEOS Chairman and CEOS Secretariat to keep all CEOS agencies informed of IGOS-P activities and issues during the period between CEOS Plenaries.

The Chairman will ensure that Plenary is adequately consulted and informed, but will rigorously avoid repetition of lengthy presentations already made in SIT and/or IGOS-P.

The SIT will be supported by the CEOS Secretariat.

The CEOS Plenary

CEOS is managed by Plenary, at which CEOS principals meet annually. The CEOS Plenary determines policy, reviews progress on the projects and activities being undertaken, and sets the agenda of activities for the upcoming year. The Chairman of CEOS rotates at the annual Plenary. The CEOS Plenary has convened 16 times since 1984—15 in formal Plenary sessions and once in interim session.

2000

The 14th CEOS Plenary was convened in Rio de Janeiro, Brazil, November 7–10, 2000. CEOS Principals discussed the major events and accomplishments over the past year. Notably, the 14th Plenary:

- Welcomed United States Geological Survey (USGS) as the 22nd CEOS Member.
- Amended the CEOS Terms of Reference, attributing reporting responsibilities to Working Group Chairs at CEOS Secretariat meetings, to facilitate the work of the Secretariat in tracking the status of Plenary actions tasked onto Working Groups.
- Endorsed the reports of the Working Group on Information Systems and Services (WGISS), the Working Group on Calibration and Validation (WGCV), the ad hoc Disaster Management Support Group (DMSG), the ad hoc Working Group on Earth Observation Education and Training (WGEdu) and the Strategic Implantation Team (SIT).
- Approved the continuation of SIT, DMSG and WGEdu for another year.
- Noted the advances achieved by the IGOS Partnership and reaffirmed CEOS' commitment to support and participate in IGOS, encouraging Members to contribute to and participate in the implementation of the Themes developed by the Partnership.
- Endorsed the WGISS concept of a Test Environment, whereby WGISS-developed products, tools and services could be tested on user application projects in partnership with the users.
- Endorsed the objective of the CNES/ESA Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, and encouraged other CEOS Members to join the Charter.
- Approved the Secretariat proposal to phase out the annual Consolidated Report in favor of an enhanced web site and a concise Annual Report summarizing key activities and accomplishments of the preceding year only.
- Reaffirmed the interest in seeking dialogue and establishing cooperative links with the private sector, encouraging Member agencies and Working Group Chairs to involve Earth observation Industry reps in their activities and endorsing the concept of an International Industry Forum.
- Reaffirmed the importance of the Space Frequency allocation issue, encouraging Members to follow more closely World Radio Congress activities and instructing the CEOS Secretariat to enhance the visibility of the Space Frequency Coordination Group as appropriate in all CEOS publications.
- Was briefed by UNOOSA on the activities being carried under the UNISPACE III Action Plan and reaffirmed the interest on following them up at the next Plenary.

- Appointed a CEOS Review Team to analyze the current CEOS structure and activities, aiming at improving their effectiveness, and make suitable recommendations to the 15th Plenary on any changes that may appear advisable, in order to cater for the longer term.
- Appointed MEXT/NASDA as the Chair for 2001.

2001

The 15th CEOS Plenary was held in Kyoto, Japan, November 5–9, 2001. CEOS Principals discussed the major events and accomplishments over the past year. Notably, the 15th Plenary:

- Endorsed the CEOS Review Team Report recommendations which dealt primarily with CEOS interaction with IGOS-P. Plenary also approved the continuation of the review activities under ESA chairmanship to address the full range of CEOS activities and organization and to develop a new CEOS strategic plan.
- Approved the replacement, as per one recommendation of the CEOS Review Team, of the ad hoc SIT with a standing working group with the same name but a new set of Terms of Reference.
- Thanked Jean-Louis Fellow of CNES for his tireless work as Chairman of SIT and appointed Tillmann Mohr of EUMETSAT as the Chairman of the re-constituted SIT.
- Expanded its Asian membership by welcoming the Korean Aerospace Research Institute (KARI) as the 23rd CEOS Member and the Geoinformatics and Space Technology Department of Thailand (GIDSTA) as the 20th CEOS Associate.
- Endorsed the WGISS report. After receiving a demonstration of the WGISS Test Facility (WTF) for the Global Observations of Forest Cover (GOFC) project which highlighted how the various WGISS tools could be put to use for data discovery, searching, access and inter-use of important applications, directed WGISS to continue to pursue WTF work with interested parties for other projects.
- Endorsed the WGCV report. Endorsed the establishment of a new WGCV subgroup on atmospheric chemistry, with NASA as its first chair.
- Extended approval of the ad hoc DMSG for a final year. DMSG expects to present a final report to Plenary 2002 with specific recommendations.
- Adopted the CEOS Strategy for Earth Observation Education and Training, as proposed by the ad hoc WGEdu. Extended the term of the WGEdu for three years to carry out the action plan envisioned in the Strategy.
- Established a small drafting group, under the leadership of the CEOS Chairman, to focus on preparations for and visibility issues associated with the World Summit on Sustainable Development (WSSD), scheduled for August/September in Johannesburg, South Africa.
- Appointed ESA as Chair for 2002.

