THE ALLIANCE FOR EARTH OBSERVATIONS

Current News

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www.strategies.org/alliance

The Alliance for Earth Observations is a publicly and privately funded effort to promote the understanding and use of land, air and sea data for societal and economic benefit. The alliance will serve as a communications link between the industry, government, nongovernment and academic sectors as the United States works with the international community to plan and implement a global, integrated Earth observation system.

The alliance is an initiative of the Institute for Global Environmental Strategies, an international, nonprofit, 501c3 organization with extensive experience in Earth observations.

Support for the alliance is provided by:

- Ball Aerospace
- Boeing
- Lockheed Martin
- Northrop Grumman
- Raytheon

Forum on Earth Observations

September 16–17, 2004
Ronald Reagan Builiding
Washington DC

Business, academic, nongovernmental and governmental leaders will convene in Washington, D.C., on September 16–17, 2004, to discuss a new era for Earth observations. This prestigious event will engage the broad community in examining the role of observational data and information in various business sectors, including agriculture, energy, public health, transportation and tourism. The forum will serve as a venue for the exchange of information and feedback on the status of U.S. and international planning for the integrated Earth observation system, and as a chance to register contributions, interests or needs regarding Earth observations. The program will include keynote speeches, panel discussions and commissioned papers. For more information, or to find out about attending, participating in or sponsoring this event, please contact: **alliance@strategies.org**

A Season to Forget

Ohio Farmer's Experience Highlights Need for Improved Earth Observations

Like so many other farmers in the Midwest, Fred Yoder would like a "redo" on the growing season of 2002. If only he had known that an unusually wet spring would be followed by drought-like summer conditions—the equivalent of a one-two punch for corn growers like Yoder.

It started with heavy rains in April and May, which delayed planting at farms throughout the Midwest, including at Yoder's 1,100 acres scattered about central Ohio. In fact, the spring of 2002 turned out to be Ohio's 10th wettest, Illinois's fifth wettest and Indiana's third wettest on record.

Constantly waiting for soggy soils to dry meant extending planting into early June, well past the typically desired mid-May completion. Still, Yoder hoped that timely precipitation would help make up for the late finish, never imagining that the ample spring rains would run so dry, so soon.

"We pushed past the accepted planting dates because of eternal optimism, not science," Yoder said. "I don't think we had more than a half-inch of rain the rest of July and August."

"We pushed past the accepted planting dates because of eternal optimism, not science," Yoder said. "I don't think we had more than a half-inch of rain the rest of July and August."

(See SEASON, Pg. 2, Col. 2)

Q&A on Earth Observations

with retired Navy Vice Admiral Conrad Lautenbacher, under secretary of commerce for oceans and atmosphere

1 *For those not familiar with the topic, would you explain the concept of, and the need for, an integrated Earth observation system?*

Currently, thousands of remote sensing and *in situ* instruments (satellites, aircraft, buoys, etc.) are observing the Earth with the purpose of enhancing our understanding of Earth system processes, including weather, climate, oceans, land, geology, natural resources, ecosystems, and natural and human-induced hazards. Understanding these areas is critical to promoting human safety and welfare, alleviating poverty and other human suffering, protecting the global environment and achieving sustainable development. By connecting all of the individual sensors—making one integrated system—we could learn and accomplish much more.

With an integrated Earth observation system, we could monitor and assess scientific and geographic blind spots, thereby reducing scientific uncertainty.

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Earth Observations

A New Perspective For Industry

Industry leaders, along with representatives from the government, nongovernment and academic sectors, gathered in Houston for a January meeting aimed at defining the role of industry in the planning for an integrated Earth observation system.

The meeting, organized by the Institute for Global Environmental Strategies as part of its Alliance for Earth Observations initiative, was hosted by Boeing with additional support from Ball Aerospace, Lockheed Martin, Northrop Grumman and Raytheon.

Keynote presentations were given by retired Navy Vice Adm. Conrad Lautenbacher, under secretary of commerce for oceans and atmosphere and National Oceanic and Atmospheric Administration administrator, Charlie Kennel, director of the Scripps Institution of Oceanography, and Mary Altalo, a corporate vice president for Science Applications International Corporation.

The more than 30 participants concluded that the private sector could realize significant economic benefits from the planned observation system as long as:

- Industry provides input into the system's development, data integration and other areas;
- The planning process includes short-term projects built on existing capabilities;
- Government, industry, nonprofits and academia define a shared vision for the system and determine roles and responsibilities;
- Long-term continuity of the system is addressed; and
- Companies and industry groups garner private-sector support by making the business case for investment in Earth observations.

