P1.24 THE TEXAQS-2000 EDITED WIND PROFILER DATASET

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1. INTRODUCTION

Although traditional signal-processing methods are designed to remove unwanted non-atmospheric signals in the Doppler spectral moments recorded by wind profilers, there are still contaminated spectral signals that produce erroneous moment-level data from which the winds are estimated. Quality control algorithms are implemented to identify and remove these erroneous data that would otherwise render inaccurate meteorological measurements and interpretation. The Regional Weather and Climate Applications Division of the NOAA Environmental Technology Laboratory (NOAA/ETL) currently uses a continuity method (Weber and Wuertz 1993) to identify and preserve only those measurements that exhibit consistency in height and time. This continuity method has produced high quality results under a variety of meteorological conditions over many months of observations. Nevertheless, certain types of contamination, such as migrating birds, can persist over time with consistent Doppler shift over many heights. In these situations, the continuity method can produce undesirable results.

In this paper we report the results of applying new and established quality control methods to the wind profiler datasets collected during the 2000 Texas Air Quality Study (TEXAQS-2000). Bird contamination is identified by its characteristics in profiles of Doppler velocity, radar reflectivity, and Doppler spectral width (Wilczak et al. 1995). After removing the bird-contaminated spectral moments, the remaining moment-level data are subjected to quality control via the continuity method.

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2. METHOD

Because the characteristics of the bird contamination found in the TEXAQS-2000 wind profiler datasets differed from site to site and from the characteristics identified in previous studies, we did not attempt to use an objective algorithm to remove the contaminated spectral moments. Instead, we created plots of the wind profiler moments and identified, by visual inspection, regions (in time and height) of data that were contaminated. We then deleted the moments from those identified regions. At one profiler observing site near downtown Houston (HTN), the Doppler spectral moments were also contaminated by severe radio frequency interference (RFI). We believe the primary source of RFI there was the high volume of cell phone traffic present in this large metropolitan area. The same method of visual inspection used to remove bird contamination was also used to remove RFI from the profiler data collected at HTN. After removing the contamination, the remaining moments were subjected to the continuity method of Weber and Wuertz (1993). The small percentage of contaminated winds and measurement noise that remained after the continuity method was applied were removed by visual inspection.

Figure 1 shows an example of bird contaminated spectral moments collected by the wind profiler at Liberty Municipal Airport on August 30, 2000. The birds are identified most easily by their increased radar reflectivity and Doppler spectral width. Note, that the birds only fly during the night, when the cover of darkness helps protect them from their predators. Figure 2 shows the winds obtained from the moment data shown in Fig. 1 before and after the contamination was removed.

