The Earth Observer

An EOS Periodical of Timely News and Events

Vol. 3, No. 4 May/June 1991

EDITOR'S CORNER

Shortly after July 7, when the Senate returns from its July 4 recess, the Subcommittee on HUD, VA, and Independent Agencies will mark up the NASA FY 1992 appropriations bill. The Subcommittee will be working from a House-passed appropriations bill for NASA, which freezes the NASA budget at the FY 1991 level. For space science, the FY 1991 level is approximately $500 million short of the requested FY 1992 level; if sustained in the Senate, this will result in cancellations and delays to the major space science missions: AXAF, CRAF/Cassini, and EOS.

The House had a major battle over the Space Station. The House Subcommittee on HUD, VA, and Independent Agencies canceled Space Station, but were defeated on the House floor. The Subcommittee's proposed budget was replaced by a budget frozen at the FY 1991 level in order to provide nearly full funding for Station.

The House, by an overwhelming majority, has provided funding for Station, and Senator Mikulski, the Chairman of the Senate HUD, VA, and Independent Agencies Subcommittee, has committed herself publicly to funding Station. Any appropriations bill prepared by the Senate Subcommittee will certainly contain funding for Station. The Station is no longer an issue.

The issue now is whether additional funding for NASA can be found, above a freeze level, in order to repair the damage to the House-passed appropriations for space science.

A budget frozen at the FY 1991 level will set back the space science program many years. It will (i) disrupt the Great Observatory program with a delay or cancellation of AXAF, (ii) disrupt the exploration of the planets with a delay or cancellation of Cassini to Saturn and CRAF to a comet, and/or (iii) disrupt the efforts to understand how the human species is affecting our planet Earth with a delay or cancellation of the Earth Observing System.

Sufficient funds need to be found for space science in FY 1992, above the FY 1991 freeze level, so that each of these major space science missions can be preserved, and so that each can make progress towards its launch.

Space science is the fulcrum about which the entire civil space program revolves, and its funding needs to be protected. The Augustine Committee argued that space science warrants the highest priority and that the space program needs to be balanced. The House-passed freeze budget provides for Space Station, but is severely deficient for space science. Adequate funding needs to be found for both the Space Station and for the unmanned space science program.

Dorothy Zukor
EOS Project Science Office Manager

Investigators Elected AGU Fellows

Among the 26 distinguished scientists elected as 1991 Fellows of the American Geophysical Union (AGU) are three EOS Investigators, as announced in the May 7, 1991 issue of *Eos, Transactions of the American Geophysical Union*. Election to Fellowship in AGU is based on the individual's attaining acknowledged eminence in a branch of geophysics. The number of Fellows elected annually is limited to no more than 0.1% of the AGU membership. The three new Fellows who are EOS investigators are:

Charles R. Bentley
Univ. of Wisconsin, Madison
"For lasting contributions to glaciology and solid-Earth geophysics, especially in elucidating the structure of the Antarctic continent and physical properties of the Antarctic Ice Sheet." Dr. Bentley is a Team Member on the Geoscience Laser Ranging System (GLRS).

Jeff Dozier
Univ. of California, Santa Barbara
"For innovative contributions to remote sensing of snow and ice in alpine environments, snow hydrology, and snow chemistry." Dr. Dozier is an Interdisciplinary P.I., a Team Member on the High Resolution Imaging Spectrometer (HIRIS), and the EOS Project Scientist.

Jean-Louis Le Mouël
Institut de Physique du Globe de Paris
"For outstanding contributions to all aspects of geomagnetism and electromagnetism, both observational and theoretical, including the discovery of geomagnetic jerks and new insights on core motions." Le Mouël is a co-investigator on the Geomagnetic Observing System (GOS).

Thirty-five EOS investigators, panel members, or administrative personnel are already AGU Fellows: David Atlas, George E. Backus, William R. Bandeen, Francis P. Bretherton, Peter G. Brewer, Wilfried H. Brutsaert, Paul J. Crutzen, Robert E. Dickinson, Thomas Dunne, Peter S. Eagleson, Lennard A. Fisk, Bradford H. Hager, W. B. Hanson, James R. Heirtzler, James R. Holton, Bryan L. Isacks, David S. Johnson, Joseph Kaplan, Michael C. Kelley, Hugh H. Kieffer, Robert A. Langel, Jean-Bernard Minster, Pearn P. Niiler, James J. O'Brien, Ronald G. Prinn, Richard H. Rapp, Raymond G. Roble, David E. Smith, Susan Solomon, Masahisa Sugiura, Byron D. Tapley, John Wahr, John Wallace, Steven C. Wofsy, David Woolhiser, and Carl I. Wunsch.

ISPRS Young Authors Awards

The success of the International Society for Photogrammetry and Remote Sensing's (ISPRS) XVI Quadrennial Congress in Kyoto, Japan, in 1988 has inspired the Japan Society of Photogrammetry and Remote Sensing to donate 10,000 Swiss Francs as a contribution to the activities of ISPRS.

The ISPRS Council, welcoming the creative Japan Society donation, has determined that this money should be awarded in the form of travel subsidies to encourage young authors to participate in the 17th ISPRS Congress in Washington, D.C., U.S.A., August 2-14, 1992. Awards for 2,500 SFr each (about $1,750 U.S. dollars) are to be given to four individuals (not joint authors) whose submitted papers are judged to be the best. These individuals must be 35 years of age or younger on August 2, 1992. The Council will complete its judgments in time to offer the travel subsidies to the four winning young authors prior to the 17th Congress.

To be considered for the awards, authors must request and submit a completed Form for Abstracts to receive an ISPRS Congress Author's Kit. The Form for Abstracts must be submitted by November 30, 1991. In order for the judges to have the time needed for reviews and decisions, a special Congress submission date of February 15, 1992 will apply for the final version of the paper. At that time, an additional copy of the final paper, together with evidence of birth date, must be submitted to the ISPRS President, Prof. Dr. Kennert Torlegard, who will coordinate the judging of the paper.

Results of the judging will be announced by May 15, 1992 — authors will be informed immediately. The winners of the travel subsidies will be expected to present their papers at either a technical or poster session at the Congress.

Vincent Salomonson, President of the American Society for Photogrammetry and Remote Sensing (ASPRS), said, "In 1992, for the first time in 40 years, the United States will be hosting the Quadrennial Congress of the International Society for Photogrammetry and Remote Sensing. I hope that all American professionals associated with the Society's disciplines will plan to participate. I know that impressive work has been done by many of our younger members since the last Congress in Kyoto, Japan, and I strongly encourage them to strive for the "Young Authors' Awards offered by the ISPRS."

To receive a Form for Abstracts for submission by November 30, 1991, send your request to:

American Society for Photogrammetry
and Remote Sensing
5410 Grosvenor Lane
Suite 210
Bethesda, Maryland 20814-2160.

Graduate Student Fellowships

After a detailed review process, 60 individuals were chosen to receive NASA Graduate Student Fellowships in Global Change Research for the 1991-92 academic year. NASA Headquarters received 379 proposals in response to an announcement sent out in January 1991, and further publicized in the February issue of *The Earth Observer*, soliciting applications from students pursuing doctoral degrees in disciplines pertinent to Earth system science. 36 fellowships were continued from last year's recipients, bringing the total number of students participating in the program to 96. Research to date has been deemed excellent by academic advisors and impartial evaluators, with the only casualty from the 1990 class beset by the trauma of graduation.

The candidates for the 1991 class represented over 135 universities and educational institutions from 45 states and 32 countries. As stipulated in the fellowship guidelines, all interested parties are currently accepted or already enrolled in full-time Ph.D. programs at accredited U.S. universities or other institutions of higher education.

