

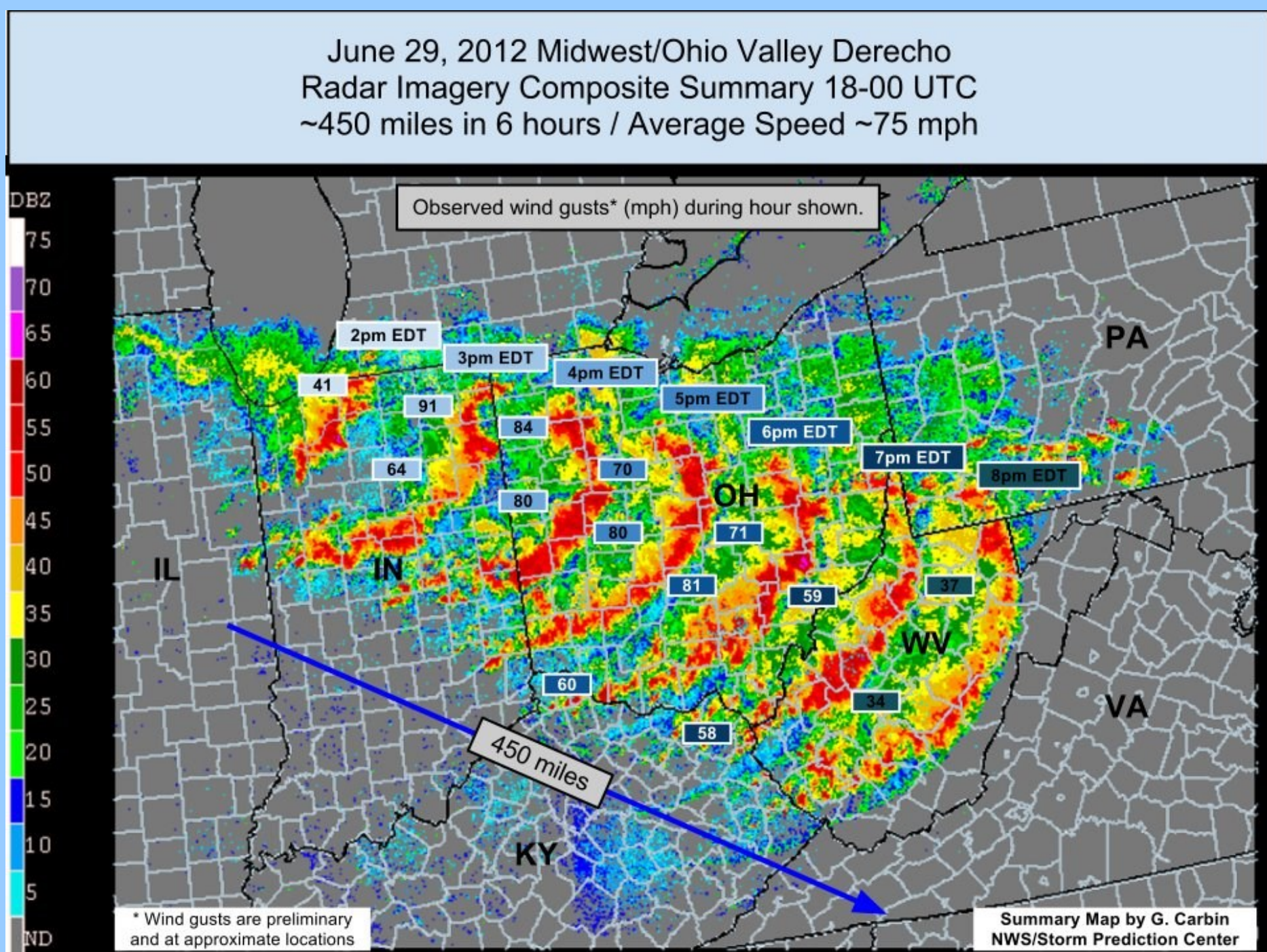
An Examination of the Forecast Process, Mesoscale Environment, and Longevity of the Northern Indiana/Northwest Ohio Derecho of 29 June 2012

