Trajectory Technical Support Document

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Meteorology plays a major role in the formation and transport of fine particulate matter over large areas. To better take into account the transport of $PM_{2.5}$ precursors and primary emissions to the violating monitor, the HYSPLIT trajectory model developed by NOAA was used to calculate wind trajectories 48 hours backward in time from the violating monitor to show the path the air mass took on its way to the site.

Trajectories were run for those days with $PM_{2.5}$ concentrations greater than the 98th percentile for a particular year. Depending upon when an area first violated the 24-hour standard, either the three year period from 2004 through 2006 or 2005 or 2007 was used. A trajectory was started from eight equally spaced times spread across the span of each day (i.e., at three hour intervals). The initial start height for each backward trajectory was set to the mixing height at the start time. The mixing height at the start time was calculated by the HYSPLIT model. Two additional evenly spaced starting heights relative to the starting mixing height and a fourth height at 10 meters were used to calculate trajectories in the same manner described above.

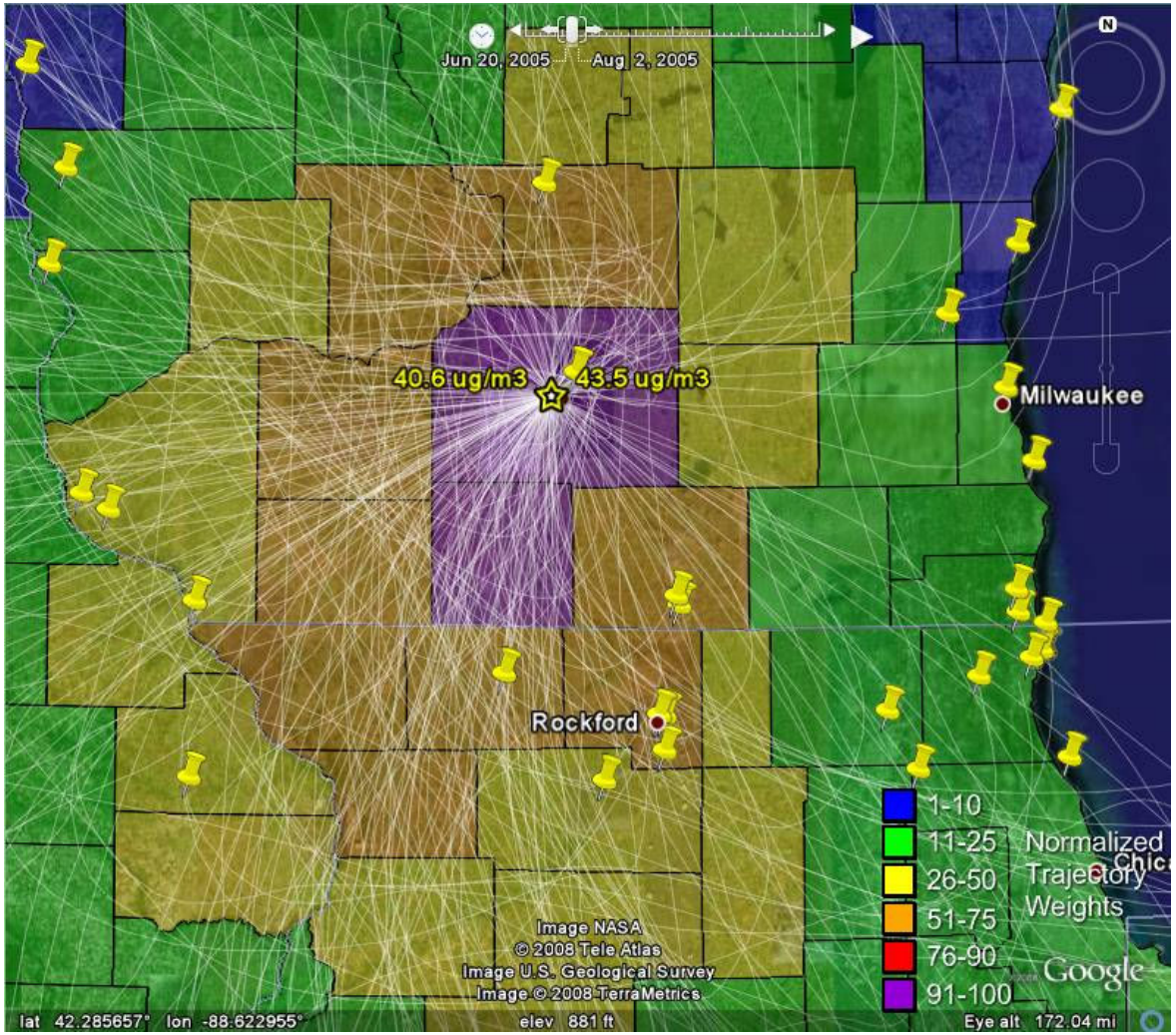
The trajectories were plotted using Google Earth and animations were created to show the path the air masses took on their way to the violating site. The trajectory paths were plotted as white lines with the locations of the air mass along the path were represented as colored dots to show the time the air mass passed over a location. The county trajectory weight corresponding to the values used for the Contributing Emissions Score (CES) were also plotted to show the meteorologic adjustment used for the CES. The trajectory weights provide an indication of the likelihood of a county being upwind of a violating monitor on days with high $PM_{2.5}$ concentrations. A more detailed description of the CES and its components is given in the CES technical support document. The locations of electric generating units were also displayed as yellow push pins on the map. The violating site was marked by a yellow star.

