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Earth Observations & Global Change
Decision Making: A National Partnership

Fall Conference

18 November 1991

Dear Colleague:

On behalf of the conference sponsors and the organizing committee I would like to thank you for attending the October 22-23 conference, "Earth Observations and Global Change Decision Making: A National Partnership" at the National Press Club. The feedback from the conference speakers and attendees has been most positive and complimentary--thank you.

You will be receiving a copy of the conference proceedings as soon as they become available. Enclosed is a list of the conference speakers and other attendees.

Following each conference in this series, the organizers meet to critique the conference and to examine ways the conference can best meet the needs of the earth observation community. As an attendee at the fall conference, your critique and suggestions for additions or changes to future meetings would be particularly helpful. We would be very grateful if you would complete and return the attached comment sheet at your earliest convenience.

I wish to thank you again for your contribution to the continued success of this conference series and look forward to you joining us again next year. Happy Holidays!

On behalf of the Organizing Committee,

Robert H. Rogers, Chairman
Global Change Conference

njw





Earth Observations & Global Change
Decision Making: A National Partnership

Fall Conference

**EARTH OBSERVATIONS & GLOBAL CHANGE
DECISION MAKING: A NATIONAL PARTNERSHIP**

October 22-23, 1991

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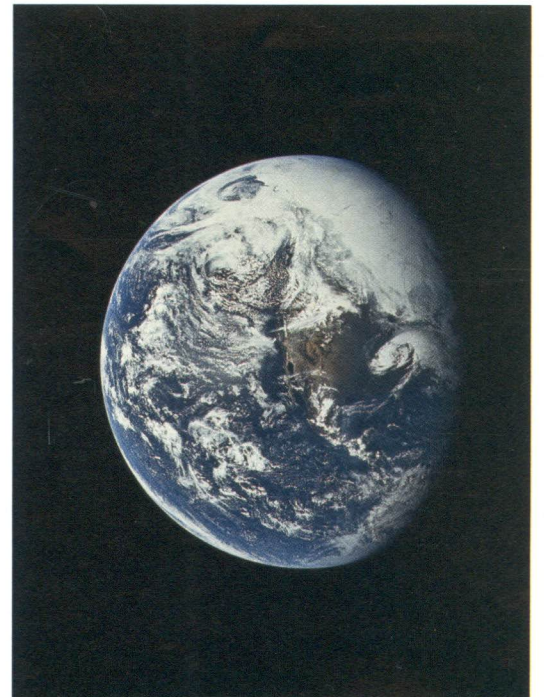
Earth Observations and Global Change Decision Making: A National Partnership

September 18-19, 1989

National Press Club
Washington, D.C.

A Conference sponsored by the

National Aeronautics and Space Administration
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Fall Conference

LIMITED REGISTRATION
AT THE DOOR

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The conference will be held at the National Press Club and the nearby 4-star JW Marriott Hotel, at the hub of downtown Washington and only ten minutes by Metro from the Washington National Airport.

The technical program, registration desk, continental breakfast, and refreshments will be located in the National Press Club, on the 13th floor of the National Press Building, the oldest, largest, and most prestigious press club in Washington. The Press Club is one of the city's most popular forums for major policy statements—a very appropriate location for this important conference. Guests of registered participants are invited to join in refreshments and informal social activities in the conference hospitality room each morning. The September 18 luncheon and the hospitality room will be located in the JW Marriott hotel.

Rooms have been reserved at the convenient JW Marriott at the special rate of \$155 (single) and \$165 (double). To qualify for these special rates, please contact the JW Marriott before August 27, 1989 and identify yourself by the conference code ERLM. The hotel's telephone number is 202-393-2000.

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To register, return the attached form by mail or fax. Due to the National Press Club's limited seating, attendance will be strictly limited to 500 participants.

The \$340 (U.S.) registration fee guarantees seating at all sessions, continental breakfast and refreshments for the two days, one ticket to Monday's luncheon at the JW Marriott, one ticket to the evening buffet reception at the National Air and Space Museum, and one copy of the full Conference Proceedings. Additional tickets to the luncheon and reception and additional copies of the Proceedings can also be purchased. There is no cost for use of the hospitality room in the JW Marriott Hotel by guests of registered participants.