In his presentation, Lautenbacher stressed that involving the industry, nongovernment and academic sectors in the planning for the integrated Earth observation system is essential to its success. He also outlined his vision of industry's role in building, maintaining and using the system.

Speaking about academia's potential contributions to the global observing system, Kennel noted that "universities are becoming more multidisciplinary and service-oriented." He also talked of a "grand convergence" of Earth science and information technology,

(See INDUSTRY, *Pg. 3, Col. 1)*

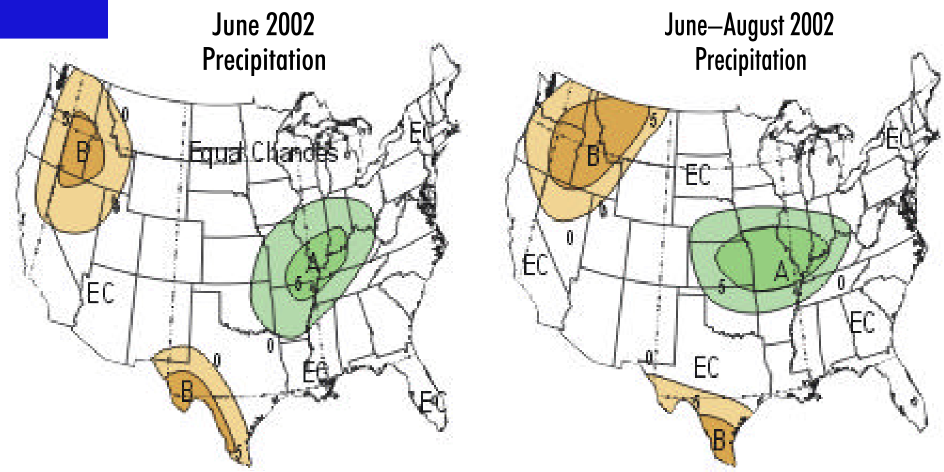

Fig. 1 **Precipitation forecasts issued by the Climate Prediction Center in May 2002 for June (left) and June-August (right). Green indicates above-normal precipitation and brown indicates below-normal precipitation. "EC" indicates equal chances of above-, below- or near-normal precipitation. (Source: NOAA)**

(SEASON, *From Pg. 1)*

Indeed, that summer was Ohio's eighth driest, leaving all of Yoder's crops—mainly corn, soybeans and wheat—starved for moisture. Come harvest time, his corn yields averaged a disappointing 58 bushels per acre, down from 178 the previous year. Soybeans fared better, but were still off nearly 50 percent from the year before.

"The results were a disaster," Yoder said. "I raised the poorest crops I ever had in all my 30 years in farming."

If only Yoder had known what Mother Nature had in store, then instead of corn he could have planted more soybeans, which can better handle adverse weather conditions. Or he might have planted nothing at all; collecting crop insurance would have been more cost-effective.

Yoder's story illustrates why the farming industry, especially the corn sector, with an annual national crop value of more than $20 billion, is desperate for more accurate and more specific weather and climate forecasts. While short-term forecasts—one to five days out—are fairly reliable and help farmers plan their day-to-day agricultural activities, longer-range and seasonal outlooks are vague and often incorrect.

"With some greater surety to seasonal weather patterns, farmers can adjust several variables to assure better production, better quality and avoid extra expense," said Rick Tolman, chief executive officer of the National Corn Growers Association.

Quantifying the accuracy of monthly and seasonal forecasts is difficult, but statistics compiled by the National Weather Service's Climate Prediction Center indicate that predictions are on the mark roughly 60 to 65 percent of the time for temperature and 55 percent of the time for precipitation.

Unfortunately for Yoder, precipitation estimates issued in May 2002 for the upcoming summer were not even close. The monthly forecast for June and seasonal forecast for June through August both showed central Ohio on the eastern edge of an above-normal precipitation area that covered much of the nation's heartland. By season's end, however, many parts of the Midwest saw a summer that was drier than usual, not wetter.

Weather and climate models are complicated and their accuracy depends on various factors, one of the most important being the observations that are fed into them. A 2001 study by the National Research Council, "Improving the Effectiveness of U.S. Climate Modeling," found that climate models "can be no better than our observations."

Not only are models initialized with measurements from ground-based, airborne and space-based instruments, but they also are evaluated and improved by comparing forecasts to observational data. Constant tweaking of observation networks in an attempt to improve short-term weather forecasts can make it hard to determine whether it's our climate, or just our instruments, that is changing, thus confounding assessment of climate model performance.