Where appropriate, an area's trajectories were divided into two seasons based on the time of year when the day above the 98th percentile occurred. The warm season was designated as the months of May through September, while the cold season was all other months of the year.

The following static images show the trajectories for days greater than the annual 98th percentiles during either 2004 through 2006 or 2005 through 2007 for the following areas: Madison WI, Paducah KY, Clarksville TN, Parkersburg WV, Knoxville TN, Louisville KY, Huntington WV, and Cleveland OH.

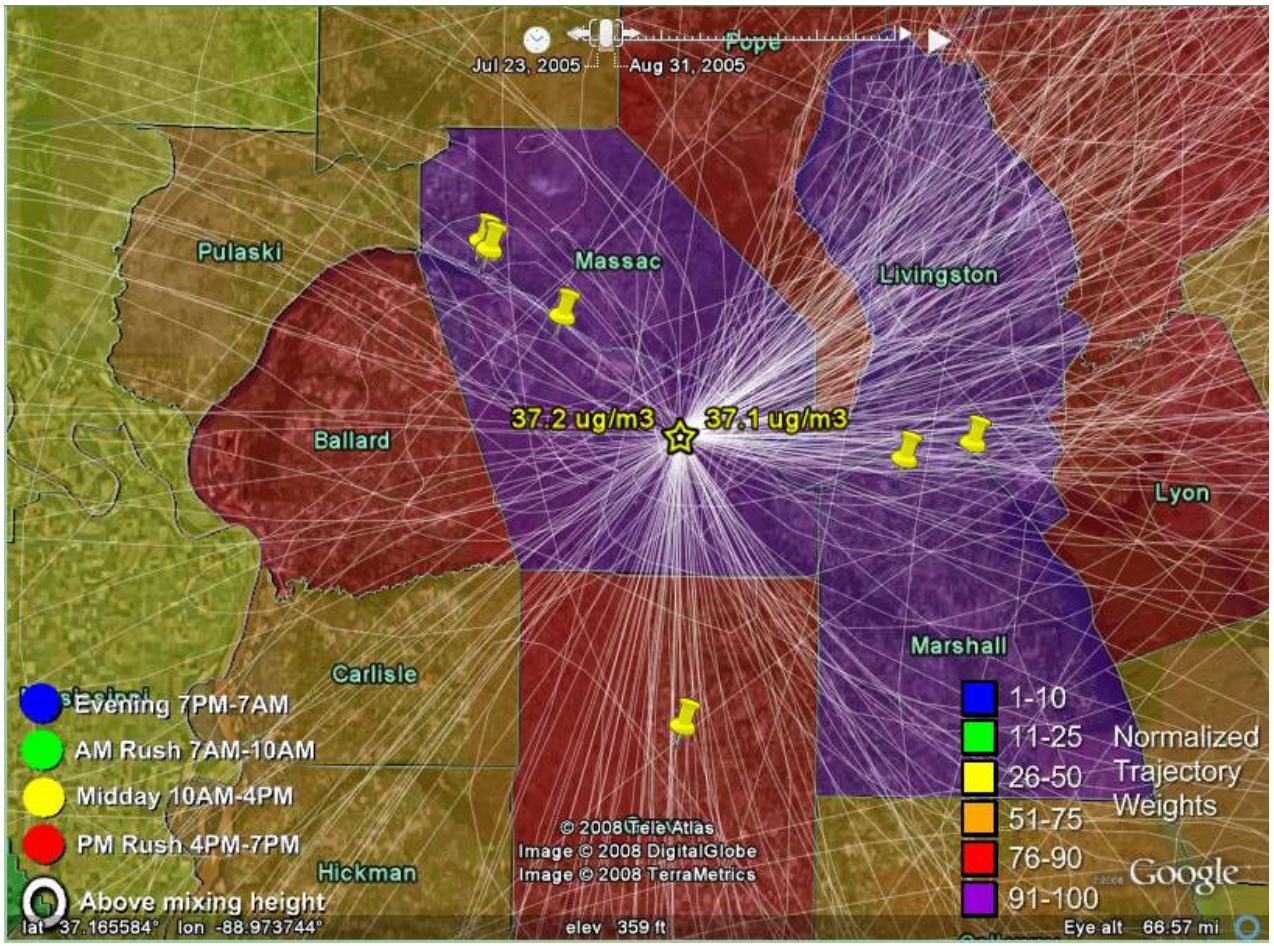
The last two pages of the document contain two examples of trajectory animations for the Paducah KY area from September 10, 2005 and July 26, 2007. The concentration at the violating site for each day is noted next to the site which is marked by a yellow star. The trajectory paths are represented by white lines with the locations of the air mass at a particular time being represented by colored dots. The clock at the top of the animation shows the time of day.

