J3.21 Statewide Monitoring of the Mesoscale Environment: A Technical Update

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1. INTRODUCTION

The University of Oklahoma (OU) and Oklahoma State University (OSU) operate ~116 surface observing stations comprising the Oklahoma Mesonet (Brock et al. 1995). Remote stations send data every 5 minutes to an operations center, located at the Oklahoma Climatological Survey (OCS), for data quality assurance, product generation, and dissemination. The Oklahoma Mesonet (http://www.mesonet.org) was established as a multi-purpose network to provide research-quality data in real time. The mission of its personnel is to operate a world-class environmental monitoring network, to deliver high-quality observations and timely value-added products to Oklahoma citizens, to support state decision makers, to enhance public safety and education, and to stimulate advances in resource management, agriculture, industry, and research. Since 1994, the Oklahoma Mesonet has collected almost 3.8 billion weather and soil observations and produced millions of decision-making products for its customers.

2. IN THE BEGINNING

The Oklahoma Mesonet was launched in January 1991 when OU and OSU received $2 million from then Governor Henry Bellmon and provided an additional $700K. By the summer of 1992, the Mesonet's first educational outreach program began for K-12 teachers in Oklahoma, well before the first sensors were installed. It is known as 'EarthStorm' (McPherson and Crawford 1996). Three years after beginning, the Oklahoma Mesonet was commissioned in a Capitol Rotunda ceremony in March of 1994. Based on these successes and with knowledge that diverse, grass-roots support would be essential to the long-term viability of the Mesonet, another 'educational outreach' program was initiated in 1996; it is called OK-FIRST and targets emergency management officials (Morris et al. 2002).

By 2001, the first of several national honors were bestowed upon the Oklahoma team for creating the Mesonet and its outreach programs: EarthStorm and OK-FIRST – honors from the Americam Meteorological Society, from Harvard University, and the Ford Foundation. Additional national honors came several years later.

3. THE KEY INGREDIENTS

The key ingredients to the long-term success of the Oklahoma Mesonet have proven to be:

1. Standardized hardware, siting and maintenance procedures at each site (Fig. 1).
2. Reliable two-way communications with each remote site (Fig. 2). The near-zero recurring costs (due to a partnership with the Oklahoma Department of Public Safety) were the initial ingredients to foster development of the Mesonet.
3. Aggressive data quality control and quality assurance procedures (QC/QA; Fig. 3; Shafer et al. 2000; Fiebrich and Crawford 2001; Fiebrich et al. 2005).
4. An efficient data ingest, processing, quality control, and product generation system capable of turning data around in <5 minutes.
5. Quality products, relevant to each sector of users, that are intuitive and operate on the user computers (Fig. 4).
6. Strong educational outreach programs that support individual user groups with a variety of products and required (in some cases) continuing education (Fig. 5).

4. DISCOVERY OF MESOSCALE PHENOMENA

Sensors at sites in the Oklahoma Mesonet have captured many unique phenomena. They are too numerous to mention, but most are documented at:

http://www.mesonet.org/bibliography/journal_arti.php

One example is shown in Figure 6 (McPherson et al. 2003). It illustrates the evaporation and transpiration occurring in the winter wheat belt that

