The Earth Observer

An EOS Periodical of Timely News and Events

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EDITOR'S CORNER

EOS External Engineering Review

As part of the President's FY 1992 budget processes, the Office of Management and Budget, the Office of Science and Technology Policy, and the National Space Council ordered "an external engineering review of the EOS platform configuration and launch sequence..." The EOS Program and Project are preparing information for this review.

The purpose of the review will be to assess alternatives for the implementation of EOS, including size of platforms, instrument configuration, and launch requirements and sequencing. Its objectives are to ensure that the recommended program (1) meets established scientific objectives; (2) places highest priority on achieving data collection needs specifically focused on climate change and global warming issues; (3) minimizes annual funding requirement; (4) minimizes technical risk; and (5) has sufficient resiliency to be adaptable to changing requirements.

For the EOS-A series of platforms, the review will assess whether any alternatives are significantly superior to the current program. For the EOS-B series of platforms, the review is to assist NASA in adopting a new design, possibly consisting of multiple platforms, that best meets the stated objectives.

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SEC Meets

Is Our Message Getting Across?

Dr. Lennard Fisk, NASA's Associate Administrator for Space Science and Applications, met with the Science Executive Committee (SEC) to call attention to the urgent need for the scientific community to better educate the public on the need for the Earth Observing System. He said that the scientists within EOS and those in the Earth science community in general need to get more involved.

As a first, organized response to Dr. Fisk's plea, the SEC and, in particular, Project Scientist, Jeff Dozier, and Payload Advisory Panel chairperson, Berrien Moore, have taken the lead in drafting a document that will define the EOS strategy. A proposed title for the document is: "Scientific Strategy for NASA's Earth Observing System." It was intended that a first draft would be in the hands of SEC members by March 8 with responses to Dozier by March 15. Then a second draft would be in the mail to all members of the EOS Investigators Working Group (IWG) by May 1. The intent is to have a document that will be endorsed by all members of the IWG.

Shelby Tilford, Director of NASA's Earth Science and Applications Division, stated that early EOS results must be reported at scientific meetings and in scientific journals. In response, Stan Wilson, EOS Program Scientist, called attention to plans to conduct "Topical Science Workshops," where the utility of the observations from the first EOS platform would be demonstrated in regard to topics such as Air/Sea Interactions, Air/Land Interactions, and Atmospheric Column Processes. The EOS Oceans Panel and the EOS Physical Climate/Hydrology Panel, respectively, have scheduled workshops for later this year that will address at least the first two of these topics.

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Editor's Corner Continued...

Review Panel Membership

Chairman: *Edward Frieman*, Scripps Institution of Oceanography

Members: *D. James Baker*, Joint Oceanographic Institutions; *Peter Banks*, University of Michigan; *Greg Canavan*, Los Alamos National Laboratories; *Richard Goody*, Harvard University; *V. Ramanathan*, Scripps Institution of Oceanography; *Warren Washington*, National Center for Atmospheric Research; and *Bud Wheelon*, Former CEO, Hughes Aircraft Corporation.

General Requirements

The review will cover both the EOS-A and EOS-B series of instruments and platforms. Because EOS-A is already under development, any recommendations for changing EOS-A must consider its current status and provide significantly reduced risk, faster schedule, better science, or cheaper costs over the current EOS-A. The Panel is charged with analyzing:

- cost, budget, technical, and scientific tradeoffs of alternative approaches to the EOS instruments;
- cost, budget, technical, and scientific tradeoffs of launching and flying all EOS instruments with a series of large platforms, or with a series of smaller platforms flying in formation;
- NASA's plans to allow for evolution in EOS technology and science goals during the 15-year life of the EOS program;
- a report from the interagency Committee on Earth and Environmental Sciences on the cost, technical challenges, budget, and scientific utility of using high-altitude, unmanned aircraft missions as precursors or complements to the current ground- and space-based observations.

Schedule

The Panel will meet May 30-31 in Washington, DC and July 18-26 in La Jolla, CA. A document on the "Scientific Strategy for NASA's Earth Observing System," currently in preparation by the IWG Science Executive Committee, will be available for the Panel's first meeting. In addition, we are scheduling a few IWG panel chairs to meet with the Review Panel, to provide scientists' views (rather than programmatic views) of the goals and implementation of the mission.

Jeff Dozier
EOS Project Scientist

EOS IWG INFO

The next EOS Investigators Working Group (IWG) meeting has been scheduled for August 28-30, 1991 at the University of Washington, Seattle. The IWG meeting schedule will be:

August 28	Short Plenary Session, followed by IWG Panel meetings (seven Panels have indicated they wish to meet)
August 29	Payload Panel Meeting
August 30	(morning only) Plenary Session

For those on tight budgets, dormitory accommodations are available. Details will be available in the next issue of *The Earth Observer*.

SEC Continued...

Another topic of general interest to the EOS community is the need for NASA to respond to a request from the National Space Council that NASA participate in an activity that could lead to the definition of a set of smaller platforms that would replace the original concept of a single large "B" platform. NASA is to prepare a Request for Information to industry that will ask for industry concepts on how best to implement the set of smaller platforms. NASA will use information supplied by the EOS science panels to define the instrument groupings that will then be presented to industry in the RFI.

The National Space Council is also in the process of creating a special committee to conduct an Engineering Review of EOS. The EOS strategy document referred to earlier is to be ready in time for consideration by the special committee before it makes its interim report in June.

Jeff Dozier described current plans for the EOS Science Forums. They will focus on the instruments that have been selected for the first EOS platform, now designated A-1, and they may also look at the EOS SAR. The Forums are planned to be held in the late winter of 1991/1992.

Piers Sellers, chairperson of the EOS Terrestrial Biosphere Panel, presented the arguments for having a morning flight of EOS instruments in order to get cloud-free images of the continental surfaces. His particular concern is with MODIS-N, which he regards as being at the heart of the land-imaging measurements. Several alternatives were proposed to meet Sellers' concern and they will be reviewed.

Diane Wickland described the current state of affairs in which funds are lacking to support aircraft flights of the AVIRIS instrument for EOS. As things stand, AVIRIS images may cost the individual investigators at least $4 K each, which may discourage their use in EOS. Tilford added that NASA may acquire a dedicated P-3 aircraft from the Navy to support EOS SAR testing. Also, the OMB has suggested that NASA look into the use of remotely piloted vehicles.

Getting back to the question of using multiple, small platforms for the "B" set of instruments, there was a detailed discussion of synergisms between instruments, the need for "congruence," simultaneity, or near-simultaneity between instruments, the requirements for polar orbits, sun-synchronous polar orbits, and non-polar orbits, equator crossing times, orbital altitudes, etc. Dixon Butler agreed to summarize the arguments that were made for the various groupings.

Jeff Dozier gave the status of the procurement for the EOSDIS Core System (ECS). The date of release of the Request for Proposals has slipped to July 1. A Source Evaluation Board has been formed, chaired by Bob Price of Goddard, with other Earth scientists serving on the board as well. With regard to the EOSDIS Version 0, Dozier said that the driving concern is to achieve better access to data. The main data sets are to be those from AVHRR, TOVS, GOES, and SSM/I.

Vince Salomonson described the thinking with regard to algorithm and data product validation. Both aircraft and ship time will be needed, but there is no NASA money for ship time. Stan Wilson answered that NASA's pattern has always been to go to the other agencies for ship time, and that Headquarters would take the lead on this as it has in the past.

The next IWG meeting may be in Colorado in September. The first day of such a meeting would be devoted to the Payload Panel.

Renny Greenstone
ST Systems Corporation

EOS Contacts

The management responsibility for the EOS Interdisciplinary and Instrument Investigations resides with the EOS Program Office at NASA Headquarters and the EOS Project Office at GSFC, respectively. For the instrument investigators, their main contracts at Headquarters are the Instrument Program Scientists. The charts on the following two pages are intended to provide you with a quick reference of the individual program scientists and managers working on the EOS Interdisciplinary and Instrument Investigations. We hope they will be useful to you.