Earth Observations & Global Change Decision Making: A National Partnership Fall Conference September 18-19, 1989

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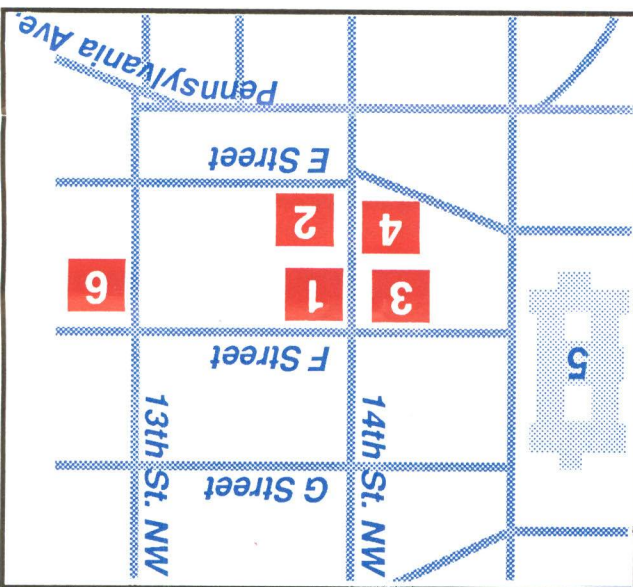
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ERLM will refund the full registration fee upon receiving a written request before September 1, 1989 and when the Press Club seating limit is reached.

PROCEEDINGS

The Proceedings of the conference will provide a permanent record of the meeting, including the recommendations and issues discussed in the seven conference sessions and the submitted papers. One copy of the Proceedings is included with each registration. Additional copies can be ordered on the registration form.



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**Earth Observations and Global Change Decision Making:
A National Partnership
Washington, D.C.
October 22, 1991**

It is a privilege and great pleasure for me to again keynote this important conference on earth observation and global change. For each of the past three years, this conference has provided an extremely valuable national forum on the issues surrounding global climate change, and its deliberations have influenced discussions not only here in Washington but around the world. The Environmental Research Institute of Michigan, the National Aeronautics and Space Administration, and the National Oceanic and Atmospheric Administration are all to be commended for their dedication and foresight in sponsoring and conducting this gathering.

Three years is a very short time within the context of global climate change. Yet it is remarkable, in looking back on the past three years, to reflect on how much has changed during that period. Three years ago, as the planning for the first of these conferences was beginning, the U.S. Global Change Research Program had just gotten off the ground. Today -- as Bob Corell will be demonstrating when he speaks after me -- the program is a thriving and global enterprise. Indeed, the U.S. Global Change Program today serves as a model of how federal agencies and offices -- 19 in all for this program -- can voluntarily come together to coordinate their separate efforts in specific areas of science and technology. A number of other interagency coordinating efforts are now under way in other important areas of science and technology under the aegis of the Federal Coordinating Council for Science, Engineering, and Technology, and all of them owe a debt to the example set by the Global Change Research Program.

Let me give you just one indication of how successful this program has been. It is something that at least one of our most prestigious Business Schools have been making into a case study. Now that is the ultimate measure of success in our society!.

The past three years have seen the release of several important national and international assessments of the science and policy issues surrounding global change. Last year the Intergovernmental Panel on Climate Change (IPCC) released its First Assessment Report, including its working group assessments of the scientific

information on climate change, the impacts of climate change, and responses to climate change. These reports have provided an indispensable background for the ongoing international negotiations on this topic.

More recently, several other important reports treating the science and economics of global change have been released here in the United States, including reports by the Office of Technology Assessment and by the National Academy of Sciences complex -- reports that I shall be discussing in more detail shortly.

In the policy arena, several important meetings have been held over the past few years that have substantially advanced the international response to the possibility of global change. In April 1990 I cochaired, with Michael Deland of the Council on Environmental Quality and Michael Boskin of the Council of Economic Advisors, the White House Conference on Science and Economics Research Related to Global Change. Several important ideas emerged from that meeting, including a new focus on the importance of including responsible economic predictions as an underpinning for policy decisions and a recommendation by the President that regional institutes on global change research be established in select locations around the world. These institutes are today moving toward reality. More recently, there have been three meetings of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, which is working to produce an international agreement on climate change ready for signing during the UN Conference on Environment and Development to be held in Rio de Janeiro next June.

