1.2.2 WIND PROFILER DATA IN A MESOSCALE EXPERIMENT
FROM A METEOROLOGICAL PERSPECTIVE

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During May and June of 1985, the Oklahoma-Kansas Preliminary Regional
Experiment for STORM-Central (OK PRE-STORM) was carried out, with the major
objectives of learning more about mesoscale convective systems (MCSs) and
gaining experience in the use of new sensing systems and measurement strategies
that will improve the design of STORM-Central. Three 50-MHz wind profilers
were deployed in a triangular array with sides about 275 km (Figure 1). There
will be great interest in learning whatever we can from the profiler data from
these sites, especially in relation to mesoscale weather systems. It is far
too soon to report any results of this effort, for it has barely begun. The
purpose of this paper is to show some examples of the data, some of the
surrounding "conventional" data, to discuss some of the issues important to
meteorologists in evaluating the contribution of the profiler data.

We concentrate on the case of 10-11 June 1985, featuring a major squall
line system which crossed the dense observing network from northwest to
southeast, passing the Liberal site about 2230 GMT/10 June, the McPherson site
about 0100 GMT/11 June, and Wichita about 0300 GMT/11 June. Radar and satellite
data show that the system was growing rapidly when it passed Liberal, and was
large and mature when it passed through McPherson and Wichita. Figure 2 gives
the radar depiction of the system during this stage, with the McPherson site in
the intense convective echoes near the leading edge at 01 GMT and in the
stratiform precipitation at 03 GMT.

Figure 3 (Liberal) and Figure 4 (McPherson) show the profiler wind data
for a 9-hour period encompassing the squall line passage at each site. (Ignore
obvious noisy data, which is not the subject of discussion here; the two
systems have different antenna systems and sizes, different processing
algorithms, and were passed by different parts of the storm system.) Both
systems were unable to function during the 60-90 minutes of most intense
thunderstorms. However, both clearly captured the major wind features ahead of
and, more interestingly, in the mesoscale stratiform precipitation region which
forms the rear half of the system. These include the northerly winds at low
levels, the increased southerly component in the upper troposphere (mostly
obscured by noise at McPherson) and a midlevel "jet" of inflow from the rear,
sloping downward from northeast to southeast (upward with time). The same
features are observed at nearby radiosonde sites, with Wichita chosen for
illustration (Figure 5). It is appropriate to compare times at Wichita with
those 2 hours earlier at McPherson to account for the later passage over
Wichita.

The increased time resolution of the profiler data is extremely important
in mesoscale research. One well-known problem is the difficulty of covering
the lowest kilometer -- in this case as in others, the wind structure here is

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Figure 1. Location map for the wind profiler network in OK PRE-STORM, marked by "P" at Liberal, McPherson, and Norman. National Weather Service rawinsonde sites are given by black dots, and supplemental sites by "S"; those surrounding the McPherson site are named.

crucial to understanding the system. It is encouraging that the profiler appears to be defining the midlevel jet in a disturbed region; it will be important to establish reliability of the profiler data in the anvil outflow region nearer the tropopause, in view of the large area covered.

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Figure 3. Time-height cross section of the Liberal wind profiler data. Each full barb is 5 m s$^{-1}$, each half-barb 2.5 m s$^{-1}$, and each flag 25 m s$^{-1}$.

Figure 4. Time-height cross section of the Wichita radiosonde wind data. Legend for winds as in Figure 3.
Figure 5. Time-height cross section of the Wichita radiosonde wind data. Legend for winds as in Figure 3.