Ming Ying Wei
EOS Program Office
NASA Headquarters

INTERDISCIPLINARY PROGRAM SCIENTIST LIST
(AS OF MARCH 1991)

Principal Investigator	Interdisciplinary Program Scientist	Interdisciplinary Investigation	OMNET Box	NASAMAIL Box	GSFCMAIL Box
Abbott	Mitchell	Coupled Atmosphere/Ocean Processes and Primary Production in the Southern Ocean	G.MITCHELL		
Barron	Dodge	Global Water Cycle: Extension Across the Earth Sciences		JDODGE	
Bates	Bergman	The Development and Use of a Four-Dimensional Atmospheric-Ocean-Land Data Assimilation System for EOS		KBERGMAN	
Batista/Richey	Murphy	Long-Term Monitoring of the Amazon Ecosystems through the EOS: From Pattern to Processes		REMURPHY	
Brewer	Mitchell	Biogeochemical Fluxes at the Ocean-Atmosphere Interface	G.MITCHELL		
Chilar	Murphy	Quantifying the Vegetation of Canada: Carbon Budget and Succession Models	A.JANETOS		
Dickinson	Bergman	NCAR Project to Interface Modeling on Global and Regional Scales with Earth Observing System Observations		KBERGMAN	
Dozier	Asrar	Hydrology, Hydrochemical Modeling, and Remote Sensing in Seasonally Snow-Covered Alpine Drainage Basins		GASRAR	
Grose	Kaye	Observational and Modeling Studies of Radiative, Chemical, and Dynamical Interactions in the Earth's Atmosphere			JKAYE
Hansen	Schiffer	Interannual Variability of the Global Carbon and Energy Cycles		RSCHIFFER	
Harris	Mitchell	Interdisciplinary Studies of the Relationships between Climate, Ocean Circulation, Biological Processes, and Renewable Marine Resources	G.MITCHELL		
Hartmann	Dodge	Climate Processes Over the Oceans		JDODGE	
Isacks	Baltuck	Tectonic/Climatic Dynamics and Crustal Evolution in the Andean Orogen		MBALTUCK	
Kerr/Sorooshian	Asrar	The Hydrologic Cycle and Climatic Processes in Arid and Semi-Arid Lands		GASRAR	
Lau	Asrar	Estimation of the Global Water Budget		GASRAR	
LeMarshall	Bergman	The Processing, Evaluation, and Impact on Numerical Weather Prediction of AIRS, AMRIR, HMMR, MODIS, and LAWS Data in the Tropics and Southern Hemisphere		KBERGMAN	
Liu	Adamec	The Role of Air-Sea Exchanges and Ocean Circulation in Climate Variability	D.ADAMEC		
Moore	Janetos	Changes in Biogeochemical Cycles	A.JANETOS		
Mouginis-Mark	Baltuck	A Global Assessment of Active Volcanism, Volcanic Hazards, and Volcanic Inputs to the Atmosphere from EOS		MBALTUCK	
Murakami	Bergman	Investigation of the Atmosphere-Ocean-Land System Related to Climatic Process		KBERGMAN	
Pyle	Kaye	Chemical, Dynamics, and Radiative Interactions through the Middle Atmosphere and Thermosphere			JKAYE
Rothrock	Thomas	Polar Ocean Surface Fluxes: The Interaction of Oceans, Ice, Atmosphere, and the Marine Biosphere	R.THOMAS.NASA		
Schimel	Murphy	Using Multi-Sensor Data to Model Factors Limiting Carbon Balance in Global Grasslands		REMURPHY	
Schoeberl	Butler	Investigation of the Chemical and Dynamical Changes in the Stratosphere Up to and During the EOS Observing Period	D.BUTLER		
Sellers	Wickland	Biosphere-Atmosphere Interactions	D.WICKLAND		
Simard	Thomas	Use of a Cryospheric System to Monitor Global Change in Canada	R.THOMAS.NASA		
Srokosz	Adamec	Middle and High Latitude Oceanic Variability Study	D.ADAMEC		
Tapley	Anderson	Earth System Dynamics: The Determination and Interpretation of the Global Angular Momentum Budget Using EOS		AJANDERSON	
Wielicki	Schiffer	A Proposal for an Investigation of Clouds and Earth's Radiant Energy System: Analysis (CERES-A)		RSCHIFFER	

EOS INSTRUMENT PROGRAM SCIENTISTS AND INSTRUMENT MANAGERS
(AS OF APRIL 1991)

Instrument	PI/TL and Location	Instrument Program Scientist (Nasa Headquarters)	OMNET Box	NASAMAIL Box	GSFCMAIL Box	Instrument Manager (GSFC)	GSFCMAIL Box
ACRIM	Willson/JPL	Schiffer		RSCHIFFER		Domen	MDOMEN
AIRS	Chahine/JPL	Kakar		RKAKAR		Dantzler	ADANTZLER
AMSU-A	Chahine/JPL	Kakar		RKAKAR		Domen	MDOMEN
AMSU-B	Chahine/JPL	Kakar		RKAKAR		Anderson, K.	KANDERSON
ASTER	Kahle/JPL	Asrar		GASRAR		Lambros	SLAMBROS
CERES	Barkstrom/LaRC	Schiffer		RSCHIFFER		DiJoseph	MDIJOSEPH
COMM*	--	Dodge		JDODGE		--	
EOSP	Travis/GISS	Suttles		JTSUTTLES		DiJoseph	MDIJOSEPH
HIRDLS	Gille/NCAR Barnett/Oxford	Kurylo		MKURYLO		Van Blarcom	
HIRIS	Goetz/Un. of Colorado	Wickland		D.WICKLAND		Bascom	
LIS	Christian/MSFC	Dodge		JDODGE		Lambros	SLAMBROS
MIMR	Spencer/MSFC	Theon		JTHEON		Lawrence	RLAWRENCE
MISR	DinerJPL	Murphy		REMURPHY		Bascom	
MODIS-N	Salomonson/GSFC	Janetos	A.JANETOS			Weber	RWEBER
MODIS-T	Salomonson/GSFC	Mitchell	G.MITCHELL			Browne	WBROWNE
MOPITT	Drummond/Un. of Toronto	McNeal		JMCNEAL		Durning	JDURNING
STIKSCAT	Freilich/JPL	Patzert	W.PATZERT			Lawrence	RLAWRENCE
WBDCS*	Butler, Rhett/Incorp. Research Institutions of Seismology	Engeln		JENGELN		Anderson, K.	KANDERSON
ALT	Fu/JPL	Patzert	W.PATZERT			Domen	MDOMEN
GGI	Melbourne/JPL	Engeln		JENGELN		Anderson, K.	KANDERSON
GLRS	Schutz/Un. of Texas, Austin	Baltuck		MBALTUCK		Anderson, K.	KANDERSON
GOS	Langel/GSFC	Baltuck		MBALTUCK		Van Blarcom	
IPEI	Heelis/Un. of Texas, Dallas	Evans				Van Blarcom	
LAWS	Baker/NOAA/NMC	Theon		JTHEON		DiJoseph	MDIJOSEPH
MLS	Waters/JPL	Kakar		RKAKAR		Lawrence	RLAWRENCE
SAFIRE	Russel/LaRC	Kurylo		MKURYLO		McGuire	JPMCGUIRE
SAGE III	McCormick/LaRC	Kaye			JKAYE	Dantzler	ADANTZLER
SOLSTICE	Rottman/Un. of Colorado	McNeal		JMCNEAL		McGuire	
SWIRLS	McCleese/JPL	Kurylo		MKURYLO		Lambros	SLAMBROS
TES	Beer/JPL	McNeal		JMCNEAL		Dantzler	ADANTZLER
XIE	Parks/Un. of Washington	Evans				Browne	WBROWNE
SAR	Elachi/JPL	Asrar		GASRAR		--	

*platform capability

Team Meetings

MODIS Science Team Meeting Marks Progress

A MODIS Science Team meeting was held at Goddard Space Flight Center (GSFC) on February 20-22, 1991. Nearly all Science Team members were present, and the majority of the MODIS Associate, Adjunct, and Technical Support Team members also attended. The excellent turnout helped the Science Team to make significant progress on the substantive science issues confronting the MODIS-N and MODIS-T instruments, which will fly on EOS-A.

