Committee on Earth Observation Satellites

CEOS

'95 Winter

NEWSLETTER

No. 4

CONTENTS

10th Anniversary Celebration in Berlin

Volker Liebig
Head of Division, Earth Observation Utilization
German Space Agency (DARA)

Dr. Jan-Baldem Mennicken, CEOS Chairman 1994, opens the tenth anniversary celebration in Berlin.

On September 28 CEOS celebrated its tenth anniversary in the historical environment of the Kronprinzenpalais in Berlin. About 150 guests from policy, science and space agencies took part. Many participants of the first plenary in Washington, September, 1984 and all current working group chairpersons were present.

CEOS chairman Dr. Jan-Baldem Mennicken, Director General of DARA, opened the event underlining the need to have an organization as CEOS in the dynamic and quickly changing world of Earth Observation but pointed out that also CEOS has to change and adopt constantly to keep pace with the new developments. He expressed his belief that CEOS, due to its organizational structure that builds purely on the effort of the member organizations and the consensus they reach, is well equipped for the future.

The second speaker, Dr. Reinhold Leitterstorf, Director General, German Federal Ministry for Research and Technology, greeted CEOS on behalf of Federal Minister Dr. Krüger and State Secretary Dr. Ziller. He recalled the successful history of CEOS and mentioned new challenges emerging from increasing inclusion of cost aspects in all future decisions, the high-speed development of technology, and the neces-

Joint Resolution by the Governments of CEOS Members and Observers on the Occasion of the 10th Anniversary of CEOS

Spaceborne Earth observation is of growing importance for understanding and monitoring global climate and environmental changes and supporting the economic development of nations. Applications include assessment of land cover changes, disaster monitoring and mitigation, and weather forecasting as well as agricultural planning and many other regional aspects meeting, amongst others, the specific needs of developing countries.

The magnitude of financial and other resources needed to develop, build and operate advanced Earth observation satellite systems calls for worldwide cooperation leading to an effective utilization of existing systems and data, and ensuring coordination in developing additional instruments and systems needed by users. The 1992 UNCED Conference in Rio de Janeiro strongly endorsed the establishment of a global earth observing system.

In this regard we recognize the substantial progress made by the Committee on Earth Observation Satellites (CEOS) together with affiliated user organizations in coordinating space programmes for the monitoring of the global environment and in establishing principles for the provision of data. In the 10 years since its formation in 1984, CEOS has steadily grown; its members, observers, and affiliates now comprise agencies from most parts of the world and the most important international scientific and intergovernmental user organizations.

We wish to confirm that the primary objectives as set forth in the Terms of Reference of CEOS continue to be of vital importance and should continue to guide its future work. We want to encourage CEOS to further develop its coordination efforts in order to enhance the ability to observe our planet and to promote easier and continuous access to Earth observations data and information in a readily understandable form for the benefit of the global community including the needs of developing countries.

We call on all parties involved to support the work of CEOS by all appropriate means, as well as to make efforts for further development of their respective Earth observation satellite programmes.

Report from CEOS 8th Plenary in Berlin

Volker Liebig
Head of Division, Earth Observation Utilization
German Space Agency (DARA)

The eighth CEOS Plenary meeting was held at Berlin, Germany on September 26-28, 1994. The meeting was hosted by the Deutsche Agentur für Raurnfahrtangelegenheiten (DARA), the 1994 CEOS Chair. A total of 91 participants representing 32 organisations attended the meeting.

Participants of the 1994 CEOS Plenary in Berlin

Dr. Jan-baldem Mennicken, CEOS chairman 1994 and Director General of DARA opened the Plenary which was co-chaired by Prof. Stoewer, Managing Director of DARA. In his welcome speech Dr. Mennicken noted that CEOS may serve as a model for a flexible modern organi ation without its own staff and buildings, but with much work being accomplished through the organization by the CEOS agencies and the secretariat. He noted that the accomplishments of CEOS depend on the members' work and consensus, so that CEOS can function as a forum within which the agencies work together.

The first day of the Plenary focused on CEOS activities in support of Developing Countries and data policy. The central part of the second day was the discussion of the working group reports and 5 year implementation plans for the future strategy of CEOS. The final day summarised and formally set down the achievements of the meeting.

Membership Issues

By consensus of the members the United Nations Office of Outer Space Affairs (UNOOSA) was welcomed as a new Affiliate, and the Commission of the European Union changed its status from Observer to Member.