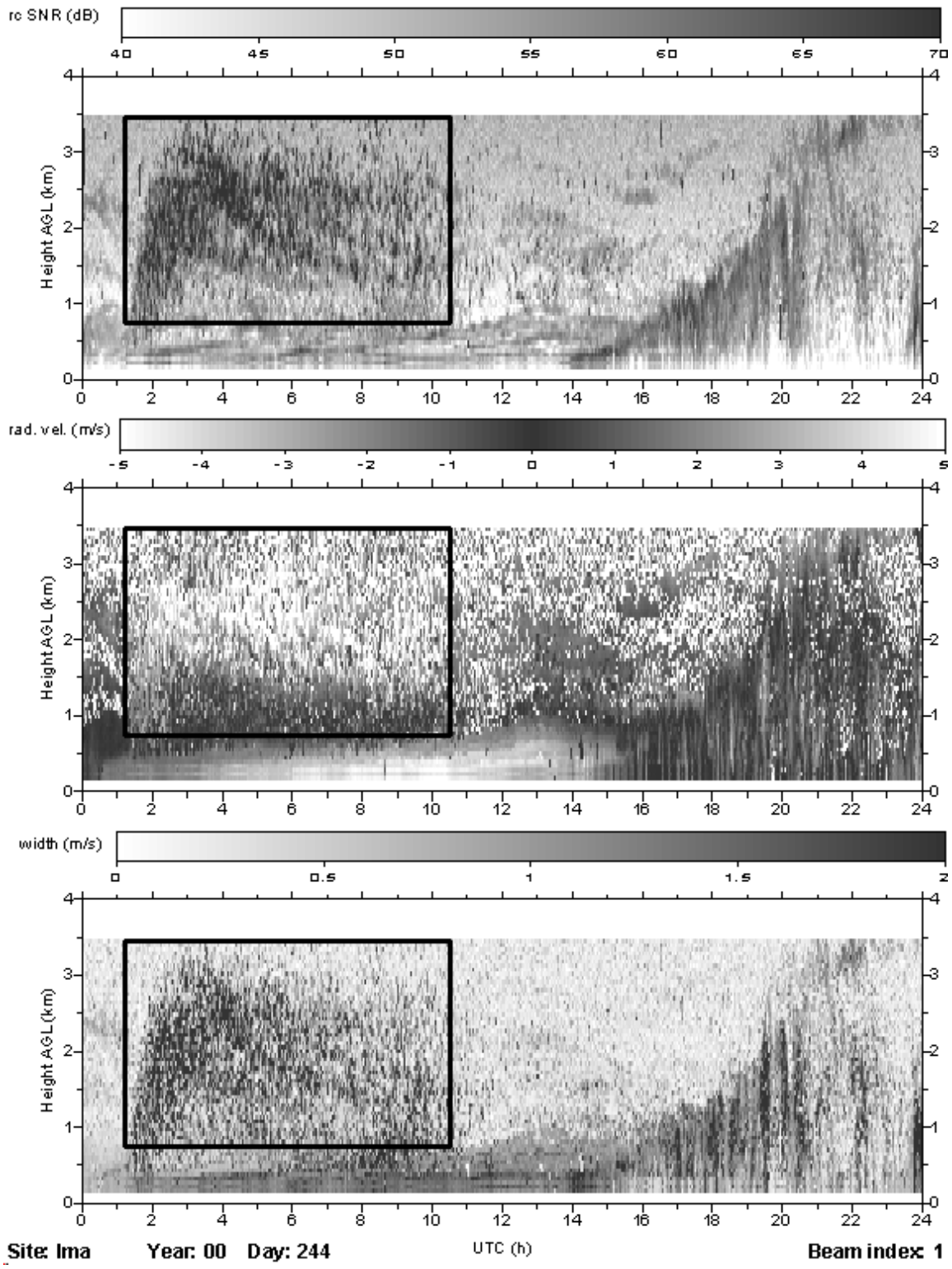

Figure 1. Time-height cross sections of radar reflectivity in the form of range-corrected signal-to-noise ratio, or SNR, (top); Doppler radial velocity (middle); and Doppler spectral width (bottom) recorded by the 915-MHz wind profiler at Liberty Municipal Airport on August 31, 2000. The boxes enclose data that are contaminated by migrating birds.

