Teaming Up To Examine Planet Earth

The reason we had so much advance notice of the latest El Niño—the periodic weakening of trade winds in the Pacific that causes a shift in ocean currents—is that several environment-monitoring satellites detected it at its inception last March.

In the next 2 years, the National Aeronautics and Space Administration (NASA) will launch more than 10 such satellites. This will form what NASA describes as "the most aggressive constellation of satellites in the history of this planet." They are designed to give the Earth a complete physical examination as part of NASA's "Mission to Planet Earth."

The exam may take 25 or more years. The resulting understanding of Earth as a system should help point to ways to protect the planet's health.

One goal is to predict critical weather and climate conditions—not 5 days ahead, as is possible with current satellites, but perhaps a month or a growing season ahead.

This issue's cover story tells how USDA's Agricultural Research Service soil moisture experts joined with many other scientists supported by NASA to turn the Planet Earth "stethoscope" on a large swath of Oklahoma to gain new insights into land-atmosphere interactions that may have parallels with the El Niño phenomenon. Depending on geography and season, anomalous or unseasonable conditions in soil moisture over a large enough area can affect regional—and possibly global—climates.

The SGP97 (Southern Great Plains 97) project, supported jointly by NASA and several other federal agencies, is led by Tom Jackson of the ARS Hydrology Laboratory in Beltsville, Maryland. It is the latest in a series of cooperative projects with Beltsville scientists dating back to 1978. This cooperative relationship has been aided by proximity: NASA's Goddard Space Flight Center is next door to ARS' Beltsville Agricultural Research Center. And Goddard has the biggest share of NASA's Mission to Planet Earth assignment.

NASA headquarters' land surface hydrology program manager, Ming-Ying Wei, is as pleased as Jackson is by the data taken in SGP97, saying it gives scientists the type of knowledge needed to design a global observing system for soil moisture.

The Beltsville scientists also work with scientists at NASA's Marshall Space Flight Center in Huntsville, Alabama, and NASA's Jet Propulsion Laboratory in Pasadena, California. ARS scientists from other labs, including those in Ames, Iowa, Riverside, California, and Phoenix and Tucson, Arizona, also work closely with NASA.

This ARS-NASA cooperation has dividends for other USDA agencies as well. In 1985, the National Agricultural Statistics Service (NASS), Foreign Agricultural Service, Farm Service Agency, and Natural Resources Conservation Service signed an agreement under which ARS provides research assistance to improve crop and land assessment reports.

One very visible result of this cooperation is the biweekly "greenness" maps that NASS began putting on the World Wide Web last year. (Go to http://www.nass.usda.gov/research) These maps of the continental United States use a sensor on a National Oceanic and Atmospheric Administration satellite to estimate the development and vigor of crops by the amount of chlorophyll in the leaves.

In 1998, NASA plans to launch the MODIS satellite, which will have a new and improved sensor to collect data for these maps. It will have better spatial resolution and be better equipped to handle atmospheric interference.

George Hanuschak, associate director of the research division of NASS, says that by giving a big picture on crop development and vigor, the maps can sometimes provide policymakers informative views of an unfolding disaster. One example was the cold and windy winter of 1995-1996 that, when combined with a subsequent spring drought, did heavy damage to major winter wheat-growing areas of the United States.

Paul Doraiswamy, who is with ARS' Remote Sensing and Modeling Laboratory in Beltsville, has helped NASS develop the mathematics model needed to generate the greenness maps from the satellite sensor. Doraiswamy is a member of the vegetative assessment and mapping team for the SGP97 study.

In another project, Doraiswamy is developing methods for integrating data from satellites with crop simulation models to supplement NASS crop estimates data. This would be yet another example of the payoffs from USDA-NASA cooperation, with international implications for everyone—from farmers to stockbrokers and crop insurance agents to urban residents.

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