Applications were evaluated through a two-step peer review process mail review and panel evaluations. The former weaned out deficient proposals by assessing the calibre of student, quality of research, and relevance to the U.S. Global Change Research Program. Those applications that passed this initial screening were then evaluated by a panel composed of members of professional scientific societies, academic institutions, NASA Centers, and the Educational Affairs and Earth Science and Applications Divisions of NASA Headquarters. Applications were considered for research on global biogeochemical cycles, radiation and physical climate interactions, the hydrological cycle, and solid Earth processes. Atmospheric and ocean physics, chemistry and biology, ecosystem dynamics, soil science, geology, geophysics, and cryospheric processes were also acceptable areas of concentration provided that the student indicated an adequate link to NASA global change research in the application.

This year's review proved especially difficult because of the high number of extremely qualified applicants and the increased visibility that this program has achieved within the academic community.

The research topics of the 60 new fellows fall into five basic categories: Biogeochemical Dynamics, Climate and Hydrological Systems, Data and Information Systems, Ecological Systems and Dynamics, and Solid Earth Processes. See the adjacent table for a listing of the 1991 recipients, their respective citizenships, the institutions where they will be pursuing their degrees, and abbreviated titles of the accepted proposals. In all, the new fellows represent 37 academic institutions from 23 states and 12 countries.

The Global Change Fellowship Program was created to provide the financial wherewithal for graduate students to pursue advanced degrees in the Earth sciences. As such, the program trains a pool of scientists to help analyze and interpret the wealth of data generated during the Earth Observing System (EOS) era-an integral element of the overarching, multi-agency U.S. Global Change Research Program. Initiated in 1990, the fellowship program was originally envisioned to scale-up-to fund 150 graduate students prior to the launch of the first EOS platform, and to remain at that level during the life of the EOS mission. Due to the overwhelming response over its first 2 years, the program has already achieved 65 percent of this commitment, firmly ensconsing itself in the EOS program by providing the necessary talent to further Earth system science objectives.

An announcement for the 1992 Global Change Fellowships will be released in December 1991, both as an information packet and as an article in *The Earth Observer*. Interested graduate students who would like additional information about the program, such as amount of the grant, progress reports, the role of the faculty advisor, etc., should contact the Earth Science Support Office at (202) 479-0360 for a copy of the 1991 EOS Reference Handbook. Specific questions about the fellowship program should be directed to Dr. Ghassem Asrar, NASA Headquarters, Mail Code SE, Washington, D.C. 20546.

David Jon Dokken
Althea Randall
Earth Science Support Office

1991 Global Change Fellowship Recipients

Student Name	Student Institution	Country	Keyword	Title
Avallone, Linnea Marie	Harvard University	USA	BIOGEOCHEMICAL DYNAMICS	High Pressure and Low Temperature Dynamics of Chlorine and Bromine Species
Bac, Margaret Golan	Stanford University	USA	BIOGEOCHEMICAL DYNAMICS	Molecular and Isotopic Characteristics of Oceanic Carbon: Implications for Global Variability of Atmospheric and Oceanic C02
Barnard, Andrew Heath	Oregon State University	USA	BIOGEOCHEMICAL DYNAMICS	Role of Southern Oceans in CO2 Cycle
Chen, Li	University of Colorado	China	BIOGEOCHEMICAL DYNAMICS	Study of Ozone Response to Solar UV Variation over 27 Days Using a 2D Chemical-Radiative-Dynamical Model
Cochran, Montgomery Ford	Yale University	USA	BIOGEOCHEMICAL DYNAMICS	Weathering, Plants, and the Geochemical Carbon Cycle
Cox, B. Lea	University of California	USA	BIOGEOCHEMICAL DYNAMICS	Microbial Ecology of Methane Oxidation in Semi-Arid Soils: Implications for Global Biogeochemical Models of Trace Gas Fluxes
Dessler, Andrew Emory	Harvard University	USA	BIOGEOCHEMICAL DYNAMICS	Participation in Second NASA Airborne Arctic Stratospheric Experiment
Donoghue, Cynthia R.	University of Virginia	USA	BIOGEOCHEMICAL DYNAMICS	Stable Isotope Analysis of Particulate and Trace Gases from Biomass Burning Emissions in Southern Hemisphere Africa and Central Brazil: Source of the Ozone
Harrison, Kevin Gever	Columbia University	USA	BIOGEOCHEMICAL DYNAMICS	The Effects of Changing Land Use on Organic Carbon and Nitrogen Storage in Mid-Latitude North American Soil and Rice Paddies
Marti, James Joseph	University of Minnesota	USA	BIOGEOCHEMICAL DYNAMICS	Role of Polar Stratospheric Cloud in Antarctic Ozone Depletion
Mote, Philip W.	University of Washington	USA	BIOGEOCHEMICAL DYNAMICS	Assessing the Stratospheric Water Vapor Using NCAR 3-D Model
Nobre, Antonio Donato	University of New Hampshire	Brazil	BIOGEOCHEMICAL DYNAMICS	Are Tropical Forests and Deforestation Primary Sources of Increasing Global Atmospheric Nitrous Oxide? Measuring and Modeling Biospheric Sources of Atmospheric N2O
Pehkonen, Simo Olavi	California Institute of Technology	Finland	BIOGEOCHEMICAL DYNAMICS	The Speciation of Iron in Marine Atmospheres
Plotkin, Beth Michelle	University of Washington	USA	BIOGEOCHEMICAL DYNAMICS	Modeling OH Field Using 14CO and CO Data
Shackelford, Christie Jean	Georgia Technical Research Institute	USA	BIOGEOCHEMICAL DYNAMICS	Photophysics and Photochemistry of the Nitrate Radical
Tabazadeh, Azadeh	University of California, Los Angeles	USA	BIOGEOCHEMICAL DYNAMICS	A Proposal to Study the Contribution of Heterogeneous Chemical Processes to Global Change
Toolan, Tara	Harvard University	USA	BIOGEOCHEMICAL DYNAMICS	Quantification of Biological Utilization of Dissolved Organic Matter
Torn, Margaret Susan	University of California, Berkeley	USA	BIOGEOCHEMICAL DYNAMICS	Environmental Controls over Methane Flux from Natural Ecosystems
Townsend, Alan Ronald	Stanford University	USA	BIOGEOCHEMICAL DYNAMICS	Responses of Soil Organic Materials to Changes in Temperature
Young, Jennifer Lynn	University of Washington	USA	BIOGEOCHEMICAL DYNAMICS	234Th as a Tracer of New Production in the Central Equatorial Pacific