The first day was primarily devoted to a MODIS status summary and informative talks of interest to the group. Dr. Greg Mitchell, MODIS Program Scientist, discussed the potential impact of reduced funding levels on the science programs. The limited funding is expected to: require prioritization of data products; constrain surface truth support from aircraft and ships; and require parallel development of algorithms for MODIS and for ocean color data that will come from the SeaWiFS sensor on the SeaSTAR satellite. (Since the MODIS Team Meeting, NASA has selected Orbital Sciences Corporation to provide the SeaWiFS data. Launch of SeaSTAR is planned for August 1993.)

The budget situation also figured prominently in the presentation by the EOS Project Scientist, Dr. Jeff Dozier. He presented a review of the MODIS budget and discussed the investigators' funding profile. Although science funding is significantly below requested levels for the early years, it will ramp up further into the program. Dr. Dozier discussed the timeliness requirements for contract establishment for team members. Issues related to cataloging of MODIS data sets and to the EOSDIS were also discussed.

Dr. Vince Salomonson, MODIS Team Leader, discussed the current state of the geophysical validation plan for MODIS data. He tasked Science Team members to review and update the plan during the meeting. Because an integral connection exists between budget, data validation, and output data products, team members were also tasked to prioritize their discipline groups' MODIS output data products during the meeting. Science Team members were also asked to consider the importance of the data products to Interdisciplinary Science (IDS) investigations. An important part of validation data comes from aircraft flights, and members were requested to establish their aircraft research requirements for MODIS for the next five years. Dr. Jim Huning of NASA Headquarters provided a detailed discussion of the NASA/Ames aircraft program to aid investigators in selection of aircraft and instrumentation, and in scheduling and budgeting flights.

Technical reports were presented by Drs. Phil Slater and John Barker on the current calibration plans for MODIS, with emphasis being placed on the MODIS-T calibration planning. The MODIS-T scan mechanism was discussed, and paddle wheel has been judged superior to barrel roll for MODIS-T applications. Dr. Bill Barnes introduced an analytical report to model the thermal infrared error budget. The MODIS Calibration Peer Review and Oversight Panel and the MODIS Characterization Support Team held a joint advance meeting on February 19 to discuss calibration issues. The results of this preliminary meeting were presented to the Science Team, and included a preliminary handbook for MODIS-T calibration.

After the Science Team plenary session, the four discipline groups broke into separate sessions. The common objectives of prioritization of output data products, the geophysical validation plan, truth data bases for validation, aircraft requirements, data base and data processing problems, and potential MODIS direct broadcast channels were tackled by all groups. In addition, the members used the session to discuss progress on individual research. After the discipline groups had completed their individual meetings, each presented a summary at a joint Science Team meeting.

Atmosphere Discipline Group

The Atmosphere Discipline Group, led by Dr. Mike King, reported one of the most significant achievements. With the cooperative funding and collaboration of ten members of the MODIS Science Team, including all members of the Atmosphere Group and most members of the Land Group, the final groundwork was laid for building a MODIS Airborne Simulator (MAS). NASA Headquarters also made a contribution toward the MAS. The MAS is thought to be a better mechanism for developing retrieval algorithms than theoretical means, and will give these investigators an early "leg up" on field-quality simu-

lations of MODIS data. The group also formulated plans to take the initiative in seeking expanded international contacts for assistance with data validation and analysis.

Calibration Discipline Group

Dr. Phil Slater presented a summary of the achievements of the Calibration Discipline Group, including the results of the preliminary session. The Calibration Group established priorities for future activities related to pre-launch and in-orbit operations. Building the MODIS characterization data base and integrating of the data to the EOSDIS system have high priority. The calibration philosophy for MODIS-T was established. The group considered the advantages of a single sphere calibrator, potential contamination of the calibrator spheres, possible substitution of a ratioing radiometer, and internal calibration sources for pre-flight and in-flight calibration. Performance monitoring at the instrument vendor during manufacture and during spacecraft integration is critical for proper calibration. Validation criteria peculiar to each of the other three discipline groups were reviewed, including methods, algorithms, surface truth data, and facilities. Problems associated with using the sun and moon for instrument calibration were discussed. Future goals include preparation of an end-to-end calibration plan and selection of uniform calibration sites from AVHRR data.

Land Discipline Group

The Land Discipline Group, represented by Dr. Alan Strahler, presented the Science Team with a linked, cohesive set of land data products. These products cannot be individually prioritized, but must be grouped together in units for interpretation of MODIS-N and -T output. An innovative set of baseline test sites for validation activities was derived. One of the Land Group's applauded ideas established a person-to-person linkage of land investigators to EOS IDS investigators in order to improve their communication with the MODIS Science Team. A group journal paper is planned to describe the data products which will be processed by the MODIS Land Group. A special presentation was given on the mandate of the EROS Data Center for archiving, processing, and distributing their part of EOS data. Elements of a plan to use a 1 km AVHRR global data set were reviewed.

Ocean Discipline Group

Dr. Wayne Esaias presented a summary of the issues discussed by the Ocean Discipline Group. This group grappled with the data validation plan as did the other discipline groups, but naturally placed special emphasis on sea cruises for the purpose of building a surface truth data base. Budget issues occupied a high priority in the group's discussions, but did not eclipse hard science issues. The interaction between algorithms for SeaWiFS and MODIS, the review of a proposal from the Land Group for sharing MODIS-T time for bidirectional reflectance distribution function (BRDF) studies, and measurement protocols were topics of interest. Cloud cover masks were once considered generic; however, the Oceans Group discussed the possibility of the need for masks tailored to the product. The group listened to two special presentations. The first provided instructions and information for a recently activated EOS electronic bulletin board. The second was a presentation by the Science Data Support Team on division of responsibilities for origination of software and data bases.

Additional spirited discussion of long-term budgetary issues followed. Dr. Jan-Peter Muller showed a computer-generated video which uses global data sets to show global change and to promote ecological issues. Dr. Salomonson closed the meeting saying that much had been accomplished, and applauded the members for their conscientious efforts. The next MODIS meeting has tentatively been scheduled for sometime in October, 1991.

Steve McLaughlin
MODIS Administrative Support Team
Ressler Associates, Inc.

The Earth Observer is published by the EOS Project Science Office, Code 900, NASA/Goddard Space Flight Center, Greenbelt, MD 20771, telephone (301) 286-3411, FAX (301) 286-3884. Correspondence may be directed to Charlotte Griner at the above address. Articles, contributions to the meeting calendar, and suggestions are welcomed. Contributions to the meeting calendar should contain location, person to contact, and telephone number. Deadline for all submissions is the 20th of each month. To subscribe to *The Earth Observer*, or to change your mailing address, please call (301) 513-1612, or write to the address above.

AIRS Team Meeting

An AIRS Science Team meeting was held at Caltech on February 19 and 20, 1991. The first day of the meeting covered the project status update, followed by a discussion of the Functional Requirements Document. The second day primarily covered the details of data simulation and algorithm development. A summary of the significant points of discussion is given below.

Status

It was announced that AIRS is now officially selected for the EOS-A platform. The entire Phase B science team and the team leader have been confirmed for Phase C/D.

Phase C/D Contract Award

The Phase B study at LORAL (Lexington, Mass.) has been completed, and the results have been documented. The Phase C/D contract award is expected early in March 1991. One engineering unit and three flight units are to be delivered as part of this contract.

Functional Requirements Document (FRD)

The AIRS FRD, which is part of the hardware contractual documentation, is now under formal change control. A number of technical issues which needed clarification for the FRD were discussed. A design using an oversize occulting mask will assure that there is no wavelength dependence of the central obscuration. It was also determined that the R-branch at 4.3 microns and the Q-branch at 15 microns of CO_2 are extremely critical for temperature sounding.

Visible Channels

Visible light channels are needed to address the following objectives:

- low level cloud discrimination
- surface inhomogeneity assessment
- improvement of co-registration with MODIS
- radiation balance studies

As a result of the discussions it was determined that the six visible light channels in the FRD could be reduced to five. LORAL will be directed to provide a feasibility evaluation after the visible channel functional requirements are compiled.