Madison, WI – Cold Season



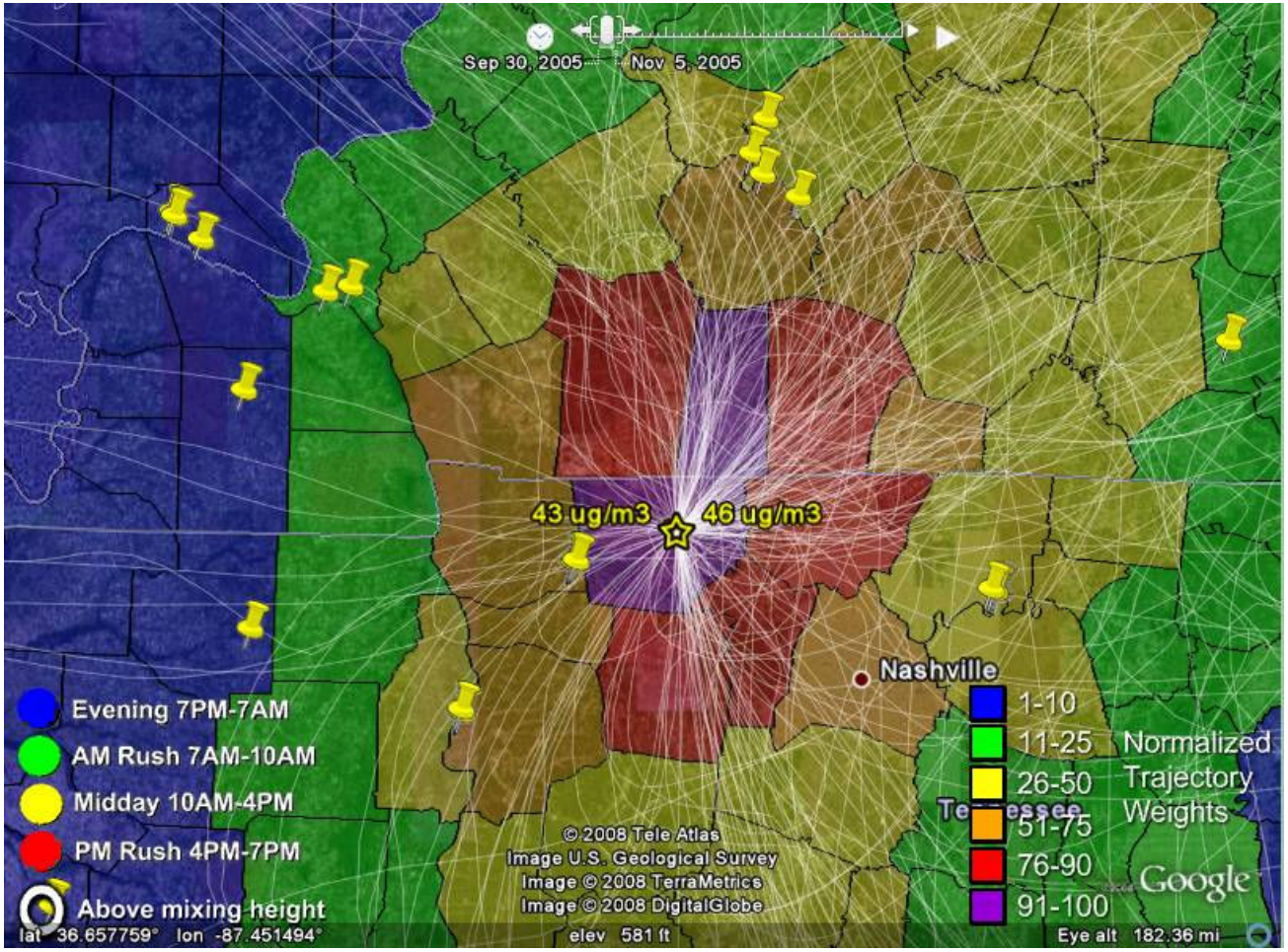
- 2/3/05: 43.5 μg/m^3
- 2/24/05: 40.6 μg/m^3
- 11/7/06: 33.4 μg/m^3
- 11/25/06: 53.9 μg/m^3
- 2/11/07: 39.4 μg/m^3
- 11/20/07: 37.3 μg/m^3
- 12/20/07: 61.6 μg/m^3

