

## **Biospheric Sciences Branch Highlights for January - February 2002**

### **\*\* Terra Data Products Meeting at NASA HQ.**

The status and availability of Terra science data products were presented and discussed at NASA HQ on January 7 and 8, 2002. The meeting was requested by Code YS to update HQ staff on the current situation regarding Terra products and organized by Martha Maiden/YS and Jon Ranson/923. All Terra Instrument Team Leaders and PIs, relevant DAAC managers, and the ESDIS Science Operations Manager were present. Jack Kaye, Martha Maiden, Diane Wickland plus several other HQ program managers were in attendance. Mike Luther, Mary Cleave and Ghassem Asrar also were able to attend at various times. In essence the Terra message was that science validated products are available and others are coming on-line soon. The DAAC message was the existing data products are being made available, but distribution is hampered by data format and volume issues. The HQ message was Terra is the first EOS platform launched and is being placed under the microscope by the leaders of the science community and our sponsors. Perceptions are that validated Terra products are becoming available too slowly. There is also an apparent disconnect between HQ program metrics and the scientists working on related problems. Improved communication can go a long way towards addressing these issues. Terra science teams and data centers will work to make the science community aware that Terra data products are ready for use and how to get access to them, through published articles, workshops and presentations at major science meetings. The Terra Project Scientist will also work to improve communications with HQ where ever possible.

### **\*\* Draft press release for Code 923 research work on weather changes and outbreaks of Rift Valley Fever and Ebola**

By observing climate variability from space with satellites, scientists are working to determine where disease epidemics are likely to occur on Earth. In a pair of recent reports, NASA earth scientists have studied weather changes and subsequent outbreaks of two viral hemorrhagic fevers prevalent in Africa: Rift Valley Fever and Ebola. The diseases are dissimilar -Ebola only afflicts people in tropical forest areas, while RVF is deadly to livestock and occasionally to people in semi-arid Africa.

"Satellite data can be an important tool for public health disease surveillance," said Dr. Assaf Anyamba, a research scientist at NASA's Goddard Earth Sciences Technology Center. "Once we learn more, we could be able to predict climatically-linked outbreaks before they occur." While the study on Rift Valley

Fever was conclusive, the Ebola study was limited by the small number of Ebola outbreaks which occurred over the past twenty years.

The two studies, which will appear in an upcoming Special issue of Photogrammetric Engineering on Remote Sensing and Human Health will, provide further evidence that climate variability can affect disease patterns: They come fast on the heels of recent NASA research that connects outbreaks of the South American disease Bartonellosis with the appearance of the weather phenomenon El Nino.

Accurate prediction of epidemics is still years away. But in the short term, satellite monitoring could still benefit public health in developing countries, where resources to combat disease are limited. "It is not feasible to send health workers everywhere," Anyamba said. "But if we know where outbreaks are likely, those areas can be targeted. We can focus our efforts where they are needed."

Locating those areas requires the use of polar-orbiting satellites, such as the Terra satellite, which NASA scientists use to monitor vegetation on the ground. Since green vegetation cover varies with rainfall, it is a good indicator of climate variability, and therefore of conditions necessary for disease outbreaks. "So far, our team has mapped areas of Africa at risk for Rift Valley Fever outbreaks," Anyamba said. "Satellite mapping has identified where and when Rift Valley Fever outbreaks will occur."

The situation with Rift Valley Fever is simple: abnormally high and persistent rainfall in semi-arid Africa leads to outbreaks of the Rift Valley Fever virus. Ensuing flooding creates conditions necessary for breeding of mosquitoes that transmit the Rift Valley Fever virus, first to domestic cattle, and frequently to people as well. Though Rift Valley Fever causes relatively low mortality (about 1%) of the human cases, it can have devastating economic impacts on the countries affected. "In East Africa, animal husbandry is a major part of economy," Anyamba explained. "Arab countries purchase a great deal of their meat products from East Africa. During the last Rift Valley Fever outbreak, many Arab nations stopped imports from the region completely, which was catastrophic to the local economy, especially in the semi-arid and arid regions of East Africa."

Ebola hemorrhagic fever is encountered in the tropical forest areas of Africa, but despite its notoriety as a highly-fatal disease, it remains a mystery in many respects. Though the first known Ebola epidemic occurred in Sudan in 1976, scientists still have not identified how the virus is transmitted or what animals might host it. In an effort to identify conditions under which the virus appears, the Goddard scientists examined satellite data of tropical areas of Gabon and the Congo afflicted in 1994-1996. They noted a sharp change from persistent dry

conditions to wetter conditions over a 1-2 month period prior to the outbreaks, suggesting these dry to wet changes might be a "trigger event". Dr. Compton Tucker, lead author on the Ebola paper, cautions that additional work is needed to verify the existence of the climatic trigger for Ebola. "It's fortunate for those affected by Ebola that we have so few outbreaks to study, but it makes our job more difficult. Drawing conclusions from a small sample is risky. " said Tucker. The work continues, using satellite data of Earth beamed to receiving stations around the clock by NASA satellites.