Working Group on Calibration and Validation

The objective of the Working Group on Calibration and Validation (WGCV) is to ensure long-term confidence in the accuracy and quality of Earth observation data and products. WGCV has two specific tasks: 1) sensor-specific calibration and validation (where calibration is defined as “the process of quantitatively defining the system response to known, controlled signal inputs,” and validation as “the process of assessing by independent means the quality of the data products derived from the system outputs”) and 2) geophysical parameter and derived product validation.

WGCV provides a forum for calibration and validation information exchange, coordination and cooperative activities. WGCV promotes the exchange of technical information and documentation, joint experiments, and the sharing of facilities, expertise and resources among its members as appropriate. WGCV also seeks to be the recognized first point-of-contact for the international user community as far as calibration and validation information is concerned.

During 2001, WGCV revised its three-year work plan (now issue 2.5) to reflect the updated concerns of the group, redesigned and re-released its website at www.wgcvceos.org, and produced and distributed brochures and promotional bookmarks in an increased effort to promote the WGCV and its subgroups.

WGCV also worked to work closely with other CEOS working groups to achieve greater efficiency and eliminate duplication of work. A presentation was given by the WGCV at the Working Group on Earth Observation Education and Training (WGEdu) meeting in September 2001, which enabled exchange between the working groups and discussion on outreach activities. Greater collaboration between the WGCV and the Working Group on Information Systems and Services (WGISS) has also been recognized as potentially very beneficial for data sharing and calibration and validation activities.

WGCV also sought closer alliance with other organizations, science projects and the IGOS theme teams. For example, the WGCV presented its activities to an International Society for Photogrammetry and Remote Sensing (ISPRS) workshop in the September 2001.

In 2001, new chairs for four of the subgroups were appointed in 2001, and the CEOS Plenary endorsed the creation of a fifth WGCV subgroup on atmospheric chemistry. The Atmospheric Chemistry subgroup will aim to ensure high quality, traceable calibration of atmospheric chemistry data from Earth observation satellites and the validation of higher-level products. The subgroup will coordinate closely with the Integrated Global Atmospheric Chemistry Observation (IGACO) theme of the IGOS Partnership.

In May–June 2001, the Infrared and Visible Optical Sensor (IVOS) subgroup promoted and participated in the Second International Infrared Radiometer Calibration and Inter-comparison. This campaign was originally proposed at the CEOS in November 2000 and several scientists from CEOS agencies took part in the campaign. The participation of many key scientists was vital to ensure that a complete calibration and inter-comparison was achieved for infrared radiometers. This work will be used in future activities to validate surface temperature products from satellite instruments.

The Land Product Validation (LPV) subgroup is active in the area of fast track leaf area index (LAI) product inter-comparison. An international workshop on LAI validation was held in June 2001. The workshop provided an opportunity to share insights and evaluate progress on LAI product validation as well as to align activities with those of the Global Observation of Forest Cover (GOFC) project and Terrestrial Carbon Observation (TCO) theme of the IGOS Partnership. One prominent recommendation resulting from this workshop was for inter-comparison of research and operational LAI products, together with an

assessment and recommendation of "best methods" for field LAI measurements and scaling. The adoption of CEOS core sites, and the open release of imagery over these sites, would be of great benefit to the LAI validation community.

A joint GOFV/LPV Fire Validation meeting was held in July 2001 to consider international collaborative efforts to contribute to the validation of GOFV fire and burn scar products. This meeting provided a follow-up on recommendations made at the GOFV Fire workshop (May 2001) for developing protocols for active fire/burned area validation and reporting. A major topic was the establishment of a network of representative long-term monitoring sites for fire product validation. The LPV subgroup will continue to coordinate with GOFV as this effort matures.