Future CEOS Strategy

The Plenary discussed and produced a final version of the Draft Future CEOS Strategy document which was prepared by DARA and BNSC on the basis of the 1993 paper of the latter. New elements of the paper which was endorsed by the Plenary were the goals related to developing countries and an analysis of member and non-member programmes.

Regarding the developing countries' subject, the fundamental aim of CEOS was expressed to encourage the creation and maintenance of indigenous capabilities, which are integrated into the local decision-making process, thereby enabling developing countries to obtain the maximum benefit from Earth Observation. CEOS members are urged to use their influence, both within the framework of CEOS and in their own individual activities, to ensure that efforts are maintained in support of developing countries, and indeed increased wherever practicable.

An analysis and planning process was agreed to encourage the development of a space segment with minimal gaps and overlaps. This should be based on CEOS efforts to consult the user communities in order to define the suite of measurements needed for sustained Earth observation and monitoring from space.

The Plenary decided that a task force shall be formed co-chaired by a representative from the research side and the operations side to identify where

- programmes and plans are adequate;
- there are gaps or deficiencies in proposed programmes;
- there are unde sirable overlaps (nothing that some redundancy may be desirable);
- Dr. Ichtiaque Rasool and Dr. Bizzarro Bizzarri nominated as co-chairs.

CEOS Activities in Support of Developing Countries

The Plenary discussed and revised the action plan resulting from the INPE organised Workshop on Developing Countries' Activities in Brazil (see CEOS newsletter No. 3) of May 1994 together with the CEOS Strategy towards Developing Countries prepares by DARA.

The main points of the Plenary decision were:

- to establish links between CEOS and developing countries, both directly and through non-CEOS organizations
- to facilitate the communication among CEOS participants regarding developing country activities
- to work to identify mechanisms to facilitate access to satellite data
- to compile a set of sample data from CEOS missions for training (CSIRO)

Finally there was support for the offer from DARA to perform a feasibility study on a possible Space Information System. Some participants expressed interest in supporting this study.

Data Policy

IGBP reported on the progress of the High resolution Data Exchange Pilot Project (see CEOS newsletter No. 2). The project is now in the stage of data

delivery. Scientific results will began to flow in mid-1995. A workshop is planned for early 1996.

The Plenary endorsed the Resolution on "Principles of Statellite Date Provision in Support of Operational Environmental Use for the Public Benefit" which resulted from the Ad hoc Data Policy Meeting held in April 1994 in Washington, DC.

Reports from the Working Groups

The Plenary received the reports of the working groups and applauded the significant progress they have made. The valuable contribution in CEOS activities was noted. The longterm implementation plans were accepted

The Ad Hoc Working Group on Net works will continue its work in the next year as Interim Working Group on International Network Services. Livio Marelli, ESA, was appointed co-chairman of this working group together with Hiroshi Kikuchi, NASDA.

User Requirements Workshop

Mr. Seipel, DARA summarised the results of the workshop held in Bonn, Germany in May 1994 (see CEOS newsletter no. 3). One of the outcomes of this workshop was the awareness that some regional user requirements may not be adequately covered by the existing CEOS documents but be potentially relevant for CEOS activities. The Plenary decided that future CEOS user conferences should focus on regional applications and accepted the recommendations from the workshop.

Dr. Hinsman, WMO reported on progress made by the affiliates in defining data requirements. He noted that since the workshop in May, the GCOS Space Plan and detailed IOC data requirements were received. In October 1995 he expects to receive a review of WMO requiurements. Other updated affiliate requirements will arrive soon.

CEOS Dossiers

The CEOS Dossier is now available via internet and as a database on diskette.

Others

Dr. Lindberg confirmed that the Canadian Space Agency will host the ninth Plenary to be held tentatively on October 11-13, 1995 in Montreal, Canada. Dr. Embleton confirmed that CSIRO would host the tenth Plenary in Australia and CNES volunteered to host the eleventh Plenary in France 1997.

10th Anniversary Celebration in Berlin

(continued from page 1)

sity of an increasing orientation to the end user.

Then Dr. Leitterstorf introduced the political resolution (see box in front) which was agreed between the governments of all member organizations of CEOS in recognition of the achievements of CEOS and in support of its future work. The resolution states that the primary objectives of CEOS continue to be of vital importance and should continue to guide its future work. The resolution closes with the call on all parties involved to support the work of CEOS by all appropriate means, as well as to make efforts for further development of their respective Earth observation satellite programmes.