**\*\* AERONET has ~160 sites world-wide but only three in Russia and China**

NASA has signed an AERONET agreement with the Institute of Atmospheric Optics in Tomsk, Siberia. Prof. Mikhail Panchenko the director of Environmental Optical Diagnostics Division is scientifically very involved in aerosol research and has warmly welcomed our offer to organize and manage a network in Russia of approximately 8 NASA AERONET stations. Over the next several months we'll establish the requirements for operation and research and work out the costs and logistical details. It is hoped we can begin data collection by mid-summer.

The Chinese Meteorological Administration (CMA) purchased 30 Cimel sun and sky-scanning radiometers and will take delivery this month. Although there has been no direct contact with AERONET staff, a recent correspondence indicates a willingness to collaborate with AERONET. CMA will be signing agreements with NOAA and NASA in March here in Washington. Code I will work to include AERONET as one of those top level agreements.

Additional AERONET products:

The AERONET web site now has dynamic monthly climatology tables of AOD for all sites by year and all years. Oleg Dubovik (Code 923) is making good progress with a new inversion using spheroids that improves size distribution retrievals for dust. Several new "products will come on line shortly--most noteworthy are modal optical depths and a quality assured data-base of the inversion retrievals. Tom Eck (Code 923) has published an INDOEX summary of our data, A. Smirnov (Code 923) a marine aerosol characterization and Dubovik a summary paper on aerosol optical properties and aerosol models. Brent Holben (Code 923) is organizing the next paper on aerosol climatology of the inversion retrievals.

**\*\* AERONET Project team contributes to special issue of the Journal of the Atmospheric Sciences**

Members of the Code 923 Biospheric Sciences AERONET Project have made a significant contribution to a special issue of the Journal of the Atmospheric Sciences published by the American Meteorological Society. The special issue was entitled "Global Aerosol Climatology Project".

The AERONET team contributed 7 papers which included three first-authored papers. Contributing members include Brent Holben, Project leader, Oleg Dubovik, Tom Eck, Ilya Slutsker, Alexander Smirnov, Stefan Kinne, and Norm O'Neil. Alexander Smirnov was first author on two papers and Oleg Dubovik was first author on one paper.

All the team members provided important contributions to this special issue which emphasized the direct and indirect radiative forcing of climate by tropospheric aerosols. The Global Aerosol Climatology Project (GACP) was a joint program of the NASA Radiation Sciences Program and the Global Energy and Water Cycle Experiment (GEWEX).

Global Aerosol Climatology Project special issue, Journal of the Atmospheric Sciences, Vol. 59, 1 February, 2002.

**\*\* Study funded by DTRA to examine the use of vegetation fluorescence in military applications**

A proposal (PI, E.M. Middleton, Code 923) submitted on 6/01/01 to the Army's Defense Threat Reduction Agency (DTRA) to support a one-year pilot study examining the use of vegetation fluorescence in military applications (e.g., locating small land mines), has been approved by DTRA for funding. This project complements ongoing NASA-supported research into the use of fluorescence to quantify and monitor the interactions of the nitrogen and carbon cycles in plant productivity.

**\*\* Early EO-1 Science Results presented**

Steve Ungar gave an invited Seminar in Physical Geography at Boston University the week of February 11. He presented early EO-1 science results to an audience of faculty and graduate students. That same week he participated in a NOAA-sponsored Hyperspectral Workshop at MIT Lincoln Laboratory, delivering the kickoff presentation on Space-borne Spectral Imaging.

**\*\* NEESPI Workshop Held in Moscow 20-22 February 2002**

On February 20-22, 2002 Dr. Don Deering, Code 923, co-hosted with Russian counterpart, Dr. Alex Georgiadi of the Institute of Geography of the Russian Academy of Sciences, the first in a possible series of workshops supporting what is currently being called the Northern Eurasia Earth Science Planning Initiative (NEESPI). Dr. Garik Gutman, Program Manager for Land Cover-Land Use Change (LCLUC), NASA Headquarters, also participated in leading the U.S. Earth Science delegation in Moscow. The NEESPI is a planning strategy that is designed to explore the possibility of establishing an international and interdisciplinary program of research with the goal of developing a better understanding of the Northern Eurasia ecosystem and atmosphere, along with its related interactions with human dynamics particularly related to land cover changes. The workshop was held at the Presidium of the Russian Academy of Sciences, where discussions were held and presentations were given by American and Russian participants on existing and potential independent and cooperative programs on various Earth Science-related topics, with the focus on satellite remote sensing, data-gathering methods, and ground-site observation on the forest land coverage, usage, and human interaction of the arboreal ecosystem. The findings of the NEESPI workshop will be developed in a formal report and are scheduled to be presented to the Earth Science Joint Working Group in June 2002.

The workshop was attended by approximately 30 Russian officials and scientists and 10 representatives from the U.S. The meeting was supported by NASA Moscow Liaison Office officials, including Mr. Patrick Buzzard, Acting Deputy NASA Russian Representative, as well as Ms. Melissa Sanderson and Dr. Steven Olson, from the U.S. Embassy Moscow's Environment, Science and Technology (EST) section. Russian NEESPI participants were mainly from the Russian Academy of Sciences, but there were also representatives from industry and several Russian governmental agencies, including the Ministry of Industry, Science and Technology, the Ministry for Land Surveys, the Ministry of Communications and Information, and the Kurchatov Russian Research Center Institute.