Calibration Concerns

Accurate knowledge of the spectral response function is critical to keeping errors below the noise-equivalent-delta-temperature (NEDT), and is more critical than the *a priori* specification. The use of a Fourier Transform Spectrometer in the calibration facility meets the pre-flight spectral calibration requirements of AIRS. The requirements for in-orbit spectral calibration can be met with the spectral signature produced by a fixed Fabry-Perot plate, which is calibrated pre-launch.

Data Simulation Report

The first set of simulations, to be distributed around July 1991, will be essentially a "data read test," with cloud-free night-time radiances over ocean with 0.95 emissivity (independent of wavelength). Only temperature and humidity will vary. The important minor constituents will be simulated at fixed nominal abundances. Subsequent distributions of simulated data will be more realistic with clouds and additional hardware details included. A subteam was directed to define the transmission functions for the first simulations, the number of representative profiles for the rapid algorithm, and the pressure levels for temperature, H_2O and O_3.

Algorithm Development

Three conceptually different approaches to the temperature/moisture retrieval algorithm are currently under development by five teams (three of which are supported by AIRS science team funding). Careful evaluation and optimization of one approach for the CDHF is a critical early activity in the AIRS software development since all AIRS data products have this retrieval as a prerequisite. Reports were given on the status of development of these approaches.

Next AIRS Team Meeting

The next team meeting is tentatively scheduled for June 1991 on the East Coast.

H. H. Aumann
AIRS Project Scientist
Jet Propulsion Laboratory

GLRS Team Meeting

The Geoscience Laser Ranging System (GLRS) team met on February 12-13 at the Goddard Space Flight Center (GSFC), in Greenbelt, Maryland. In addition to the team, attendees included representatives from NASA Headquarters, GSFC, universities, and contractors.

Miriam Baltuck (NASA Headquarters Instrument Program Scientist) summarized the January GLRS Headquarters review. In her view, the one-day review went well. Because GLRS is an EOS-B platform instrument, the execution phase proposals are expected to be due later in 1991. Dot Zukor (EOS Project Science Office Manager/GSFC) noted that the GLRS CDCR is now planned for Spring, 1992. Flying GLRS on a smaller platform is being discussed, possibly on a platform that would include GLRS, ALT, and GGI, thereby enhancing the synergism of these instruments. Ken Anderson (GLRS Instrument Manager/GSFC) summarized the schedule for development of C/D specifications and instrument construction.

Ken Brown (GSFC GLRS Study Manager) summarized the current contractor tasks. The risk items such as the laser and the streak camera are being breadboarded. Plans are to complete the lasers and other items necessary to parameterize the timing resolution of the system. Each contractor (General Electric and McDonnell Douglas) presented a nondisclosure summary of its current status to the team. A study of a ground target design by Pete Minott (GSFC) was summarized by Brown. Preliminary analysis indicates that the design meets most of the science team requirements. It will be examined more completely in science team simulations.

Tom Zagwodzki (GSFC) reviewed current activities at the Goddard Optical Research Facility (GORF) to develop a two-color laser ranging instrument, regarded as an evolutionary step for GLRS. The facility now has two streak cameras from a commercial source, including one with a 2 picosecond resolution. The instrumentation is now in place and preliminary tests have been performed. Attempts to range to the Relay Mirror Experiment (RME) satellite are planned in the near future, depending on availability of the satellite. Experiments with other satellites, such as STARLETTE and LAGEOS, will be scheduled.

Jim Abshire (GSFC) reviewed tasks being initiated or underway. A NOAA group has been asked to examine atmospheric turbulence effects in the vicinity of a ground target. He also summarized ongoing preparations for an aircraft experiment in the vicinity of GORF to enhance the two ranging experiments. In these experiments, the aircraft will carry a laser corner cube and will use GPS tracking in a kinematic mode for aircraft position. Software to simulate laser altimeter waveforms is being developed, which will be an important step in characterizing the nature of laser waveforms on a variety of surfaces.

Details of a new link analysis were provided by John Degnan (GSFC). The results reaffirmed that the link at 532 nm is satisfactory and showed that, at least theoretically, a satisfactory link in the ultraviolet exists under moderate atmospheric conditions. The ongoing two-color experiments should provide essential observational data to supplement the theoretical studies.

Bernard Minster (UC/San Diego), chair of the GLRS Target Working Group, summarized information collected on laser propagation in a turbulent atmosphere. He noted that experiments were required, possibly transmitting a laser pulse from a tower to a ground target and measuring the signal characteristics under a variety of atmospheric conditions.

Robert Thomas (NASA Headquarters), chair of the Altimeter Working Group, gave a status report, and summarized aircraft experiments planned for June and July in which a laser altimeter will be flown over Greenland on several traverses. Jack Bufton (GSFC), chair of the Aircraft Working Group, provided additional details on the Greenland experiments as well as requirements for future aircraft experiments.

Bob Schutz (UT/Austin), chair of the Orbit/Attitude Working Group, discussed real-time and post-processing requirements for orbit and attitude. Current status of the error budgets for both altimetry and ranging were summarized. Steve Cohen (GSFC) reviewed recent geodetic simulations using proposed target designs.

The next open meeting will be held May 14-15, 1991, at GSFC. The major focus of this meeting will be the refinement of a Science Management Plan, as well as review of ongoing experiments and Working Group analyses.

Bob Schutz
GLRS Team Leader
University of Texas, Austin

LAWS Science Team Meeting

The LAWS Science Team met on February 4 - 6, 1991 in Clearwater, Florida. The meeting was attended by all 14 science team members, one associate team member, and 30 other people including representatives from NASA Headquarters, the EOS Project Office at GSFC, the NASA/Marshall LAWS Instrument Project Office, and private industry. The following key points were discussed:

Because of the budget impact of serious problems with their H-II Rocket development, the Japanese are no longer able to consider a payload large enough to accommodate LAWS. LAWS has, therefore, been baselined for an EOS-B platform.

At the request of NASA Headquarters, a white paper is now being drafted which discusses the science synergisms of various possible payload combinations. Following discussions in Clearwater and subsequently, arguments for the following list of options are being developed:

(1) LAWS alone in polar or 55° orbit
(2) LAWS + TES in polar orbit
(3) LAWS + TRMM Rain Radar + Passive Microwave Imager (SSM/I) in 55° orbit.

The feasibility of platform accommodations and other engineering considerations have not yet been studied for options (2) and (3), however.

In order to enhance the signal-to-noise ratio of the LAWS instrument in regions of low aerosol content, the Science Team recommended a baseline orbit altitude of 450 km. The previous orbit altitude was 705 km. The latest recommendation may need to be revised upward depending on the results of the mission study options underway at NASA/Marshall.

Preliminary results of analyses of data from the recent Global Backscatter Experiment (GLOBE) aircraft survey missions indicate a wide range of variability in the Pacific circumnavigations. In cloud-free areas of the equatorial region, the backscatter levels observed were near the low end of the range.

Table 1. LAWS Data Products, Expected Resolution and Accuracy

Product	Expected Resolution	Expected Accuracy
Horizontal Vector Wind Profiles	100 km -- Horiz.; 1 km -- Vert. (300 m in high aerosol regions-- e.g., PBL or cirrus)	± 1 to 5 ms^{-1} depending on aerosol amount with quality flags
Line of Sight Wind Profiles	6 per 100^2 km^2 -- Horiz.; 1 km -- Vert. (300 m in high aerosol regions -- e.g., PBL or cirrus)	± 1 to 5 ms^{-1} depending on aerosol amount with quality flags
Aerosol[A] Distribution	100 km -- Horiz.; 1 km -- Vertical (300 m in high aerosol regions-- e.g., PBL). Temporally averaged (e.g., daily)	TBD
Cirrus[B] Distribution	100 km -- Horiz.; 300 m -- Vert. Temporally averaged (e.g., daily)	TBD
Cirrus Cloud Top Height	50 km -- Horiz.	± 20 - 50 m[C]
Stratiform Cloud Top Height	50 km -- Horiz.	± 50 m

Notes: A. Wavelength dependent (currently 9.11 μm)
B. Cirrus not detectable by passive techniques (i.e., sub-visible)
C. Height determination for thin cirrus will be significantly more accurate with LAWS than current passive techniques