Dr. Lisa Shaffer, Director MTPE Division, Office of External Relations, NASA, reviewed the first ten years of CEOS. She reminded the audience of the dedication and hard work of many people and its organizations who made CEOS possible in the last ten years. As an outlook to the future of CEOS she stated that CEOS clearly has a role to play in the debate about future long term observing capabilities due to their international nature to make sure that the limited resources each of the nations can contribute give the most benefit to their citizens and the rest of the world.

Dr. Garry Lindberg, Vice President of the Canadian Space Agency, and next year's CEOS chairman presented the state and importance of Earth Observation. He gave an exciting overview on the problems which can be solved by the utilization of satellite based remote sensing data.

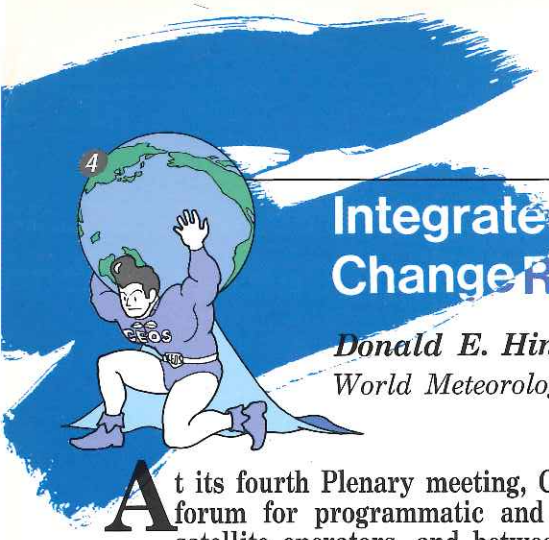
Mr. Isao Uchida, Commissioner of the Japanese Space Activities Commission spoke on the importance of Earth Observation for the Asia-Pacific region and introduced the Japanese vision of a Global Earth Observation System (GEOS). The Commissioner expressed his hope to reach the tremendous aim that Japan will contribute with one forth of the system that will make up GEOS.

The celebration was adjourned by Dr. Mennicken after having handed over the CEOS chairmanship to Canada.

GlobeSAR is a program intiated by Canada and delivered by the Canada Centre for Remote Sensing to strengthen the capabilities of the participating countries to use radar data in preparation for the opearational use of data from Canada's RADARSAT.

A "results workshop", The Asia Regional GlobeSAR Workshop was held from November 28 to December 2, 1994 in Bangkok, Thailand. Including Thailand, the host, countries invited to the Workshop included: Bangladesh, Cambodia, China, India, Indonesia, Laos, Malaysia, Nepal, Pakistan, The Phillippines, Singapore and Vietnam.

The meeting resulted in a beneficial learning experience and offers to share expertise and provide assistance between the GlobeSAR and non-GlobeSAR representatives and will undoubtedly help spur the future successes of the Asian GlobeSAR program and lead to closer relations within the Asian scientific community.



Integrated User Data Requirements for Global Change Research

Donald E. Hinsman
World Meteorological Organization

At its fourth Plenary meeting, CEOS established itself as a forum for programmatic and policy discussions among satellite operators, and between space segment operators and the international user community. At that meeting, CEOS Members agreed to invite international user groups to affiliate themselves with CEOS and to participate in future Plenary meetings and thus the CEOS Affiliate was established.

Since the fourth CEOS Plenary meeting, major international user groups are participating in CEOS consultations as CEOS Affiliates including the World Climate Research Programme (WCRP), the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC), the United Nations Environment Programme (UNEP), the International Geosphere-Biosphere Programme (IGBP), the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS).

One important contribution made by the CEOS Affiliates is a statement of their satellite data requirements. Satellite data requirements are stated in two forms. First, each CEOS Affiliate has identified specific data requirements in terms of spatial and temporal resolutions and accuracy. Individual programme requirements can be found in the CEOS Dossier, Volume C, Section 2. The second form for the data requirements combines all the individual programme requirements into a single statement that will meet all the CEOS Affilates' needs. The statement is called the CEOS Affiliates' Dossier and uses Instrument type as a means to combine the various programme requirements into one coherent statement. A concerted effort was made to use standard terminology across the various programmes and to avoid ambiguity in the descriptions of needs. The Dossier contains sections describing the overall and individual programme needs at the instrument level, and the characteristics for a particular instrument referred to in the overall and individual programmes.