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thus allowing us to "observe globally, model regionally and act locally." In turn, "local observations and regional modeling will enable us to think more globally."

Meanwhile, Altalo provided an in-depth look at how weather, climate and ocean forecasts are used in the energy, health, tourism, transportation and finance sectors.

For more information, including complete copies of the keynote presentations, visit *www.strategies.org/alliance.* ■

Earth Observation Summit II

Recognizing that Earth's most pressing problems know no geographic boundaries, ministers of 47 nations and the European Commission agreed at the second Earth Observation Summit, held last month in Tokyo, to develop pioneering global architecture that will, over the next decade, revolutionize the understanding of how Earth works. Ministers set forth a visionary agreement committed to scientifically connecting the world for the benefit of people and economies around the globe.

"We all breathe the same air and drink the same water. We all cause pollution," said Mike Leavitt, Environmental Protection Agency administrator. "And working together, we can find the solutions and affect the changes needed to protect people, promote prosperity and preserve our planet."

Leavitt led the U.S. delegation to the summit, which included John Marburger, the president's science adviser, and retired Navy Vice Adm. Conrad Lautenbacher, under secretary of commerce for oceans and atmosphere and National Oceanic and Atmospheric Administration administrator. Also among the more than 300 participants was Japanese Prime Minister Junichiro Koizumi.

"Collectively we're pioneering the framework of a comprehensive [integrated Earth observation system]," Lautenbacher said. "The result will be sound science on which sound policy must be built."

The Tokyo summit fulfills a commitment made last year by the Group of Eight industrial nations. It builds on the first Earth Observation Summit, hosted by the United States last July, and directly feeds into next month's G-8 meeting in Georgia.

—*NOAA*

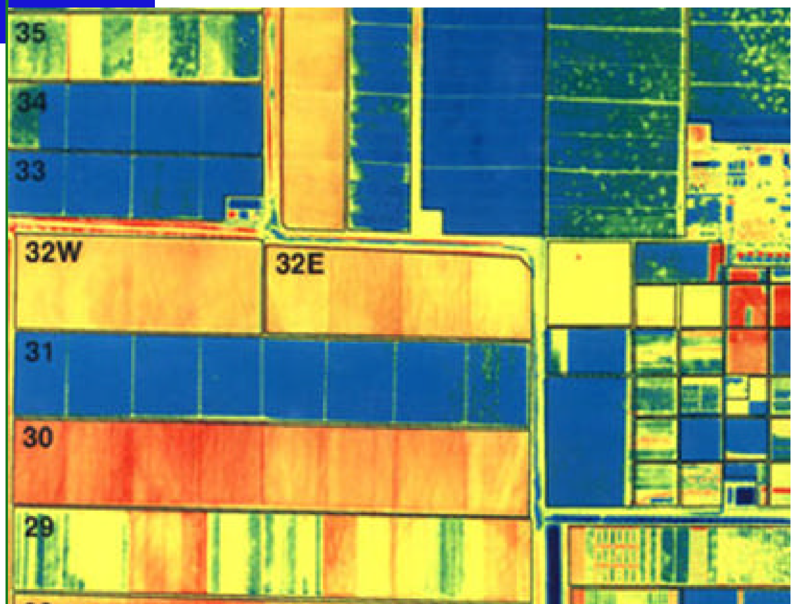

Fig. 2 **Infrared satellite image of the Maricopa Agricultural Center, a research farm in Arizona. Cool temperatures (blue and green) are associated with vegetation, warm temperatures (yellow and red) with bare soil. (Source: NASA)**

(SEASON, *From Pg. 2*)

"An effective and integrated system for producing and delivering climate information needs to be supported by data collected from a dedicated climate observing system," according to the National Research Council study. "Lack of a suitable sustained observing system for climate limits progress in climate modeling."

Observations are also critical to the fast-developing field of precision farming, the careful management of soil and crops based on data collected by satellites and other sensors.

For example, yield monitors installed on combines use global positioning system (GPS) data to produce detailed maps showing differences in productivity and soil moisture within individual fields. Meanwhile, satellite and aircraft images provide farmers an overview of growing conditions in all of their fields. Together, this information allows farmers to more effectively manage crops and target application of fertilizer, chemicals and water.

"Using yield monitoring, GPS and other tools helps farmers more precisely put inputs on crops, saving them money, maximizing production and minimizing environmental impact," Tolman said.

Despite these technological advances, more frequent satellite observations and improved remote sensing techniques are needed to realize the full potential of precision farming. Currently, long intervals between satellite passes can easily miss critical growth stages. Also, it sometimes can be difficult to distinguish between different kinds of plants, soils and shadows in remotely sensed images.

