Atmospheric Radiation Measurement Program
www.arm.gov
ARM

September 2003

ARM Facilities Newsletter

ANL/ER/NL-03-09

Diffuse Irradiance Study Planned for October

The Second Diffuse Irradiance IOP (intensive observation period) will be held at the SGP central facility on October 6-17, 2003. (The first IOP in the series was held in fall 2001.) The purpose of this second IOP is to develop a reference standard for shortwave diffuse horizontal solar irradiance, which is the amount of sunlight that reaches the ground after it has been scattered by air molecules, dust, or clouds. Currently, there is no absolute reference for this measurement.

Solar irradiance measurements are made with pyranometers, instruments that gather and record the amount of solar energy reaching Earth's surface. Pyranometers measure both direct and indirect sunlight. For the indirect measurement, a shade that follows the sun as it moves across the sky is installed over the instrument. The shade allows only indirect (scattered) sunlight energy to reach the detector.

Figure 1. A group of pyranometers and radiometers installed at the SGP CART site near Lamont, Oklahoma. The instruments measuring diffuse solar radiation have black sphere-shaped shades to keep direct sunlight from reaching the sensors (ARM photo).

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

In the 2001 IOP, about half of the participating pyranometers gave consistent measurements of 2 watts per square meter. (One square meter equals nearly 11 square feet.) For the scheduled second IOP, pyranometers that were the most consistent in 2001 will participate again, along with a new prototype instrument that has tested at improved levels.

Water Vapor Experiments Scheduled at SGP

On October 27-November 16, 2003, David Whiteman and Francis Schmidlin from the National Aeronautics and Space Administration (NASA), Holger Voemel from the National Oceanic and Atmospheric Administration, Larry Miloshevich from the National Center for Atmospheric Research, and Barry Lesht from Argonne National Laboratory will collect data at the SGP central facility in an effort to validate a satellite-based atmospheric moisture sensor called AIRS (atmospheric infrared sounder). The researchers will compare AIRS data with results from both permanently installed ARM instruments and some guest instruments.

Figure 2. An ARM technician launches a weather balloon to measure vertical profiles of atmospheric temperature, pressure, winds, and water vapor (ARM photo).

The AIRS instrument, built by the Jet Propulsion Laboratory, is onboard Aqua, an Earth Observing System (EOS) satellite launched by NASA in May 2002 to collect data on atmospheric moisture, clouds, temperature, ocean surface, precipitation, and soil moisture. During the three-week IOP, researchers will launch several types of weather balloons (radiosondes) to measure specific atmospheric characteristics while the satellite passes overhead. Water vapor data will be collected from ARM's Raman lidar system and the microwave radiometer that operate year-round at the central facility. The researchers will compare the ground-truth data collected by the radiosondes, lidar, and microwave radiometer with the AIRS data.

Because atmospheric water vapor measurements are critical to the accuracy of solar radiation calculations in climate models, the instruments making the measurements must be correctly calibrated and verified. The AIRS instrument, one of the most accurate for water vapor measurement, provides much more data than can be collected by launching weather balloons manually. This IOP will attempt to confirm that the ARM water vapor instruments can be used as standards for validating the AIRS satellite-based instrument.