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Radar Improved with New Reflector

A new corner reflector (too small to be seen in Figure 1) on the W-band ARM Cloud Radar (WACR) calibration tower at the ACRF Southern Great Plains (SGP) site has helped to correct problems related to signal interference.

The WACR is a 95-GHz system designed for a unique purpose — monitoring the radar returns from insects in the lowest 5 km of the atmosphere. The resulting data are used to remove "noise" from millimeter wavelength cloud radar (MMCR) return signals. Soon after the WACR began collecting data at the SGP site in December 2005, its radio frequency (RF) unit was removed for use in the new ARM Mobile Facility. With a new RF unit installed and a subsequent calibration problem solved, the radar is once again in action at the SGP site.

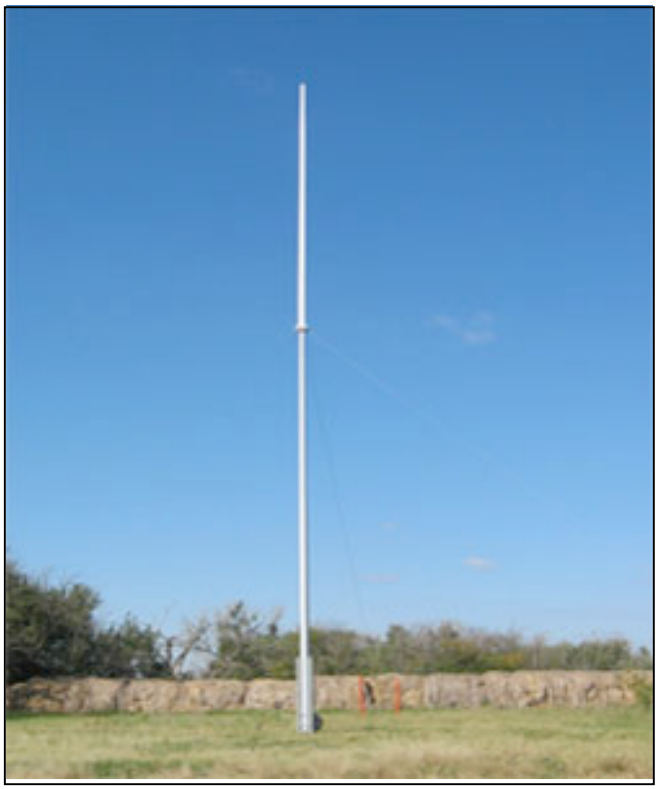

Figure 1. W-band ARM cloud radar calibration tower (ARM photo).

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Several months after installation of the new RF unit in the WACR, calibration issues arose. The source of the problem was identified as the proximity of trees to the calibration tower, which is located across the road and north of the SGP central facility. The solution is a new, larger corner reflector installed on the tower. The RF unit was returned to the manufacturer (ProSensing; http://www.prosensing.com/) in late August 2006 for the additional software work needed for successful calibration. In the meantime, part of the tower was raised to reduce ground clutter further.

The WACR was successfully reinstalled in October 2006. The detailed radar display features multiple screen modes for various health and status readings, as well as for the standard one-hour scrolling display of atmospheric response. Fine atmospheric detail is clearly visible on the computer screen, which displays rain signals even before drops reach the ground. Data comparisons between the WACR and MMCR are under way to ensure proper alignment of the WACR transmitter and MMCR beam.

Upgraded Radar Wind Profiler Has Optimized Performance, Increased Reliability

Radar wind profilers (RWPs) provide hourly measurements of wind speed and direction from 100 m to 5 km above the ground. In 1992–1996, four 915-MHz nine-panel RWPs were deployed at the SGP site, followed by one more at the North Slope of Alaska (NSA) site in Barrow in 2001. As these systems have aged, hardware repair costs have increased significantly, and parts have become more difficult to obtain. To overcome these problems, all of the components (other than the antenna) on each RWP system are being upgraded, at a cost of only about 20% of that for a new system (Figure 2).

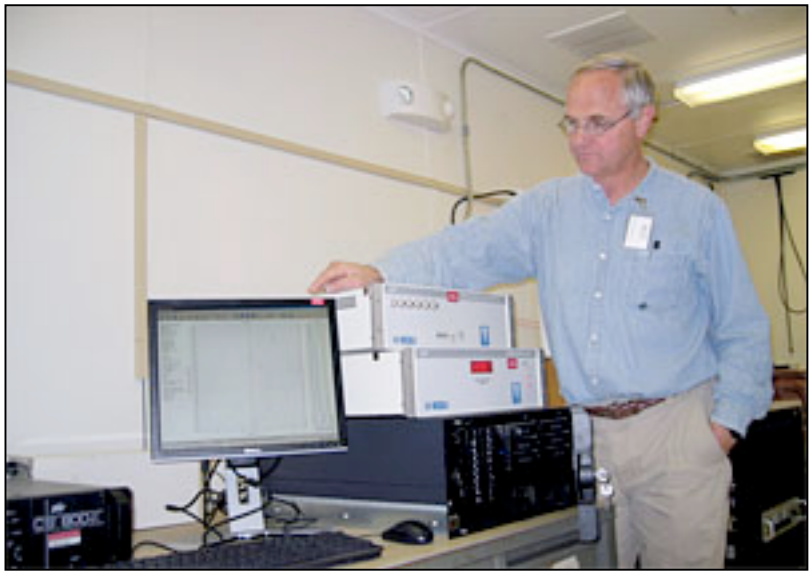

Figure 2. Tim Martin, the RWP associate instrument mentor, shows the new amplifier, interface, processor, and display of the upgraded 915-MHz RWP at the SGP central facility (ARM photo).

The RWP upgrade includes a new computer with the latest version of Vaisala's Lower Atmosphere Profiler (LAP) operating software, as well as new digital receivers based on the PC-Integrated Radar AcQuisition System (PIRAQ-III) processor. Also licensed through Vaisala (www.vaisala.com), the PIRAQ-III processor provides enhanced performance and increased reliability, while the LAP-XM® software allows site-specific optimization of system performance, depending on the application. Technical support should be highly efficient with one vendor supplying both the processor and operating software.

The RWPs at the SGP central facility and the SGP intermediate facility at Meeker, Oklahoma, were upgraded in September 2006. In 2007, the SGP site's remaining two RWPs (at Beaumont and Medicine Lodge, Kansas) will be upgraded, as will the NSA system in Barrow.