# **METHODS FOR REANALYSIS OF HISTORIC TORNADOES**

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## **I. INTRODUCTION**

Many important tornado events around the world have happened but, because they occurred many years ago, these events are poorly documented. The so-called "Tri-State" tornado of 18 March 1925 is an example. Its place in history is dominated by the fact that it produced the most fatalities (695) of any single tornado in United States (US) history, and its recorded path length of 219 miles (352 km) is also at the top of recorded US tornadoes. However, some questions linger about the nature of the event (e.g., Doswell and Burgess 1988), as well as the about the meteorological setting that produced this record-breaking tornado.

In order to try to answer some of these lingering questions, a team of researchers was formed to reassess the facts regarding this case, including the continuity of the damage along the path and the environment associated with the storm. Methods for conducting this research have been developed and are presented herein, with the hope that sharing them might prove useful for researchers around the world seeking to reinvestigate historical events. The ultimate goal of such work is to have as much information about past events as possible in order to anticipate the future.

# **II. ABOUT THE TRI-STATE TORNADO**

It is somewhat surprising that this event has never before been the subject of a detailed meteorological analysis in a refereed publication. A brief account to the storm was published in 1925 and an article appeared in the unrefereed publication *Weatherwise* (Changnon and Semonin 1966 – hereafter, CS66). In CS66, the track was shown (Fig. 1) and various meteorological aspects of the event were described.

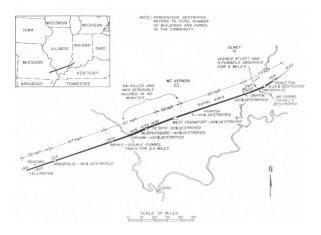
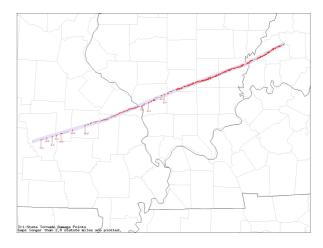
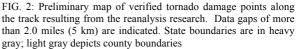


FIG. 1: The tornado track, showing significant damage locattions.

In this short summary, space doesn't permit much of a discussion about prior or revised understanding of this event. However, it is of interest to illustrate the current level of detail our team has been able to reconstruct along the path (Fig. 2) by using the methods summarized herein. We have been able to locate and verify more than 1500 damage points along the track, although there are still some data gaps along the track. New interpretations of this event are likely.





## **III. REANALYSIS RESEARCH METHODS**

There are two primary reanalysis research topics within the Tri-State Reanalysis Project: (1) the meteorological setting within which the event took place, and (2) verification of the continuity of damage along the track. For brevity's sake, only the damage path reanalysis methods will be summarized herein; the conference presentation will include both, however.

Counties along the track were assigned to the team members. Contacts with individuals in each county were developed at first via Internet searches and phone calls to local libraries, county officials, and local historical societies. Team members then travelled to each county to interact with their initial contacts. New contacts would be found during research visits; sometimes those contacts could be developed during that visit or might need to be scheduled for a subsequent visit. In general, investigations into multiple counties would take place during each data-gathering trip.

A high priority was associated with obtaining interviews with eyewitnesses. After letting them first describe the event in their own way, specific questions about important elements of the event were asked. On many occasions, these eyewitnesses were able to take researchers on a driving tour of the area, pointing out locations where significant things happened, even if there currently is no visible evidence remaining. During the course of this investigation, many of those interviewed have since died, which underscores the high priority we assigned to obtaining such interviews. Their information has been invaluable.

Contemporary accounts of the event, often in local newspapers that could be reviewed in libraries, usually would list damage locations by the name of the residents (e.g., the Smith farm, a home belonging to Mr. Johnson). This necessitated obtaining information about the approximate location of these locations in geospatial terms. In many US counties, information about property owners is documented on a "plat map" that is revised at intervals, showing the locations of tracts of land and designating the name of the owners. For many documented damage locations, it was not possible to locate them and so they couldn't be included. School and church locations in rural areas also provided information about the track if they were hit by the tornado. In many cases, if these buildings are still standing, their exact location could be determined (often with the help of a GPS device). In locating the track, nondamage points also proved to be helpful, when the point was close to the track. These have been recorded, but aren't shown in Fig. 2.

