

MULTIFILTER RADIOMETER ADDED TO CESSNA PAYLOAD

Downward-facing multifilter radiometers (MFRs) are instruments used to measure the intensity and distribution of reflected energy from different surfaces, such as grass or dirt. The relative amount of reflected energy — also called *surface spectral albedo* — is important for determining the amount of energy exchanged between the surface and atmosphere in a given location.

In May 2007, an MFR was added to the instrument payload on the Cessna 206 aircraft, to acquire routine in-situ aerosol profiles and carbon measurements at the ACRF Southern Great Plains (SGP) site as part of the long-term In-situ Aerosol Profiles campaign.

Historically, the only surface spectral albedo measurements at the SGP site were made by downward-facing MFRs positioned at the 25-m level of the 60-m tower in a wheat field at the SGP Central Facility, as well as on a 10-m tower in the adjoining pasture. The limited spatial coverage generated a very narrow data set. The addition of an MFR to the Cessna payload now allows routine measurements of surface spectral albedo over a much broader area around the SGP Central Facility.

To house the MFR, the Cessna required installation of new, larger wing tips; modification of the new starboard wing tip to hold the instrument; and rewiring for the MFR data acquisition system. After the wing and wiring modifications were made in Wichita, Kansas, the plane was flown back to its field base at Greenwood Aviation in Ponca City for installation of the MFR instrument.



The new multifilter radiometer (inside blue box), mounted inside the Cessna 206 wing tip (ARM photo).

ACRF Southern Great Plains Newsletter is published by Argonne National Laboratory, managed by UChicago Argonne, LLC, for the U.S. Department of Energy under contract number DE-AC02-06CH11357.

Technical Contact: Brad W. Orr
Phone: 630-252-8665
Email: brad.orr@anl.gov
Editor: Donna J. Holdridge
Contributor: Lynne Roeder
Website: <http://www.arm.gov>

IN-SITU AEROSOL PROFILES CAMPAIGN STUDIES VERTICAL DISTRIBUTION OF AEROSOL PROPERTIES

The In-situ Aerosol Profiles campaign is a joint effort between the ARM Program and the Climate Monitoring and Diagnostics Laboratory of the U.S. National Oceanic and Atmospheric Administration. The objective is to obtain a statistically significant data set of the vertical distribution of aerosol properties (e.g., light scattering and absorption, particle chemistry) over the SGP site. The Cessna 206 used for the campaign carries an aerosol instrument package similar to the one at the SGP during level flights at altitudes between 500 m and 3500 m several times each week.

Analysis of the data gathered by the campaign will help researchers determine how aerosol properties vary through a vertical column of the atmosphere. Scientists will also try to identify the conditions under which surface-based measurements of aerosol properties can be used to calculate the direct aerosol radiative forcing from measured aerosol optical depth.

Measurements of backscattered radiation and of aerosol absorption, concentration, extinction, and scattering are considered scientifically relevant by the research community. Besides the MFR, instruments aboard the Cessna 206 include a nephelometer to measure light scattering by aerosol particles at three separate wavelengths; a particle soot/absorption photometer to record light absorption by particles at a single wavelength; a temperature-humidity sensor to capture atmospheric temperature and relative humidity data; and a drum sampler that collects size-segregated samples of aerosol particles for measurement of chemical properties and elemental composition.



The Cessna 206 has been flying since 2000 over the SGP site, gathering data for the In-Situ Aerosol Profiles campaign (ARM photo).