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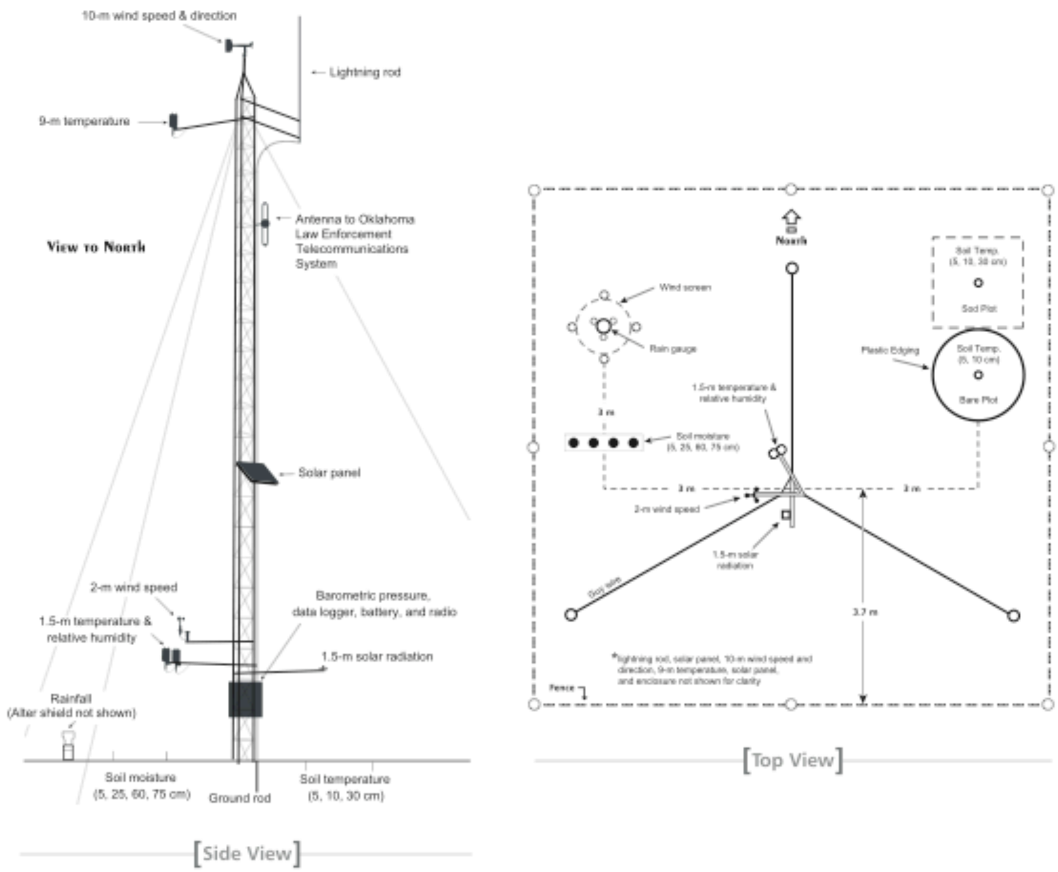

Figure 1. A schematic of an Oklahoma Mesonet tower with standard equipment and instrumentation.

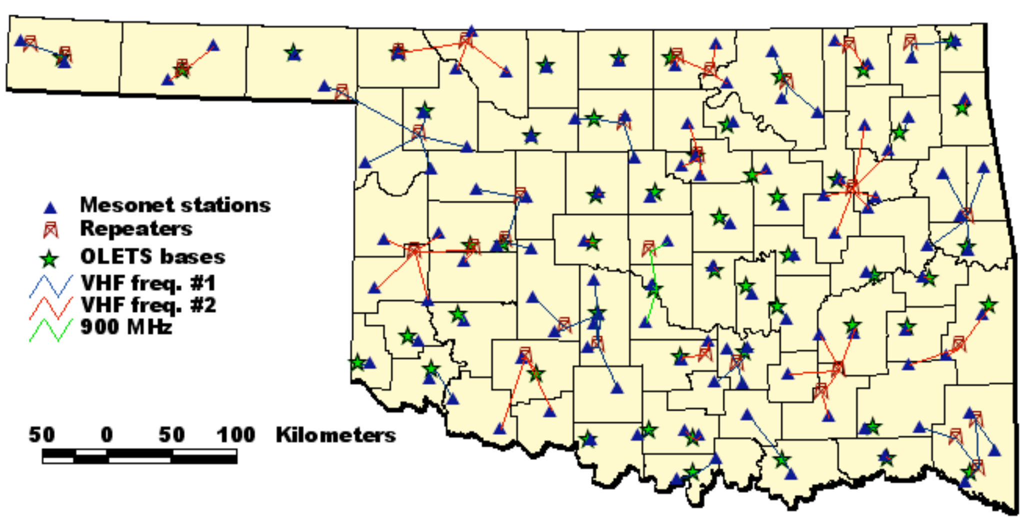

Figure 2. Map of Oklahoma Mesonet sites that also illustrates how data are transferred via RF transmission from the remote observing sites to a nearby police, sheriff, or highway patrol bases.