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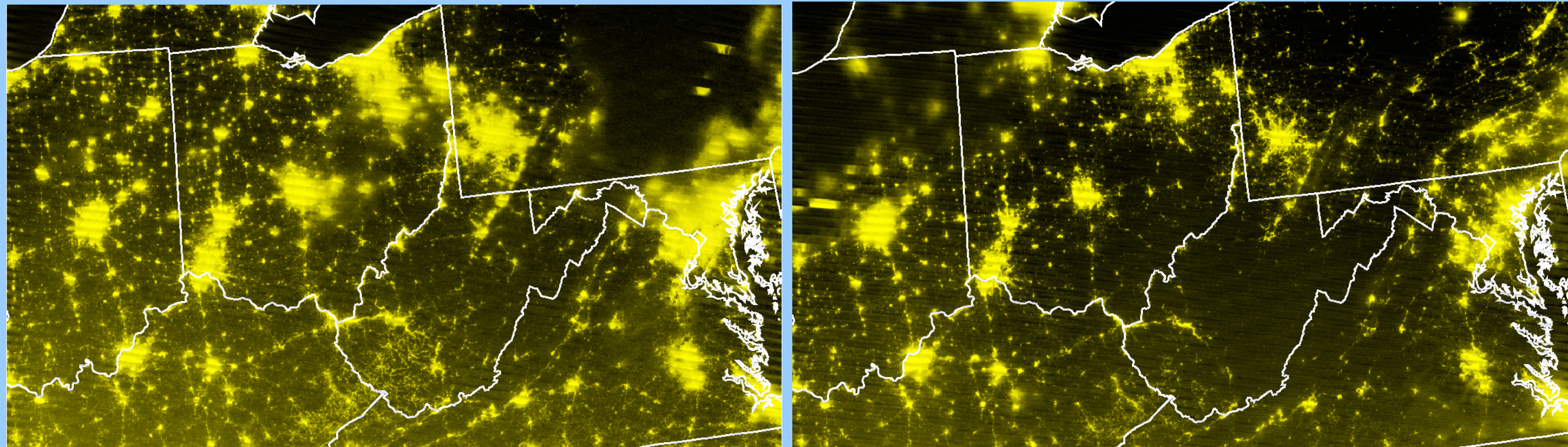


Overview in Numbers

- **79 knots**—Max measured wind gust along the entire path. (Reported at Fort Wayne Airport)
- **18**—direct deaths from winds
- **\$2.9 billion**—Total damages
- **4 Million**—Number of people left without power
- **34**—heat related deaths in areas without power in following days
- **1000 km**—Total distance traveled