Paducah, KY – Warm Season



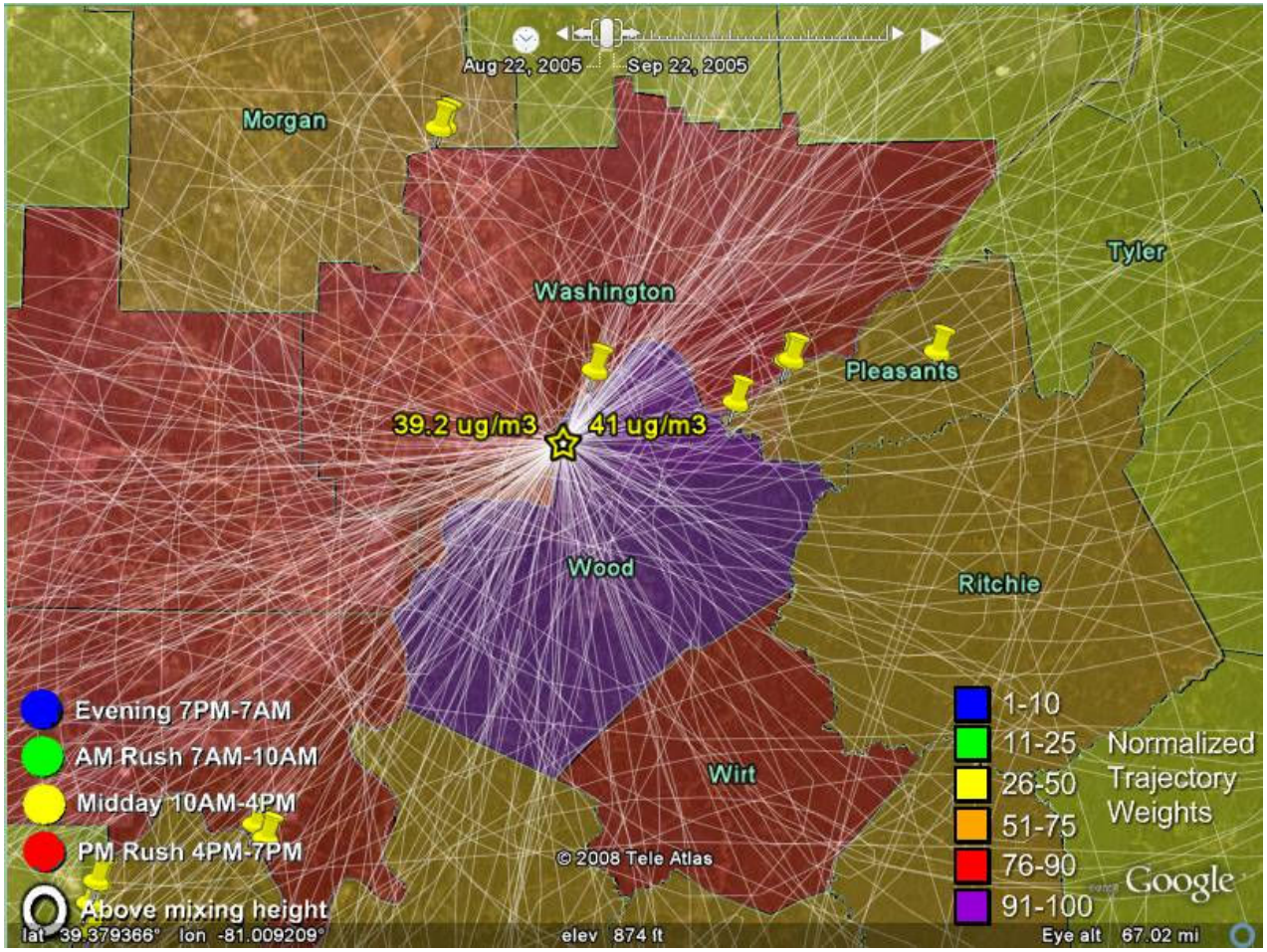
- 6/24/05: 37.1 μg/m^3
- 7/9/05: 37.2 μg/m^3
- 9/10/05: 39.6 μg/m^3
- 7/19/06: 36.7 μg/m^3
- 8/12/06: 39.3 μg/m^3
- 8/18/06: 38.9 μg/m^3
- 5/24/07: 39.4 μg/m^3
- 7/26/07: 36.8 μg/m^3
- 8/1/07: 34.2 μg/m^3