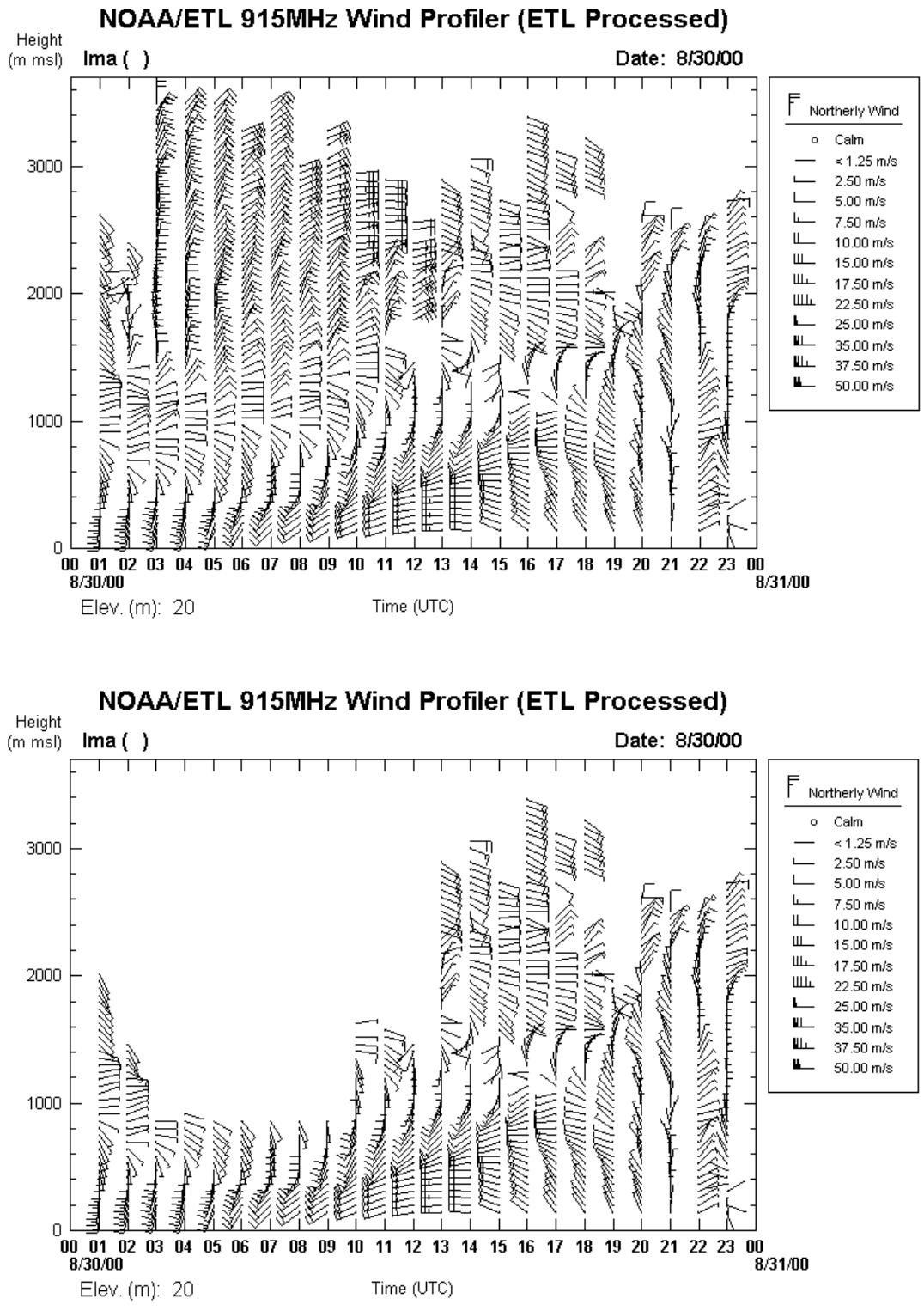

Figure 2. Time-height cross sections of hourly mean winds measured by the 915-MHz wind profiler at Liberty Municipal Airport on August 31, 2000 processed with (top) and without (bottom) bird contamination.

3. DISCUSSION

More sophisticated signal processing routines may have been able to recover winds from the contaminated regions of the TEXAQS wind profiler datasets, but only if Doppler velocity spectra were archived. Unfortunately, spectral data were available from only two out of the six wind profiler sites operating during the study. However, it is likely that the best means of removing the contamination from birds, RFI, and other forms of intermittent clutter present in wind profiler spectral moments is at the time series level (i.e., before the spectral moments are computed). NOAA/ETL has developed an intermittent clutter rejection scheme that uses wavelet transforms to help distinguish between clutter and atmospheric return in the signals received by wind profilers (Jordan et al. 1997). Work is currently being done to implement this scheme as part of the radar control program used by the 915-MHz wind profilers.

4. ACKNOWLEDGMENTS

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5. REFERENCES

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