Atmospheric Radiation Measurement
Climate Research Facility
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Southern Great Plains Newsletter

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New Ceilometer Evaluated at Southern Great Plains Site

To analyze cloud properties, ARM scientists use data from an instrument called a ceilometer. This instrument transmits pulses of light into the sky and receives return signals to measure scattered radiation, cloud base heights, and visibility. In preparation for a pending upgrade to the instrument, operations staff completed a field campaign at the ACRF Southern Great Plains (SGP) site to evaluate the new ceilometer against the current model, as well as against other instruments that measure similar properties. From June 15 to July 18, the new model was deployed alongside the current ceilometer and Micropulse lidar used at the SGP site. In addition to comparing and contrasting measurements against the lidar, measurements of mixing-layer height from the new ceilometer will be compared to measurements obtained by the SGP's balloon borne sounding system during the same time period.

Improved techniques for measuring cloud properties and the ability to support these observation systems beyond 2010 are critically important to understand and improve the performance of global climate models. The ACRF uses ceilometer model CT25K at all its sites, but they are approaching the end of their supportable lifetime, with repairs getting more and more expensive. The ceilometer manufacturer, Vaisala, recently released a new model, the CL31, which includes additional capabilities such as a newly developed algorithm for mixed-layer cloud detection. The CL31 demonstration will help ACRF personnel to develop instrument requirements and specifications for replacement of the CT25Ks. Data from the instrument comparison are being analyzed by Vaisala and researchers at the University of Iowa, who are interested in the instrument for application to carbon cycle research.

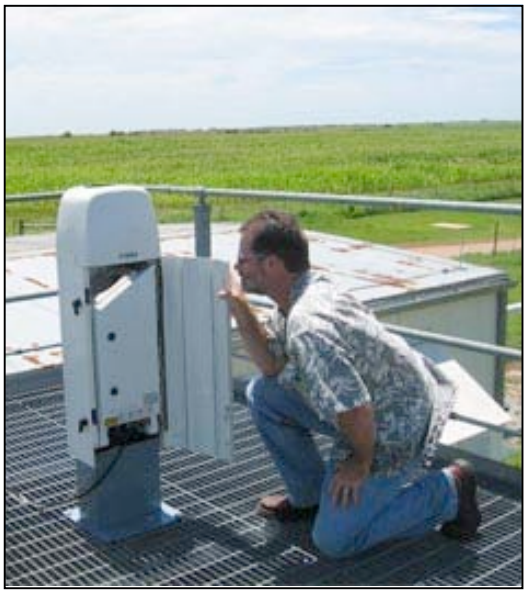

Image: Dan Nelson, SGP facilities manager, inspects the new ceilometer during its evaluation period on the platform of the SGP Guest Instrument Facility between June and July 2008 (ARM photo).

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Southern Great Plains Conducts Instrument Intercomparison

One instrument that scientists use to obtain measurements important for climate studies is an atmospherically emitted radiance interferometer, or AERI. This sophisticated instrument measures the absolute infrared spectral radiance of the sky directly above the instrument. In July, the ACRF Southern Great Plains (SGP) site hosted a new instrument for measuring these spectra, called the Atmospheric Sounder Spectrometer for Infrared Spectral Technology, or ASSIST. It operated for 10 days side-by-side with the AERI to obtain comparative data that will help scientists to validate new instrumentation and data processing algorithms, as well as improve research performed using AERI-like measurements. Data from the AERI can be used to evaluate radiative transfer codes in models, detect and quantify cloud effects on ground-based radiance measurements, and calculate vertical atmospheric profiles of temperature and water vapor and the detection of trace gases.

For the instrument intercomparison, operations staff at the SGP helped to locate the ASSIST next to the AERI, and also carved out space for the control computer and data display at the SGP Guest Instrument Facility. On relatively cloud-free days, SGP staff also supplemented their routine radiosonde launch schedule with additional launches to coincide with the MetOp satellite overpasses in the morning and evening. Scientists sponsored by the Department of Energy's Remote Sensing Laboratory will compare radiance measurements from the ASSIST with those from the AERI and radiances calculated from the radiosonde observations to determine systematic and random differences from a statistical ensemble of these comparisons.

Image: Comparisons between an atmospherically emitted radiance interferometer (AERI) (top) and the Atmospheric Sounder Spectrometer for Infrared Spectral Technology (ASSIST) (bottom) took place at the ACRF Southern Great Plains site in July 2008 (ARM photos).

What is MetOp?

MetOp is the European Space Agency's Meteorological Operational satellite program designed to provide weather data services for monitoring climate and improving weather forecasts.

It is a cooperative venture with the United States' National Oceanic and Atmospheric Administration (NOAA). MetOp-A, the first satellite in the series launched in October 2006, replaced one of two satellite services currently operated by NOAA and will be Europe's first polar-orbiting satellite specifically dedicated to operational meteorology.

Instruments onboard continually measure variables throughout the depth of the atmosphere and include temperature and humidity, ocean surface wind speed and direction and concentrations of ozone and other trace gases. These data will significantly improve weather forecasting by direct integration into numerical weather prediction models used to compute weather forecasts.

For more information, visit the MetOp website at: http://www.esa.int/esaLP/LPmetop.html