

# AN ASSESSMENT OF REAL-TIME TORNADO INFORMATION DISSEMINATED THROUGH NWS TORNADO WARNINGS AND STATEMENTS

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## INTRODUCTION

Previous studies have suggested that real-time confirmation of tornadoes increases the perceived credibility and urgency of warning messages, since it represents the highest level of certainty that the hazard is occurring (Brotzge and Erickson 2009; Schumacher et al. 2010; Joplin Tornado Service Assessment 2011).

The timely confirmation of a tornado in official NWS products, announced through multiple sources by private and public partners, is believed to improve overall public response to the tornadic threat, ultimately reducing casualties. This study shows the frequency of NWS products that provide real-time information of ongoing tornadoes, and discusses the implications to NWS operations and external partnerships.

A total of 1,362 Enhanced Fujita Scale (EF)-1 and greater tornadoes were investigated from 2007-2011 over 15 states, east of the Continental Divide and west of the Mississippi River. All Tornado Warnings (TOR), follow-up Severe Weather Statements (SVS), and Local Storm Reports (LSR) associated with these tornadoes were examined to determine if real-time confirmation of a tornado occurred.

Data are sorted by their EF-scale rating, path length and duration, time of day, geographic region, and by fatality.

These findings determine explicit cases when tornadoes are more likely to be reported in real-time and reemphasizes the importance of the initial science-based tornado warning prior to confirmation.

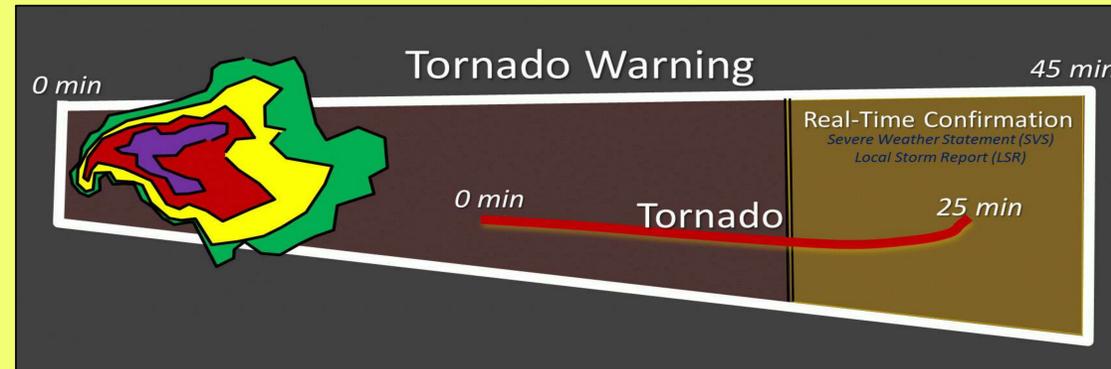


Forty percent (524 tornadoes) of the 1,362 EF-1+ tornadoes in the study were confirmed in real-time (top left).

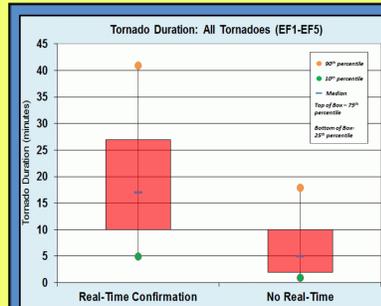
The geographic distribution of tornadoes confirmed in real-time (red triangles) are shown across the study domain.

A total of 62 tornadoes resulted in fatalities, of which approximately 75% were reported in real-time (top right).

## OVERVIEW

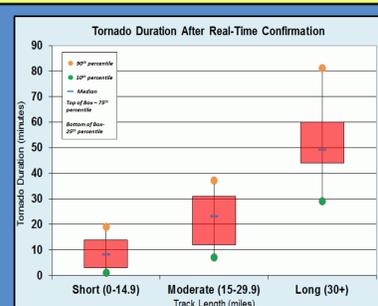


## TORNADO DURATION

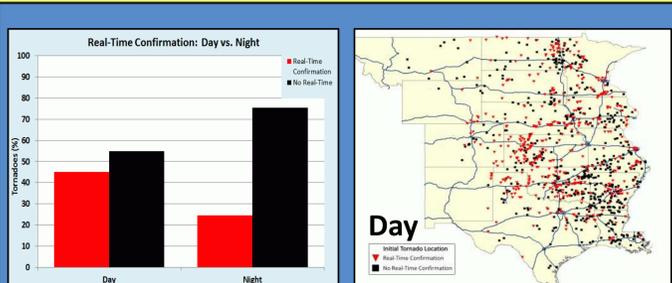


Tornado duration (left) played a significant role in discriminating between cases that were confirmed in real-time versus those that were not. Tornadoes that were confirmed in real-time had a median duration of 17 minutes versus 5 minutes for tornadoes without real-time confirmation.

The amount of time the tornado remained on the ground following the initial real-time confirmation increased with increasing path length (right), from a median of 8 minutes for short-tracked tornadoes to 49 minutes for long-tracked events.