U.S. GLOBAL CHANGE SCIENCE PRIORITIES

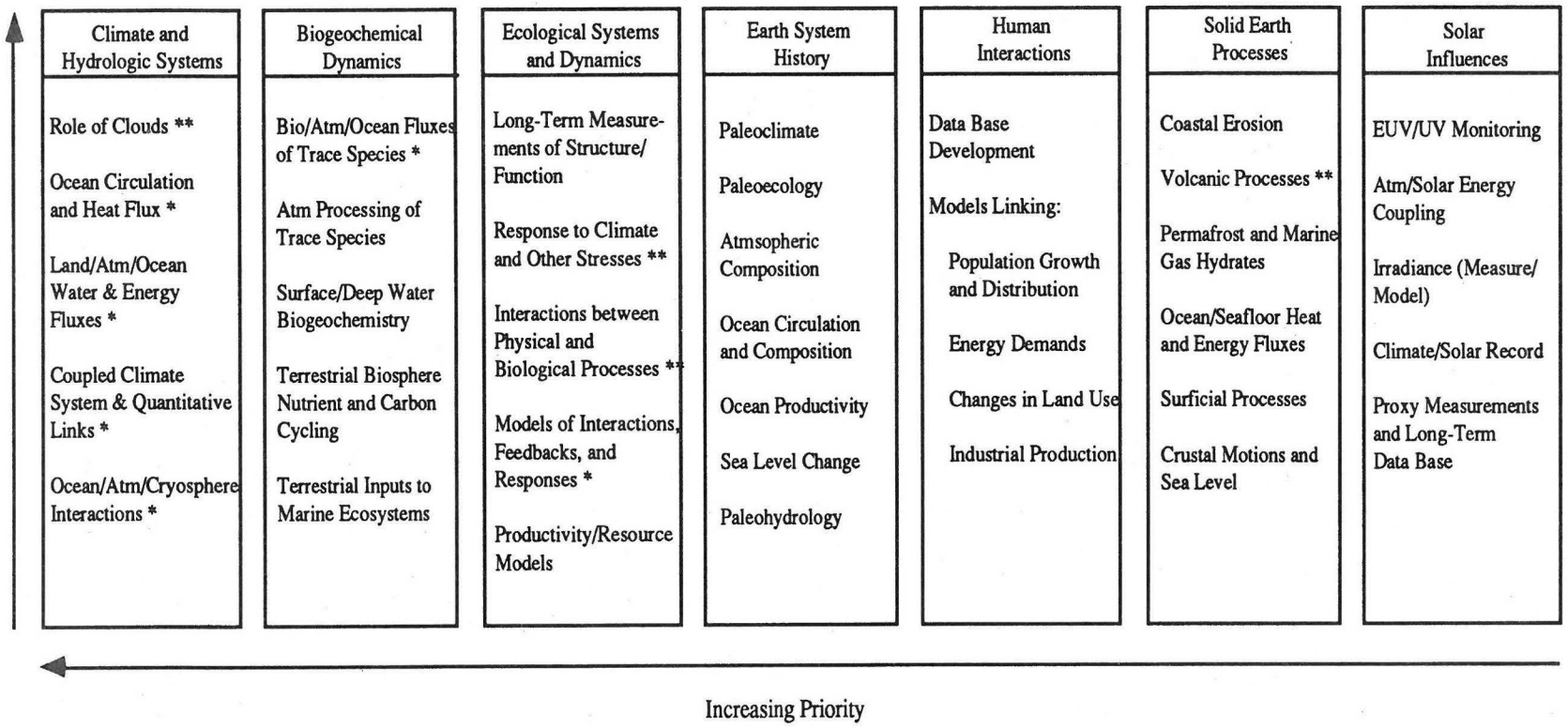


Figure 1. Anticipated contributions of the LAWS measurements to the U.S. Global Change Science Priorities. Reproduced from Figure 11 of a report by the Committee on Earth and Environmental Sciences (CEES), 1989. See text for more details. Critical and secondaryanticipated LAWS contributions are denoted by a * or a ** , respectively.

The high-latitude tropospheric backscatter levels were observed to be generally higher than those observed in the tropical middle and upper troposphere.

LAWS instrument performance requirements involving the transmitter pulse energy, pulse repetition frequency (prf), and shot density were discussed and clarified for the Contractor Phase B design studies, under an assumed atmospheric environment with a corresponding backscatter coefficient near $10^{-11}m^{-1}sr^{-1}$. The Science Team recommended that the baseline mode provide a shot density of 6 per $(100\ km)^2$, and that the transmitter be capable of delivering a (scan circle average) maximum sustained prf of 10 Hz. There should be a density equalization algorithm resulting in the prf being expressed as a function of scan circle azimuth angle and latitude. The Science Team also recommended that in-flight intensity calibration procedures be added as a requirement for the LAWS instrument design studies, and that calibrated backscatter data be provided as a LAWS data product. The laser-transmitter-breadboard contractor tasks, a critical part of the Phase-B design effort, are anticipated to begin in March.

Finally, the fundamental importance of LAWS observations, especially winds, but also aerosol and cirrus cloud distribution and estimates of cloud top height, is illustrated in Figure 1, reproduced from Fig. 11 in a report by the Committee on Earth and Environmental Sciences (CEES), 1989. The original figure has been modified to show the anticipated contributions of LAWS to the U.S. Global Change Science Priorities. An additional entry ("Aerosols and Sub-Visible Cirrus") has also been added under "Climate and Hydrologic Systems," because of the expected contribution of LAWS measurements there.

The LAWS data products that are expected to provide contributions to the science priorities in Figure 1 are listed in Table 1 along with the expected resolution and accuracy.

The next LAWS Science Team Meeting is scheduled for July 15-17, 1991 in Aspen, Colorado immediately following the Sixth Topical Meeting on Coherent Laser Radar, July 8-12.

Wayman E. Baker
LAWS Science Team Leader
NOAA/NMC

TES SCIENCE TEAM MEETING

In the shadow of the sudden death of an irreplaceable colleague, Bob Norton, the Third TES Science Team Meeting convened at the University of Denver, Colorado, for one day of working group meetings (March 26) and a day and a half of general sessions. Our hosts were David Murcray, Frank Murcray and Aaron Goldman of the Physics Department. We are most grateful to them for their gracious hosting of this meeting.

The morning of March 26 was occupied by a meeting of the Spectroscopy Working Group (Jack Margolis, chair). This group deals with the spectral data bases that are the key element for both abundance retrievals and data simulation for sensitivity studies. Most of the effort that has gone into this field in the past several years has been aimed at planetary atmospheres and the Earth's stratosphere. The advent of systems such as TES make the extension of the data bases to include tropospheric species (many of which are complex molecules) mandatory. Part of the group's charter is to encourage such laboratory activities. Another part is to make critical evaluations of all data as they become available.

The afternoon of March 26 was given over to the Data Analysis Working Group (Curtis Rinsland, chair). Members of this group are all active in the area of retrieval algorithms, the key issue in any atmospheric remote sensor. The group heard presentations on past experiences (MLS and ISAMS for UARS), from which the primary lesson is that one always underestimates the effort required to generate operational, and fully-documented, computer code. Presentations were also given by group members on their own algorithms but, with the recognition that TES will generate an unprecedented volume of data that must be analyzed in near-real-time, much interest was generated by an ongoing JPL development of a parallelizable sequential estimation algorithm called SEASCRAPE and it was agreed that this approach would be the one presented to next year's Science Review.

Of particular note was the recommendation by Clive Rodgers to apply a "success criterion" to the retrieval process, in addition to the usual convergence criteria. This additional criterion consists of making a direct comparison between the measured spectrum and one

computed using the retrieved temperatures and abundances. The correlation of the two provides both a quality control metric and a useful means of determining if unexpected species are present.

The plenary sessions of March 27 and 28 began with a description by Frank Wright (TES Project Manager at JPL) of the overall experiment progress that has taken place since our last meeting six months ago. During this time, the EOS-B CDCR has been postponed for about one year (to June 1992) and the announcement made that a major Science Review of TES will be conducted about February 1992.