As is evident, the activities involving global climate change are numerous and their numbers continue to increase. What I would like to do this morning is to review some of these activities in greater detail to provide a backdrop for your discussions of the next two days. I shall focus largely on policy matters and leave most of the science of global change to Bob Corell, including some of the very exciting new results of the U.S. Global Change Research Program. That way, between the two of us, we can present a broad overview of the government's actions involving global change.

I cannot pass this topic, however, without referring you to a press conference later today that will present new NASA data that throw into question much of what

we believed we knew about the atmospheric chemistry of a number of important greenhouse gases. This again provides a vivid demonstration of how great is our remaining ignorance of such matters and how probable are substantial surprises. There is much that we still do not understand about our atmosphere and the behavior of its component gases.

The NAS Report

One of the landmark events of the past year was the publication of the report "Policy Implications of Greenhouse Warming" by a distinguished panel, chaired by former Senator Dan Evans, of the National Academies of Science and Engineering and the Institute of Medicine. It was read with great interest in the Administration as part of our effort to ensure that this issue receives the most thorough examination possible and that our discussions and decisions are based on the strongest scientific and economic information available.

The panel clearly laid out its conclusions about the science of climate change and the nature and extent of uncertainties in the science. It also presented a practical and proactive set of recommendations regarding potential adaptation and mitigation responses to climate change.

What most struck me, as I read through the report, was the congruency between the Panel's thinking and the actions that the Bush Administration has been taking in this area. I testified on the report before Senator Gore last spring, and I sought to point out to him -- with only partial success -- the many points in common between the government's current approach and the Panel's recommendations.

To put it succinctly, we in the Administration believe that the government's current stance toward greenhouse gas emissions is a highly appropriate response given our current scientific understanding of global change. Because of the possibility of climate change, we are taking actions today that will reduce greenhouse gas emissions substantially. We are not willing, however, to impose heavy economic costs on our citizens in light of the current uncertainties. As Roger Revelle -- the man who first

drew attention, national and international, to the possibility of a greenhouse effect -- put it in the last article he published, "The scientific base for a greenhouse warming is too uncertain to justify drastic action at this time."

Personally, I believe that the Bush Administration has received far too little credit for the actions we have already taken. Let me list some of these actions to provide a sense of what is already under way:

- The United States is committed to the strengthened Montreal Protocol agreed to in London in June 1990. We also have implemented a phaseout schedule of the major CFCs and halons more rapid than is required by the Protocol, whereas few other countries even have implementation measures in place. And the United States supports a financial facility to encourage and assist increased participation of developing countries in the Montreal Protocol.

- The Clean Air Act Amendments of 1990 substantially reduce the emissions of a number of gases that are either greenhouse gases themselves or greenhouse gas precursors. For example, the act puts a permanent ceiling on sulphur dioxide emissions and gives utilities the flexibility to make reductions by any means. This market-based approach is a powerful incentive for energy-saving measures, which in reducing fossil fuel combustion will sharply reduce carbon dioxide emissions.

- The National Energy Strategy, which is now working its way through the Senate, includes a number of provisions that aggressively promote energy conservation. These include steps to increase efficiency in electricity generation and use, encourage energy savings in residential and commercial buildings, boost the efficiency of industrial processes, and raise energy efficiency in transportation. The federal government is investing a significant amount in research and development for conservation and renewable energy technologies. Our Fiscal Year 1992 budget proposed that the R&D program for conservation and renewable energy increase by 18 percent, which represents an increase of over 50 percent since 1989.