1991 Global Change Fellowship Recipients

Student Name	Student Institution	Country	Keyword	Title
Bao, Jian Wen	Pennsylvania State University	China	CLIMATE & HYDROLOGIC SYSTEMS	Four-Dimensional Data Assimilation Using the Adjoint Method
Beegle, Cynthia Juyne	University of Washington	USA	CLIMATE & HYDROLOGIC SYSTEMS	The Decadel Circulation of the Pacific Ocean as Elucidated by Chlorofluorocarbons
Breitenberger, Eric	University of Alaska, Fairbanks	USA	CLIMATE & HYDROLOGIC SYSTEMS	Sea Ice and its Relationship with Atmospheric Circulation
Chu, Shaoping	Rice University	China	CLIMATE & HYDROLOGIC SYSTEMS	Atmosphere-Sea-Ice-Ocean Interactions and Climate Change
Eltahir, Elfaith A.B.	Massachusetts Institute of Technology	Sudan	CLIMATE & HYDROLOGIC SYSTEMS	Precipitation Recycling and Sensitivity of Regional Climate in the Amazon Basin
Gao, Xiaogang	University of Arizona	China	CLIMATE & HYDROLOGIC SYSTEMS	Parametrizing Land-Surface Hydrologic Processes up to GCM's Scale
Greenwald, Thomas Joseph	Colorado State University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Cloud Radiative Effects and Their Role in Global Climate
Hughes, Marilyn Ginberg	Rutgers University	USA	CLIMATE & HYDROLOGIC SYSTEMS	The Use of Snow Cover as an Indicator of Anthropogenic Climate Change
Klein, Andrew George	Cornell University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Modern Snowlines in the Central Andes: Indicators of Climate/Topography Interactions
Kumar, Praveen	University of Minnesota	India	CLIMATE & HYDROLOGIC SYSTEMS	Scale Invariance of Remotely Sensed Hydrologic Fluxes: Theoretical Developments and Role in Global Climate Change Research
Kwiatkowski, John Martin	Michigan Technological University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Applications of Polarimetric Radar in Coherent Imaging of Earth and Remote Sensing of Precipitation
Landsea, Christopher W.	Colorado State University	USA	CLIMATE & HYDROLOGIC SYSTEMS	A Study of Interannual and Interdecadal Fluctuations of Hurricanes
Lin, Dah-Syang	Princeton University	Taiwan	CLIMATE & HYDROLOGIC SYSTEMS	Active Microwave Remote Sensing of Surface Soil Moisture and Its Applications to Land-Atmospheric Modeling
Lofgren, Brent Melvin	Princeton University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Assessing Potential Feedbacks Among Soil Moisture, Surface Albedo, and Climate
Mantua, Nathan John	University of Washington	USA	CLIMATE & HYDROLOGIC SYSTEMS	The Influence of Basic States on the Behavior of a Tropical Coupled Ocean-Atmosphere Model with Emphasis on ENSO Predictability
Maslowski, Wieslaw	University of Alaska, Fairbanks	Poland	CLIMATE & HYDROLOGIC SYSTEMS	Three Dimensional Numerical Modeling of the Marginal Ice Edge Zone of the Greenland Sea
Norris, Joel Roland	University of Washington	USA	CLIMATE & HYDROLOGIC SYSTEMS	Role of Clouds in Perturbations of Climate System
Pincus, Robert M.	University of Washington	USA	CLIMATE & HYDROLOGIC SYSTEMS	An Investigation of Marine Stratocumulus Breakup Using Satellite Observations
Porter, John Nolan	University of Hawaii, Manoa	USA	CLIMATE & HYDROLOGIC SYSTEMS	AVHRR-Derived Marine Aerosol Measurements: Validations and Improvements
Qualls, Russell James	Cornell University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Determining the Dependency of Sensible Heat Flux on Surface Temperature and Soil Moisture
Stephens, Catherine Anne	Florida State University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Sea-Surface Stress Maps and SST
Vogelmann, Andrew Mark	Pennsylvania State University	USA	CLIMATE & HYDROLOGIC SYSTEMS	Cirrus Cloud Radiative Modeling

1991 Global Change Fellowship Recipients

Student Name	Student Institution	Country	Keyword	Title
Qian, Yong	University of Maryland	China	DATA & INFORMATION SYSTEMS	Exploitation of the Potential Computing Capabilities of Climate Models on a Massively Parallel Computer
Bassow, Susan Lynn	Harvard University	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Dynamic Interaction Between Forest and Atmosphere
Brown, Daniel George	University of North Carolina	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Stress, Disturbance, and Climatic Sensitivities Affecting the Pattern of Vegetation at Alpine Treeline
Cross, Anne Fernald	Duke University	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Biogeochemistry at the Desert Grassland-Desert Shrubland Boundary: A Case Study of Regional Desertification
Decker, Mary Beth	University of California, Irvine	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Ecology of High Latitude Marine Birds in Relation to Variations in Oceanographic and Climatic Processes
Fuller, Douglas Orison	University of Maryland	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Remote Sensing of Vegetation Phenology as an Indicator of Global Change
Hartley, Anne Elizabeth	Duke University	USA	ECOLOGICAL SYSTEMS & DYNAMICS	An Arid Ecosystem Processes Model for Studying Desertification
Jakubauskas, Mark Edward	University of Kansas	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Landscape-Scale Vegetation Dynamics
Leadley, Paul W.	San Diego State University	USA	ECOLOGICAL SYSTEMS & DYNAMICS	Response of Arctic Vegetation to Global Change
Luque, Sandra Silvia	Cook College	Argentina	ECOLOGICAL SYSTEMS & DYNAMICS	Temporal Changes in Landscape Patterns and Conditions and their Relation with Human Impact and Natural Disturbances
Waelbroeck, Claire	University of California, Santa Barbara	Belgium	ECOLOGICAL SYSTEMS & DYNAMICS	A Model of the C02 Exchanges Between Biosphere and Atmosphere in the Tundra
Anderson, Suzanne P.	University of California, Berkeley	USA	SOLID EARTH PROCESSES	Effect of Flowpath, Runoff, and pCO2 on Chemical Weathering Rates in a Steep Deforested Catchment
Casassa, Gino	Byrd Polar Research Center	Chile	SOLID EARTH PROCESSES	Use of Satellite Imagery to Investigate Causes for Ongoing Changes in West Antarctica
Haddad, Geoffrey Allen	Rice University	USA	SOLID EARTH PROCESSES	Quarternary Intermediate Water C02 Levels Inferred from Sea-Floor Aragonite Preservation Patterns: Bahamas, Nicaragua Rise, Maldives and Queensland Plateau
Horton, Keith A.	University of Hawaii	USA	SOLID EARTH PROCESSES	Temporal Change on Volcanoes, and the Interaction between Volcanoes and the Earth System
Le Bel, Deborah Anne	University of Washington	USA	SOLID EARTH PROCESSES	Using Coral Cores as Indicators of ENSO Events
Sigmundsson, Frexsteinn	University of Colorado	Iceland	SOLID EARTH PROCESSES	Active Isostasy in Iceland
Tarter, Shana Lee	Cornell University	USA	SOLID EARTH PROCESSES	Eolian Erosional and Depositional Landforms of the Puna- Altiplano Plateau: Applications to Modern and Paleoclimatic Studies

Earth Observations International Coordination Working Group Meets

The 15th meeting of the Earth Observations International Coordination Working Group (EO-ICWG) was held April 9-11, 1991 in Paris, hosted by the European Space Agency (ESA). The first two days were devoted to data policy discussions, followed by a plenary meeting addressing payload scenarios and program status. NASA was represented by Dixon Butler, Ray Roberts, Peter Backlund, Lisa Shaffer, and Ralph Brescia. Other participants represented ESA, EUMETSAT, STA, NASDA, MITI, CSA, AES, and NOAA.

The EO-ICWG is nearing completion of a set of data policy principles for all the elements of the International Earth Observing System (IEOS). IEOS includes EOS, POEM, and the Japanese EOS beginning with ADEOS and TRMM, as well as the NOAA polar free-flyers. The data exchange principles would be confirmed by letter as being consistent with agency plans and policies, and then used as guidelines for MOUs.

In parallel, a joint data management plan is being developed which will address implementation of the principles and interfaces among data systems. Japan has the lead for drafting this plan, with support from Canada and input from all participants. The first draft of the plan, reflecting the considerable effort already devoted to defining common data management requirements and approaches, will be presented in advance of the next EO-ICWG meeting in November.

Members reported on significant programmatic developments. ESA is refining its polar platform proposal in light of requirements from EUMETSAT and other considerations. The proposal will be submitted to the ESA Council and ultimately to the Ministerial meeting scheduled for later this year. The current payload under study is the operational payload, (including SEM), a possible high-resolution sounder (interferometer), core facility instruments: SCATT-2 (also known as A-SCATT), RA-2, MERIS, MIPAS, and MIMR (to fly on EOS). ATLID and a high-resolution imager are also being studied. AO instruments are now PRAREE, GOMOS, SCIAMACHY, AATSR, CERES, AURIO, and APAFO.

The M1 platform would be launched at the end of 1997, with an identical M2 available for launch 18 months later to ensure operational continuity. M1 and M2 would carry: AMSU A&B, AVHRR, HIRS, MCP, SEM, S&R, ARGOS, HIGH RESOLUTION SOUNDER, SCATT-2, RA, MERIS, MIPAS, PRAREE, AATSR, CERES, GOMOS, SCIAMACHY. N1 would carry: A-SAR, ATLID (?), HIGH RESOLUTION OPTICAL IMAGER, AURIO, APAFO. ESA is also proposing ARISTOTELES as part of the same program proposal.