In the meantime, Tom Glavich (recently formally appointed as TES Instrument Manager) and his design team have virtually completed the instrument conceptual design preparatory to beginning the detailed costing exercise. In addition, work has begun on breadboarding a segment of the detector and signal chain sub-system because this is always identified as a significant challenge in any instrument (not just TES). We have been fortunate in that we have been loaned some sample mid-IR PC HgCdTe detectors to attach to the breadboard signal chain, and a development contract has been awarded to produce a pair of PV HgCdTe detectors with a shape close to that we have specified (10:1 aspect ratio); delivery is due this summer. We shall also be able to "tap into" a 16fm PV HgCdTe development currently underway for AIRS since the detector engineer (Kirk Seaman) works on both tasks. One of the tests to be performed on the signal chain will be to couple it to a Nicolet FTS at JPL whose fastest scan speed is only slightly less than that of TES. This will test a number of aspects: frequency response, phase response, and linearity.

In the regrettable absence of representation either from the Goddard Project Office or NASA headquarters, Reinhard Beer took the opportunity to present the TES and Atmospheres Panel response to the list of questions posed in January by Dixon Butler, Stan Wilson and Jeff Dozier. Some modifications to the draft response prepared by Mark Schoeberl were suggested and have been forwarded to him.

Tom Glavich presented the current instrument concept, which is considerably advanced over that in the proposal. Notably, the mass has been reduced significantly, as has the power requirement. However, this latter is still of some concern and will continue to be addressed. Both the optical and mechanical design are essentially complete and TG showed detailed views of these, with particular emphasis on the 65K detector enclosures. The next major activity will be to generate a realistic cost estimate for the life of the project. This task will occupy several months beginning in late summer.

Jack Margolis briefly described the JPL sensitivity studies that have been ongoing for some time. These have been performed using the JPL forward modelling program EMISSION_SPECTRA (ES) which, in the past few months, has been successfully ported from a VAX to a SUN 4. When the new HITRAN database is issued, it will be incorporated. One useful feature of ES is that it can employ absorption coefficients (cross-sections) without any of the pain endemic to the ATMOS software (on which ES was originally based). Another is that the line lists are broken into 100 cm-1 segments and re-ordered by a product of the line strength and a representative concentration, resulting in a significant speed-up in computation because the computation ceases when lines in the chosen geometry become insignificant. The species receiving most attention is tropospheric O_3 because not only is it our primary target but also it is probably the most difficult to measure in the face of the large stratospheric column overlying it. Fortunately, tropospheric lines are significantly wider than ones formed in the stratosphere, making them discernable in the wings and permitting retrieval of the tropospheric component. Daniel Jacob also presented a list of heavy molecules of tropospheric interest that will be investigated as candidates for retrieval (which also requires that good absorption coefficients become available for these species).

Carol Bruegge discussed what she had learned at the recent TRACE A planning meeting and emphasized that we need to keep ourselves well informed on all such field campaigns even though they precede the TES launch by many years because, (a) they make a good model for our own future correlative measurements programs and (b) they keep us informed about changes in the atmosphere that should be incorporated into our atmospheric models. Several team members also mentioned the need to obtain existing or planned aircraft and balloon data for algorithm validation.

Daniel Jacob showed some of his modelling activities in the arena of

regional ozone episodes and indicated that the transects that TES will provide in its Intensive Campaign mode will generate valuable inputs both to calibrate the existing GCM's and future assimilation models. It was agreed that we should map potential swaths and footprints against existing data such as Jack Fishman's tropospheric ozone maps to give us a better feel for coverage and sensitivity requirements (re-visit time and ground-track spacing is an issue).

One of the matters arising out of Graham Bothwell's data system studies was the recognition that a subset (about 10%) of the TES data will need to be processed as "Special Products" on a TES-dedicated computing facility. It was agreed that the best way to address this was to set up a central facility at JPL with high-speed (T1?) links to each co-investigator site where the Co-Investigator's would also have some local workstation-level capability (the ATMOS approach). The importance of this decision is that such facilities must be costed for the CDCR. Similarly, it is important that we soon have better estimates of the computing power we shall require of EOSDIS for the Standard Product generation. Current guesses approach 10 GFLOPS but the credibility of this estimate is questionable. The urgency stems from the fact that EOSDIS is being designed right now and we need to be certain that whatever system emerges will fulfill our needs.

The final major topic was a detailed review and criticism of the first six sections of the recently-issued *Scientific Objectives, Goals & Requirements* document. Some portions engendered considerable discussion and debate. The changes and promised revised inputs will be incorporated at the next revision (Version 3.1).

It was tentatively agreed that the next meeting would be held at JPL on Sept 9 and 10 1991, immediately preceding the International Workshop on Fourier Transform Spectrometry from Space (Sept 11 - 13, 1991). This will make for a busy week but does reduce the amount of traveling for those planning to attend both meetings.

Reinhard Beer
TES Principal Investigator
Jet Propulsion Laboratory

U.S. ASTER Team Meeting

The U.S. ASTER team held a meeting at JPL on March 19-20, 1991 to prepare for the International ASTER team meeting in Tokyo scheduled for May 15-17, 1991. In addition to U.S. ASTER team members and associates, personnel attended from EROS Data Center and GSFC. Discussion topics included data processing responsibilities, ground data system and operations concepts, instrument calibration, supporting aircraft data needs, roles and responsibilities within the international team, and last but not least, budgets.

An ASTER instrument steering committee has been formed, with working groups chaired jointly by Japanese and U.S. team member or associates. These working groups and their U.S. chairpersons are:

Registration	Dr. Hugh Kieffer
Calibration & Validation	Dr. Phil Slater
Atmospheric Correction	Mr. Frank Palluconi
Digital Elevation Models	Dr. Dave Pieri
Temperature - Emissivity	Dr. Alan Gillespie
Operation/Mission Planning	Mr. Jim Weiss
Data Receiving, Processing & Archiving	Mr. Graham Bothwell
Airborn Sensor	Dr. Simon Hook
Geology, Soil, Volcanology & Paleoclimatology	Dr. Laurence Rowan
Petroleum Geology	Dr. Harold Lang
Geology of Mineral Deposits	Mr. Michael Abrams
Oceanography & Limnology	Dr. Anne Kahle
Ecosystem Change/Land Surface Climatology	Dr. Tom Schmugge

Selection of Japanese chairpersons is being finalized.

In addition, a U.S. ASTER team member has been selected as a representative to each EOS Interdisciplinary Science team, and will be contacting the IDS team shortly. Lists of these reps can be obtained from the U.S. ASTER team leader, Anne Kahle at Jet Propulsion Laboratory, Mail Stop 183-501, 4800 Oak Grove Drive, Pasadena, CA 91109; Phone (818)354-7265; FAX (818)792-0966.

The next team meeting is scheduled for May 15-17, 1991 in Tokyo, Japan.

Anne Kahle
U.S. Aster Team Leader

Jim Weiss
Chair, Operation/Mission Planning

EOSDIS Version 0 Workshop

An Earth Observing System Data and Information System (EOSDIS) Version 0 (V0) Workshop was held at the Marriott Hotel in Greenbelt, Maryland, on February 26-28, 1991. The first day of the workshop was an open meeting, and was attended by EOSDIS participants and industry representatives. The open meeting was intended to provide a high-level overview of the V0 effort, and to present the status of current V0 tasks. The second and third days consisted of closed working sessions concentrating on the V0 management issues and system engineering activities, and were open to V0 participants only.

The first portion of the open meeting included Project-oriented presentations. Tom Taylor, EOS Ground System and Operations Project Manager, and H.K. Ramapriyan, EOS Ground System and Operations Deputy Project Manager, opened the meeting and discussed V0's relationship to the overall EOSDIS effort. Dixon Butler, from NASA Headquarters, provided a NASA Headquarters perspective of V0 activities.

The second portion of the open meeting described science- related activities at all levels. Among the topics discussed were V0 data plan development, pathfinder data set activities, and Distributed Active Archive Center (DAAC) science activities. Presenters were drawn from NASA Headquarters, the EOSDIS Project Office, and each DAAC.

