



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
6201 Theiler Lane
Louisville, Kentucky 40229

March 23, 2022

MEMORANDUM FOR: Russell S. Vose
Acting Chief, Climate Monitoring Section
Climatic Science and Services Division
National Centers for Environmental Information (NCEI)

FROM: Tom Reaugh
Lead Forecaster, National Weather Service, Louisville, KY

SUBJECT: SCEC Report for Kentucky Maximum Wind Gust December 10, 2021

Summary

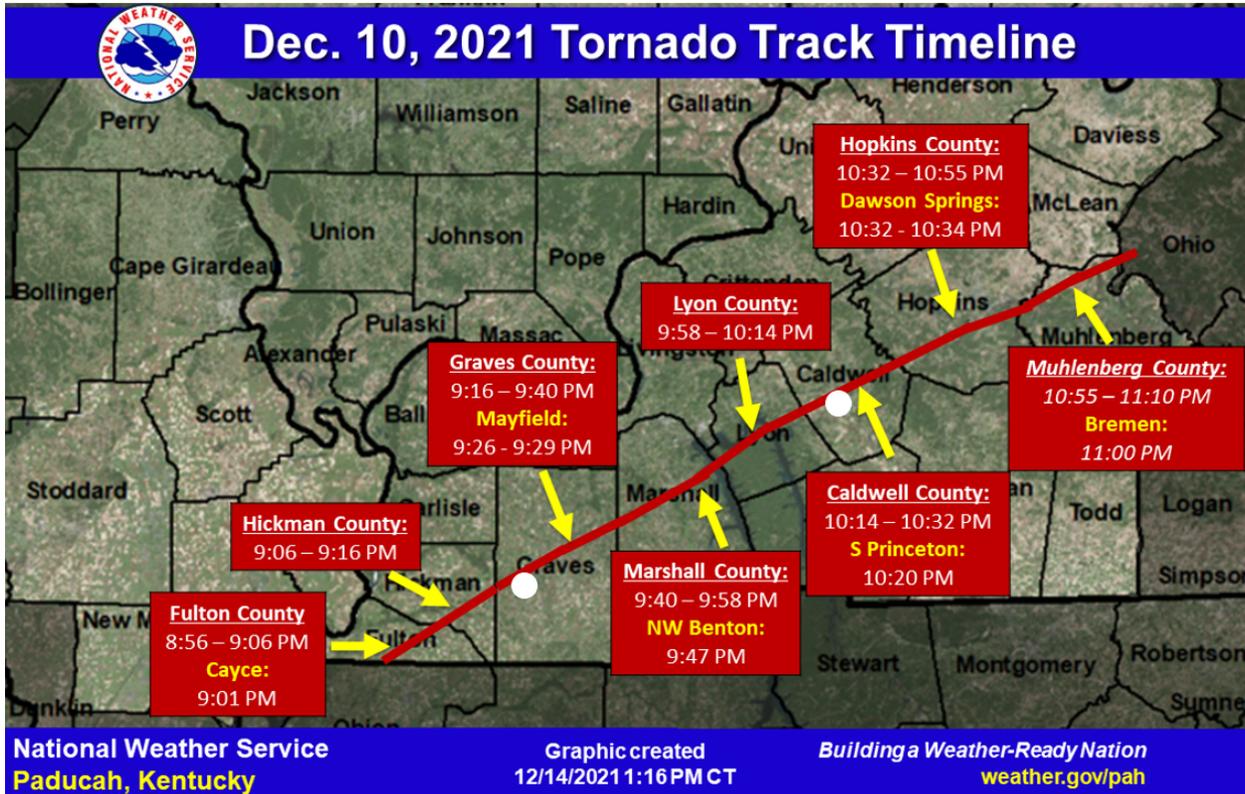
On December 10, 2021 a large tornado, at times a mile wide, caused extensive damage along a 163-mile long path in western Kentucky. Storm surveys found evidence of winds up to 190 mph, making the tornado a strong EF-4. The storm struck at least two Kentucky Mesonet sites, producing measured wind gust speeds higher than any previously known in Kentucky.

In January 2022 a State Climate Extremes Committee (SCEC) was convened to discuss the possibility of a new record wind gust speed for Kentucky. If verified, it would surpass the previous record wind gust, which had just been declared by an SCEC several months earlier in August 2021, of 100.8 mph on April 26, 2011 in Calloway County. That gust was also measured at a Kentucky Mesonet station.