NASDA distributed a chart showing instrument candidates ranked according to priority and scientific objectives. This will be the basis for further studies to develop candidate scenarios for the ADEOS follow-on (polar orbit) and TRMM follow-on (55 degree inclination orbit) missions.

It was agreed that NASA would try to conclude agreements with each of the relevant partners within 12 months. These agreements (either Memoranda of Understanding or Letter Agreements as appropriate) include:

ESA:	CERES and MIMR
Japan:	ASTER, ADEOS, TRMM
Canada:	MOPITT, X-band transmitter
EUMETSAT:	AMSU-B (MHS)

The next EO-ICWG meeting is scheduled for November 20-22 in Montreal, Canada.

Lisa R. Shaffer
Senior Policy Analyst
Earth Science Support Office

THE EARTH OBSERVER

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.

Panel Report

EOS Calibration Panel

The Calibration Panel held a three-day meeting in LaJolla, California April 23-25, 1991. The Working Group A (WGA), Reflected Solar, led by Bruce Barkstrom, and the Working Group B (WGB), Thermal Infrared, led by John Gille, met on the first day. WGA continued work on their Reference Handbook which describes the Instrument Geometry, Instrument Math Models, Calibration, Ground Source and Measurement Equation, and the Flight Procedure and Measurement Equation.

WGA also formed subcommittees on Integrations and Test Calibrations Plans (Carol Bruegge, JPL) and Calibration Site Selection (Catherine Gautier, UC, Santa Barbara). The final major topic discussed was the proposed lunar mapping study by Hugh Kieffer (USGS, Flagstaff). The study is considered important for getting the maximum benefit from using observations of sunlight reflected off the lunar surface for tracking instrument behavior during its lifetime in orbit.

WGB discussed four topics:

- topics to cover in the thermal IR Calibration Workshop,
- definition of the Calibration Implementation Plan,
- procedures and contents of the Calibration PDR and CDR, and
- cross-calibration.

Calibration Workshops to identify the state-of-the-art for measuring and calibrating instruments which measure optical radiation have been set as part of the calibration peer review process by WGA and WGB for sensors operating between 0.4 microns and about 20 microns. These two Workshops have been scheduled for the week of November 18, 1991 for WGA in Williamsburg, VA, and the week of January 20, 1992 for WGB in New Orleans, LA. WGB established a tentative agenda for the topics to cover at that Workshop, and identified some candidate speakers to address the Workshops. Each instrument operating within these spectral ranges will be expected to participate in these Workshops. A proceedings will be published to document the "art" shown in each Workshop. WGB also discussed various aspects of cross-calibration, which is programmed to occur during the Integration and Test phase at General Electric for the A1 Observatory. This aspect of the project offers challenges for schedule and test design, and will be developed over the coming months.

The Observatory Project is considering doing the A1 Observatory positioning using a TDRSS On-board Navigational System (TONS) rather than GPS. This is the subject of an Observatory Project study, and review with the Orbit Determination Panel. The final decision here will be driven by conformance to requirements established, in part, from the EOS Instrument Pointing Questionnaire.

The Plenary Sessions received reports from the Working Groups, including brief presentations from Active Microwaves and Time-Of-Flight, and a briefing from General Electric on Accommodation Status, Interface Documentation, and Integration and Test.

Data Product Validation material was presented to the Panel by representatives for EOSP, MISR, ASTER, AIRS, MOPITT, HIRDLS, TES, MODIS, CERES, and HIRIS/AVIRIS. The MOPITT investigation requested that the GEWEX Continental Scale Program extend their geographical boundary slightly northward into the Canadian peat bogs west of Lake Superior to assist in their methane validation studies.

Specific issues in Validation (of Level 2 data products) which arose during this session included the need for agreed definitions of certain terms: what are the field experiments and laboratory investigations that each Instrument Investigation will need for their algorithm concepts; how will each establish long-term product stability; and what is the role of the Panel for algorithm validation and simulations studies.

The next meeting of this Panel is set for September 24-27, 1991 in Baltimore, Maryland. Representatives from the national standards laboratories of Canada, Japan, the U.K., and the U.S.A. are being invited to address the Panel on their specific calibration capabilities that might be of use to the investigators in the realm of optical radiation measurements.

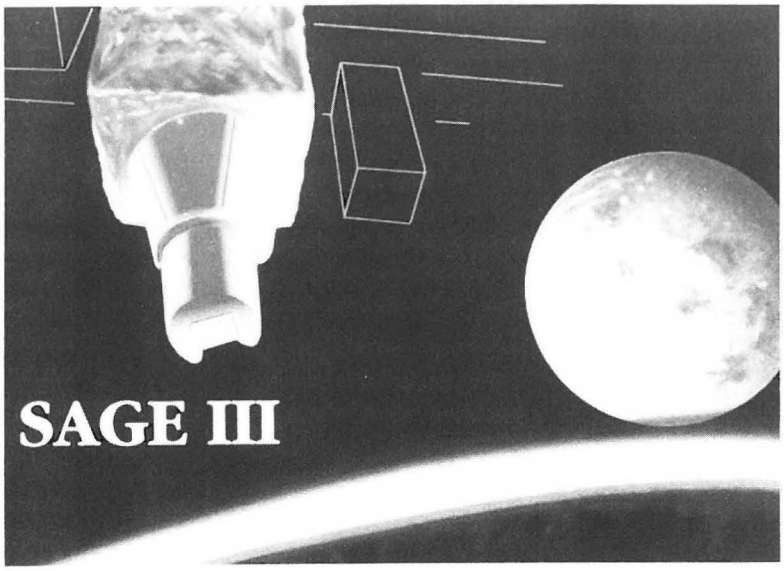
Bruce Guenther
EOS Project Scientist for the Observatory

TEAM MEETINGS

SAGE III Science Team Meeting

A Stratospheric Aerosol and Gas Experiment III (SAGE III) Science Team meeting was held on March 26-27, 1991, at the Omni Hotel in Newport News, Virginia. The meeting was attended by 16 of the 20 co-investigators, as well as members of the Langley Research Center engineering and support staff, and Dot Zukor of the GSFC Project Science Office. Regrets were sent from Jack Kay of Headquarters whose wife had other plans for him on those days — congratulations to Jack and his wife on the birth of a new baby girl.

The Science Team meeting covered a potpourri of topics to acquaint the team members with current activities relative to the instrument status, retrievals, potential flight opportunities, orbit selection, and possible rationales for instrument selection. Pat McCormick discussed the evolution of the SAGE instruments, emphasizing the reasons for each new addition. The importance of SAGE III on EOS-B for the measurement of global change and long-term trends will be stressed in a report being written by the panel and edited by John Pyle (University of Cambridge).



The team was instructed to look for logical clusters of EOS-B instruments and synergisms to assist in EOS-B advocacy. The rationale for the EOS-A instrument selection was discussed and other EOS-B candidate instruments were reviewed. The discussion also covered other possible platforms such as TRMM, and JEOS.

The instruments GOMOS, GOME, SCIAMACHY, ILAS, and SAGE III were compared in detail. It was concluded that groupings of these instruments are very complementary and could provide measurements of important gases at different times of the diurnal cycle. It appears, however, that SAGE III will be the only instrument capable of characterizing aerosols below 20 km, and the only one of these instruments that can provide vertical profile data to at least the mid-troposphere.

Dot Zukor of the EOS Project Science Office at GSFC, reviewed the events unfolding at the Project level and the probable schedule for these events. Of particular interest was the EOS Engineering Review to be led by Edward Allan Frieman, Director of Scripps Institute of Oceanography, which will be an "all everything" review of science, engineering, budget, data, and phasing. Both EOS-A and EOS-B will be examined; interim report is expected June 1; final report is due September 30, 1991. Also of interest were the Request for Information (RFI) to industry soliciting concepts on how best to implement EOS-B, and the Science Strategy Report due out May 1, 1991.