In developing the CEOS Affiliates' Dossier, a meeting of CEOS Affiliates was organized in Geneva, March 1993, to discuss common satellite data requirements. Each Affiliate agreed to present its requirements by indicating the measurement required, a type of instrument that could obtain the measurement, and a candidate sensor (s) for that type of instrument. Candidate sensors were identified from the list of the present plans of CEOS Members. Where appropriate, the Affiliates agreed on common terminology to identify a particular measurement. For example, sea surface temperature (SST) appeared as a required measurement in WCRP, WMO, IOC, IGBP and GCOS, The Affiliates also agreed to common terminology for the instrument type.

Upon combining the instrument types into one list, the Affiliates unanimously agreed that three classes of satellite instruments and/or missions will contribute to fulfill their total data needs: a basic real-time observing system component; an earth system monitoring component; and an experimental component. The basic real-time observing system supports the needs of operational environmental forecasting. Earth system monitoring requires the basic real-time data and the information from the earth system monitoring package. Scientific research will use data from all three components. It can thus be seen that a common requirement for all three applications is the continuation of operational environmental satellite systems that provide long-time series data sets. In addition to this basic real-time component, earth system monitoring requires more complex satellite systems and sensors. Finally the basic real-time and earth system monitoring components, when supplemented by the experimental component, are the prerequisites to support scientific research. The experimental component develops in parallel to the other two such that long-term data set continuation, if required, can be realized in future satellite systems of the basic or earth system monitoring components. The three components, as an ensemble, represent the needs of the CEOS Affiliates.

CEOS Affiliates identified instrument types for each of the three components. Although many specific data requirements may be important to different Affiliates, one instrument type will normally satisfy several needs. For example, an imaging multi-spectral (vis, IR) radiometer provides the basic rediance measurements for inferring many geophysical and vegetation properties; cloud amount and cloud top temperature, cloud particle properties, aerosols in the troposphere, earth surface albedo, snow cover, vegetation index, etc.

In recognizing the multiplicity of satellite data products, the Affiliates have identified three instrument types for the basic real-time observing system: imaging multi-spectral (vis, IR) radiometer, atmospheric sounder (IR, microwave), and wind (microwave) scatterometer. Earth system monitoring requires the basic real-time observing system and in addition: high-resolution multispectral mapper, ocean colour radiometer, imaging multi-spectral (microwave) radiometer, earth radiation budget radiometer, limb-scanning spectrometer, radar altimeter, precision radar altimetry package, and mapping radar (SAR). Finally, scientific research requires the basic real-time and earth system monitoring systems and calls for a range of new exploratory or "proof-of-concept" missions to include doppler lidar, advanced atmospheric chemistry spectrometer, rain radar, multidirectional radiometer, polarimeter/radiometer, cloud radar profiler, and gravity gradiometer. Figure 1 is a schematic of the three components.

The Affiliates also have identified their requirements for spatial and temporal coverages that call for three categories of satellites, operational satellites, earth system monitoring satellites and experimental satellites.

An operational satellite is one of a series of environ-

(to be continued on page 7)

CEOS Special Report on Successful Applications of Earth Observation Satellite Data (Pilot Version)

Shushi Ueta
Director, International Space-Affairs Division,
Research and Development Bureau, STA

Yukio Haruyama
Senior Engineer, Earth Observation Planning Department
Office of Earth Observation Systems, NASDA

An attempt to gather information as to how satellite Earth observation data are being used successfully on a worldwide scale is currently being conducted by CEOS. This information is being documented in a CEOS special report.

At the 1993 CEOS Plenary in Japan, Science and Technology Agency (STA)/National Space Development Agency (NASDA) proposed that a pilot version of the special report should be written which comprised examples of projects which successfully utilised satellite EO data in various application areas. One of the aims of the pilot report was to promote discussion at the 1994 Plenary regarding the possible production of a full version of the special report for the 1995 Plenary.

The pilot report was submitted at the 1994 plenary and was extremely well received by CEOS delegates because of, amongst other things, the emphasis on successful projects which have demonstrated real benefits through the use of Earth observation data and which have fostered valuable lessons for future applications. It was agreed that a full version of the special report should indeed be prepared for the 1995 Plenary.

The special report is intended to:

- provide a preliminary guide to the successful utilization of satellite Earth observation data in various applications projects;
- identify the benefits which have been derived from the use of satellite Earth observation data, including quantifiable benefits where possible.
- identify any implications for future projects and satellite missions.

It should be noted that both climate change and weather forecasting applications are not included. These are obviouly large and important areas but are omitted because they have been dealt with in detail in other fora.

Contents and Scope

In compiling the pilot report, all CEOS members, observers and affiliates were requested to supply information on 2-3 projects which they consider to have been the most successful in utilizing satellite Earth observation data. The projects considered ranged from proof-of-concept demonstration to operational system. Projects in very early stage of definition-for example those considered as research or experimental-were excluded.