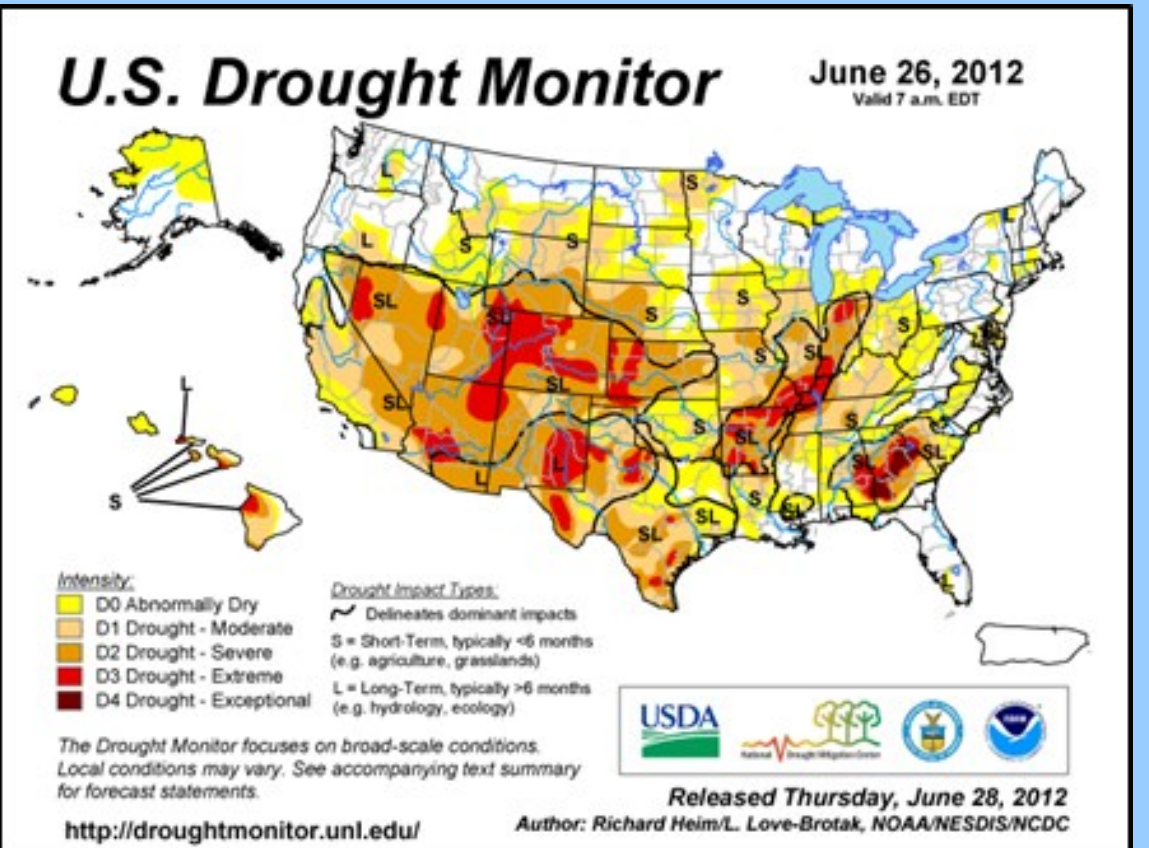
Composite radar image as the storm moved from northern Indiana to the Appalachians



Suomi NPP VIIRS Day/Night Band images around 07Z on June 29 (left) and June 30 (right) showing areas where power was out following the derecho (Image courtesy of Jordan Gerth, CIMMS)