The Terrain Mapping subgroup established strong links with the ISPRS and collaborated with them on the production of a book on global terrain databases. The Shuttle Radar Topography Mission (SRTM), which paid great attention to complex calibration and validation issues, has been a success and has resulted in the generation of high quality digital elevation maps.

The Microwave Sensors subgroup met for the First International Microwave Radiometer Calibration Workshop in October 2000. Its objectives were to gather together for discussion an international group of scientists and engineers from industry, government and academia with an interest in microwave radiometer calibration. This forum allowed for discussions on current and future calibration requirements and served as a guide for the research efforts of the microwave radiometer calibration community. The subgroup also met in November 2001. Resulting from discussions at this meeting, the group is now focusing on the need to standardize terminology in the field of microwave radiometry, and is also addressing the issue of multi-mission test sites, such as Antarctica, for validation.

The Synthetic Aperture Radar (SAR) subgroup hosted a workshop in 2000, and the full proceedings, including round table reports and recommendations, have been published. A further workshop was held in April 2001. The workshop covered a wide range of up-to-date topics, including issues relating to interferometry, polarimetry, radiometric and geometric calibration, new instrumentation, applications, ALOS and ENVISAT. The full proceedings were published on CD-ROM in 2001.

Working Group on Information Systems and Services

The objective of the Working Group on Information Systems and Services (WGISS) is to facilitate data and information management and services for users and data providers, including the capture, description, processing, access, retrieval, utilization, maintenance and exchange of Earth observation data from satellites and supporting auxiliary data and information. WGISS places great emphasis on the use of demonstration projects involving user groups to solve the critical interoperability issues associated with the achievement of global services. WGISS has developed a number of tools, standards, and services to assist access to and use of Earth observation data resources available on-line. Most of the technical work of WGISS is carried out in subgroups and task teams.

The following is a selection of WGISS achievements for 2000 and 2001:

- Developed and operated a "Purge Alert" program aimed at saving "orphaned datasets," one of the successes of this activity was the rescue of some African data;
- Initiated development of an interchange format to facilitate the exchange of raw satellite data;
- Coordinated the operation of the International Directory Network (IDN) with over 10,000 dataset descriptions; there were more than 30,000 user sessions per month accessing the international IDN nodes;
- Coordinated the operation of the Interoperable Catalogue system (ICS) linked to over 1200 catalogues operated by many CEOS agencies;
- Developed and distributed a data format guidelines document and distributed previously developed browse and catalog guidelines documents;
- Established and coordinated the operation of a virtual "CEOSNet" that links all CEOS agencies; carried out constant performance monitoring of this network;
- Performed a number of outreach activities including: distribution of 2000 copies of the WGISS brochure, 20,000 copies of the CEOS CD-ROM and 40,000 copies of the CEOS business card;
- Organized two EO/GEO workshops, in April 2000 in London, England attended by 150 delegates and in June 2001 in Fredericton, New Brunswick, Canada, as part of the Digital Earth Conference attended by 650 delegates.

To build on these achievements, WGISS has spent the last year considering a number of aspects related to its work:

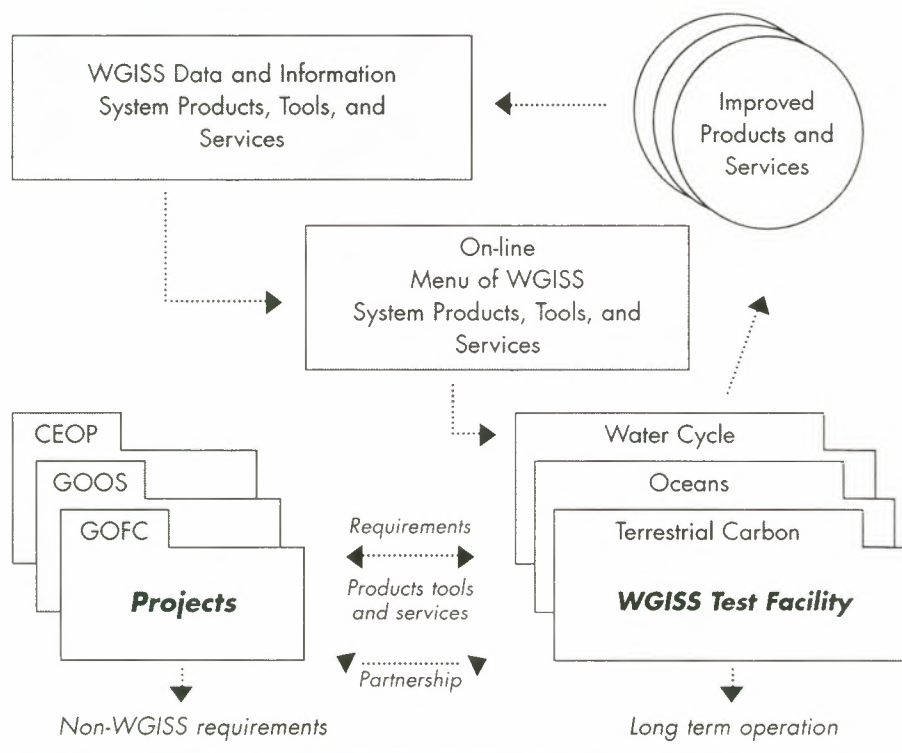
- User driven development: the CEOS Plenary has been encouraging its Working Groups to work closely with user organizations. Of particular note is the development of the IGOS-P, and the role of data and information systems and services. The WGISS Test Environment described below was developed to support applications projects;
- Spatial information world: WGISS needs to be a partner in the wider spatial information world, which is rapidly developing information technology. The Open GIS Consortium (OGC) is one example of this.

- Commercial development: WGISS has continued to liaise with the Earth observation commercial sector on the development of information systems and services, in-line with CEOS's wider contact with commercial organizations and Plenary's approval of such an approach.
- Standards: WGISS needs to influence the real and de facto standards that are driving the spatial information and commercial developments. Continued links are maintained with key standards organizations, such as ISO and OGC.

The WGISS Test Environment offers a framework under which WGISS will work in partnership with selected international science and Earth observation projects to test and develop information systems and services to meet their requirements. Specific Test Facilities will be set up to address the needs of individual projects. By making available Test Facilities for this purpose, WGISS information systems and services products will be demonstrated and improved to take account of user requirements. Such demonstrations will advertise WGISS's technical capability, lead to an improved take-up of its products and facilitate improved coordination of information systems and services across the spectrum of Earth observations space operations. The WGISS Test Environment will encompass the agglomeration of WGISS tools and services held and operated by CEOS WGISS agencies. These will be made available via an on-line *WGISS Menu*, which is basically a web site providing an open reference list of WGISS products, systems and services. The *WGISS Menu* will be linked on-line to the products, systems and services held by the individual organisations.

WGISS has worked closely with the Global Observation of Forest Cover (GOFC) scientists since April 2000 to develop a Test Facility for GOFC. This effort was culminated with a highly successful demonstration at the 15th CEOS Plenary meeting in Kyoto in November 2001. A video of this demonstration can be viewed at <http://lennier.gsfc.nasa.gov/wtf-gofc/>

THE TEST ENVIRONMENT SCHEMA



The WGISS Test Environment Schema

Ad Hoc Working Group on Earth Observation Education and Training

The goals of the ad hoc Working Group on Earth Observation Education and Training (WGEdu), created in 1999, are to:

- Enable CEOS to promote and facilitate activities that substantially overarch and enhance international cooperation in education and training;
- Maximize benefits of the use of Earth observing satellite data and information in the sustainable management of natural and managed resources, global change research, weather and ocean state databases, ocean color applications, and in basic and applied research that fosters new knowledge; and
- Facilitate the improvement of data availability and access, the transfer of satellite data processing and data interpretation methodology, the integration of satellite derived data with other geo-spatial data streams, and improvement of the training infrastructure necessary to support operational and strategic decision-making.

In 2000, WGEdu conducted a detailed survey of Earth observation educational institutions of the world; conducted an international workshop on Earth observation education and training; administered a questionnaire to CEOS space agencies for assessing their existing and future programs of Earth observation education/training/professional development; interacted with the UN Regional Centres for Space Science and Technology Education to understand their role in capacity building; and held two formal meetings.

In November 2000, WGEdu presented the 14th Plenary with a report on the survey and possible directions for CEOS Strategy on Earth Observation Education and Training. The report addressed the interests of CEOS Members and Associates to participate in a coordinated effort for Earth observation education and training and also showed the requirements of some major international Earth observation educational and training institutions.