Clarksville, TN – Warm Season



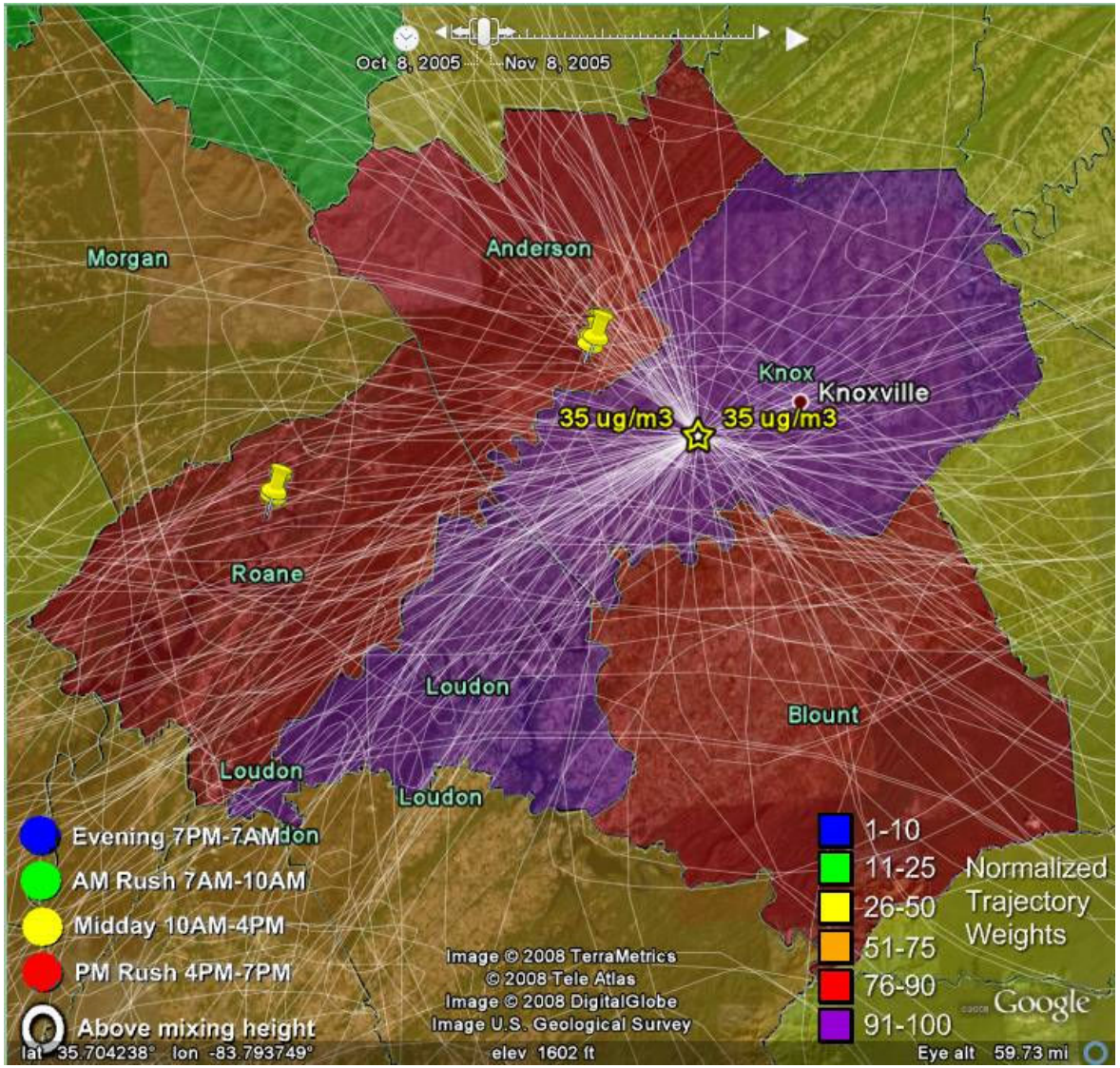
- 9/10/05: 46 μg/m^3
- 6/25/06: 34.3 μg/m^3
- 7/19/06: 40.4 μg/m^3
- 8/18/06: 37.1 μg/m^3
- 5/30/07: 35.7 μg/m^3
- 8/1/07: 38.7 μg/m^3
- 8/4/07: 43 μg/m^3