Ed Mauldin, SAGE III Project Manager, gave an overview of the SAGE III instrument covering the Phase B instrument contract, accomplishments, personnel, schedule, and risk areas. Ball Electro-Optics/Cryogenics Division of Boulder, Colorado built the SAGE I and II instruments, and their Project Manager, Joe Guy, has been involved in the SAGE heritage almost from its inception. Ball is currently under contract to NASA Langley for the SAGE III development and build. They have completed the first year of the Phase B study and are continuing in the definition of the instrument. The contract is such that after Phase B, Phase C/D can be immediately exercised as an option. The spectrometer development — CCD concept, array design, procurement, and development testing — was covered in detail.

Improvements in the CCD dynamic range, independent clocking, segmentation/redundancy, quantum efficiency, and spectral performance were all discussed. Radiation-shielding testing and grating-supplier issues are currently being worked. The overview ended with a discussion of what can be accomplished within the limited funding available.

Bill Chu reviewed the accuracy and precision obtainable for the retrieval of various species with both solar and lunar occultation measurements, and compared these with SAGE II results and validation. He showed that the SAGE III H_2O and NO_2 retrievals, for example, will be much more accurate than the SAGE II retrievals because of the narrower-band multiple wavelength channels. Also, the increased dynamic range of SAGE III will provide retrievals over a greater range of altitudes, including much more retrieval capability in the mid- and upper troposhere. Finally, the ability to retrieve temperature using the O_2 A-Band will allow SAGE III to be completely independent of outside data.

Joe Zawodny discussed EOSDIS Version 0, Level 2 and 3 data, the Information Management System, and the expected and desired data products to be provided from SAGE I and SAGE II data, and scheduled development dates. Science Team members and other attendees were asked to examine the *SAGE Contributions to EOSDIS Version 0* handout and to suggest changes and/or additions to the list of higher level products.

The meeting then turned to the discussion of three specific topics to be worked on by the participants. The topics were "Getting Ready for SAGE III Tropospheric Measurements," "Long Lead Time Considerations for the SAGE III Instrument and Software," and "The SAGE III Rationale for Earth Probe Measurements such as TRMM." It was clear to the group that SAGE III would make significant contributions to many tropospheric studies.

" It was clear to the group that SAGE III would make significant contributions to many tropospheric studies. "

On the second day, the session started with selected team members presenting either work with SAGE II data in preparation for SAGE III, or preparatory work directly related to SAGE III. The opening presentation by Zawodny was a discussion of the QBO (Quasi Biennial Oscillation), seasonal variations, and linear trends shown in SAGE II O_3 and NO_2 data. The equatorial time behavior and phasing of NO_2 and ozone trends were demonstrated.

David Rind of GSFC/GISS reviewed his work with SAGE II water vapor data. Results obtained from the GISS GCM calculations and SAGE II data were compared and discussed. Both showed increased relative humidity in the upper troposphere during convective periods.

Next, Derek Cunnold described work with SAGE II ozone and NO_2 data. He discussed the seasonal cycle in ozone from 1986-1990, and some comparisons of SAGE II NO_2 with ATMOS data. A key point was the need to know the aerosol model's effects, if any, on the ozone retrieval. This discussion also defined issues for further study, i.e., thermal effects of the instrument on sunrise data, the long-term trend changes in the 0.448 μm channel, an algorithm to allow for the temperature dependence of NO_2 absorption, and the interaction between all species during retrieval as it affects vertical resolution.

V. Ramaswamy, Princeton University, discussed his work using SAGE II data to compare stratospheric aerosol and trace gas forcings to surface temperatures over all seasons at three separate latitude bands for a 10-year period. His results showed a definite effect on surface temperature due to stratospheric aerosols, and even though aerosol forcing is highly variable, the surface temperature changes due to aerosol forcing are much greater than that due to gases.

Nagatanit of NOAA's National Weather Service, Climate Analysis Group, reviewed the NOAA satellite program. Current and proposed satellites and instrument complements were shown, as were the NDSC (Network for the Detection of Stratospheric Change) instruments and candidate sites.

The meeting ended with a review and update of the SAGE III science objectives. They were considered to be appropriate as previ-

ously developed and no modifications were incorporated. Attention was called to the NRA Research Announcement 91-OSSA-07 for Earth System Science having a May 1991 deadline. It was announced that Jack Kaye was the new SAGE III Instrument Program Scientist at Headquarters replacing Bob Schiffer. The next team meeting will be held in late summer or early fall.

George L. Maddrea, Jr.
SAGE III Executive Secretary
NASA Langley Research Center

SAR Facility Instrument Team Meetings

The EOS SAR Facility Instrument Team and the EOS SAR Project have been quite active as of late, working hard to obtain a new start in 1994/95, to analyze field and aircraft SAR data obtained during recent campaigns, and to finalize the Science Concept Document. Many important results were presented recently at IGARSS'91 in Espoo, Finland and at the JPL Airborne Geosciences Workshop, using the multi-frequency polarimetric AIRSAR, as well as other aircraft SAR, especially in the vegetation, soil moisture, snow, and sea ice disciplines. These results are particularly timely for the ongoing examination, with increasing detail, of EOS SAR instrument design considerations as well as, of course, development of algorithms for generating data products.

An informal review of EOS SAR Project Requirements was held March 11, 1991 at the Jet Propulsion Laboratory in Pasadena, California; most of the Facility Instrument Team attended. The intention of the review was to provide an assessment of the Project's initial efforts in formalizing the science and project requirements. Active discussion on instrument calibration and performance, mission design, and data processing took place. The key result of such a review is to determine which requirements seem to be well in hand and which need further study. On March 12, an informal Facility Instrument Team meeting took place that focused on vegetation and hydrology issues, near-term data requirements, and a review of the Science Concept Document.

More recently, an EOS SAR Facility Instrument Team meeting was held at the Nansen Environmental and Remote Sensing Center (NERSC), home institution of Team Member Johnny Johannessen, in Bergen, Norway, on May 29-31, the week before IGARSS'91 in Finland. The intent of this meeting was to focus solely on the current understanding of each major science discipline and where concentrated effort needs to be placed in the next few years to develop and validate the key SAR data products. Most Team Members attended, as well as representatives from the EOS SAR Project Science Team, NERSC, Deutsche Forschungs - und Versuchanstalt für Luft - and Raumfahrt (DLR, partner in SIR-C/X-SAR), EROS Data Center, Environmental Research Institute of Michigan, and Tromsø Satellite Receiving Station.

Charles Elachi, Team Leader, opened the meeting with a discussion of the meeting goals and, of course, the current budget situation for the EOS SAR. Budget requirements for the Team and for the Project to meet a 1993 NAR and a FY95 New Start were discussed. The Project Science Team, in conjunction with the Facility Instrument Team, has been working on a "white paper" discussing the merits and requirements of the EOS SAR mission for Len Fisk's Space Science and Applications Advisory Committee (SSAAC) for the OSSA 1992 Strategic Plan; this committee will meet to prioritize future New Starts for NASA in late July at Woods Hole, MA.

A discussion of requirements for algorithm development and validation followed. Each algorithm will have three supporting documents; algorithm specification, validation, and management. A chapter covering algorithm development and validation will be included in the current Science Concept Document (Version 3.0 released for the meeting) as well as included in project requirements documents. The Team will determine requirements for algorithm development by February 1992 as well as determine procedures for turning over the algorithms to the Project for implementation.

Throughout the presentations, efforts were made to evaluate the status of all the data products and to determine which products were well in hand, which demanded primary focus due to scientific value, which groups of products may be generated as sets from a unified algorithm, and which were not well in hand at present. The Team will identify a list of primary products (e.g., biomass, sea ice properties,

soil moisture) that can be produced at launch and also identify "experimental" products that may be developed and validated later in the mission.