Sequence of Events, Examination, and Decision

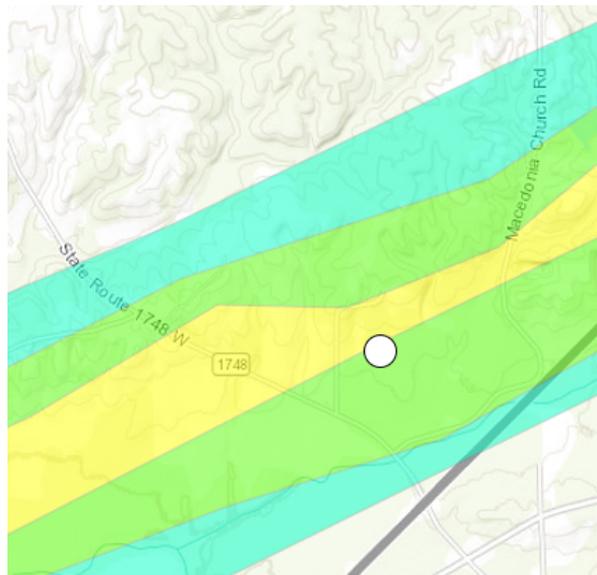
Causal Event

Late on the evening of December 10, 2021 a powerful thunderstorm produced a violent tornado that crossed western Kentucky.



Map of tornado track, courtesy NWS Paducah. The locations of the Kentucky Mesonet stations germane to this report have been added (white dots).

The storm first struck the Graves County Kentucky Mesonet site 5.7 miles southwest of Mayfield.



This image shows the track of the tornado with the blue, green, and yellow colors indicating EF-0, EF-1, and EF-2 magnitude winds, respectively. The location of the Graves County Mesonet station is shown by the white dot.

At 9:24 pm CST, 0324Z, the anemometer measured a peak wind gust of 47.89 m/s, or 107.1 mph. This may have been associated with the tornadic circulation or possibly a rear flank downdraft, according to analysis by NWS Paducah. Either way, this measurement would surpass the previously held record of 100.8 mph set in [Murray](#) in 2011.

GRAVES COUNTY: 107.1mph @10m

Station Metadata

Station identifier: PRYB

Site Name: Mayfield 6 SW

Lat/Lon: 36.69823, -88.72388

Sensor Metadata

Manufacturer: RM Young Company

Model: 05103-5, Wind Monitor (propeller/vane anemometer)

Installation date: 2019-04-03 18:03:00

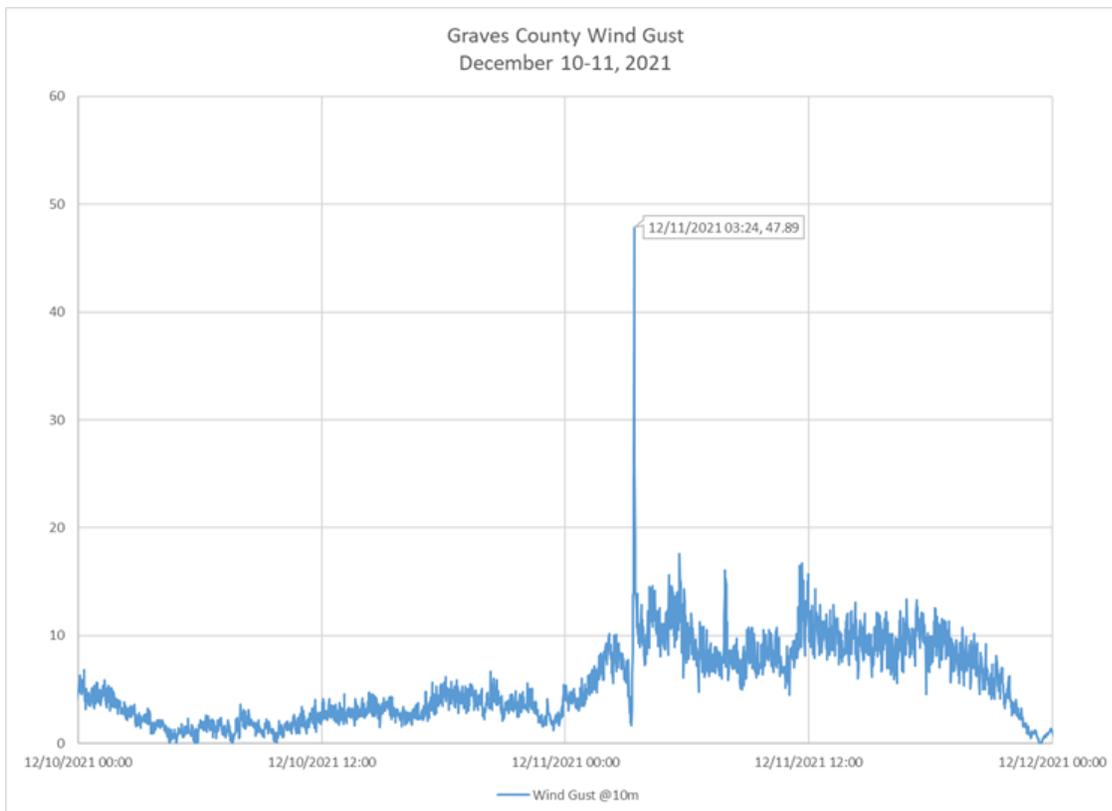
Last Calibration date: 2018-01-03 14:15:00