The following application areas were addressed:

- agriculture;
- resource management;
- hazard monitoring and disaster assessment;
- civil mapping and planning;
- ice monitoring;
- coastal zone management;
- oceanographic applications.

Report Structure

Details on 46 projects were received, distributed across the various application areas. Of these, a subset of 19 was chosen for inclusion in the pilot report. For each of these the structure in the pilot report is identical:

- overview: a summary of the information received and an analysis of the different satellite instruments of interest;
- detailed project profiles: categorized into the above applications areas;
- a description of the project;
- the required data (from Earth observation satellites and other sources), together (where appropriate) with an identification of the resources necessary to process the data;
- the benefits and impacts to the projects;
- any lessons learnt and future implications.

Satellite instruments

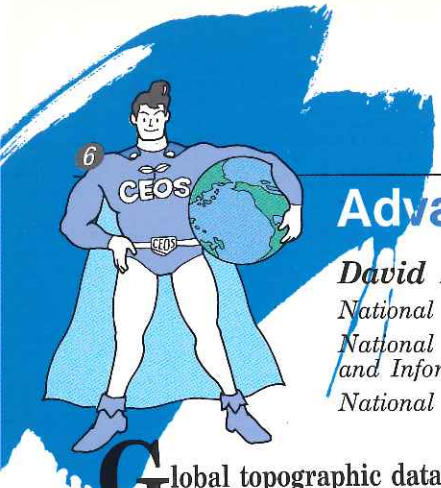
The full 46 projects utilized 20 satellite instruments ranging from multi-spectral imagers on-board operational geostationary satellites to synthetic aperture microwave radars on-board satellites which do not have assured long-term continuity. The importance of additional in-situ data sources is discussed in each project.

Major findings and Way ahead for 1995 Plenary

Although the report is still a pilot version, from the information supplied by CEOS participants, the following status of Earth observation satellite data utilization seems apparent;

- utilizations of Earth observation satellite data is very advanced in various fields, with some applications having attained operational status several years ago:
- the number of Earth observation satellite data applications projects is increasing, and increased especially rapidly during the end of the 1980s. This is due to the availability of high resolution data, increased user familiarisation with Earth observation data in general and the emergence and ready availability of data analysis tools (both in hardware and software).
- with the emergence of new missions planned by CEOS members, and the ready availability of large amounts of computing power for personal use, it is likely that more applications of satellite Earth observation data will arise.

STA/NASDA is planning to develop a full CEOS Special Report for the 1995 Plenary. Before developing the full report, STA/NASDA plan to conduct a second survey of the status of Earth observation satellite data applications with support from CEOS participating agencies and non-CEOS agencies as well. The pilot report was extremely useful as it gave a clear indication of the type of material which will be included in the full special report. Information on new projects to be included in the special report will be most gratefully received.



Advancing Global Topographic Knowledge: Signific

David A. Hastings
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
National Geophysical Data Center

Gunter Schreier
German Aerospace Research Establishment
German Remote Sensing Data Center

Global topographic data are among the most important data sets for many scientific, technical, and other applications.

Digital elevation models (DEMs) have almost unlimited applications. They can be used to help rectify satellite-derived data, such as the Normalized Difference Vegetation Index or high resolution synthetic aperture radar data, for making ortho-images for improved accuracy in comparisons over time. They can be used to optimize the development of new cellular communications infrastructures. Even when not used directly in a study, topographic data are often used in preparing visualization tools such as perspective or stereoscopic views of terrain.

However, high-quality, accessible, global coverage of digital elevation data is sorely lacking. There are sources of DEMs in space (notably stereoscopic satellite imagery), but there are no operational programs that offer inexpensive unrestricted high-quality global DEM coverage from any source. Although some dedicated space missions to map global topography are being considered, none is a certainty. The current reference model is ETOPO5, distributed by the National Geophysical Data Center. It includes some 10-arc-minute grids and some 5-minute grids, all presented at a 5-minute gridding.

