

P9.2 IMPACT OF SMALL TORNADOES ON NATIONAL WEATHER SERVICE OPERATIONS
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John J. Kwiatkowski* and David L. Sherrieb,
National Weather Service, Indianapolis, Indiana

1. INTRODUCTION

Very small, weak tornadoes and funnel clouds affected portions of central Indiana in the early evening of 29 July 2001. The phenomenon attracted considerable public notice. Sightings were quickly relayed to the Indianapolis office (WFO IND) of the National Weather Service (NWS). WFO IND is responsible for convective warnings for central Indiana.

The staff at WFO IND faced a dilemma. As shall be discussed, the threat of damage was very low, but the event was apparently perceived as a tornado outbreak by the public, creating an expectation for warnings.

The next sections discuss the synoptic overview of the situation, the ‘outbreak’ itself, NWS actions during this event, and suggestions about research that would prove useful in responding to similar events.

2. SYNOPTIC PATTERN

Synoptic situations favoring tornadoes have been discussed by Doswell and Johns, (1993), as well as many others. Figures 1 and 2, taken from *Daily Weather Maps* (Climate Prediction Center, 2001)), show the synoptic and upper air patterns over central Indiana 29 July 2001. Even allowing for changes over the course of the day, there could hardly be greater variance from the ‘traditional’ tornado patterns.

In fact, the pattern only marginally supported deep convection. Satellite pictures and the WFO IND Weather Service Radar (WSR-88D) indicated fair weather cumulus prevailed in central Indiana for the afternoon of 29 July 2001. The authors, who were both present through this event, noticed increasing returns at 0.5 degree

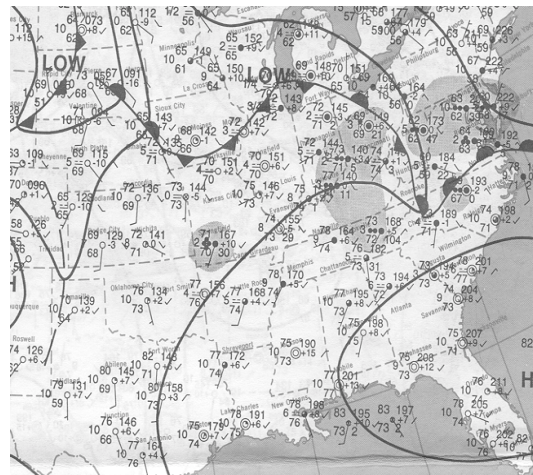


FIG. 1. Surface Situation 1200 UTC 29 July 2001

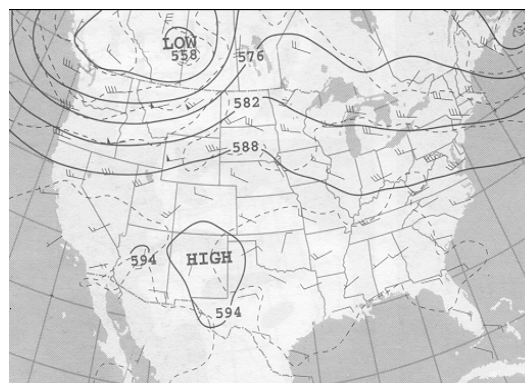


FIG. 2. 500 MB Plot 1200 UTC 29 July 2001

elevation on the WSR-88D about 2100 UTC (not shown). These were concentrated over the area shown in Figure 3. All returns were less than 35 dBZ, the majority were less than 20 dBZ. With available data, the NWS staff was not able to resolve features explaining the location of these ‘enhanced’ returns.

The radar situation *certainly* did not suggest a supercell described in Moller *et al.*

* *Corresponding author address:* John J. Kwiatkowski, National Weather Service, 6900 West Hanna, Indianapolis, IN 46241; e-mail John.Kwiatkowski@noaa.gov

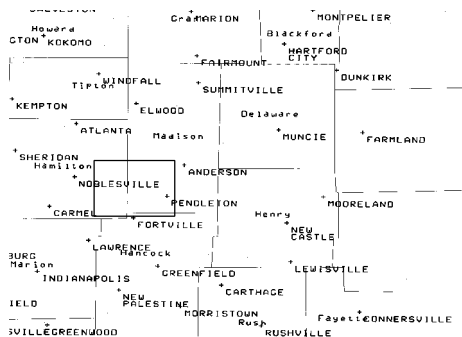


Figure 3. Central Indiana. County names in lower case. Area of interest within box.

(1994) and others. While surface dewpoints were (fairly high as shown in Figure 1, the low dBZs strongly suggested weak updrafts struggling to produce precipitation. Even disregarding supercell formation, the potential to “spin-up” a tornado by stretching horizontal vorticity as discussed in Waikimoto (1989) seemed limited.

3. ‘OUTBREAK’

Figure 4. exemplifies what was reported to WFO IND in a series of ground reports from about 2100-2300 UTC in the area depicted in Figure 3. A trained spotter (Arnold, 2001) on the scene in Delaware and Madison Counties confirmed the presence of numerous funnel clouds, as well vortices that were ‘tornadoes’ in the sense they briefly touched the ground. No reports of damage—even crop damage—or injuries were forwarded to WFO IND. The evidence seems consistent with an outbreak of small landspouts, as described in Wakimoto (1989).

There is little doubt the phenomena was widely visible, in part because little or no precipitation was falling, according to observer reports. Judging from reports to WFO IND, seeing rotating columns of air from a dark cloud to the ground—or an obscured horizon—convinced many people they were witnessing tornadoes.

4. RESPONSE

The NWS is charged with issuing appropriate warnings in response to tornadoes. It also provides its staff with explicit instructions regarding funnel clouds are not expected to reach the ground. (NWS 1995). Neither a ‘tornado



FIG 4. Funnel Cloud near Andersen, IN approx . 2300 UTC 29 July 2001. (Photo by M. Conliff.)

response’ nor a pure ‘funnel cloud’ response seemed appropriate.

With the information available, WFO IND was unable to determine why there should be funnel cloud/very small tornado development 29 July 2001 as distinct from many other (apparently) similar days when nothing happened. This complicated the response decision.

Considering the lack of supporting factors for ‘true’ tornadoes, the staff of WFO IND ultimately issued information in Special Weather Statements as described in NWS (1995). Subjectively judging from telephone calls, these met most concerns.

5. DISCUSSION

The ‘Outbreak’ was minor by many standards. Still, it posed a significant technical challenge to NWS forecasters.

Further research into the low end of the tornado spectrum would be valuable to forecasters facing similar situations.

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