MCV-Induced Severe Weather Event of 21 July 2003 across Pennsylvania

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Kinzua Viaduct Bridge – constructed 1882, improved 1900.
... destroyed July 21, 2003
PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE STATE COLLEGE PA
515 PM EDT TUE JUL 22 2003

...F1 TORNADO CONFIRMED IN MCKEAN COUNTY ON MONDAY JULY 21...

A TEAM FROM THE NATIONAL WEATHER SERVICE OFFICE IN STATE COLLEGE
SURVEYED DAMAGE AND INTERVIEWED RESIDENTS AND EMERGENCY
MANAGEMENT OFFICIALS IN MCKEAN COUNTY TODAY. THE TEAM
DETERMINED THAT AN F1 TORNADO DID TOUCH DOWN IN MCKEAN
COUNTY BETWEEN 315 PM AND 330 PM MONDAY AFTERNOON.

THE THUNDERSTORM WHICH SPAWNED THE TORNADO FIRST STARTED
PRODUCING DOWNBURST WIND DAMAGE 2 MILES WEST OF KANE. IT
CONTINUED TO THE NORTHEAST FOR 15 MILES...BEFORE THE TORNADO
TOUCHED DOWN 1 MILE WEST OF THE KINZUA VIADUCT IN A WOODED AREA.
THE TORNADO CONTINUED NORTHEAST...PRODUCING A DAMAGE PATH 3 1/2
MILES LONG...AND ABOUT 1/3 MILE WIDE. WINDS WERE ESTIMATED AT 100
MPH...WHICH CLASSIFIES THE TORNADO AS AN F1 ON THE FUJITA SCALE. THE
TORNADO CAUSED THE COLLAPSE OF THE HISTORIC KINZUA VIADUCT
BRIDGE. NINE OF THE 20 BRIDGE SUPPORTS WERE DESTROYED...LEADING
TO THE COLLAPSE OF THE BRIDGE. THOUSANDS OF TREES WERE ALSO
DOWNED ALONG THE PATH OF THE TORNADO.
Pennsylvania

Potter County – F3
McKean County – F1
Lycoming County – F1
Juniata County – F1
Mercer County – F0

68 reports of wind damage
Character of MCV


• 50 – 250 km in radial extent

• Generated by vertical gradients of diabatic heating within stratiform precipitation

• Quasi-balanced lower tropospheric ascent capable of extended lifetimes

• Balance supported lower tropospheric moistening, lowering static stability, focused subsequent moist convection

• Convection, associated latent heating likely responsible for vortex intensification

• Demise may be tied to differential advection of ambient shear
Figure 3. As in Figure 2 except for a) 1740 and b) 2040 UTC.
00 UTC 22 July 2003
850 mb

35 kt wind
00 UTC 22 July 2003
500 mb

50 kts
00 UTC 22 July 2003
500 mb
1912 21 July 2003
In Summary . . .

- Convectively-induced mid-level vorticity center
- Preceding surface warm front
- Several convective OBs
- 40-50 kts WSW mid level wind enhanced deep layer shear
- Mid-level vorticity generation
- MCV enhanced LL WAA supported deep convection sustained vortex
- Surface pressure rise-fall couplet supported damaging isallobaric wind
Ahead...

- Mode of MCV re-intensification
- Role of nocturnal theta-e transport
- Impact of diabatically produced surface cool pool on MCV maintenance
- Predictability of convection near MCV center