In 2001, CEOS highlights of WGEdu activities included:

- CEOS WGEdu initiated development of a proto-type of an Internet-based Earth observation and GIS training programme with the main focus “learn while you can” and adopting distance learning concepts.
- WGEdu started preparing an inventory of available Earth observation materials with CEOS agencies for distribution. In conjunction with this effort, WGEdu began development of a website which will feature WGEdu activities, inventories and pointers to Earth observation education materials on the web. The WGEdu website will ultimately be linked to the CEOS home-page.
- WGEdu supported the Earth observation Image Gallery project, a publication which highlights images of the Earth from Earth observation satellites.

- WGEdu established close working relationships with the UN Regional Centres for Space Science and Technology Education—established by the UN in Asia and Pacific (India), Africa (Morocco for French language countries; Nigeria for English language countries), Latin America and Caribbean (Brazil/Mexico), Middle East (Jordan) and a Network of Space Science and Technology Education and Research Institutions for Central Eastern and South-Eastern Europe. The emphasis of these Centers is capacity building in space-related sciences and technology in developing countries.

In November 2001, the 15th Plenary adopted the CEOS Strategy on Earth Observation Education and Training which states:

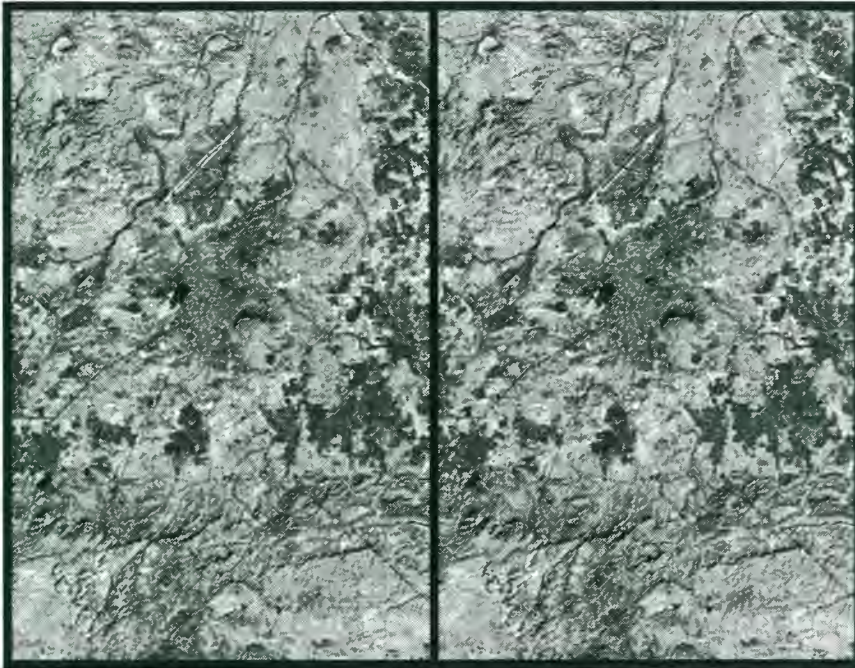
The CEOS strategy for Earth observation education and training is to establish an effective coordination and partnership mechanism among CEOS agencies and institutions offering education and training around the world. The key objective of the strategy is to facilitate activities that substantially enhance international education and training in Earth observation techniques, data analysis, interpretation, use and application.

WGEdu will implement the strategy over the next three years according to the action plan also approved by Plenary.

Ad Hoc Disaster Management Support Group

The ad hoc Disaster Management Support Group (DMSG) supports natural and technological disaster management on a worldwide basis by fostering improved utilization of existing and planned Earth observation satellite data. The DMSG focuses on developing and refining recommendations for the application of satellite data to selected hazard areas—drought, earthquake, fire, flood, ice, landslide, oil spill, and volcanic hazards. Particular emphasis is placed on working closely with space agencies, international and regional organizations, and commercial organizations on the implementation of these recommendations.

With over 300 participants from more than 140 organizations, the DMSG has found strong support among CEOS space agencies and IGOS Partners, as well as an enthusiastic reception from numerous international, regional, and national emergency managers, and distinct interest from the commercial sector. In addition, the group has worked to give full support to the work of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) in pursuit of decisions taken at UNISPACE III and the United Nations International Strategy on Disaster Reduction (ISDR). The DMSG has also worked to promote and support the use of space systems in all phases of disaster support, with specific emphasis on the *International Charter for Space and Major Disasters*. During 2002, the DMSG is entering its final phase of work and is putting primary focus on documenting its work and migrating on-going activities to other fora, such as IGOS and COPUOS.