Data

Timestamp: 2021-12-11 03:24:00 UTC (2021-12-10 9:24pm CST)

Maximum 3-second wind speed value: 47.89 m/s (calculated: 107.1 mph)

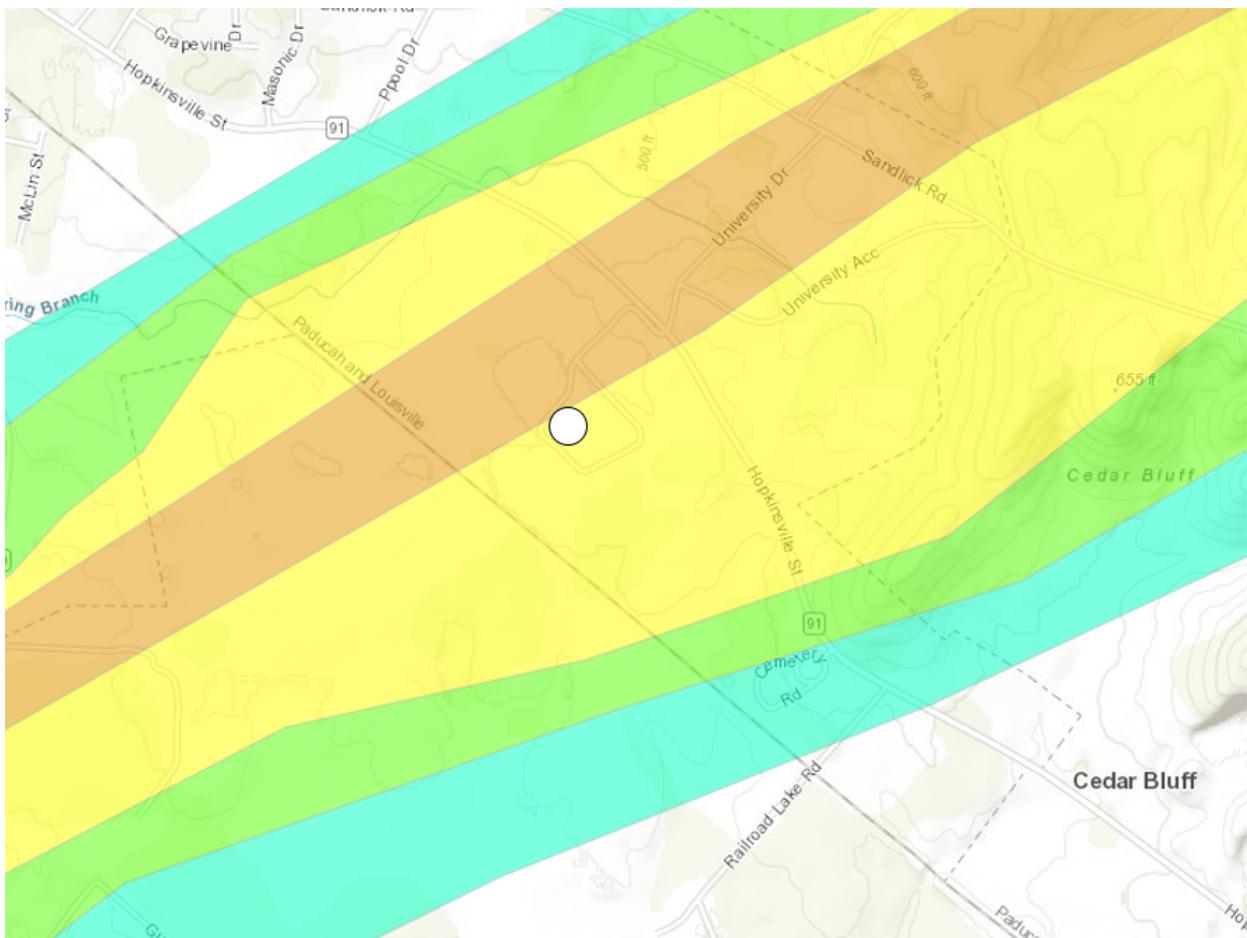
Average 5-minute wind speed value: 16.99 m/s (calculated: 38.0 mph)