Collection of field data in this fashion requires multiple visits to each county, to follow up on new information sources and occasionally to re-interview eyewitnesses. Creative ways to locate and document damage have been found, although some leads that promised to be helpful proved to be unfruitful. The field data collector must be willing to pursue unexpected leads, but have a consistent set of goals for the process. Gaps in our data were understood to be inevitable at the outset. Nevertheless, a considerable mass of information has been collected and is currently being archived so that future researchers can conduct their own investigations of this event without having to re-locate all of the data.

#### **IV. RECOMMENDATIONS**

Space does not permit a comprehensive set of recommendations but the following represent some of the lessons we have learned during the course of this project:

•*Living eyewitnesses* are critically important information sources and should be the highest priority

-Record the interviews for reviewing later, if possible. Ask for their permission to do so. Keep detailed notes, if it is not possible to record the interview. Photograph your interviewees, if they're willing (ask for their permission).

-Let the interviewee describe the event in their own way at first and only ask questions after that first description is complete

-Interviews can corroborate or refute newspaper accounts, so be prepared to ask questions about issues obtained from your prior research

-80 years is about the farthest back this method can be used because eyewitnesses die or become unable to recall important details

-Second-hand histories from eyewitnesses (i.e., from surviving friends, family) can be nearly as useful as first-hand accounts

-Physical visits are preferred, but phone interviews with eyewitnesses can be a useful alternative

-Driving tours should be suggested, if the eyewitness is willing and able physically to do so

-Try to obtain copies of any documentation (photographs, newspaper clippings, etc.) in their personal possession

-Seek independent corroboration for eyewitness accounts wherever possible

-Assess the credibility of the information obtained

•*Physical evidence*, if available, can be located precisely

-Damage remnants (rebuilt structures, foundations, debris, gaps in vegetation, etc.)

#### •For field research trips:

-Keep up with a *daily diary!* - record as much detail about what you did and what you heard as possible, including items that are interesting but may not seem to be directly relevant to your goals

-GPS for site location is a powerful tool

-Use Internet and phone calls to develop contacts

-Be prepared to follow up on new contacts and investigate new leads for filling data gaps and corroborating the information you've already obtained

-Genealogical research sources are useful for clarifying information about individual names in the documentation

-Newspaper accounts often include errors or conflicting reports - have multiple sources wherever possible

-Take numerous photographs, with documentation of what the photograph represents, as well as where and when the photograph was made. Even if no physical evidence at a damage location remains, it can helpful to have an image of what that location looks like currently.

•*Potentially useful sources*: city, county, state, and national government archives, newspapers, libraries, churches, historical societies, local schools (including universities), weather service records, weather data archives, records of local businesses, real estate and census records (if available) are all useful sources.

•*Aerial photographs* may be available and strong tornadoes can leave physical damage that might remain visible for decades

•Don't be afraid to knock on doors or ask people in the area to develop new contacts – explain what you're doing and request information or contact information for people that could help fill in data gaps

•Develop a permanent archive and retain therein as much of your data as possible. This greatly simplifies and enhances the potential value of any future investigations and confirmation of your work.

•*Share your results* with those who helped you during your research, as well as the scientific community

## V. AKNOWLEDGMENTS

The author acknowledges that this project has been a *team effort* – it has been a privilege to work with and learn from all the members of this team: R. A. Maddox, C. Crisp, D. W. Burgess, J. Hart, R. H. Johns, S. Piltz, and M. S. Gilmore. We greatly appreciate the time and effort given freely by our field contacts, without whom this project would not have been possible.

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