9.9A PROGRESS AND PLANS FOR THE COLORADO WIND PROFILER NETWORK

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Since January 1983, the Wave Propagation Laboratory (WPL) has placed four wind profiling radars in operation. These radars and the Platteville radar (originally developed by the Aeronomy Laboratory (AL) and jointly operated by AL and WPL for several years) form the Colorado Wind Profiler Network. These radars are described by STRAUCH et al. (1984a) and experiences with operation are summarized in another paper (STRAUCH et al., 1984b) in this workshop. Plans and improvements for the Colorado Wind Profilers are summarized below.

(a) VHF Radar at Platteville

Funds permitting, our plans to make the following improvements:

1. The 100 m x 100 m antenna arrays that are used to observe horizontal wind components are not nearly as efficient as the newer zenith-pointing antenna. The dipole elements of the older antennas have more loss, and the phasing of the array is not as accurate. We want to replace these antennas with new 100 m x 100 m collinear-coaxial dipole antennas. The ground must also be leveled; there is presently a 0.6-degree slope across the array.

2. The computer and data system will be replaced with the data systems used with the newer VHF radars. This will enable the radar to operate with the height resolution that is allowed by the bandwidth allocation (0.4 MHz), and it will improve sensitivity because the pulse repetition rate can be increased. The new data system also provides remote control of the radar and calculates hourly-averaged winds at the site.

With these two improvements, we expect the Platteville radar to be more sensitive than the other 6-m wavelength radars in the network because of the 6-dB greater antenna aperture. Comparison of winds measured by Platteville with those measured by the other VHF radars will allow an intelligent judgement as to the cost effectiveness of the additional expense of the larger antennas. In particular, we need to determine if the increased sensitivity radars suffer signal dropout.

3. Separate (Yagi) receiving antennas will be added to the zenith antenna to allow us to test the spacedantenna drift method of wind measurement.

(b) VHF Radars Near Sterling, Craig and Cortez

These radars have been operated for more than one year. There are a number of changes we would like to make on the basis of our experience.

1. These radars are operated with high pulse repetition rates so that echoes from the mesosphere will be range-aliased into the heights where we measure tropospheric winds. These echoes can be effectively eliminated by changing the phase of each transmitted pulse with a psuedo-random binary phase code; time-domain integration then will randomly sum the aliased signals. All the necessary hardware has been built into the radars, but software modifications are needed to implement the coding (STRAUCH, 1984).

2. We want to develop a simple method for using an aircraft to check the antenna pointing angles and the antenna sidelobes. We believe that most of the "unusual" data points we obtain can be explained by our antenna patterns and specular echoes observed through antenna sidelobes.

3. We want to decrease the minimum height that can be measured when we use a 3-μs pulse duration. The present minimum height is about 1.7 km AGL and is limited by the transmit/receive switch and associated transients; a new switch may be required.

4. Limited data recording on-site will be implemented to aid in investigations of the causes of invalid data points. The data recorder will be controlled remotely to record Doppler spectra during particular events.

5. The format of the data are transmitted hourly from the remote sites will be expanded to include estimates of spectral width. We will also transmit wind component data instead of speed and direction.

(c) UHF Radar at Stapleton Airport

The only component failures that have occurred on this 33-cm wavelength radar in more than one year of operation have been associated with the mechanical switches that select the antenna pointing direction. These switches are being replaced with switches rated for 10^6 operations.

The data processing used with this radar is identical to that used with the VHF radars. With VHF radars the dwell time required to obtain the time series input for spectral analysis is 5 to 6 s, so the 1 to 2 s needed to calculate power spectra in software is relatively unimportant. However, with the 33-cm radar the dwell time is only about 0.5 s so the calculation time significantly reduces the available averaging time. We are planning to add a hardware spectral processor to our data system to reduce this overhead time. The processor will be added to the hardware preprocessor that performs the time-domain integration.

(d) UHF Radar at Boulder

We are completing construction of a 74-cm wavelength radar at Boulder, CO. It will use the same generic receiver and data processing that are used on all the Colorado Network Radars. The antenna is a phased array of 100 Yagi elements (60 m^2) with two sequential pointing directions. The transmitter has 30-kW peak power, 1.2-kW average power. The radar will use 1-, 3-, and 9-μs pulse durations (the same as the UHF radar at Stapleton Airport). Testing is expected to start in the spring of 1984.

REFERENCES

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