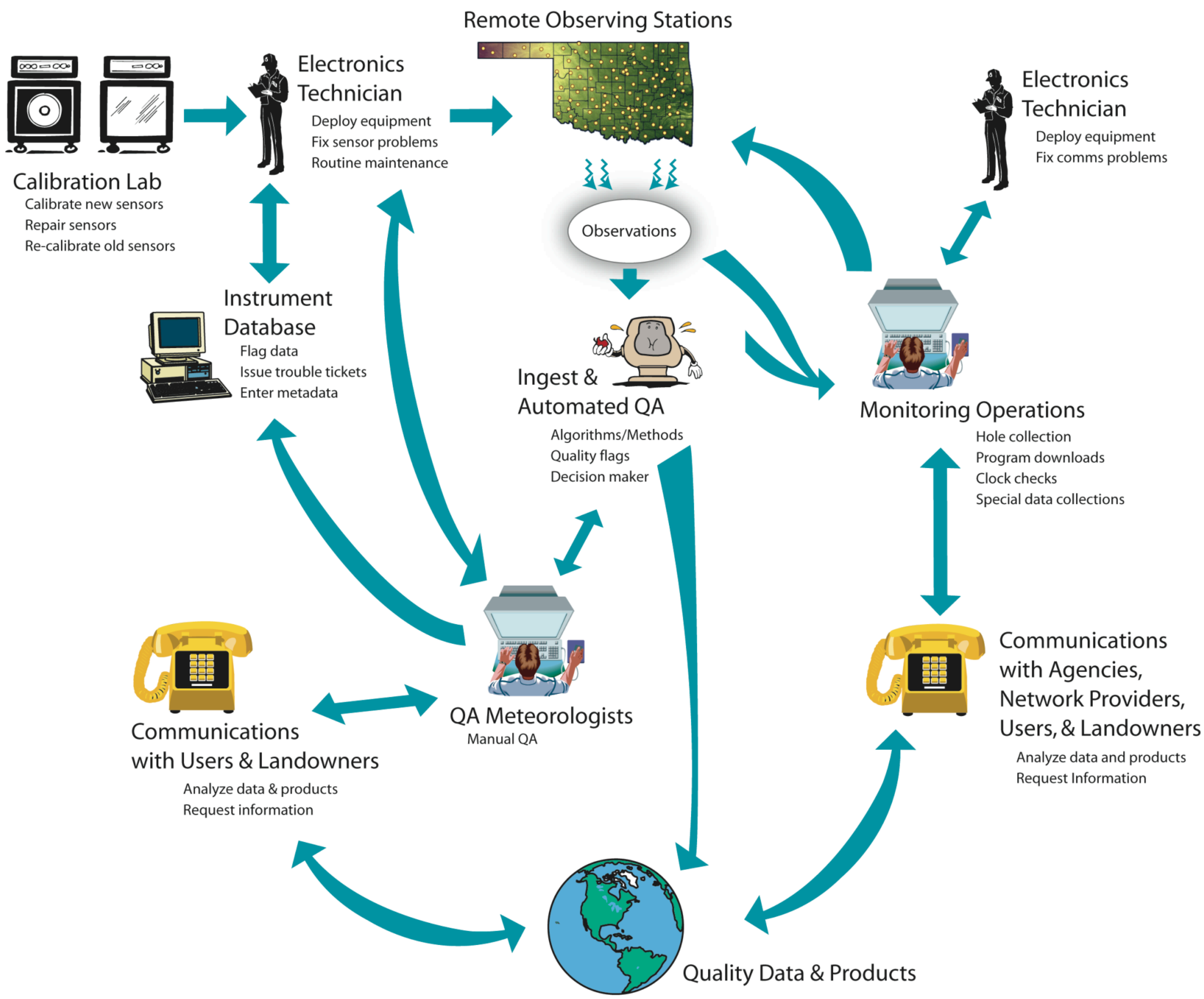

Figure 3. Schematic of the data quality assurance (QA) system of the Oklahoma Mesonet. Arrows display the transfer of information or equipment. The diagram demonstrates the critical role of manual QA to the integrity of the observations.

