ARM Climate Research Facility

Southern Great Plains Newsletter

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Site Operations Manager to Retire

Southern Great Plains (SGP) site operations manager Jim Teske has announced that he will retire in October 2004. Teske has held his position since the SGP site became operational in 1992. During the 14th ARM Science Team meeting held recently in Albuquerque, New Mexico, he was honored by Dr. Wanda Ferrell, Department of Energy ARM Program manager, for his outstanding contribution to the ARM Program. Dan Rusk, the current SGP project manager, will take over site operations management in October.

Figure 1. Jim Teske, ACRF SGP site operations manager (ACRF photo).

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Mesoscale Convective System IOP Focuses on Storms

A two-year seasonal intensive operational period (IOP) is resuming now that storm season has arrived. Dr. Peter May, a researcher at the Bureau of Meteorology Research Centre in Australia (http://www.bom.gov.au/bmrc/), is the lead scientist for the Mesoscale Convective System IOP, which began in May 2003. Dr. May is investigating the strength of upward and downward vertical drafts in thunderstorm clouds. A better understanding of these drafts is needed to refine weather models' treatment of storms.

The intensity of a thunderstorm and its ability to produce large hail depend on the strength of its vertical winds. Direct measurements of up and down drafts are currently sparse. Such measurements can be made by flying research aircraft into thunderstorms, but this very dangerous approach gathers information only at the elevation of the aircraft. The IOP seeks to use profilers on the ground at the SGP central facility to make direct measurements of vertical drafts through the height of storm clouds passing overhead.

Figure 2. The 50-MHz radar wind profiler located at the ACRF SGP site central facility is being used for the Mesoscale Convective System IOP (ACRF photo).

Dr. May is using the SGP site's 50-MHz (megahertz) radar wind profiler (RWP) (Figure 2) at the central facility to measure up and down drafts by locating irregularities in the atmosphere, including temperature, humidity, and pressure variations over relatively short distances. The RWP is a stationary radar that points vertically and transmits a pulse of electromagnetic energy (like a radio wave). When the energy pulse encounters an irregularity or "target," the energy is scattered in all directions. A small portion is reflected back to the radar. The distance to the target can be computed from the time required for the reflection to return to the radar. Operating on this principle, the RWP can measure wind speeds and temperatures up to 10 miles directly above its location.

To measure wind speeds and directions, Dr. May uses the Doppler principle. When an electromagnetic wave from a radar encounters a moving target, the frequency of the energy changes because of the relative motion between the target and the radar. A

target moving toward the radar increases the returned signal's frequency. Conversely, a target moving away from the radar decreases the returned signal's frequency. The observed frequency shifts are translated into wind speed and direction by using common mathematical relationships.

In the IOP, Dr. May uses a radio acoustic sounding system (RASS) with the RWP to measure the temperature structure inside storms. The RASS is composed of three acoustic sources (speakers) pointing skyward, each in its own shelter. The speakers transmit low-pitched, foghorn-like sounds at 100–110 Hz (hertz). These RASS sound waves act as targets from which the RWP receives reflected signals. The RWP data can be used with the known relationship between the speed of sound and air temperature to compute vertical profiles of virtual temperature (not corrected for humidity or pressure).

With a stationary instrument like the RWP, the researcher must wait for storms to travel directly overhead. The SGP site's location, in the heart of storm country, was chosen to provide ample opportunity for data collection.

In his laboratory in Melbourne, Australia, Dr. May can to follow weather events over the SGP site by monitoring radar images on the National Weather Service website (http://weather.gov). When storms approach the SGP site during the IOP, Dr. May remotely logs on to the RWP's computer and resets the collection parameters to take measurements of large vertical motions. Once the storms have passed through the SGP area, Dr. May resets the radar to its standard operating configuration.

The ARM Climate Research Facility (ACRF) is demonstrating its value to the research community worldwide. Scientists travel from all over the globe to take advantage of the vast network of instrumentation ACRF has to offer. Dr. May is taking science one step farther by conducting real-time research on storms in the Southern Great Plains while he works at his desk 9,000 miles away in Melbourne, Australia.

To provide more research capability for the global scientific community, the scientific infrastructure and data archive established through the Department of Energy's Atmospheric Radiation Measurement (ARM) Program are now being made available for use by scientists worldwide through the ARM Climate Research Facility.