For Yoder, even precision farming wasn't enough to overcome the complications caused by late planting and unpredictable weather. Two years later, his soil, damaged from having been operated on in wet conditions, is still recovering, which serves as yet more evidence that farming depends on environmental information as much as any industry.

"Imagine the economic benefits one could realize if even general [weather] trends for the growing season could be known," Yoder said. "Decisions would make a lot more sense if we had good scientific criteria on which to base those decisions."

—*Dan Stillman*

Related Resources

Crop Moisture Stress Index
http://lwf.ncdc.noaa.gov/oa/climate/research/cie/cmsi.html

Improving the Effectiveness of U.S. Climate Modeling
http://books.nap.edu/books/0309072573/html

Earth Observatory: Precision Farming
http://earthobservatory.nasa.gov/Study/PrecisionFarming

National Corn Growers Association
http://www.ncga.com

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(Q&A, *From Pg. 1)*
Just as a doctor cannot diagnose a patient's health by taking one measurement, neither can scientists truly understand what is happening on our planet without taking Earth's pulse everywhere it beats, which is all over the globe.

Technology in the 21st century must be as interrelated as the planet on which we live. Water, weather, climate and other key concerns know no geographic boundaries, which is why one integrated system is required to understand them.

2 *Could you describe a specific scenario that will be improved or different as a result of the integrated Earth observation system?*

Through an integrated Earth observation system, we could see a number of improvements, such as:

- Up-to-the-minute, accurate forecasts of weather and road conditions available in every car and truck on our highways would give travelers and commercial vehicle operators on every road in our national system the advantage of knowing if there is fog, heavy rain, hail or developing ice and snow ahead. Savings in lives and economic benefits in the billions would accrue.
- Real-time monitoring and forecasting of the water quality in every watershed and accompanying coastal areas would provide agricultural interests with immediate feedback and forecasts of the correct amount of fertilizers and pesticides needed to maximize crop production at minimum cost, and to maintain healthy ecosystems that will support greatly increased exclusive economic zone fisheries output and value from coastal tourism.
- Agriculture and energy are just two of many important economic sectors that will benefit from improved observation networks and satellite coverage, as more accurate global and regional climate forecasts will maximize crop production and efficient use of resources.
- Comprehensive monitoring of physical, chemical and biological parameters in combination with supercomputing will give us the capability to predict and prepare for such human health risks as the next outbreak of diseases like malaria, West Nile virus or SARS.

3 *How is the United States going about planning and preparing for the international, coordinated and sustained system?*

The United States is involved on both the domestic and international fronts. The United States has established the Interagency Working Group on Earth Observations (IWGEO) to draft the multiyear U.S. implementation plan for the system, as well as to provide input into the international group, the ad hoc Group on Earth Observations (GEO).

The IWGEO, which is comprised of 15 U.S. government agencies, reports to the National Science and Technology Council's Committee on Environment and Natural Resources (CENR), which the National Oceanic and Atmospheric Administration (NOAA) co-chairs with the Environmental Protection Agency (EPA) and the White House Office of Science and Technology Policy (OSTP).

The IWGEO is co-chaired by Ghassem Asrar, NASA associate administrator for Earth science, Cliff Gabriel, OSTP deputy associate director for science, and Greg Withee, NOAA assistant administrator for satellite and information services. All of the represented agencies possess Earth observation technologies or have a vested interest in the use of the data. The IWGEO meets weekly and is tentatively planning to release the draft U.S. implementation plan for public comment around the one-year anniversary of the first Earth Observation Summit, held July 31, 2003.

The 15 government agencies that make up the IWGEO are the departments of Agriculture, Commerce (NOAA), Defense, Energy, Health and Human Services, Homeland Security, Interior (United States Geological Survey), State, Transportation, and the EPA, NASA, National Science Foundation, Smithsonian, Tennessee Valley Authority and the U.S. Agency for International Development. The White House, through the OSTP, Council on Environmental Quality and Office of Management and Budget, also participates. Before submission to GEO, all U.S. inputs must be approved by the CENR.

I serve as one of four GEO co-chairs along with counterparts from the European Commission, Japan and South Africa. There have been four GEO meetings, the most recent in Tokyo in conjunction with the second Earth Observation Summit. The next meeting is planned for fall 2004 in Ottawa, Canada.

Thus far, we have made remarkable progress. GEO members have agreed on language for a draft framework document, which was presented to ministers for approval at the Tokyo summit. The framework document, which should be available to the public soon, focuses on the socioeconomic benefits provided by Earth observations. GEO has also established a team to begin writing the 10-year implementation plan for establishing the integrated Earth observation system, known as the Global Earth Observation System of Systems (GEOSS). A final draft of the plan will be presented to ministers at the third Earth Observation Summit, slated for Brussels, Belgium, in February 2005.