Preconditions

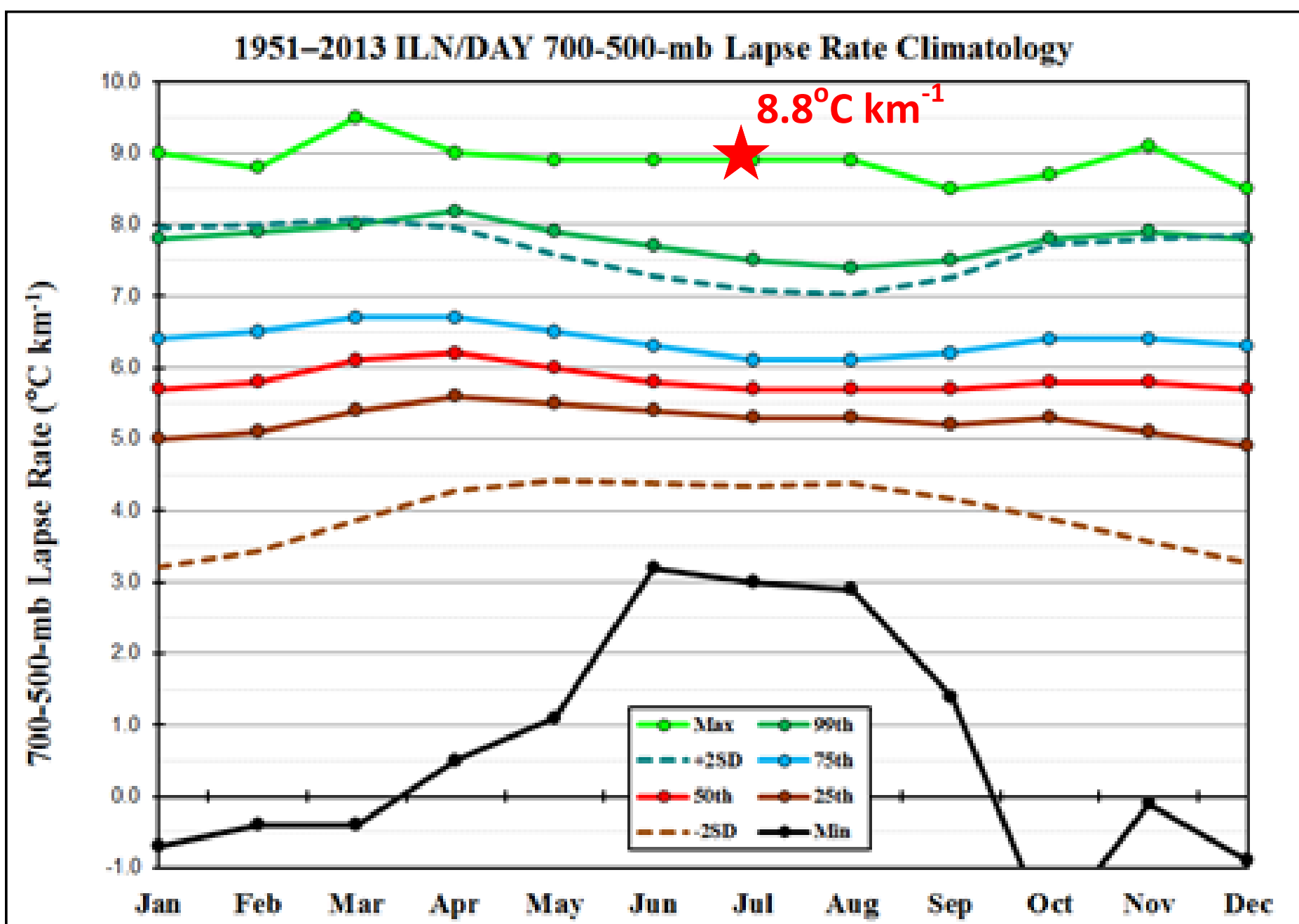
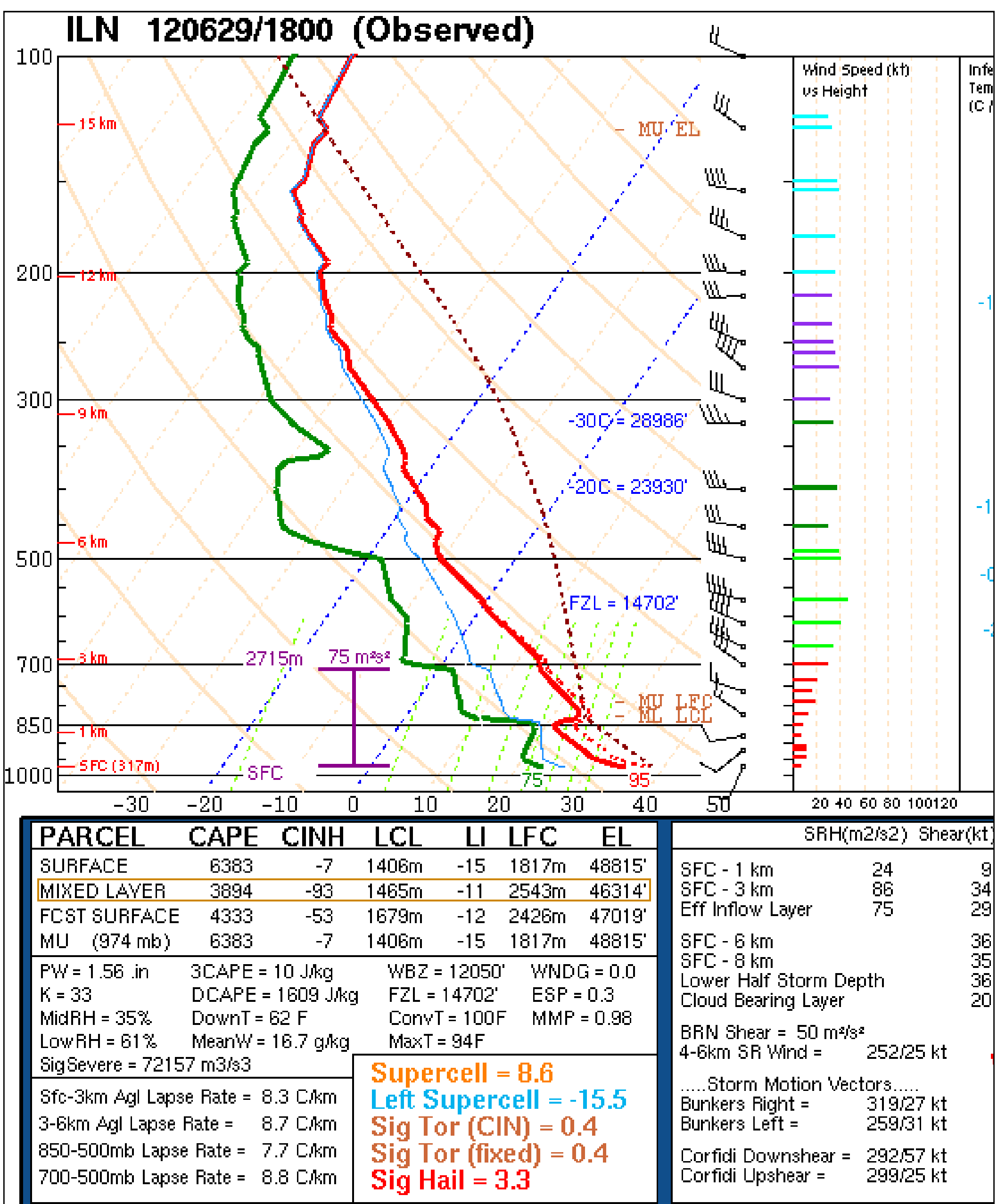
Fort Wayne received 3.0" of rain in the three months prior to this event during a span when the normal precipitation is 11.95."