In the area of vegetation, Fawwaz Ulaby discussed recent results that show L-band data will be useful in determining vegetation height and biomass. His work will concentrate on developing algorithms for vegetation extent/type, leaf area index, total biomass, and soil moisture under the canopy. While significant progress has been made in direct-solution model development and verification, future work must concentrate on inversion algorithms. He stressed that Team Members must continue to work with IDS investigators to better define product requirements. JoBea Way discussed her recent AIRSAR results from Alaska to investigate seasonal change (freeze/thaw, flooding, and stress) and weather effects on forests and implications for carbon dioxide fluxes. Her work concentrates on algorithm development for vegetation moisture properties as they relate to environmental and phenologic state.

Ted Engman discussed his recent results in measuring soil moisture changes in Pennsylvania and California. Difference in L-band HH measurements for wet vs. dry field have been measured at about 4 dB over a variety of field sizes, row directions and slopes, implying that SAR may be used to measure general soil moisture conditions over large areas. Fawwaz Ulaby discussed the requirements for snow products, including depth, water equivalent, and liquid water content.

Frank Carsey presented requirements for measuring sea ice characteristics. Results from JPL show that ice types may be discriminated using L- or C-band HH-VV phase differences. Johnny Johannessen presented the requirements for measuring surface current fronts, near-surface wind features, long gravity waves, and wave current refraction. Hans Graber (for Bill Plant) discussed the requirements for measuring ocean waves, as well as participation in various, extensive, multi-instrumented ocean experiments.

Diane Evans presented the requirements for geologic investigations, including requirements for surficial boundary mapping, paleoclimate indicators, and topography. The focus of her work has been on estimating surface roughness with multiparameter AIRSAR data.

Herwig Öttl, from DLR, presented recent x-band data showing differences between HH and VV data. Whether there was a difference in HH and VV X-band data has been a concern of the EOS SAR Project as the design of the SAR has evolved to an L-quad, C-dual, and X-dual polarization design. Further research must be performed to model these differences, however.

Harald Johnsen of the Tromsø Satellite Station in Norway, gave a presentation on the capabilities of Tromsø to produce and distribute near-real time (<30 minutes) SAR images from ERS-1 at high or low resolution. Full-resolution data (20 m x 16 m) will be used for ship detection and for ocean wave studies. Tromsø may provide a valuable direct downlink resource to the SAR project as it lies nearly directly opposed to the Alaska SAR Facility and could provide full coverage of the Arctic Ocean.

Ola Johannessen, director of Nansen, gave an overview of the research being done at the Nansen Center. Of particular interest was discussion of the 100th anniversary of Dr. Fridtjof Nansen's drift across the Arctic Ocean in the Fram from 1893-1896. While the primary goal of drifting across the North Pole was not accomplished, the expedition reached further north (above 86°N) than any previous expedition and also provided valuable information about the Arctic Ocean currents. This experiment will be repeated starting in 1993 by freezing another research vessel in the sea ice, north of Siberia, and allowing it to drift across the Arctic.

At the conclusion of the meeting, Team Members were asked to provide a written summary of their plans and requirements for algorithm development as well as requirements, if any, for SEASAT data processing and AIRSAR flights and/or data and for plans for participation in other experiments. The next team meeting will be sometime this fall.

Marguerite Schier
EOS SAR Project Science Team

ASTER Team Meeting

The International ASTER team held a meeting in Tokyo on May 15-17, 1991 to discuss an assortment of pertinent issues pertaining to ASTER science investigations, instrument development, mission and system requirements and overall coordination. In addition to U.S. ASTER team members and associates, personnel attended from NASA Headquarters, EROS Data Center and GSFC. This meeting was the first opportunity for the members of the thirteen working groups to meet individually and discuss topics pertinent to their interests. The results of these splinter sessions were very encouraging with many fundamental issues resolved and directions for future work clarified.

Among the most important discussions resulting in a better understanding of the overall team position were those involving standard data products, the basic need for DEMs, registration and resampling techniques, airborne simulations and selection of appropriate calibration sites, ground data system sizing and degree of needed commonality across the team, and the possible need for multiple instrument gain states.

The next meeting of the international team will be held in the U.S. in late October or early November 1991.

Anne Kahle
Jim Weiss
ASTER Science Team Leaders

GGI Team Sponsors GPS Occultation Workshop

A workshop was held on May 16 at the Jet Propulsion Laboratory (JPL) to discuss use of a low-Earth orbiting Global Positioning System (GPS) receiver to remotely sense the Earth's atmosphere and ionosphere. Meeting attendees included members of the GPS Geoscience Instrument (GGI) team, representatives from JPL, universities, Lockheed, and AFGL, as well as CNES and CNRS of France.

Although a principal role of GGI for EOS is providing precise orbit determination in support of GLRS and ALT, remote sensing of the Earth's atmosphere and ionosphere are also integral to its operation. French scientists have proposed a derivative mission named GLIMPSE in which a high precision GPS receiver would be placed on a dedicated microsatellite in low Earth orbit to monitor, in particular, the Earth's stratospheric temperature.

The meeting was opened by Tom Yunck (JPL) who presented a brief overview of the occultation science possibilities proposed for GGI. The basic concept is to use the GPS microwave signals as probes during periods when a GPS satellite is occulted by the Earth's atmosphere and ionosphere. Changes in the transmitter-to-receiver optical path length due to the intervening media are measured to infer refractive properties of those media. This is a limb sounding geometry with approximate vertical and cross beam resolutions of 1km and a long beam resolution of 200 km. One GPS receiver in a 700 km near-polar orbit will see approximately 500 occultations per day, roughly evenly spread across the globe with some concentration near the polar regions

Dave Hinson (Stanford University) presented material on the general technique of retrieving vertical profiles of refractivity, number density, pressure and temperature from the measured microwave signal phase. He reviewed some results of the technique for the outer planets and moons of the solar system measured by Voyager including characterization of wave structures in the Uranian atmosphere. Dave pointed out the complementary nature of this technique relative to other atmospheric sensors due to its fundamentally different method of sensing. The inherent stability and repeatability of the technique requiring no on-board calibration appears ideal for monitoring long term trends in atmospheric temperature. Because it is a low frequency microwave instrument it is also insensitive to cloud particulates.

Alain Hauchecorne (CNRS) presented the objectives of the French GLIMPSE team to characterize the vertical temperature profile of the stratosphere on a global scale. This, in turn, will be used to characterize changes spanning a wide range of time scales including perturbations due to atmospheric waves, seasonal variations and still longer term trends expected due to CO_2 increase and ozone decrease.

The estimated accuracy of the recovered temperature profiles was discussed. The useful vertical range is limited at higher altitudes by insufficient atmos-

pheric density and at lower altitudes by water vapor. Alain Hauchecorne presented preliminary simulations done at CNRS indicating that 1 cm errors in the path length change during an occultation will set the upper altitude limit for a temperature accuracy of 2 K at 26 km. Rob Kursinski (JPL) showed work indicating sub-mm occultation path length errors may be achievable, leading to temperature errors of 1 K or less for altitudes up to 43 km. Ensuing discussions indicated that the largest uncertainty is probably removal of the ionospheric error and further analysis is planned in this area.

Temperature recovery in the troposphere is limited by the uncertainty in the water vapor along the signal path. Ken Hardy (Lockheed) presented results on potential accuracies in this area. In the tropics, due to the large amount of water vapor, a 10% knowledge of the vertical distribution of water vapor would limit the 1 K altitude to approximately 9 km. However, a better use of the data might be to take temperature data derived from other instrumentation and solve for water vapor content. A vertical temperature profile accurate to 2 K would allow recovery of the vertical water vapor profile to better than 10% below 6 km. In the polar regions, due to the limited water vapor, a 10% knowledge of water vapor would keep temperature errors due to water vapor below 1 K at all altitudes.

