

Earth Observation Summit

Monitoring the Heartbeat of Mother Earth



NASA/Bill Ingalls

Secretary of State, Colin Powell. **Below:** Senior NASA and other U.S. government officials met with representatives from 34 nations in Washington, D.C. on July 31, 2003 to establish plans for an integrated international Earth observation system. The Summit convened in order to raise awareness of the importance of cooperation and investment in Earth observations in order to provide key scientific data to support global economic, social and scientific decision-makers.

Marc Cheves, LS

For more than 40 years, scientists and experts around the world have been building systems that observe and measure conditions on the earth. Thanks to such earth observing systems as Landsat and others, we know about change over time (see sidebar in the July issue of EOM, page 13). By watching the earth over time, we can see the effects of pollution and man-made changes. We now can make accurate predictions of future climate by observing ocean temperatures in the Pacific Ocean. Jack Dangermond, President of Environmental Systems Research Institute (ESRI), has long been a proponent of the use of geographic information systems (GISs) to analyze and map environmental data derived from all observing systems. GIS enables us to make informed decisions about the best course of action to prevent and reverse detrimental changes. One recent heartbreaking example of environmental damage is Saddam Hussein's systematic destruction and draining of the marshes of Southern Iraq after the first Gulf War, destroying a culture and wetland community that was thousands of years old.



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NASA Administrator, Sean O'Keefe, speaks at the Earth Observation Summit.

But gaps exist in the data at the global level. For example, a handful of countries have funded the Argo project which has deployed nearly 825 ocean-monitoring buoys worldwide. The buoys regularly drop below the sea surface to take salinity and velocity measurements, monitoring the ever-changing climate of the upper ocean. Data is sent to satellites overhead. But to be truly effective and fill in data gaps, 3,000 buoys are needed. With more than \$3 trillion (40 percent) of U.S. Gross Domestic Product (GDP) affected by climate and weather, including agriculture, energy, construction, travel and transportation industry sectors, there are powerful economic as well as environmental incentives for gaining a greater understanding of these phenomena. (See sidebars on the economics of global earth observation.)

Strengthening International Ties

At a G-8 meeting in Evian, France in June of this year, the G-8 Action Plan on Science and Technology for Sustainable Development called for strengthening global observation at the international level. Similar international summits were held in 2002, 2001, and 1992.

To that end, the Bush administration convened the first Earth Observation Summit in Washington, D.C. on July 31. The 2003 summit brought together ministerial-level representatives of 34 countries, as well as the Secretaries from the U.S. Department of State, Department of Commerce, Department of Energy, Department of the Interior, and the administrators of NASA, NOAA and the EPA. The purpose of the summit was to obtain high-level, international support for a comprehensive system of coordinated space-borne, airborne, and *in situ* observations, to help understand and address global environmental and economic concerns, and to increase knowledge about our planet.

In an effort to show the level of the Bush administration's commitment, Secretary of State Colin Powell opened the meeting by remarking that it was unusual to have three Cabinet-level Secretaries at one meeting. He went on to say that the peoples of the world are profoundly inter-connected, and that the goal of the meeting was to increase knowledge about our planet by forming a partnership between science and statecraft, geophysics and geopolitics. He elicited a chuckle from the crowd by revealing he had left college with a degree in geology and the rank of 2nd Lieutenant, saying he was sure that the world of science was glad he had chosen a military path. Career choices aside, he went on to say that for every dollar spent on good weather forecasting in the U.S., farmers reap a \$15 benefit. He also reiterated that the Internet gives us the power to make information available globally and eventually, in real-time, and underscored the need for scientific efforts to be based on sound science.

Closing the Data Gap

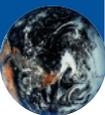
Secretary of Commerce Don Evans noted that 13 U.S. agencies are involved in research and monitoring as they "measure the heartbeat of Mother Earth." He spoke about the paucity of data globally, but underscored technology strides here in the U.S. As an example, Evans contrasted the effects of Hurricane Claudette's recent impact on Texas in which two people died with the hurricane that struck Galveston in 1900, killing 8,000 people and leaving 10,000 homeless.



The Economics of Global Earth Observation

Current Savings

- The annual economic return to the U.S. economy of NOAA's El Niño forecast system is between 13 and 26 percent. (The Office of Management and Budget specifies a minimum rate of return of 5.8 percent for federal projects.)
- Agricultural sector benefits from weather services are about 15 to 1—farmers get about \$15 of value out of every dollar spent forecasting the weather.
- The vast increase in warning lead-times not only decreases deaths and injuries, but substantial monetary savings as well. Improvements in all facets of observing and forecasting have on average made our five-day forecast of a hurricane's track as accurate as our three-day forecast was 15 years ago.
- A new financial industry—seasonal weather derivatives—has seen exchanges double from \$2 billion a year in 1998-2000 to \$4 billion in 2001. It is now at \$7 billion and as accuracy in forecasts increase, this industry will continue to grow.
- Worldwide agricultural benefits of better El Niño forecasts are at least \$450 to \$550 million per year.
- In the U.S. alone, the benefits to U.S. agriculture from altering planting decisions are estimated at \$265 - \$300 million. The El Niño forecast system is an international effort to observe and forecast an international event. The benefits from improved forecasting of El Niño affect large parts of the U.S. economy. For instance:
 - ★ There was a \$1.1 billion decrease in storm losses in California in the 1997-1998 El Niño as compared to the 1982-1983 El Niño. Although portions of the difference are due to different storm intensities and durations during each El Niño, a significant portion of the savings came from heightened preparedness.
 - ★ Benefits to U.S. agriculture by altering planting decisions have been estimated at \$265-300 million annually, throughout El Niño, normal and La Niña years. Benefits to Mexican agriculture range from \$10 to \$25 million per year.