Parkersburg, WV – Warm Season



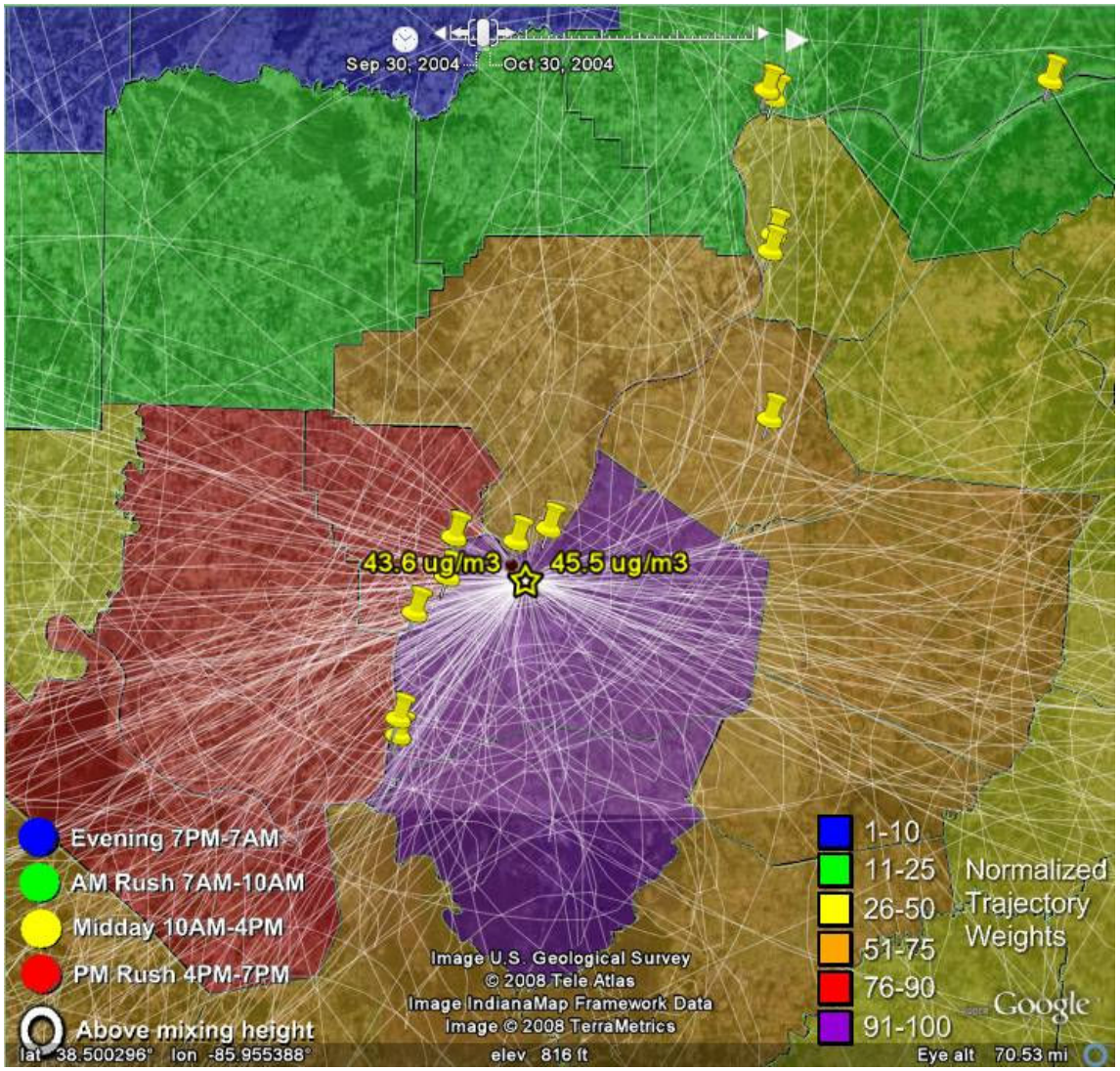
- 6/24/05: 39.3 $\mu g/m^3$
- 6/27/05: 43.6 $\mu g/m^3$
- 6/30/05: 36.2 $\mu g/m^3$
- 7/10/06: 42.1 $\mu g/m^3$
- 7/19/06: 39.2 $\mu g/m^3$
- 7/31/06: 35.1 $\mu g/m^3$
- 5/30/07: 41 $\mu g/m^3$
- 7/29/07: 39.3 $\mu g/m^3$