- The National Energy Strategy also promotes the development of nonfossil fuel energy sources, including nuclear, solar, and alternative fuels. The nuclear option, in my opinion, will prove to be a particularly important component of the

future energy mix. Today, nuclear plants provide about 20 percent of America's electricity needs and make overall U.S. emissions of carbon dioxide 9 percent lower than they would otherwise be. Nuclear fission is the only technology currently available to us that can produce the large blocks of electrical energy now provided by fossil fuel plants with none of the associated greenhouse gas emissions. The National Energy Strategy includes a comprehensive strategy for nuclear energy development, including the development of new kinds of reactors, reform of the current licensing process, and the development of a permanent repository for nuclear waste. The strategy also emphasizes renewable resources, which, although they are almost certain to remain niche sources of energy for the foreseeable future, can play a larger role in meeting our energy needs than they do today. Quite simply, we as a nation have frittered away the lead time that we should have devoted to the development of inexhaustible, renewable energy sources, so that we now have no option but to use every energy source, in the short term, that is economically viable. Our challenge is to find the energy pathway to an inexhaustible, renewable source without destroying our environment or our economy along the way.

All of the above actions influence sources of greenhouse gases. Regarding sinks for greenhouse gases, the United States is also taking steps. For example, we are working with a number of developing countries to assess the land available for reforestation and to judge the feasibility of managing it to sequester carbon. The Congress has authorized the President's Tree Planting Initiative (PTPI), which is designed to offset greenhouse gas emissions and achieve other important social benefits through tree planting. The program entails the planting of 1 billion trees per year on 1.5 million acres and the improvement of forest management practices.

The actions I have been describing are extremely diverse, reflecting the many ways in which human activity involves the generation or sequestration of carbon dioxide. But together they have a powerful cumulative effect. With these policies in place, U.S. greenhouse gas emissions will remain at approximately current levels for the next 40 years -- through the year 2030 -- even accounting for our anticipated growth in economic activity. No other country can make a similar claim on the basis of the actions it has implemented.

The NAS Evans Panel concluded that the United States could reduce or offset its greenhouse gas emissions by between 10 and 40 percent of 1990 levels at low cost, or at some net savings, if proper policies are implemented. But this assumed a constant level of economic activity. If the Administration's policies were converted to such a "static" scenario, our policies would yield greenhouse emissions reductions comfortably within the range advocated by the Evans Panel.

In fact, however, very substantial economic growth is expected over the next 40 years, but the actions included in the Administration's policies are estimated to reduce the warming potential of greenhouse gas emissions in 2030 by one-third of what they would otherwise have been.

The Evans panel did not recommend targets or timetables for the future reduction of greenhouse gas emissions. I interpret this to support the more delivery-oriented approach that we in the Bush Administration have adopted. This approach uses the National Energy Strategy, the Clean Air Act, and other actions to ensure that we, as a nation, can -- and will -- deliver on our promises.

Meanwhile, we are continuing to examine strategies for reducing or offsetting emissions, ways of adapting to any warming that may occur, and mechanisms for working with other nations to address the full array of potential problems. This broad-based consideration of the issue has allowed us to develop a comprehensive, balanced, and flexible approach.

One last note on the NAS report: A few months ago one of the contributing panels to the study -- that on adaptation to potential climate change, which was chaired by Paul Waggoner of the Connecticut Agricultural Experimental Station in New Haven and Jesse Ausubel of The Rockefeller University -- released a report in which the panel did not take for granted that the optimum response is to try to prevent any change from taking place. Rather, they examined the costs of adapting to the various projected and predicted impacts of climate change and tried to place those costs in context. The panel's overall conclusion is as follows: "So far as we can reason from the assumed gradual changes in climate, their impacts will be no more severe, and adapting to them will be no more difficult, than for the range of climates already on earth and no more difficult than for other changes humanity

faces. However, because we cannot rule out major changes in ocean currents, atmospheric circulations, or other natural or social surprises, we need to be alert to any substantial probability or signs of such changes that would require responses not considered in our report."

It is always possible to argue about the panel's generally optimistic conclusions, particularly regarding its assessment of possible ecological impacts -- and many have! But it is refreshing to see the adaptation option to global climate change examined in a scholarly fashion and as a socially acceptable option.