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July 31, 2003, State Department, Washington, DC. U.S. Secretary Spencer Abraham of the Department of Energy speaks at the Earth Observation Summit.

Within a few decades the earth will have 12 billion people, and Evans proclaimed that it's time to close the data gap, "not just for us, but for the future." He spoke of the recently-announced 10-year, \$103 million program to speed research in climate change. Later, it was revealed that the funding wasn't new money, but rather re-allocated from other programs. At a press briefing afterward, it was also revealed that one of the major problems in sharing data is the policies of various countries around the world. Countries such as China, whose military zealously controls the taking of aerial images, make it difficult if not impossible for the private sector to engage in aerial photography.

In America, the term sustainable development generally elicits a blank look. We can see the effects of too-rapid growth: overloaded streets and highways and infrastructure that can't meet demands. But we also realize that growth is essential to our economy. The question then becomes one of how much growth and where. In America, we have plenty of land into which we can grow, but are well aware that the notion of inexhaustible natural resources is false.

The Bush Administration has been severely criticized for disregarding the Kyoto Protocols. Some say that the global warming argument is based on junk science, and furthermore, that the costs of implementing it don't outweigh the benefits. Other scientists say that if we look back in time, our current climate changes are simply part of a natural cycle.

Potential Savings

- ★ The annual cost of electricity could decrease by at least \$1 billion if the accuracy of weather forecasts was improved by just one degree Fahrenheit.
- ★ In the U.S., about one-third of our Nation's GDP is climate and weather sensitive. About \$3 trillion is at risk in agriculture, finance, insurance and real estate; retail and wholesale trade and manufacturing.
- ★ Better ocean observations can reduce the overall cost of oil pollution incidents by improved deployment of oil-spill clean-up equipment. Reliable oil-spill trajectory models depend on sea current and weather observations. Just in the Gulf of Maine, a one percent reduction in oil spill volume saves \$750K a year.
- ★ In the commercial aviation community, weather is responsible for approximately 2/3 of air carrier delays at a cost of \$4 billion annually—\$1.7 billion of which is avoidable with better observations and forecasts.
- ★ Improved data from more complete observations on volcanic ash plumes will provide more accurate and timely warnings of the presence of these hazards to aviation. Airlines will be able to avoid the serious damage these plumes can cause to aircraft engines, and avoid any chance for serious accidents.
- ★ If we can narrow our window of uncertainty through more relevant data and through the integration of multiple data sources, we will enable more informed economic decisions on many fronts—emergency response management, for example. It is cheaper to evacuate five square miles than 25 square miles.
- ★ With more observations, and more accurate forecasts, ships at sea will be able to make the changes in their routes to take advantage of favorable weather and avoid hazardous weather sooner, thus saving time and money.
- ★ In pure economic terms, studies show that national institutions providing weather, climate, and water services to their citizens contribute an estimated \$20-\$40 billion dollars each year to their national economies.
- ★ Knowing the water depths to a higher level of accuracy will allow ships to carry more cargo, producing more profit, and allowing the supply pipeline to continue flowing safely. We receive 95 percent of our goods by ship, and any information that keeps this supply going is vital. When a marine accident occurs, better forecasts lead to quicker rescues and salvage of the ships.
- ★ Twenty-five percent of the earth's biological productivity and an estimated 80-90 percent of the global commercial fish catch is concentrated in the coastal zones—where our populations are rising. In the U.S., 71 percent of our recent disasters were coastal storms. As the global population doubles in the next 10 years, people and economies will be at increasing risk.
- ★ Using very modest assumptions about costs, benefits, time horizons, discount rates, etc., the net present value of a program to modernize NOAA's weather service, similar to the effort undertaken in the 1980s and 90s, would provide about a 10 percent annual rate of return on the investment.

Source: U.S. Gov't



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Henri Djombo, Minister of Forest Economy and Environment, Republic of the Congo.

Today, with fingertip-ease and the click of a few buttons we have multi-media access to a staggering selection of global information sources. Travelers access long-range weather forecasts and pack their bags accordingly, farmers estimate crop yields and plan their activities, and scientists document extreme El Niño/La Niña climate trends caused by ever-so-slight changes in the oceans' temperatures. But more data is needed. In his remarks, Secretary Evans stressed the economic and humanitarian benefits, and told the audience, "the power exists in this room to make a difference."

An ad hoc Group on Earth Observation (GEO) was commissioned to develop a global observing strategy, with an open invitation given to other government and governing bodies of existing Earth observation systems to participate. Summit attendees also issued a declaration that can be viewed at www.earthobservationsummit.gov/declaration.html 

About the Author

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