4 *How does the international effort support our national interest?*

Water, climate, weather and other key environmental issues transcend political borders. An integrated global observing system would better address gaps in our understanding of Earth system processes. For example, NOAA scientists recently have been working with students from Howard University and scientists from Spain to trace the impact of dust from the Saharan desert as it heads west across the Atlantic Ocean. This movement of African dust could significantly impact climatic, biogeochemical and meteorological phenomena in the tropical Atlantic.

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(Q&A, *From Pg. 4)*

5 *When will such a system be established?*

The investments for an integrated Earth observation system are already being made. GEOSS will be a distributed system of systems, building on current cooperation efforts among existing observation and processing systems, while at the same time encouraging and accommodating new technologies. A draft of the 10-year implementation plan establishing GEOSS will be presented to ministers at the third Earth Observation Summit in February 2005.

Beyond 2005, the implementation of the 10-year plan will require a successor mechanism with maximum flexibility that builds on the work conducted by GEO. The system must be an evolving, adaptable system that accommodates emerging technologies and environmental problems.

6 *In what ways will industry benefit from this system?*

There are significant benefits that could be realized by industry, both at the development and user level. Industry has always played a critical role in the development of our Earth observing systems, ranging from satellites to computers to buoys. We would not be where we are today without industry's innovation. As this process evolves, we anticipate that industry will play a role in helping us address gaps, building new systems and helping develop data management tools; data management and archiving is probably one of our greatest challenges. The system will include the highest quality data available, which includes commercial data.

From the user side, an improved Earth observation system will lead to better understanding of environmental phenomena, which will ultimately provide better information for decision-makers throughout the private and public sectors in areas such as urban planning, mining, transportation, energy, agriculture, forestry management, coastal management, tourism, insurance and construction.

Earth observations already provide benefits for many of these sectors. For example, farmers gain about $15 for every dollar spent on weather forecasting. Improving the accuracy of weather forecasts by just one degree Fahrenheit could decrease the annual cost of electricity by at least $1 billion. In the commercial aviation sector, weather is responsible for approximately two-thirds of air carrier delays at a cost of $4 billion annually, $1.7 billion of which would be avoidable with better observations and forecasts.

Imagine the benefits of a truly global integrated system.

7 *How can industry participate in planning for the system?*

In order for this effort to succeed, we need partnerships with industry, academia and nongovernmental organizations. Right now we are working at the governmental level focusing on policy issues, such as securing agreements to share data and provide products, and identifying the needs of other nations—these are difficult political issues.

To address user needs and technical questions, GEO has established the Subgroup on User Requirements and Outreach. Its purpose is to engage users such as industry in a continuing dialogue on their current and evolving requirements. The IWGEO has also established a parallel team to work with users on the national front.

We would also look to industry to organize itself, through such mechanisms as The Alliance for Earth Observations, to put forward its ideas, needs and concerns. Finally, once we have developed the draft U.S. implementation plan, we anticipate opening it to public comment. This would provide industry, as well as other stakeholders, an opportunity to participate in the planning for the system.

8 *What are the most important steps that must be taken over the next five years to make the system a reality?*

On the international front, we must reach agreement and gain ministerial approval of the 10-year implementation plan for GEOSS, preferably at the Brussels summit in February 2005. How we move forward on implementation of the plan will depend on what mechanism replaces GEO. We hope to see a successor mechanism established, with membership open to all interested governments, the European Commission and relevant international organizations—similar to the process we have now. On the national front, the next important step is the unveiling of the draft U.S. implementation plan for public comment, tentatively scheduled for this summer.

Success will be measured by operational achievements, both short-term and long-term. We must improve the coverage, quality and availability of the essential information derived from remote sensing instruments and *in situ* networks, and involve users from developed and developing countries and the private and public sectors to ensure we are addressing needs over time. In particular, success will be measured by how well we apply global, multisystem information capabilities to areas such as disaster mitigation, including response and recovery; water resource management; ocean monitoring and marine resources management; air quality monitoring and forecasting; biodiversity conservation; sustainable land use and management; and tracking invasive species vectors. ■

INSTITUTE *for* GLOBAL ENVIRONMENTAL STRATEGIES

This newsletter was produced by the Institute for Global Environmental Strategies (IGES) as part of its Alliance for Earth Observations initiative. For additional news and information, please visit: *www.strategies.org/alliance*.

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