The Reconfiguration of EOS

Another major development of the past year -- and one of special interest to this group -- is the continued evolution of our very important Mission to Planet Earth and its planned centerpiece, the Earth Observing System (EOS). Last summer an EOS Engineering Review Panel headed by Ed Frieman, director of the Scripps Institution of Oceanography, examined the general issue of how EOS should best implement available and new technologies. Originally, to obtain the essential element of simultaneity of observation for the 15 or so instruments on EOS through a common atmospheric column, a large platform capable of carrying all 15 instruments was planned. In the course of the study's deliberations, however, the Department of Defense and the Department of Energy declassified technologies, including new pointing and formation flying techniques, that appear to have substantial promise in observing global climate change phenomena. Also, the Air Force has indicated that additional medium-class expendable launch vehicles (Atlas IIAS's) will be available, within the EOS time frame, from the Western Test Range.

The availability of these medium-class launch vehicles from the previously unavailable Western Test Range and the new formation flying and pointing techniques has made it possible to think more realistically about replacing the single platform EOS with a fleet of smaller platforms. These platforms would still achieve the needed simultaneous observations and clustering of sensors required to respond to the

scientific priorities set by the IPCC and the U.S. Global Change Research Program.

I would like to echo the comments of the Frieman Panel by commending NASA for not only bringing the concepts of space-based remote sensing to bear on the issue of global change over these past years, but also for their responsiveness and creativity in helping to create a more robust and resilient EOS program through the recent Frieman report. As a result of their efforts, a new U.S. Global Change Observing System is presently emerging that combines -- in a new partnership -- the efforts of NASA with NOAA, DOE, and DOD to more effectively meet the space-based portion of the U.S. Global Change Research Program.

The Frieman Panel also reiterated the need to examine the data handling challenges that EOS will pose. Regardless of how the satellites are configured, the EOS system will continuously be returning massive amounts of data to the Earth -- the equivalent of the Library of Congress every 4.8 days. NASA and its partners are developing a data handling system capable of dealing with such huge amounts of information expected from the program. This is the object of the EOS Data and Information System (EOSDIS), which will have a scope that far exceeds that of any existing civilian data management system.

The "grand challenge" of developing EOSDIS is one of the driving forces behind the President's initiative, announced last February, in high performance computing and communications. This latter initiative will allow us to develop our information handling capability in parallel with the Global Change Research Program, so that when the need arises we will be able to digest, analyze, and present these huge amounts of data in useful form. Its goals are to increase the speed, memory capacity, and data transfer rates by factors between 100 and 1,000 in the next few years. Nothing less will suffice, but, happily, progress in this area is proceeding at a rate exceeding even our most optimistic estimates of a year ago.

It is also important to recognize that, while very large systems like EOS get more press and attention, equally important developments are taking place on the surface. Only by putting the space-based and ground-based activities together can we hope to answer the fundamental questions surrounding our global environment.

Regional Institutes

Another important development affecting the science of global change has been the ongoing planning for three regional institutes on global change research. One institute would focus on the Americas, a second on Europe and Africa, and a third on Asia and the western rim of the Pacific. The concept for these institutes was presented by President Bush at the 1990 White House Conference on Science and Economics Research Related to Global Change, and the United States and other countries have been moving aggressively to establish them since then.

Last July, for example, I attended a workshop in Puerto Rico attended by representatives of 22 Latin American countries to discuss the scientific agenda and administrative structure of the institute to be located in the Americas. This workshop was a great success, reflecting the strong commitment and interest of countries throughout South and North America to this concept. Also, while I was in Japan last week, I met with officials there to discuss a similar workshop to further planning for the Asian institute. And discussions are continuing to take place about reorienting the mission of the International Institute for Applied Systems Analysis (IIASA) in Vienna toward global change research.

Once all three of these planned institutes with north-south orientations are in place, it will be essential to develop strong east-west latitudinal linkages so that together -- with their satellite institutions -- they form a truly global network to address environmental issues of global concern.

Framework Convention Negotiations

All of these developments involving the science of global climate change form the backdrop for the ongoing international negotiations on the policy approaches to climate change. Since last February the Intergovernmental Negotiating Committee (INC) on a Framework Convention on Climate Change has held three meetings -- the first in Chantilly, Virginia, hosted by the United States, the second in Geneva, and

the third last month in Nairobi. The INC is working to develop a framework convention that would establish the relationships, institutions, procedures, and funding mechanisms with which countries would cooperate in responding to climate change. Though the schedule will be tight, the United States remains committed to a convention that will be ready for signing during the June 1992 UN Conference on Environment and Development (UNCED).