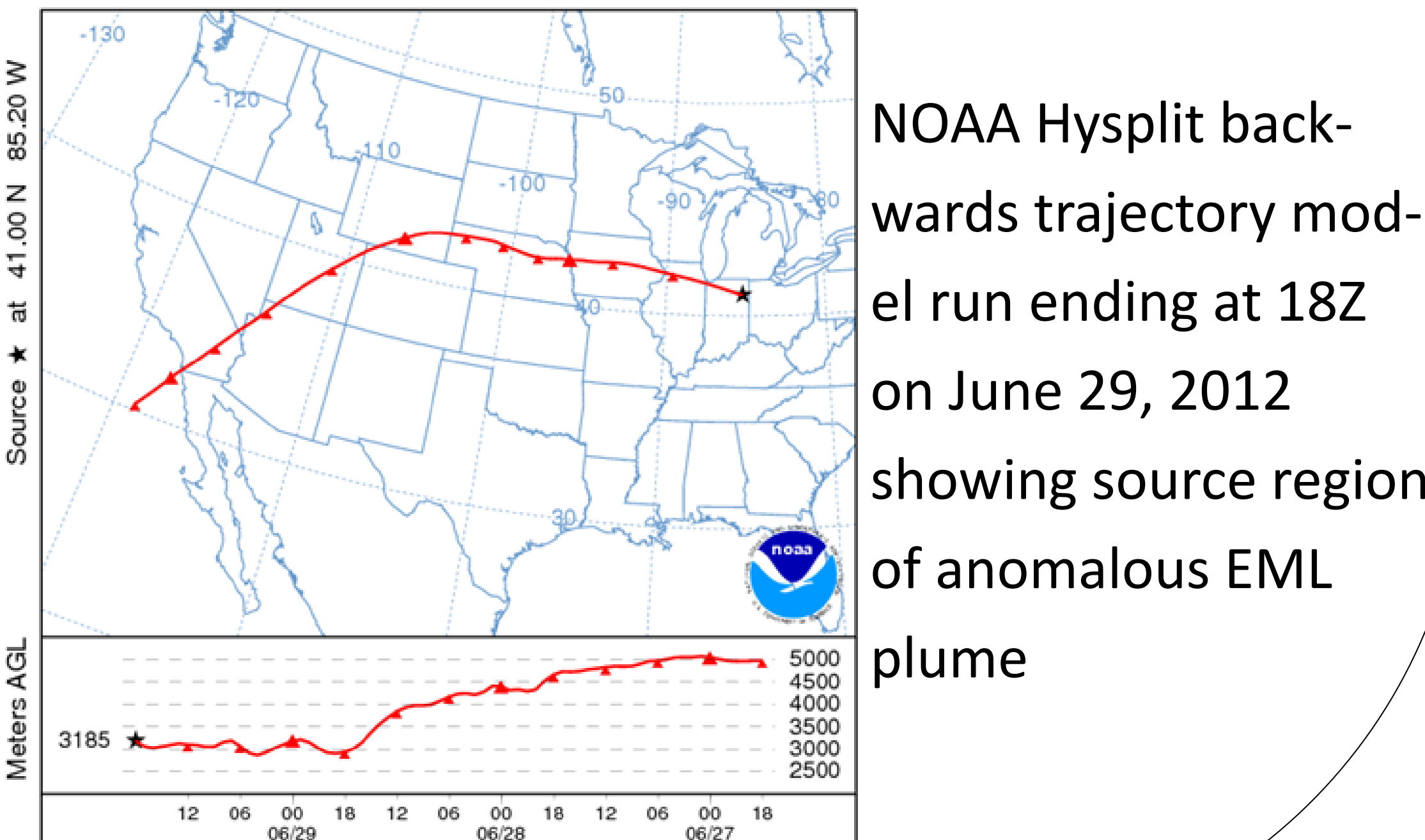
Mesoscale Environment

Variable	min	25%	75%	max	Jun 29	Source
0-6 km shear (kt)	2.2	20.4	38.8	54	36	ED 2001
0-3 km shear (kt)	1.9	15.6	29.2	46.7	34	ED 2001
MUCAPE ($J kg^{-1}$)	1286	2664	4194	8512	6383	ED 2001
DCAPE ($J kg^{-1}$)	601	698	1352	1758	1609	ED 2001
MLCAPE ($J kg^{-1}$)	741	1578	2924	5611	3894	ED 2001
Θ_e deficit (K)	6	18	28	33	45	ED 2001
Θ deficit (K)	3	6	10	17	18	ED 2001
LI ($^{\circ}C$)	-2			-13	-15	JH87

Table comparing mesoanalysis variables on June 29, 2012 to research done by JH87 and ED 2001. Columns show the minimum, maximum, 25th, and 75th percentiles for all cases.



1953 to 2013 ILN/DAY 700-500-mb lapse rate climatology by month (Source: Matthew Bunkers [NWS WFO Rapid City.])