The CEOS Working Group on Data Auxiliary Data Subgroup, and several organizations around the world, are helping to coordinate an attempt to address this problem of quality global DEM coverage. The effort is called the Global Land One-kilometer Base Elevation (GLOBE) project, not to be confused with several other projects that use the same acronym. The GLOBE project is developing a 1-km gridded, quality-controlled global DEM. The final product is scheduled for release in 1996. The general aims of GLOBE are:

1. Develop a 1-km global DEM, by including the best available data sets and by encouraging specialists to participate in production and review of the data. The GLOBE DEM will be made available to the worldwide research community, perhaps on 8-mm tape or CD-ROM. There may be two versions of GLOBE:
"BAD GLOBE" based on the Best Available Data (BAD), even if some data are restricted from general distribution. This version would be distributed in accordance with whatever agreement is negotiated with contributors of various copyright data sets. High-quality restricted data may improve the usability of those data for people having permission to use such data. Nevertheless, data not available to everyone are of limited value in promoting scientific advances (and the social benefits therefrom).

"GOOD GLOBE" based on Globally Only Open-access Data (GOOD). This is the primary aim of GLOBE: to produce an unrestricted DEM that is the most useful database to everyone.

2. Strengthen international collaboration in the development of research-quality digital global data sets. Advance technical and cultural capabilities for international collaboration in the development of such data.

3. Strengthen social awareness of the need for optimal quality high-resolution global topographic information, including the provision of a focus for the timely release of currently restricted terrain data sets.

4. Supply a "pathfinder" data set to the Earth observation community.

5. Develop a data structure (nested multi-resolution grid system) useful for future enhancements such as might come from future topographic satellite miss

6. Give the Committee on Earth Observation Satellites Working Group on Data (CEOS-WGD) a prototype in cooperatively improving vital data. Input data and methods used for GLOBE are:

- Elevation contours from the 1:1,000,000 Operational Navigation Charts digitized into the Digital Chart of the World (DCW) will be gridded at 1-km nominal latitude-longitude spacing.
- Currently available high-resolution DEMs at higher resolution than GLOBE's will be sampled and inserted into GLOBE.
- DEMs derived from satellite imagery (stereo-optical and radar) and altimetry will be added to GLOBE where applicable.
- Available data from the 3 sources above do not currently provide global coverage, so GLOBE coverage will be filled out by resampling lower-resolution DEMs (for which there is global coverage) into GLOBE.

Documentation on sources, methods of derivation, quality control procedures, and data characteristics will be provided as text and figures/maps. Additional data, such as global hydrological networks, land-sea masks, and terrain slope information, are expected be developed as byproduct digital data sets.

Several specialists/institutions have jointly developed the GLOBE project, which has been approved by the Auxiliary Data Subgroup of CEOS-WGD. The International Geosphere-Biosphere Programme's Office of Data and Information Systems is also participating in GLOBE design & evaluation efforts. Since its formation early in 1992, the GLOBE project has conducted meetings about every 6 months. It has developed prototype methods of adapting high resolution DEMs and Digital Chart of the World contours to GLOBE-resolution DEMs, and for adapting contributed lower-resolution DEMs to GLOBE scale.

GLOBE was recently given a significant boost by a major contribution of data by the U.S. Defense Mapping Agency. DMA, in conjunction with GLOBE participants, derived a 30-arc-second model from selected DMA coverage, as a contribution to GLOBE.

This data set alone covers over half of the Earth's land surface. Additional contributions of 30-arc-second data have been made by the USA and Italy. with additional contribution currently under negotiation. The U.S. Geological Survey's EROS Data Center, and the Department of Photogrammetry and

ant Progress, but CEOS Members Can Help Greatly!

Surveying at University College London, are converting digitized elevation contours from the U.S. Defense Mapping Agency's Digital Chart of the World to gridded DEMs. The National Oceanic and Atmospheric Administration's National Geophysical Data Center is compiling global coverage DEMs at best available resolution to complete GLOBE's coverage.

Nevertheless, GLOBE still faces considerable obstacles. Many parts of the Earth lack quality DEMs. Several areas with DEM coverage are currently unusable in GLOBE because of copyright or other restrictions. Also, GLOBE is an unfunded project, based on the ability of its participants to fit GLOBE's objectives with their own individual missions. These financial realities limit GLOBE's ability to enhance GLOBE DEM coverage from spaceborne radar imagery, for example.

CEOS members, and other readers of this article can help immensely, if they can find or produce DEMs that can be used in GLOBE.

Some institutions, which must honor governmental copyright on high-resolution DEMs, have found a way to contribute versions with somewhat reduced horizontal resolution or vertical accuracy, which may be released without copyright or other restriction. As part of its documentation, GLOBE will cite these sources, and note that higher-resolution DEMs are available from these sources. GLOBE considers this as proper scientific citation of source materials. The institutions may consider this to be valuable free publicity for their higher-resolution data. Please contact us at the address below, if you are responsible for national, regional, or other DEM development, and wish to explore this option.