The international element of these negotiations reflects an important fact. No single country or limited group of countries can, in the longer term, have a significant effect on climate change through unilateral action. As the Office of Technology Assessment has pointed out, even if the United States were to reduce its emissions of carbon dioxide by 20 percent from current levels, it would represent a decline of just 2 percent in worldwide emissions of all greenhouse gases.

The meetings of the Intergovernmental Negotiating Committee have been a productive forum for the many countries represented, and significant progress has been made. However, significant differences have also emerged from the discussion, and intensive negotiations will be required to resolve them. Some countries have been very outspoken in their desire to focus on short-term targets and timetables for stabilizing or reducing carbon dioxide. The United States has taken the view that it is much more important to take actions than it is to make promises. We believe that countries should describe the actions they are taking or are prepared to take and quantify what the results of those actions will be. These actions should be selected by individual countries based on their particular situations; the kinds of actions that would produce a given benefit in reducing climate change differ substantially from country to country in their nature, applicability, and costs. We believe that commitments to results without commitments to action are not meaningful commitments.

The United States also advocates taking a comprehensive approach to greenhouse gas emissions, treating all radiatively active gases in terms of a scientifically determined global warming potential. This would make it possible to use market-based methods to achieving reductions in greenhouse gases. For example, a given country might find it economically advantageous to help another country reduce

emissions rather than spending an equal amount to make marginal reductions in its own emissions.

One very positive aspect of the negotiations thus far has been the progress made in the area of technology cooperation. Technology cooperation involves not just hardware but also techniques, practices, methodologies, know-how -- the software needed to use technological hardware. It also implies a two-way street, where developing countries assess their needs and opportunities and work together with developed countries to specify and meet those needs.

The United States has advocated a country study process, in which the vulnerability of individual countries to climate change would be assessed together with their contribution to greenhouse gas emissions. Technology options suited to that country could then be identified on the basis of the study. Using this information, countries would be asked to establish priorities, identify specific needs, and consider the availability of resources from a variety of sources. Indeed, the United States is already initiating such studies, even in absence of any formal commitments under the upcoming convention. The U.S. Environmental Protection Agency is already starting work with the governments of Brazil, Mexico, and Poland.

As I noted earlier, significant hurdles remain, but the United States continues to believe that a framework convention on climate change can be ready for signing during the UN conference next June. We are working hard in the INC to achieve an aggressive but realistic agreement that will provide the basis for a continued long-term response by essentially all countries to potential climate change. We are also intensively involved in the planning for UNCED, because we see it as a very important event in shaping the relationship between the developed and developing world regarding both the environment and development.

Conclusion

What, then, can be said overall about the issues I have been discussing this morning? Obviously, it is a very active and exciting time in the area of global

climate change, both nationally and internationally. I sometimes consider myself fortunate -- if occasionally hard-pressed -- to be involved in deliberations that will set a path for substantial world development extending many years into the future.

I believe that the political will and international solidarity exist to address these issues in a meaningful and responsible way. The development of the Antarctic ozone hole demonstrates that human beings have the capability to exert a major influence on their environment, on a short time scale, with consequences that are often difficult to foresee. The rapid international response to the threat of ozone depletion -- a threat heightened by the development of this ozone hole over Antarctica and by a reduction of ozone over the Northern Hemisphere -- demonstrates that the nations of the world can, and must, effectively work together when a well-defined environmental threat has been identified.

The emission of all greenhouse gases is a much more complex and large-scale issue than the emission of ozone-destroying chemicals, and the effort required to address greenhouse gas emissions will be correspondingly more involved. But we now have the opportunity to accept that challenge and set a course that could pay rich dividends. As President Bush has said, "Global stewardship is our shared responsibility and our shared opportunity. We must manage the Earth's natural resources in ways that assure the sustainability of humanity on this planet and in ways that maximize our potential for growth and opportunity for all. . . Let us join together and accept the challenge."