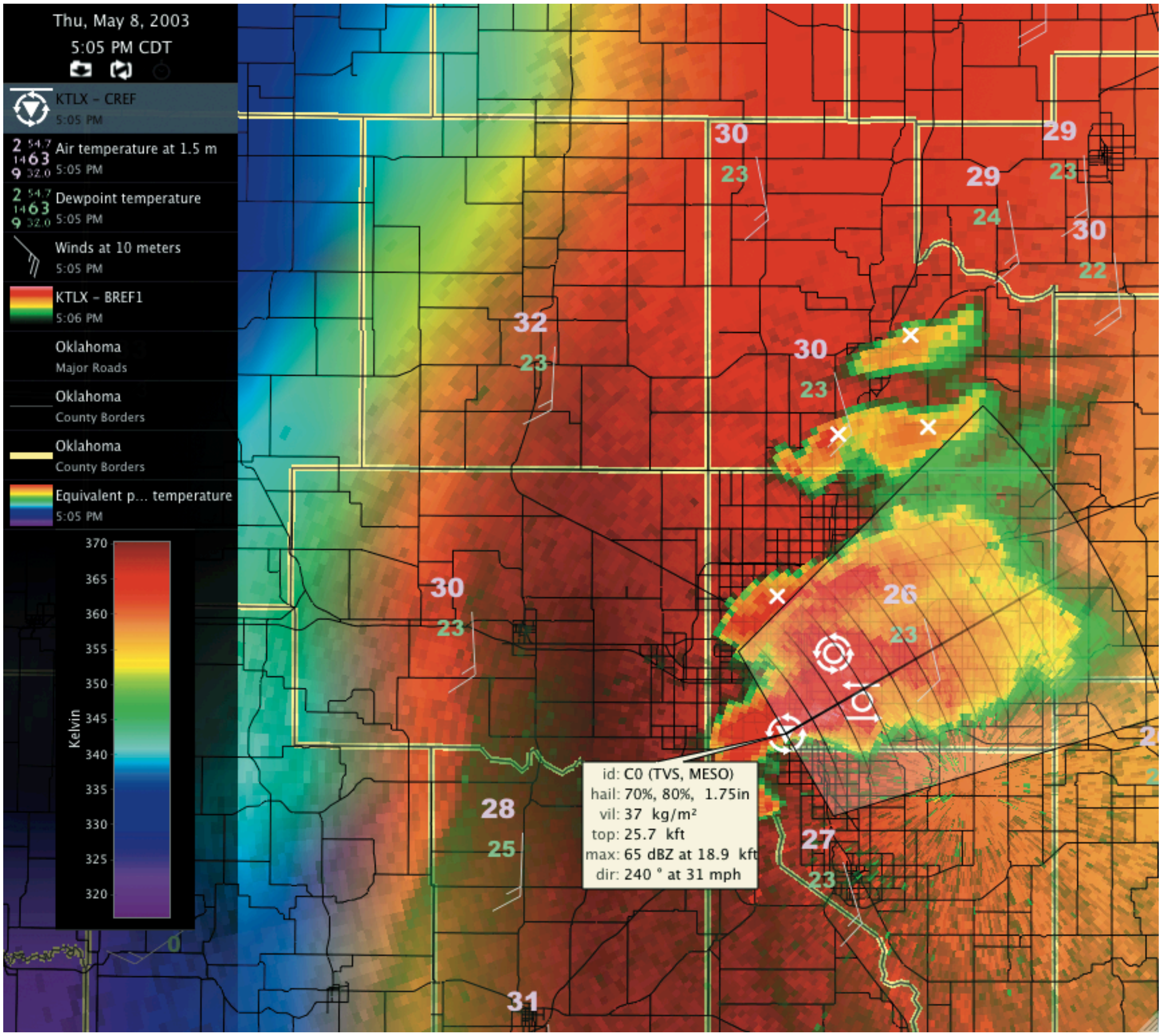

Figure 4. An example of a map generated by the Oklahoma Mesonet's WeatherScope software using data files and an XML-based configuration file. Data are displayed for the 8 May 2003 tornadic storm near Oklahoma City, OK. Air temperature (light pink text), dewpoint temperature (light green text), and winds (white barbs) from the Oklahoma Mesonet are plotted for 5:05 PM CDT. Equivalent potential temperature is colored as a gradient. Geographic overlays include county borders (light yellow lines) and major roads (black lines). The map also displays NEXRAD Level-II reflectivity data from 5:06 PM CDT and the Level-III storm attribute product, including storm motion, from 5:06 PM CDT.