The current participants in GLOBE profusely thank the following major contributors to improve understanding of the Earth's topography:

- USGS EROS Data Center, Sioux Falls, South Dakota, USA
- University College London UK
- DLR-German Remote Sensing Data Center, Oberpfaffenhofen, Germany
- NOAA National Geophysical Data Center, Boulder, Colorado USA
- Defense Mapping Agency, Fairfax, Virginia, USA
- Plus many other institutes and individuals.

For further information contact: David A. Hastings, Secretary of GLOBE
World Data Center-A. Boulder Centers
National Oceanic and Atmospheric Administration
National Geophysical Data Center
325 Broadway
Boulder, Colorado 80303, USA
Tel: (+1-303) 497-6729 FAX: (+1-303) 497-6513

GLOBE: Existing Coverage of Digital Elevation Models.

Areas in Green have 30-arc-second DEMs derived from higher-resolution DEMs or from Digital Chart of the World contours. Areas in gray have lower-resolution coverage (the darker the gray, the coarser the coverage). Dark blue areas have moderate-to-coarse-resolution bathymetric models. CEOS participants can help by offering leads to better data in all areas, but especially in areas shaded dark gray.

Integrated User Data Requirements for Global Change Research (continued from page 4)

mental observation satellites with the primary purpose to routinely provide real-time observations and services to a consistant standard over a long period of time. Resources are committed to ensure continuity of services thus allowing a reliable satellite replacement policy.

CEOS AFFILIATES REQUIREMENTS

BASIC REAL-TIME OBSERVING	EARTH SYSTEM MONITORING	EXPERIMENTAL
Imaging multi-spectral (vis, IR) radiometer	→	→
Atmospheric sounder (IR, microwave)	→	→
Wind (microwave) scatterometer	→	→
	High-resolution multi-spectral mapper	→
	Ocean colour radiometer	→
	Imaging multi-spectral (microwave) radiometer	→
	Earth radiation budget radiometer	→
	Limb-scanning spectrometer	→
	Radar altimeter	→
	Precision radar altimetry package	→
	Mapping radar (SAR)	→
		Doppler lidar
		Advanced atmospheric chemistry spectrometer
		Rain radar
		Multi-directional radiometer
		Polarimeter/radiometer
		Cloud radar profiler
		Gravity gradiometer

Figure 1.

The earth system monitoring satellites are meant to provide long (and consistent) time series of data, using existing or well proven observing techniques and technologies that will support established climate applications or assist in meeting earth system sciences needs. Earth system monitoring satellites will provide a more comprehensive set of measurements by adding oceanographic, climatological and environmental observations to the basic real-time observing system.

An experimental satellite is an environmental observation satellite with the primary purpose of acquiring a special set of research (exploratory) data, or providing a flight demonstration (proof-of-concept) of new or improved sensors and satellite systems.

The present is bright and the future clear. The presentation of the CEOS Affiliates' Dossier to the CEOS Plenary was the first occasion for all the satellite operators to view the total requirements for satellite data from the major user communities. CEOS Members have stated their plans and programmes as contained in the CEOS Dossier and in databases available to the CEOS Affiliates. CEOS Affiliates are continuing their dialogue with CEOS through User Workshops and at Plenary. Affiliates are also continuing internal reviews of both their requirements and space agency plans to continue the dialogue.

CEOS Activity Plan for 1995

Canada is honoured to lead CEOS during 1995 and to host the next Plenary in Montréal in October, 1995.

1994 marked the 10 year anniversary of CEOS and the substantial progress made in coordinating space programs and in establishing principles for data provision. CEOS has now a firm ground established from which we can continue to build on.

The year ahead will be full of opportunities and challenges as CEOS continues to further develop its coordination efforts and continues to promote easier access to Earth Observations data and information for the benefit of the global community. Special emphasis will be placed on the requirements of developing countries.

The main areas of CEOS interest for the upcoming year are as follows:

1) Establishment of a Task Force for CEOS Planning and Analysis

One of the key points arising from the Plenary was the need to conduct an analysis to correlate the Dossier Volumes A, and C to ensure consistency among the space segment, and user requirements. In this regard, the Affiliates have made significant advancement by updating the Affiliates Dossier and combining individual program requirements into a consolidated statement of instrument requirements.

The task force will have members from both research and operations and will draw up a work plan and do a first analysis during 1994-95. In May 1995 the first results will be discussed at a user workshop to be hosted by NASA.