Knoxville, TN – Warm Season



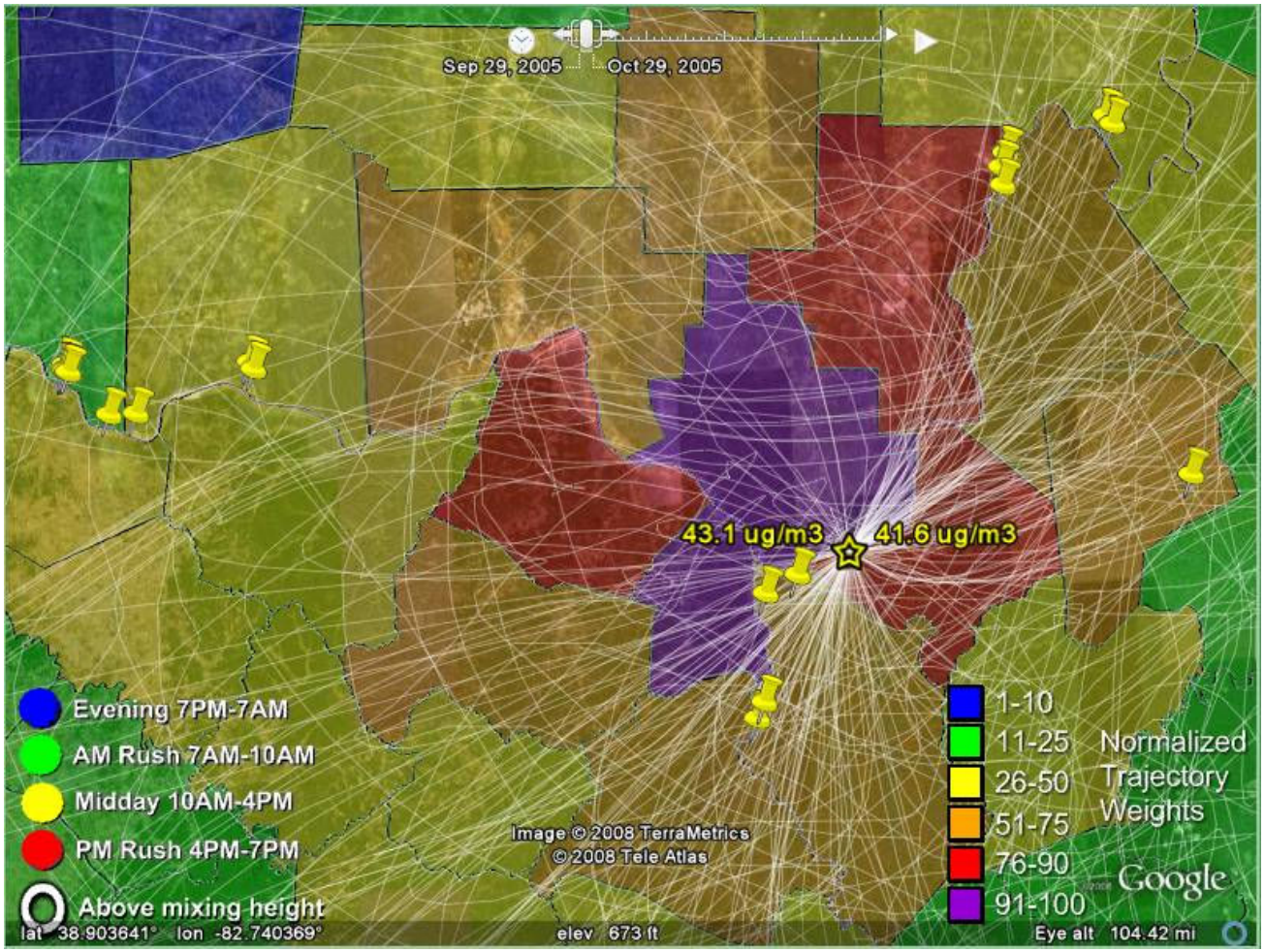
- 8/11/05: 35 μg/m^3
- 7/4/06: 46.9 μg/m^3
- 8/18/06: 40.7 μg/m^3
- 8/4/07: 35.4 μg/m^3
- 9/3/07: 35 μg/m^3