The tornado continued on its path and struck the Caldwell County Kentucky Mesonet station, 1.5 miles southeast of Princeton, 61 minutes later at 10:25 pm CST (0425Z). There were two anemometers mounted on the observation tower: one at 10m and one at 2m. The anemometer at 10m recorded a wind gust of 33.52 m/s (75.0 mph) when the upper part of the tower failed, causing the instrument to stop recording. The maximum wind load rating for the tower was 49 m/s (110.0) mph. However, the lower part of the tower was not compromised. The anemometer at 2m survived intact and recorded a peak wind gust speed of 53.7 m/s (120.1 mph).

After the storm a careful inspection was made of the surviving anemometer and other equipment on the lower part of the instrument tower that survived. It was determined that the instruments were working properly.

From the RM Young Company's manual for the 03102 Wind Sentry cup anemometer, the documented gust survival range for the 2m anemometer is listed as 0-50 m/s (0-111.8 mph) for sustained winds and up to 60 m/s (134.2 mph) for gusts, so the measurement of a 53.7 m/s (120.1 mph) gust was within reliable tolerance limits.



This image shows the track of the tornado with the blue, green, yellow, and orange colors indicating EF-0, EF-1, EF-2, and EF-3 magnitude winds, respectively. The location of the Caldwell County Mesonet station is shown by the white dot.

CALDWELL COUNTY: 120.1 mph @2m

Station Metadata

Station identifier: PRNC

Site Name: Princeton 2 SE

Lat/Lon: 37.09534, -87.86162

Sensor Metadata

Manufacturer: RM Young Company

Model: 05103-5, Wind Sentry (cup anemometer)

Installation date: 2020-07-01 17:25:00

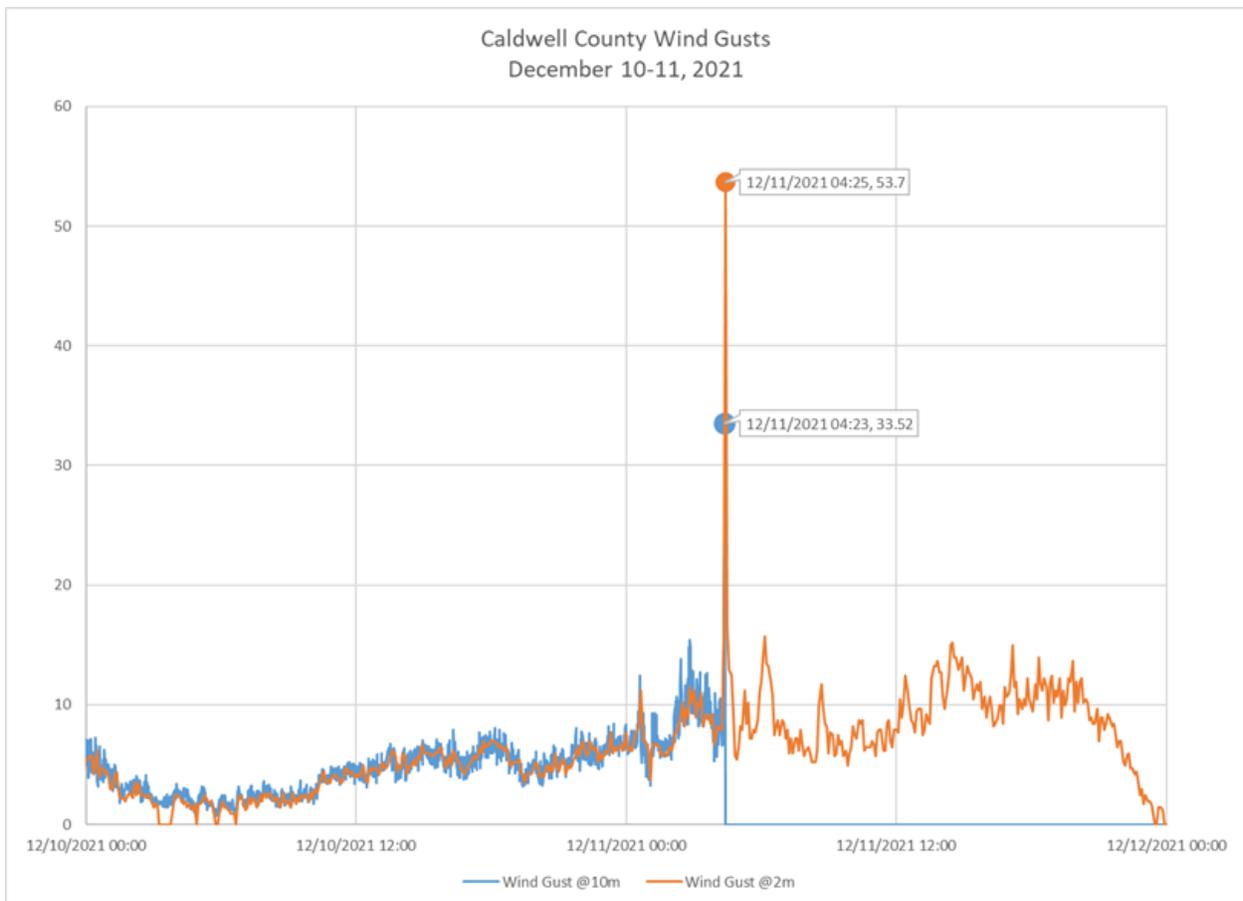
Last Calibration date: 2020-02-17 16:00:00