The final portion of the open meeting focused on V0 systems-related activities. The current status and goals of the system-level tasks were presented by Gail McConaughy, the V0 Systems Engineering Manager, and the system-level task managers. A representative from each DAAC outlined their unique V0 activities. At the conclusion of the meeting, a question and answer period was provided for industry representatives.

The closed sessions focused on management and system engineering activities, allowing the principal participants in the V0 effort to "roll up their sleeves" and address critical issues. The sessions were structured into splinter or working group meetings for key representatives, with plenary sessions for all attendees to summarize activities and address issues of broader concern. On the first day, the session was broken into three splinter groups:

→ Data Panel/Management Working Group: This meeting, co-chaired by Jeff Dozier, the EOS Project Scientist, and H.K. Ramapriyan, was designed to facilitate communication between the EOSDIS Project, DAAC Project Managers/Scientists, and the EOSDIS Advisory Panel (Data Panel).

→ System Engineering Working Group: This meeting, chaired by Gail McConaughy, provided an opportunity to discuss the status of current system-level tasks, review previous action items, and identify issues to be raised to the management/data panel working group. An overview and status of the V0 Networks task, including candidate network architectures, was presented by Dave Peters and Todd Butler from the Data Systems Technology Division (GSFC Code 520).

→ Affiliated Data Centers (ADCs)/International Partners (IPs) Working Group: Paul Hwang, the Science Data and Interface Manager, chaired this "get acquainted" session to allow the ADCs and IPs to become more familiar with each other and the EOSDIS V0 effort.

The final day was also broken into splinter sessions. System engineering working groups included a networks splinter group, an information management system prototyping group, and a data formats splinter group. Each splinter group addressed very specific issues and activities related to their task. The management working group met with the ADC/IP representatives to discuss ADC activities and concerns.

The meeting report for the EOSDIS V0 Workshop is broken into two packages - one for the open session and another for the closed sessions. Copies of the meeting report packages, which include detailed minutes, copies of all presentation materials, and a list of registered attendees, can be obtained through the GSFC EOS Library.

Terri Wolfrom
EOSDIS Project Support Office
Computer Technology Associates, Inc.

NOAA BEGINS EARLY EOSDIS ACTIVITIES

*[The following articles were reprinted, with permission, from the **Earth System Monitor**, September 1990 issue — the "NOAA Begins Early EOSDIS Activities" article was the first in a series of articles on NOAA's evolving role in EOSDIS.]*

NOAA participation in EOSDIS —Earth Observing System (EOS) Data and Information System — started with the signing in July 1989 of a Memorandum of Understanding (MOU) between NOAA and NASA that provides the framework from which the two agencies will build a cooperative program in Earth system science data management. A major objective of the MOU is to provide rapid data access between each agency's Earth observation programs — principally NASA's EOS mission (and possible others) and NOAA's operational satellite and in situ data collection systems. For NOAA this will involve the definition, development, and implementation of: catalog, directory, and inventory information (metadata) for NOAA data sets; near real-time access to selected EOS instrument data; an operational active archive for NOAA satellite data; and long-term active archive responsibilities for selected oceanic and atmospheric EOS data sets.

EOS is planned as a series of six large low-altitude polar orbiting platforms with EOS-A scheduled for launch in 1998. NASA's goal is to build an integrated data and information system that will place unprecedented focus on end-to-end information flow and data management of remotely sensed Earth observations. The EOS mission is being designed to observe and study the Earth as a complete system with concurrent observations from as many as 16 instruments. EOSDIS will include spacecraft command and control, data processing, archival, user services, and distribution functions.

A major goal of EOSDIS is to provide a user friendly system that will facilitate and encourage multidisciplinary and interdisciplinary research. To achieve this, the EOSDIS architecture will be highly-distributed to take advantage of existing institutional science expertise and data systems facilities. NASA has called these facilities DAACs — Distributed Active Archive Centers, of which there are presently seven: Goddard Space Flight Center, Langley Reserach Center, Marshall Space Flight Center, EROS Data Center, Alaska SAR Facility, National Snow and Ice Data Center, and Jet Propulsion Laboratory.

Although the launch of EOS-A is eight years away, NASA is busy moving forward with the development of EOSDIS. Two parallel Phase B studies (detailed design concepts) were completed this past April and a Request-For-Procurement for Phase C/D (final design and deployment) is scheduled for release to industry in mid-1991.

Teams are currently being formed to provide definition and implementation planning for Early-EOSDIS program development. Early-EOSDIS will be a series of phases that will feature bottom-up, "build-a-little, test-a-little," development and prototyping that are expected to be transition to, and carried forward by, the Phase C/D contractor who should on onboard by mid-1992. An important data in all this phasing is 1994. At that time, NASA expects to have a working prototype system that will demonstrate initial EOSDIS functionality — at all of the DAACs.

Early-EOSDIS development has provided an excellent starting point for defining the work needed to develop NOAA-NASA data systems interoperability. NOAA is participating in NASA working groups that are focusing on the 1994 milestone. The major activities that NOAA will participate in are intra-DAAC networking, catalog interoperability, standards, and experimental browse.

Plans are being formulated whereby NOAA facilities, principally its national data centers and selected operational centers, will be participating, as affiliated DAACs in the 1994 phase of Early-EOSDIS. Indeed, NOAA has already been active in many of the Early-EOSDIS activities, especially standards and catalogs, as reported in the first issue of Earth System Monitor (June 1990).

Another area of EOSDIS participation by NOAA has become known as Pathfinder data sets. Pathfinder data sets have large data volumes and long time-series, and are critical to global change science. They are also critical to NASA's EOSDIS program development. To date, only NOAA operational satellite data have been identified as Pathfinder data. NOAA in situ data will eventually be added to this effort. NASA and NOAA are nearing completion of an agreement in which Pathfinder data will go through a two-step process: first, the data will be migrated to new working storage media (perhaps optical) which will facilitate easy access and encourage global change investigations;

second, NOAA/NASA science working groups will decide on algorithms and product generation, with the goal of producing research-quality, climate-related data sets, such as global sea-surface temperature, vegetation index, Earth radiation budget, cloudiness, atmospheric temperature, water vapor, winds, and aerosols.

The ocean and atmospheric instruments planned for EOS-A will generate in a day what one current NOAA polar orbiting satellite produces in 50 days. Yet the success of EOSDIS will not be measured by the billions of information bytes that flow, but by the productivity of the researchers using the system, which is why NOAA's participation in Early-EOSDIS embodies two necessary requirements for global change science-efficient access to the data, and the production of quality data.

Arthur Booth
Program Manager
NOAA/NESDIS

Interagency Working Group on Data Management for Global Change

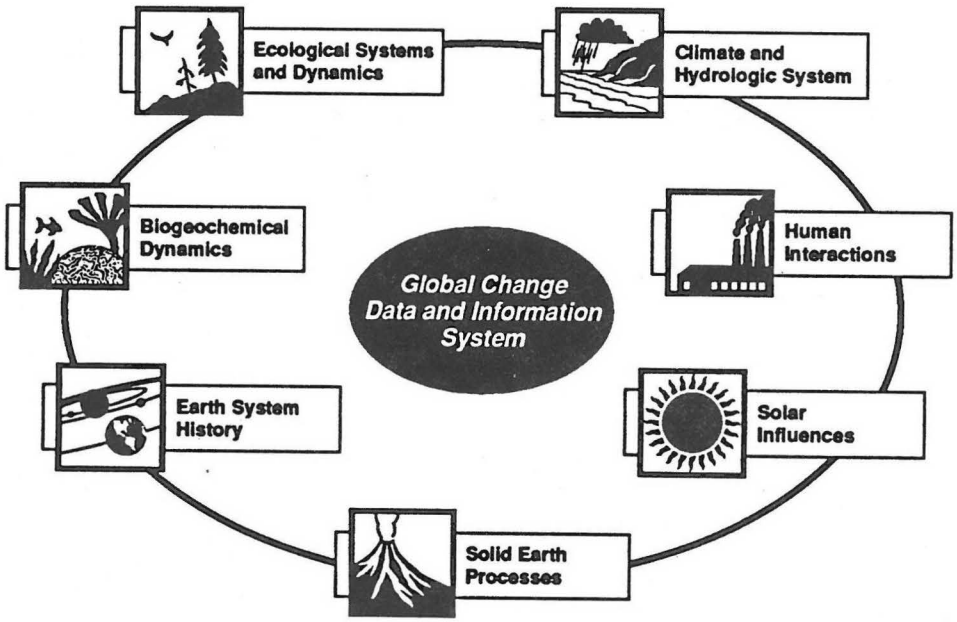
The Interagency Working Group on Data Management for Global Change (IWGDMGC) was organized to coordinate development and implementation of a data and information system to support global change research. The Group has been meeting since June 1987. Initial participants were NOAA, NASA, the National Science Foundation, and the U.S. Geological Survey. Since then, interest in the IWGDMGC has expanded, and participants now also include the Department of Energy, U.S. Department of Agriculture, Environmental Protection Agency, Department of State, U.S. Navy, National Archives and Records Administration, and Bureau of Reclamation.