SRTM Stereo Pair: Bhuj, India, Two weeks after earthquake

In 2000 and 2001:

- DMSG developed and refined recommendations for the application of satellite data by bringing together experts from eight hazard areas to identify user needs, as well as satellite capabilities to meet these needs.
- On January 26, 2001, the city of Bhuj suffered the most deadly earthquake in India's history. About 20,000 people were killed, and more than one million homes were damaged or destroyed. Shortly after the quake, geologists conducted field investigations to inventory and analyze the natural effects of the event. Stereoscopic views, similar to this image, aided the geologists in locating landforms indicative of long-term (and possibly ongoing) deformation.

This stereoscopic image was generated by draping a Landsat satellite image (taken just two weeks after the earthquake) over a preliminary Shuttle Radar Topography Mission (SRTM) elevation model. Two differing perspectives were then calculated, one for each eye. They can be seen in 3-D by viewing the left image with the right eye and the right image with the left eye (cross-eyed viewing) or by downloading and printing the image pair and viewing them with a stereoscope. When stereoscopically merged, the result is a vertically exaggerated view of the Earth's surface in its full three dimensions.

The Landsat 7 Thematic Mapper image was provided by the United States Geological Survey, Earth Resources Observation Systems (EROS) Data Center. The SRTM mission is a cooperative project between NASA, National Imagery and Mapping Agency (NIMA) of the U.S. Department of Defense (DoD), DLR and ASI.

- DMSG developed disaster scenarios intended to serve as guidelines for identifying appropriate satellite data and products to support emergencies, and specifically, to assist the Parties to the *International Charter for Major Disasters* with scenario definition. The intent of the scenarios is to describe in advance, the satellite data and products that would be useful under specific disaster circumstances. This is meant to offer a standard procedure to use when the emergency on-call officer and project manager make requests for data and services for a specific disaster. Taken together, the scenarios would comprise a handbook of what to do when each type of disaster occurs.
- In conjunction with IGOS, several members of the DMSG hazards teams (earthquake, landslide, and solid Earth dimensions of volcanoes) joined the effort to develop a theme proposal to explore the creation of an IGOS Geohazards theme team.
- An information tools team developed a server <ceos.disaster.org> intended to demonstrate timely access to satellite-derived data and information products (i.e., "one stop shopping") to support various facets of disaster management.

Membership

CEOS Members

CEOS Members are governmental organizations that are international or national in nature and are responsible for a civil spaceborne Earth observations programs currently operating, or at least in Phase B or equivalent of system development. Members must have a continuing activity in spaceborne Earth observations, intended to operate and provide non-discriminatory and full access to data that will be made available to the international community.

Organization		Country/Countries
ASI	Agenzia Spaziale Italiana	Italy
BNSC	British National Space Centre	United Kingdom
CAST	Chinese Academy of Space Technology	China
CNES	Centre National d'Etudes Spatiale	France
CONAE	Comisión Nacional de Actividades Espaciales	Argentina
CSA	Canadian Space Agency	Canada
CSIRO	Commonwealth Scientific and Industrial Research Organization	Australia
DLR	Deutsches Zentrum für Luft-und Raumfahrt	Germany
EC	European Commission	Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom
ESA	European Space Agency	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom
INPE	Instituto Nacional de Pesquisas Espaciais	Brazil
ISRO	Indian Space Research Organization	India
KARI	Korea Aerospace Research Institute	Korea
MEXT/NASDA	Ministry of Education, Culture, Sports, Science and Technology/National Space Development Agency of Japan	Japan
NASA	National Aeronautics and Space Administration	United States of America
NRSCC	National Remote Sensing Center of China	China
NSAU	National Space Agency of Ukraine	Ukraine

NOAA	National Oceanic and Atmospheric Administration	United States of America
ROSHYDROMET	Russian Federal Service for Hydrometeorology and Environment Monitoring	Russia
Rosaviakosmos	Russian Aviation and Space Agency	Russia
SNSB	Swedish National Space Board	Sweden
USGS	United States Geological Survey	United States of America

CEOS Associates

CEOS Associates are either:

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; or
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.

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

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