Data

Timestamp: 2021-12-11 04:25:00 UTC (2021-12-10 10:24pm CST)

Maximum 3-second wind speed value at 2m: 53.7 m/s (calculated: 120.1 mph)

Average 5-minute wind speed value at 2m: 18.69 m/s (calculated: 41.8 mph)





Damage to the Kentucky Mesonet's instrumentation tower in Caldwell County. While the upper part of the tower, including the anemometer mounted at 10m, failed, the lower part of the tower, including the anemometer mounted at 2m, visible on the left, remained intact and operational.



Nearby tornado damage

During the SCEC conference call on March 3, 2022, the team discussed the question of whether a wind speed measured in a tornadic circulation was appropriate to be counted as a record wind gust. While the phrase “wind gust” may initially evoke the thought of straight-line winds, it was felt that a measured wind speed, regardless of the meteorological cause, was fitting for this category of record wind. Also, this report and the report from August 2021 with the previous record wind gust will continue to be available, should the need arise in the future to separate a straight-line wind speed record from a tornadic wind speed record. It should be noted that if this need does arise, there will have to be an investigation into whether or not the Graves County wind gust on December 10, 2021 mentioned in this report (107.1 mph) was the result of tornadic winds or a rear flank downdraft (RFD). If the Graves County measurement is determined to be from straight-line winds in an RFD it would surpass the previous record of 100.8 mph thunderstorm winds set on April 26, 2011. However if the 2021 Graves County wind speed is considered to be a result of the tornadic circulation, then the 2011 straight-line wind gust record would stand.

Finding of Committee

All of the above evidence was shared among the SCEC members via e-mail and was discussed on an hour-long conference call on March 3, 2022. **Based upon the meteorological evidence and degree of nearby damage, it was decided (4-0 vote) that the 120.1mph gust measured by the Kentucky Mesonet’s observation site two miles southeast of Princeton in Caldwell County on December 11, 2021 at 0325Z (December 10, 2021 at 10:25pm CST) was valid.** Further, the committee is not aware at this time of stronger wind gusts in Kentucky that were measured on reliable, verifiable instrumentation. It is understood that reliable information about a stronger wind gust may exist but has yet to be discovered. If a challenge to the 120.1 mph gust is found, it can be addressed as necessary in the future.

NCEI Climate Monitoring Chief Decision:

Approved
as recommended in boldface above:

Not approved
returned to SCEC with no action taken:

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Appendix

State Climate Extremes Committee for the Establishment of a Record Wind Gust for Kentucky:

Voting Members:

- Karin Gleason, Meteorologist, Monitoring Section, NOAA's National Centers for Environmental Information (NCEI)
- Megan Schargorodski, Interim State Climatologist for Kentucky
- Tom Reaugh, Lead Forecaster, National Weather Service, Louisville, KY
- Melissa Widhalm, Associate Director/Regional Climatologist, Midwestern Regional Climate Center

Non-Voting Participant:

- John Gordon, Meteorologist-in-Charge of NWS Louisville

Karin Gleason, Megan Schargorodski, Melissa Widhalm, Tom Reaugh, and John Gordon were present at the conference call on March 3, 2022. All voting members voted in favor of the new record.