2) Developing Country Activities

Building upon the successful workshop earlier in 1994, the Plenary agreed to increase its efforts toward promoting the effective use of earth observation data in developing countries. A positive report on the status of the project on 'analysis of geographic coverage by high resolution satellites' was presented and IGBP noted that progress on this project would be presented to the next Plenary.

As well the Plenary supported the DARA offer to undertake a preliminary study on a possible space information system in support of developing countries. This information system would be intended to provide reliable and updated information to developing countries and organizations involved in developing countries work. The proposed information study supports the objective of CEOS to serve as a forum for exchange of EO information. It will be decided at the 9th Plenary session whether the outcormes of the feasibility study warrant further action.

3) Interim WGINS, Working Groups and Subgroups

The ad-hoc Working Group on Networks will be converted to an interim Working Group on international Network Services for a 1 year period. During this coming year, the interim WGINS shall develop a strategy that will provide a framework within which the interoperable user services and data systems of CEOS participants would be harmonised. Also, the terms of reference and structure of the Working Groups and Subgro will be reviewed under the guidance of the CEOS chairman, the Secretariat, and jointly with the chairs of the Working Groups and Subgroups.

In cooperation with the WGD and WGCV, the interim WGINS will evaluate pilot demonstration projects among member agencies and users in the field of international network services.

4) Special Report on Successful Applications of EO Satellite Data

The Plenary commended Japan on its fine efforts in preparing its special report on successful applications of EO satellite data and agreed to respond positively to the NASDA request for further inputs.

The next edition of this report is planned for late 1995.

News Highlight

• NASA will host a CEOS Workshop during the week of May 8, 1995 in the Washington area, to review the progress of the Task Force evaluating requirements and plans, as agreed at the plenary meeting in Berlin. Further details will be provided soon.

CEOS Meeting Calendar

As of Dec., 94

Activities	1994 October	1994 November	1994 December	1995 January	1995 February	1995 March	1995 April	1995 May	1995 June	1995 July	1995 August	1995 September	1995 October	1995 November	1995 Decemb
CEOS Plenary level													▲ 9th Plenary (10/11-13, CSA/Montréal, Canada)		
CEOS WGD (Working Group on Data)		▲ WGD-17 (11/1-4, NRSCC/ Beijing. China) ▲ ADS-6(10/17-19) FS-9(10/19-21) (BNSC/Farnborough. UK)						▲WGD-18 (5/23-26, NASA/Washington DC) ▲CS-14(4/24-26, ESA/ESRIN NS-8(4/26-28) Frascati, Italy) ▲ADS-9(4/24-26) FS-10(4/26-28)				△ WGD-19 (Roshydormet/Moscow) ▲ CS-15(9/18-20) NS-9 (9/20-22) (NASA/San Francisco, USA)			
CEOS WGCV (Working Group on Calibration and Validation)			▲ WGCV9 (12/6-9. CSIRO/Australia) ▲ IVOS/TM (12/5-6, CSIRO/Australia)						▲ WGCV10 (6/27-30, RSA/ Moscow)						
CEOS WG INS (Interim WG on International Network Services)			▲WGINS-1 (12/8-9, NASDA/ Tokyo)		▲WGINS-2 (2/28-3/1, ESA/ Frascati, Italy)			▲WGINS-3 (5/23-25, NASA/ Washington DC)							
CEOS Task Force			▲Task Force (12/1-2, ESA/Paris)			▲Task Force (3/9-10, ESA/Paris)		▲User Work shop (5/8-9, NASA/ Washington DC)							

▲: determined △: to be determined
(Date, Host organization/Location)

Meetings are open only to CEOS designated participants.

NASDA

Published by
Office of Earth Observation Systems
National Space Development Agency of Japan (NASDA)
Hamamatsu-cho Central Bldg., 10F
1-29-6, Hamamatsu-cho, Minato-ku,
Tokyo 105, JAPAN

For further information contact in each area allocated:

[Asia, Pacific]
Mr. S. Ueta, STA
TEL:+81-3 3581 0603
FAX:+81-3 3501 3683
EMAIL:CEOSJ@IPX.TKSC.NASDA.GO.JP

[North & South America]
Dr. L. Shaffer, NASA
TEL : +1-202 358 0793
FAX : +1-202 358 2798
EMAIL:LSHAFFER@CODEI.HQ.NASA.GOV

[Europe, Africa]
Dr. H. Hopkins, ESA
TEL : +33-1 5369 7131
FAX : +33-1 5369 7560
EMAIL:HHOPKINS%ESA.BITNET@VM.GMD.DE