Figure 5. Web pages of two educational outreach and decision support systems built around the Oklahoma Mesonet: OK-FIRST (upper left and password protected at http://okfirst.ocs.ou.edu) and EarthStorm (lower right and at http://earthstorm.ocs.ou.edu). Another focus of Mesonet outreach (not shown) is our agricultural weather page at http://agweather.mesonet.org).

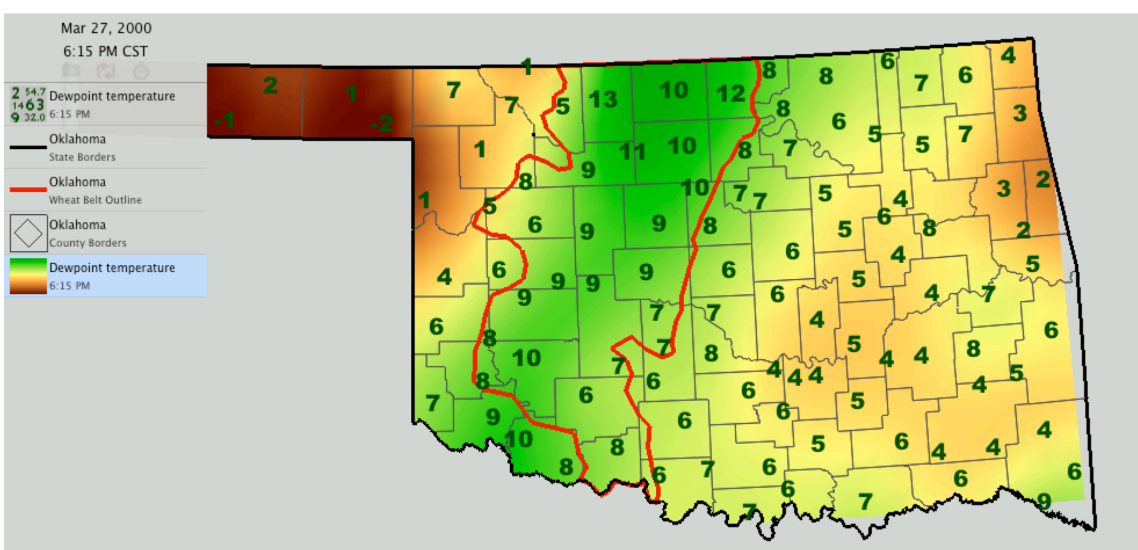

Figure 6. Dew point analysis (^{o}C) at 6:15 PM CST from 27 March 2000 using observations from the Oklahoma Mesonet. Winter wheat field outlined in red. (From McPherson et al. 2003)

extends south southwestward from north central Oklahoma. The presentation will provide additional examples of unique phenomena captured by the Oklahoma Mesonet.

5. REFERENCES

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