Tim Raymond (University of Illinois) presented a brief overview of ionospheric science, the importance of the role it plays in understanding the energy and mass cycles in the solar-terrestrial system and the possible applications of total electron content (TEC) measurements by a low Earth-orbiting GPS receiver. Traveling ionospheric disturbances (TID) and their role in energy transport were also discussed. Tim and George Hajj (JPL) discussed the possibility of 2- and 3-D ionospheric tomography utilizing a flight GPS receiver in conjunction with multiple ground receivers. They will both present at a special session on this subject at the URSI meeting this month in Ontario, Canada.

On the subject of instrumentation, Tom Meehan (JPL) presented an overview of the "TurboRogue" GPS receiver being developed at JPL for NASA's geodynamics program. This receiver has the basic functions and performance needed for these observations. Rob Kursinski discussed the conceptual design for GGI, which is derived from the TurboRogue. Also discussed was an effort to create a prototype flight version of a repackaged TurboRogue receiver which could be used on a low-cost GLIMPSE type mission.

The meeting concluded with a discussion of future directions. There is great interest in making GPS observations as soon as possible and the necessary technology is available. Measurements will be taken in Hawaii in conjunction with the July solar eclipse. A potential balloon opportunity later this year was discussed and will be pursued. Several low cost rides into space are being considered including possibilities on the shuttle and an Air Force STEP satellite.

A special session of the AGU meeting will be held this fall in San Francisco on this general topic, chaired by Ken Hardy and Jack Klobuchar (AFGL) for neutral atmosphere and ionospheric sensing, respectively.

Rob Kursinski
GGI System Engineer
Jet Proulsion Laboratory

The Boreal Ecosystems-Atmosphere Study (BOREAS): Progress Report

BOREAS is a large planned research project in the boreal forest of North America. It is concerned with the interactions between the boreal forest and the atmosphere, to clarify their roles in global change. BOREAS centers on a cooperative field experiment integrating land surface climatology, tropospheric chemistry, and terrestrial ecology; remote sensing will play a strong integrating role.

In preparation for the main experiment year in 1994, with a shorter field campaign in 1993, the following recent developments have taken place.

Final Science Workshop

From May 13 - 15, 1991, over 160 scientists from the U.S., France, U.K., USSR, and Canada met to take the next step in planning the BOREAS project. The meeting was held at Waskesiu, a small resort area near one of the proposed BOREAS sites. Following presentations on the rationale leading to the most recent version of the science plan, the meeting participants discussed the following issues:

- proposed scientific goal and specific objectives;
- site stratification criteria leading to the selection of locations for gas flux towers;
- methodology of measurements (surface, towers, airborne, and satellite);
- timing and coordination of field campaigns;
- cooperation among disciplines and teams; and
- site access and environmental impact issues.

Discussion took place in four subgroups, corresponding to the major science themes of BOREAS: land surface climatology, tropospheric chemistry, terrestrial ecology, and remote sensing science.

The workshop resulted in numerous ideas and suggestions for enhancing and focusing the final science plan (see below).

Site Selection

After an extensive search for suitable sites involving 45 locations, two prime and two back-up candidate sites were selected near the extremes of the boreal forest ecological gradient. The candidate prime sites are:

Southern Site: Prince Albert National Park, Saskatchewan

Northern Site: Nelson House, Manitoba

During the May workshop, further data were collected concerning representative locations for placing flux towers. It is expected that by the end of 1991, the feasibility of locating towers and measurement sites will be established.

Another important issue is access to the sites and possible environmental impact caused by the proposed research. A rigorous environmental impact assessment procedures must be undertaken at both sites. This process has already started, and it will involve two levels of government as well as native people.

Planned Announcement of Opportunity

The present plan is to publish two coordinated announcements of opportunity (AO): one by NASA for the U.S. and other countries, and one by the Canadian BOREAS Coordinating Committee (CBCC) for Canada.

The AOs should be distributed in early fall of 1991. One peer-review procedure will then be undertaken through a coordinated approach involving government research organizations from the U.S. and Canada. Selected Canadian university proposals will subsequently be integrated into a proposal to the National Sciences and Engineering Research Council. It is envisioned that the selected BOREAS proposals will be announced in late summer of 1992.

International Participation

The BOREAS project offers an excellent opportunity for scientists from other countries to participate in an inter-disciplinary research program addressing questions concerning the role of the boreal forest, and to have access to a comprehensive environmental data base for the two sites. The participation of scientists from other countries is therefore strongly encouraged. It is expected that scientists from countries other than Canada will respond to the NASA research announcement, and that their involvement will be on "no exhange of funds" basis.

Additional Information

An abbreviated version of the science plan was published in Eos [**BOREAS Science Steering Committee**, 1990, *Charting the boreal forest's role in global change*, Eos 72(4):33,35,40]. For further information contact:

Inquiries from Canada

Dr. Josef Cihlar
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Canada Centre for Remote Sensing
4th Floor, 1547 Merivale Road
Ottawa, Ontario, K1A 0Y7
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Fax: (613) 952-7353

Inquiries from other countries:

Dr. Piers Sellers
U.S. BOREAS Office
NASA/Goddard Space Flight Center
Code 923
Greenbelt, Maryland 20771
Telephone: (301) 286-4173
Fax: (301) 286-4098

BOREAS Science Steering Committee

Scientists Believe a Colder Upper Atmosphere May Imply a Warmer Earth

Scientists have peered into the atmosphere and once again, forced it to reveal some long-held secrets. Goddard Space Flight Center's Arthur Aikin, Code 916, a scientist in the Atmospheric Chemistry and Dynamics Branch, was one of an international group of scientists who reported a 10-year, 2.5 degree centigrade temperature decrease in the lower mesosphere, at an altitude of 34.2 miles (55 kilometers) above the Earth. Such a decrease is predicted by some models of global warming because of enhanced concentrations of carbon dioxide (CO_2), methane and other gases.

The measured temperature decrease, according to a paper published by Aikin, is evidence of enhanced greenhouse gases which prevent the Earth's heat from escaping into the atmosphere, causing the greenhouse effect.

Arthur Aikin (seated), NASA/Goddard Space Flight Center, discusses a graph of changes in mesospheric ozone and temperature as a function of time with co-author David Kendig, ST Systems Corporation (STX).

The increase of greenhouse gases causes the temperature of the atmosphere to change. As short wavelength radiation is trapped, air becomes warmer near the surface. At the same time, there is an increase in the amount of longwave radiation in the middle atmosphere. The result, depending upon cloud cover and other factors, is that the surface may warm by one or two degrees centigrade and the temperature in the mesosphere may drop by as much as ten degrees centigrade.

Aikin, along with co-authors David Kendig, ST Systems Corporation (STX), Lanham, Maryland; Marie-Lise Chanin, Service d'Aeronomie, Verrieres Le Buisson, France; and John Nash, United Kingdom Meteorological Office, Bracknell, found the Earth's atmosphere at the 25 to 43.4 mile (40 to 70 kilometer) altitude range was best for measuring short-term temperature changes which may be caused by human activity because the fluctuations are greater in the mesosphere than those nearer the Earth's surface. According to Aikin, *"The problem with making surveys closer to the Earth's surface is that there is a margin of error around one to two degrees centigrade. So, in studies of a decade or two, it is easier to detect changes in the upper atmosphere where changes are larger."*

Aikin does not believe this temperature drop is related to the 11-year solar cycle. The study conducted by Aikin and his coauthors lasted 10 years (1980-1990) and showed a steady drop in temperature without any evidence of a cycle being involved.

The ten-year study used data both from ground-based studies in France and from the British Stratospheric Sounding Unit (SSU) instrument flown aboard most of the U.S. TIROS weather satellites.

The scientists' report also indicates that after longer study during this decade, they should be able to estimate more accurately how the atmosphere responds to greenhouse gases.

Analysis of existing data is a key component of NASA's Mission to Planet Earth.

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EOS IWG INFORMATION & REGISTRATION

As announced in the March/April 1991 issue of ***The Earth Observer***, the next EOS Investigators Working Group (IWG) meeting is scheduled for August 28-30, 1991 at the University of Washington, Seattle.