Record Values

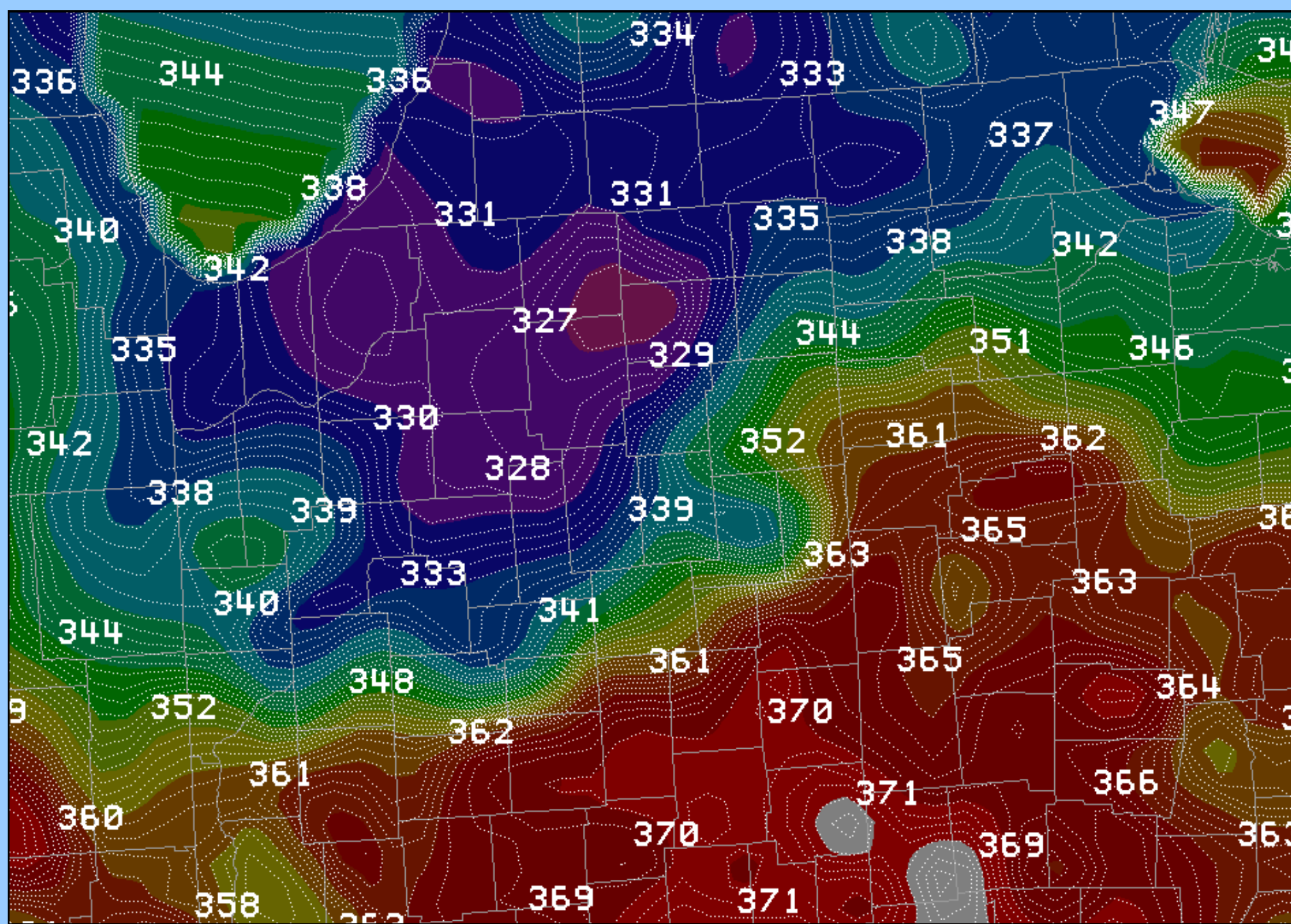
Several mesoanalysis variables exceeded previous maximum values found by Evans and Doswell 2001 (ED 2001) and Johns and Hirt 1987 (JH87)

- June 29 Θ_e deficit = 45K, previous maximum = 33K
- June 29 Θ deficit = 18K, previous maximum = 17K
- June 29 Lifted Index = -15, previous maximum = -13

The max wind gust of **79 knots** at Fort Wayne Airport is the highest wind gust ever reported at the site.

Strong Cold Pool

- Max pressure rise of 7.1 hPa at KDAY (Dayton, OH)
- Estimate ~10 hPa pressure change using Θ deficit
- Shear vector was nearly perpendicular to the line
- Estimated cold pool strength using horizontal vorticity equation



19Z LAPS Surface Θ_e (K)

Cold Pool = $19-23 ms^{-1}$

Environmental Shear = $15.4 ms^{-1}$

Cold Pool Dominant