

# Warning Challenges and Successes of the June 16-17, 2014 Southern Wisconsin Nocturnal QLCS Event

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Objectives: 1) Examine the near storm environment, radar data, warning decisions, and decision support provided by the National Weather Service (NWS), Milwaukee/Sullivan, Wisconsin (MKX) during the June 16-17, 2014 Southern Wisconsin Nocturnal Quasi-Linear Convective System (QLCS) Event.

2) Use this examination to improve service to NWS partners and the public during these events.

Takeaway Messages: 1) Near-storm environment and dual-polarization radar analysis are important for QLCS tornado events. 2) Warning decisions remain challenging in these events.

On June 16, 2014, a deepening lee cyclone and attendant warm front over the Northern Plains and Upper Midwest brought a series of severe thunderstorms and tornadoes to the region. Severe convection congealed into a large QLCS, with embedded supercells, across northern Iowa. This complex continued east into southern Wisconsin by late in the evening. Due to a substantial low-level jet, the low-level shear remained strong through the night, and robust moisture transport kept instability at high levels. This environment allowed the QLCS to march across southern Wisconsin during the overnight hours. The QLCS produced 10 tornadoes, before eventually diminishing upon reaching cooler air near Lake Michigan. Meanwhile, a second QLCS developed over Iowa before moving across extreme southern Wisconsin and northern Illinois, where it eventually produced an additional tornado in Wisconsin.

Of the 11 tornadoes in the state, 9 occurred within the NWS MKX county warning area (CWA). While most tornadoes were rated EF-1, a short lived EF-3 tornado struck Verona, Wisconsin. Verona is a suburb of Madison, Wisconsin, the second largest city in the CWA. Unfortunately, the tornadic nature of the two QLCSs that moved across Wisconsin was not well anticipated. All 8 tornadoes from the first QLCS within the MKX CWA occurred outside of a Tornado Watch. Furthermore, while all tornadoes within the MKX CWA occurred within at least a Severe Thunderstorm Warning, 8 of the 9 tornadoes occurred outside of a Tornado Warning.

Previous research has shown significant forecast challenges with nocturnal convection. Furthermore, several studies have shown that it is particularly difficult to make warning decisions on QLCS tornadoes, given their short-lived nature. Clearly, this event was no different. The difficulty of this case is especially evident upon examination of the warning verification statistics, which fell far short of NWS standards. However, there were 0 injuries and 0 deaths associated with these tornadoes. Furthermore, NWS partners and the public seemed generally satisfied with the service provided by the NWS.

These facts lead to several questions. Why was the tornadic nature of these storms so poorly forecast? How was the impact of these under-forecast tornadoes so small? What could have been done differently to improve the service provided by the NWS? The goal of this presentation will be to

answer these questions through the examination of the near storm environment, radar data, warning decisions, and decision support provided by the NWS.