Thomas N. Pyke, Jr., Assistant Administrator for Satellite and Information Services, is NOAA's principal representative and functions as the IWGDMGC Chair. Kenneth Hadeen (Director, National Climatic Data Center), Gregory Withee (Director, National Oceanographic Data Center) and Gerald Barton (National Oceanographic Data Center), work on the Contacts level of the Working Group.

The Working Group's charge is to make it as easy as possible for scientists and others to locate and obtain data needed for studies of global change. The Group's goal is to develop by 1995 a national global change data and information system that is consistent across agencies and involves and supports the university and other user communities.

The Working Group is approaching data management problems via a number of activities such as:

- improving interconnectivity and interoperability among existing agency data systems;



- assembling data and information requirements and developing standards for quality control and confidence limits;
- defining requirements for data providers such as documentation standards; and
- fostering international data exchange.

Completed and ongoing projects of the IWGDMGC include:

- the Global Change Master Director, an on-line computer system for finding global change data sets;
- the Arctic Data Interactive, a CD-ROM that holds a directory of Arctic data, as well as selected Arctic data sets, publications, bibliographies, and images (in preparation);
- the Forum on Data Management for Global Change, a workshop held in Baltimore in 1988 that focused on data management requirements, issues, and problems;
- *U.S. Strategy for Global Change Data and Information Management*, A Report by the Committee on Geophysical Data of the National Research Council (planned for late 1990 publication);
- input to the Data Management sections of the FY 90 and FY 91 Global Change Research Plans prepared by the Committee on Earth and Environmental Sciences, and
- recommendations for the U.S. Data Management Policy.

The IWGDMGC works closely with the Committee on Earth and Environmental Sciences (CEES), which is responsible for the U.S. Global Change Research Program (GCRP). The CEES is a committee of the President's Federal Coordinating Council for Science, Engineering, and Technology. The CEES has divided the GCRP into seven science elements: Ecological Systems and Dynamics, Climate and Hydrologic Systems, Human Interactions, Solar Influences, Solid Earth Processes, Earth System History, and Biogeochemical Dynamics. The IWGDMGC is concerned with data management for these science elements because the data provide the foundation for global change research. The Working Group believes that data management practices instituted now will benefit global change research far into the next century.

For more information on the IWGDMGC contact Gerry Barton, National Oceanographic Data Center, 1825 Connecticut Avenue, N.W., Washington, D.C. 20235; (202) 673-5548; G.BARTON (OMNET); GBARTON (NESDIS Telemail); NODC::BARTON (SPAN).

Gerald Barton
National Oceanographic Data Center
NOAA/NESDIS

EOS Off-Site Project Science Library

Documents, viewgraphs and other reference works are available for use by interested EOS scientists, investigators and contractors in the EOS Project Science Library, located at the ST Systems Corporation (STX) office at 7601 Ora Glen Drive, Suite 300, Greenbelt, Maryland. Some of the information you may find helpful at the STX location are:

- Copies of the original Interdisciplinary Proposals
- Copies of the original Phase C/D Facility Instrument Proposals (with exceptions)
- A wide selection of viewgraphs for all disciplines
- Assorted documents and science magazines

Access to the library can be arranged by calling Charlotte Griner at (301) 286-3411, Debra Tighe at (301) 513-1614, or Linda Carter at (301) 513-1613. Library hours are 8:30 a.m. - 5:30 p.m., Monday - Friday. Library materials are the property of NASA/Goddard Space Fight Center and may be borrowed if needed. If you need document copies, they may be on-hand, or will be made as needed, with permission from the EOS Project Science Office, Code 900.

GLOBAL CHANGE MEETINGS

April 29-May 2	Eighth Thematic Conference on Geologic Remote Sensing: *Exploration, Engineering, and Environment*, Denver, Colorado. Contact Nancy Wallman, ERIM, (313) 994-1200, extension 3234, FAX (313) 994-5123.
May 11-12	*Local and Global Impacts of Monitoring the Urban Oceans*, Workshop at the Catalina Island Marine Science Center. Sponsored by the Los Angeles section of Marine Technology Society. For information contact Sam Kelly, (714) 758-3338, FAX (714) 758-3222.
May 13-17	Seventh Catalog Interoperability Workshop, Annapolis, Maryland. Contact Janis Shipe (301) 513-1688 or on NSSDCA::SHIPE or contact Jim Thieman at (301) 286-9790 or on NSSDCA::THIEMAN.
June 4-6	Fourth Annual Geographic Information Systems Conference, Towson State University, Towson, Maryland. For information call Dr. John M. Morgan III at (301) 830-3126. For registration, lodging or travel information contact the College of Continuing Studies at (301) 830-3126; FAX (301) 830-2006.
October 6-11	*NATO Advanced Research Workshop on the Atmospheric Methane Cycle: Sources, Sinks, Distributions and Role in Global Change*, Portland, Oregon. Contact the Workshop Director: Prof. M.A.K. Khalil, Oregon Graduate Institute, Beaverton, Oregon 97006; phone (503) 690-1078; FAX (503) 690-1029.
October 22-23	Third Annual Conference: *Earth Observations and Global Change Decision Making: A National Partnership*, National Press Club, Washington, D.C. Contact Dr. Robert H. Rogers, ERIM, Box 8618, Ann Arbor, Michigan 48107-8618; phone (313) 994-1200, extension 3234; FAX (313) 994-5123.
1992	
November 2-6	Sixth Australasian Remote Sensing Conference, *Remote Sensing and Spatial Information: the Functions...the Payback...the Future*, Michael Fowler Centre, Wellington, New Zealand. Contact Stella Belliss, DSIR Physical Sciences, P.O. Box 31-311, Lower Hutt, New Zealand. Telephone 64(4)666-919, extension 8693, FAX 64(4)690-067.

FUTURE EOS SCIENCE MEETINGS

June (TBD)	AIRS Team Meeting, East Coast. Contact H.H. Aumann at (818) 584-2934.
July 15-17	LAWS Science Team, Aspen, Colorado. Contact Wayman Baker at (301) 763-8005.
July 22-26	*Science Foundations for the EOS Era: Physical Climate and Hydrology*, Earth System Science Center, 248 Deike Building, The Pennsylvania State University, University Park, Pennsylvania. Contact Eric Barron at (814) 865-1073.
August 28-30	EOS IWG Meeting, University of Washington, Seattle, Washington.
September 9-10	TES Team Meeting at JPL. Contact Reinhard Beer at (818) 354-4748.
October (TBD)	MODIS Team Meeting. Contact Locke Stuart at (301) 286-5411.
October 22-25	ALT Team Meeting (TOPEX), Paris, France, Contact Lee-Leung Fu at (818) 354-8167.
Late Summer/ Early Fall	EOS Oceans Panel Topical Science Meeting on Air/Sea Interactions. Contact Mark Abbott, (503) 737-4045.

EOS SCIENCE MEETINGS for MAY 1991

Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
		1	2	3	4 5
	← CERES Conceptual Design Review & 5th CERES Science Team Meeting, LaRC →				
6	7	8	9	10	11 12
13 UARS Science Mtg. Wash., D.C. ← →	14 ← GLRS Team Mtg., GSFC →	15 ← ASTER Team Meeting, Japan →	16	17	18 19
20	21	22	23	24	25 26
27	28	29 ← EOS SAR Meeting, Bergen, Norway →	30	31	

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