June 2002

ARM Facilities Newsletter

ANL/ER/NL-02-06

Atmospheric Radiation Measurement Program

www.arm.gov

ARM Intensive Operational Period Scheduled to Validate New NASA Satellite

Beginning in July, all three ARM sites (Southern Great Plains [SGP], North Slope of Alaska, and Tropical Western Pacific; Figure 1) will participate in the AIRS Validation IOP. This three-month intensive operational period (IOP) will validate data collected by the satellite-based Atmospheric Infrared Sounder (AIRS) recently launched into space.

On May 4, the National Aeronautics and Space Administration (NASA) launched Aqua, the second spacecraft in the Earth Observing System (EOS) series. The EOS satellites monitor Earth systems including land surfaces, oceans, the atmosphere, and ice cover. The first EOS satellite, named Terra, was launched in December 1999. (See the *March 2001 ARM Facilities Newsletter* for more information on Terra.)

Figure 1. Locations of ARM sites around the globe.

ARM Facilities Newsletter is published by Argonne National Laboratory, a multiprogram laboratory operated by The University of Chicago under contract W-31-109-Eng-38 with the U.S. Department of Energy.

Technical Contact: James C. Liljegren
Phone: 630-252-9540
Email: jcliljegren@anl.gov
Editor: Donna J. Holdridge

The second EOS satellite is named Aqua because its primary focus is understanding Earth's water cycle through observation of atmospheric moisture, clouds, temperature, ocean surface, precipitation, and soil moisture. One of the instruments aboard Aqua is the AIRS, built by the Jet Propulsion Laboratory, a NASA agency.

The AIRS Validation IOP complements the ARM mission to improve understanding of the interactions of clouds and atmospheric moisture with solar radiation and their influence on weather and climate.

In support of satellite validation IOP, ARM will launch dedicated radiosondes at all three ARM sites while the Aqua satellite with the AIRS instrument is orbiting overhead. These radiosonde launches will occur 45 minutes and 5 minutes before selected satellite overpasses. In addition, visiting scientists from the Jet Propulsion Laboratory will launch special radiosondes to measure ozone and humidity over the SGP site. All launches will generate ground-truth data to validate satellite data collected simultaneously. Data gathered daily by ARM meteorological and solar radiation instruments will complete the validation data sets.

Data from Aqua-based instruments, including AIRS, will aid in weather forecasting, climate modeling, and greenhouse gas studies. These instruments will provide more accurate, detailed global observations of weather and atmospheric parameters that will, in turn, improve the accuracy and quality of weather forecasts. A satellite-based instrument is cost-effective because it can provide continuous global measurements, eliminating isolated yet costly weather balloon releases.

Figure 2. Launch of the Aqua satellite on May 4, 2002, from Vandenberg Air Force Base in California. (Source: NASA)

Aqua, launched from Vandenberg Air Force Base in California (Figure 2), carries six state-of-the-art instruments that measure various water vapor parameters:

1. AIRS, which measures atmospheric temperature and humidity, land and sea surface temperatures, cloud properties, and radiative energy flux.
2. Advanced Microwave Sounding Unit, which measures atmospheric temperature and humidity during both cloudy and cloud-free periods.
3. Advanced Microwave Scanning Radiometer, which measures cloud properties, radiative energy flux, precipitation rates, land surface wetness, sea ice, snow cover, sea surface temperature, and wind fields.
4. Clouds and the Earth's Radiant Energy System, which measures radiative energy flux.
5. Humidity Sounder for Brazil, which measures atmospheric humidity by using a passive scanning microwave radiometer.
6. Moderate Resolution Imaging Spectroradiometer, which measures cloud properties, radiative energy flux, aerosol properties, land cover and land use change, vegetation dynamics, land surface temperature, fire occurrence, volcanic effects, sea surface temperature, ocean color, snow cover, atmospheric temperature and humidity, and sea ice.

Figure 3. A drawing of the Aqua satellite as it orbits Earth. (Source: NASA)

The data-gathering capabilities of the Aqua instruments will provide an unprecedented view of atmosphere-land interactions (Figure 3). The availability of more frequent, more accurate global measurements of important atmospheric parameters will both improve our capabilities for short-term weather forecasting and lead to a better understanding of climate variability and climate change. Simultaneous measurements of many parameters will allow scientists to study complicated forcings and feedbacks of the atmosphere, which can be integrated into climate models.

For more information on the Aqua satellite, see http://aqua.nasa.gov on the Internet.