Lodging Accommodations

Travel and lodging reservations and payment are the responsibility of each individual IWG participant. The following hotels (all within walking distance to the meetings on campus) have reserved space for NASA/IWG participants:

- Meany Towers—100 single rooms at the rate of $70 per night plus 14.2% tax. This hotel is third closest to campus. Reservations: 206/634-2000
- University Plaza Hotel—80 single rooms at the rate of $78 per night plus 14.2% tax. This hotel is the farthest from the meetings on campus. Reservations: 206/634-0100
- University Inn—28 single rooms blocked at $63 per night plus tax. This hotel is the second closest to the campus. Reservations: 206/632-5055
- University of Washington Dorms—36 single rooms blocked at $23 per night inclusive. These rooms do not have a private bath but are the closest to the meetings on campus. Reservations at the University of Washington dorms must be made by calling Jan Hostetter at Birch & Davis (202/479-0360) for reservation forms. She will send the form to the attendee, who must return it to University Housing with a check (made out to the University) for the full amount. There are no refunds for early checkout. No credit cards are accepted.

August in Seattle is a peak season for tourists, and this meeting is only a week before classes begin. If you plan to attend, you must make your airline and hotel reservations as soon as possible (remember that the Friday this meeting ends is the start of Labor Day week-end!). When calling a hotel, please mention that you are attending the NASA/IWG meeting. The cut-off date for all room reservations is July 27, 1991. Space is not guaranteed after this cut-off date. Once these reservations are filled or released, the closest hotel is located in downtown Seattle, a 20 minute drive from the university. ***Please make your hotel reservations early!***

Social

A salmon bake at the Kiana Lodge is planned for Thursday evening. The cost is $35.00 per person, including transportation by boat, and should be included with your registration fee. An alternative meal will be available for those who prefer not to eat fish. A bus will leave the campus at 4:30 pm and transport participants to the city docks, where we will travel by covered boat to the Kiana Lodge, a ride of 1 hour and 15 minutes. Beverages (cash bar) and hors d'oeuvres will be served on the boat, and dinner will be served at the Kiana Lodge. Because the Kiana Lodge is reachable only by boat, we must have a guaranteed count by August 5.

Registration

Pre-registration will be held on the first floor of Kane Hall on the University of Washington campus from 5:00 to 7:00 pm on Tuesday, August 27, and from 8:00 to 10:00 am on Wednesday, August 28. Advance registration should be made by sending the registra-

tion form below and a check made payable to Birch & Davis Associates, Inc. to:

Jan Hostetter
Birch & Davis Associates, Inc.
Earth Science Support Office
600 Maryland Avenue, SW, Suite 440
Washington, DC 20024

Purchase orders and credit cards will not be accepted. A registration fee of $15.00 is required for each person registering to attend the NASA/IWG meeting. This fee covers the cost of coffee and danish each day. Birch & Davis will assume that you are not planning to attend the salmon bake if we only receive a check for $15.00. All checks must be received by Birch & Davis no later than August 5, 1991.

Additional information will be sent to you in a follow-up logistics package from Birch & Davis . Information will include: detailed maps, information on parking on campus, support services available, and more details about hotel accommodations and registration. In the meantime, if you have any questions, please do not hesitate to call Jan Hostetter, Cathy Freeland, or Debby Critchfield at(202) 479-0360, fax: (202) 479-2743, or E-mail:

JHOSTETTER/NASAMAIL
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D.CRITCHFIELD/OMNET

NASA/EOS IWG MEETING
REGISTRATION FORM

Attendee Name _____

Affiliation _____

Address _____

_____
City State Zip

Tel. ( ) _____ Fax ( ) _____

Thursday, August 29, 1991 -- Salmon Bake

☐ I plan to attend ☐ I do not plan to attend

☐ I plan to attend with _____ family members ☐ I do not eat fish

Amount enclosed: $_____

Registration Fee -- All attendees ($15.00 per person)
Salmon Bake at Kiana Lodge ($35.00 per person)

Make check payable to: **Birch & Davis Associates, Inc.**

Please return advance registration and remittance by August 5, 1991 to:
NASA IWG Meeting
Birch & Davis Associates, Inc.
Earth Science Support Office
Attn: Jan Hostetter
600 Maryland Avenue, S.W., Suite 440
Washington, D.C. 20024

GLOBAL CHANGE MEETINGS

July 22-26	*Synthetic Aperture Radar Technology and Applications* five-day short course offered through Engineering Conferences at the University of Michigan. For information contact Dr. Robert Schuchman at (313) 994-1200, ext. 2590; FAX (313) 936-0253.
August 18-25	Tenth International Symposium on Environmental Biogeochemistry, San Francisco, California. Symposium theme is *Global Change and the Biogeochemistry of Radiative Trace Gases.* Contact Ronald S. Oremland, USGS, (415-329-4482; FAX (415) 329-4463.
October 6-11	NATO Advanced Research Workshop on *The Atmospheric Methane Cycle: Sources, Sinks, Distributions and Role in Global Change*, Timberline Lodge on Mount Hood near 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 21-24	International Conference on Global Climate Change: Its Mitigation Through Improved Production and Utilization of Energy, Los Alamos National Laboratory, Los Alamos, New Mexico. Contact Dr. Robert Glasser at (505) 664-5808; FAX (505) 665-3107.
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.
December 2-6	World Conference on the Chemistry of the Atmosphere: Its Impact on Global Change, Baltimore, Maryland. Contact CHEMRAWN VII Secretariat, c/o American Chemical Society, Washington, D.C., phone (202) 872-6286; FAX (202) 872-6128.

1992

January 5-10	Third Symposium on Global Change Studies, sponsored by the American Meteorological Society, Atlanta, Georgia. Contact Eric J. Barron at (814) 865-1619; FAX (814) 865-3191; Omnet: E.BARRON.
January 14-16	Center for Global Change Science, Massachusetts Institute of Technology Symposium *The World at Risk: Natural Hazards and Climate Change*, Cambridge, Massachusetts. Contact Anne Slinn, (617) 253-4902; FAX (617) 253-0354.
August 2-14	XVII Congress of the International Society for Photogrammetry and Remote Sensing (ISPRS), Washington, D.C. Concurrent to the ISPRS Congress, two other meetings will be held nearby: the ASPRS and the American Congress on Surveying and Mapping (ACSM) will conduct a conference on Global Change; the International Geographical Union will convene its 27th International Geographical Congress (IGC) during the second week. For more informaton contact XVII ISPRS Congress Secretariat, P.O. Box 7147, Reston, VA. 22091 U.S.A.
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

August 28-30	EOS IWG Meeting, University of Washington, Seattle, Washington.
September 9-10	TES Team Meeting at JPL. Contact Reinhard Beer (818) 354-4748.
September 24-27	EOS Calibration Panel Meeting. Contact Bruce Guenther (301) 286-5205.
October (TBD)	MODIS Team Meeting. Contact Locke Stuart (301) 286-5411.
October 14	SAR Meeting, Munich. Contact Jo Bea Way (818) 354-8225.
October 22-25	ALT Team Meeting (TOPEX), Paris, France, Contact Lee-Leung Fu (818) 354-8167.
Late Summer/ Early Fall	EOS Oceans Panel Topical Science Meeting on Air/Sea Interactions. Contact Mark Abbott (503) 737-4045.
November 20-22	EO-ICWG Meeting, Montreal, Canada.

EOS SCIENCE MEETINGS

JULY

Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
1	2	3	4	5	6 7
8	9	10	11	12	13 14
15	16 LAWS Science Team Aspen, CO.	17	18	19	20 21
22	23 HIRIS Team Meeting, Pasadena, CA. Science Foundations for the EOS Era: Physical Climate and Hydrology -- Pennsylvania State University, PA.	24	25	26	27 28
28	29	30	31		

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National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland
20771