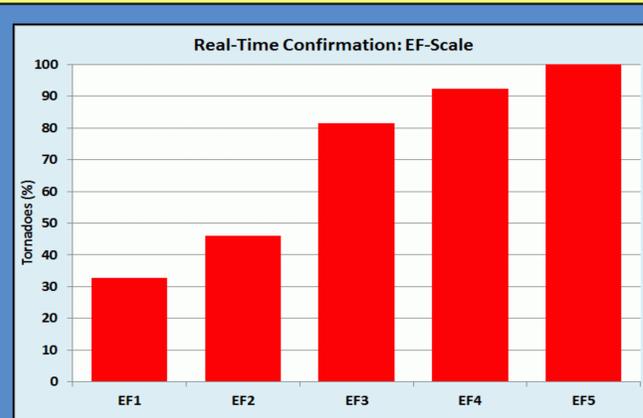


## DAY VS. NIGHT

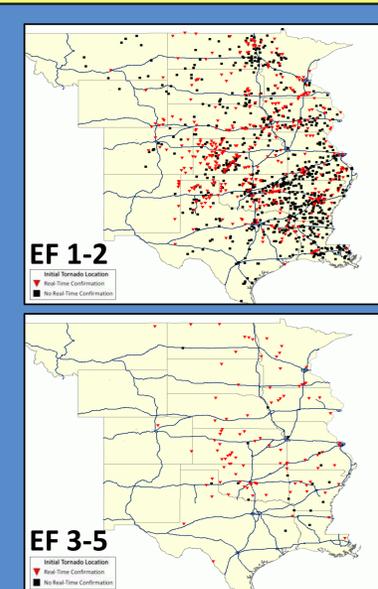


Tornadoes occurring during the nighttime hours, defined as the period of one hour after sunset to one hour before sunrise, had a much higher rate of not receiving real-time confirmation. This is likely due to the difficulty of observing tornadoes in the dark, whereas an improved occurrence of real-time confirmation of tornadoes during the daytime exists (45% day versus 25% at night).

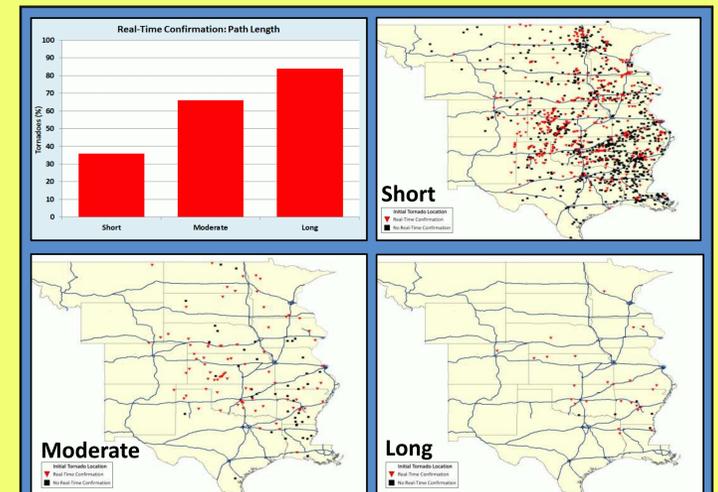
## CONFIRMATION BY RATING



The strongest tornadoes (EF-3 to EF-5) were confirmed in real-time at a much higher rate than weaker tornadoes (EF-1 and EF-2), due to a tendency for strong and violent tornadoes to have longer path lengths and residence times (Brooks 2003). The spatial distribution of the EF-1 and EF-2 tornadoes (upper right) and EF-3 to EF-5 tornadoes (lower right) confirmed in real-time is depicted.



## PATH LENGTH



The data were broken up into short (0-14.99 mi; 0-24.1 km), moderate (15-29.99 mi; 24.1-48.3 km), and long (30+ mi; 48.3+ km) track tornadoes. Increasing path length resulted in a higher number of tornadoes confirmed in real-time (36% short-tracked versus 83% long-tracked). The spatial distribution of the tornadoes confirmed in real-time is depicted in the three maps above.

## CONCLUSIONS

This study identified situations that are more conducive to real-time NWS tornado confirmation. The variables that best discriminated whether a tornado may be confirmed in real-time were the tornado duration and subsequent path length. The median lifespan of tornadoes confirmed in real-time was 17 minutes, versus 5 minutes for tornadoes without real-time confirmation, with 83% of long-tracked tornadoes confirmed in real-time.

The strongest rated tornadoes had a significantly higher incidence of real-time confirmation than EF-1 and EF-2 tornadoes, with EF-4 and EF-5 tornadoes receiving real-time confirmation in 92% and 100% of the cases, respectively.

Tornadoes can be challenging to confirm in real-time due to several factors including vegetative and terrain obstructions, storm modes, short residence times, time of day, and population density. This is illustrated by a decrease in real-time confirmation in nighttime cases, and a general geographic preference for confirmation in some urban areas.

This study's findings are the first to quantify the frequency of NWS products that contain real-time confirmation of ongoing tornadoes. This is expected to help operational meteorologists and external partners better understand when it is reasonable to anticipate real-time confirmation of tornadoes.