

FIRST RESULTS FROM THE NCAR 449 MHZ, 126-ELEMENT WIND PROFILER RADAR

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The National Center for Atmospheric Research (NCAR) Earth Observing Laboratory has recently developed a 449-MHz spaced antenna wind profiler radar. The system is divided into 18-element linearly polarized circular patch antenna subarrays that can be reconfigured. Three of the 18-element subarrays were combined and have been deployed to field projects such as the Persistent Cold-Air Pool Study (PCAPS).

More recently, seven of the 18-element subarrays were combined for a 126-element system (Figure 1) that is able to sense winds at a higher altitude (up to 7 km). In addition to this high gain array, a 16 kW transmitter is under construction for this system using low-cost LDMOS 1-kW push-pull pulse amplifier modules. While the 16-kW transmit pulse power is distributed over the whole array, each 18-element subarray has its own receiver. The seven independent receiver signals are digitized and processed for horizontal winds using spaced antenna interferometry (cross-correlations and auto-correlations). Benefits of the spaced antenna method include higher time resolution of the wind and a simpler beamforming network compared with the Doppler beam steering method.

Because the return signal from clear air wind is quite low (about -150 dBm), the system must be adequately protected from clutter and interference. Band pass filters on the receiver are used to block out of band interference. Coherent averaging is used to mitigate intermittent in-band interference. Antenna placement with respect to other structures is chosen so that clutter is minimized. Antenna sidelobe levels were optimized to mitigate clutter using full-wave simulations with FEKO and HFSS. Further testing of these systems is nearing completion and they are currently available for deployment to field projects.



Figure 1. 126-element, 449 MHz wind profiler radar