Louisville, KY – Warm Season



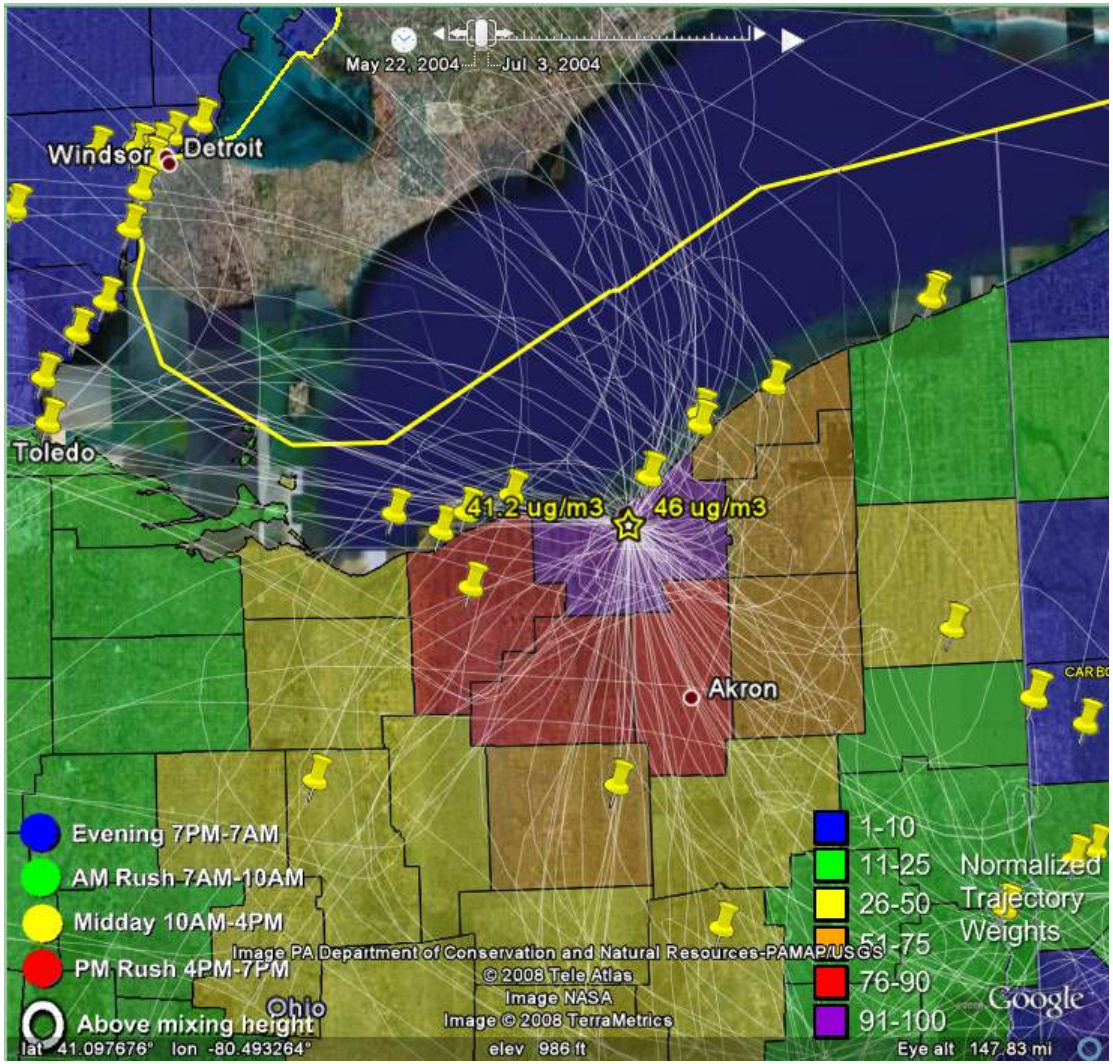
- 8/4/04: 43.6 μg/m^3
- 6/30/05: 45.9 μg/m^3
- 9/10/05: 45.6 μg/m^3
- 9/13/05: 45.5 μg/m^3
- 7/19/05: 36.4 μg/m^3
- 7/25/05: 35.9 μg/m^3
- 8/18/06: 36.2 μg/m^3

Huntington, WV – Ashland, KY Warm Season



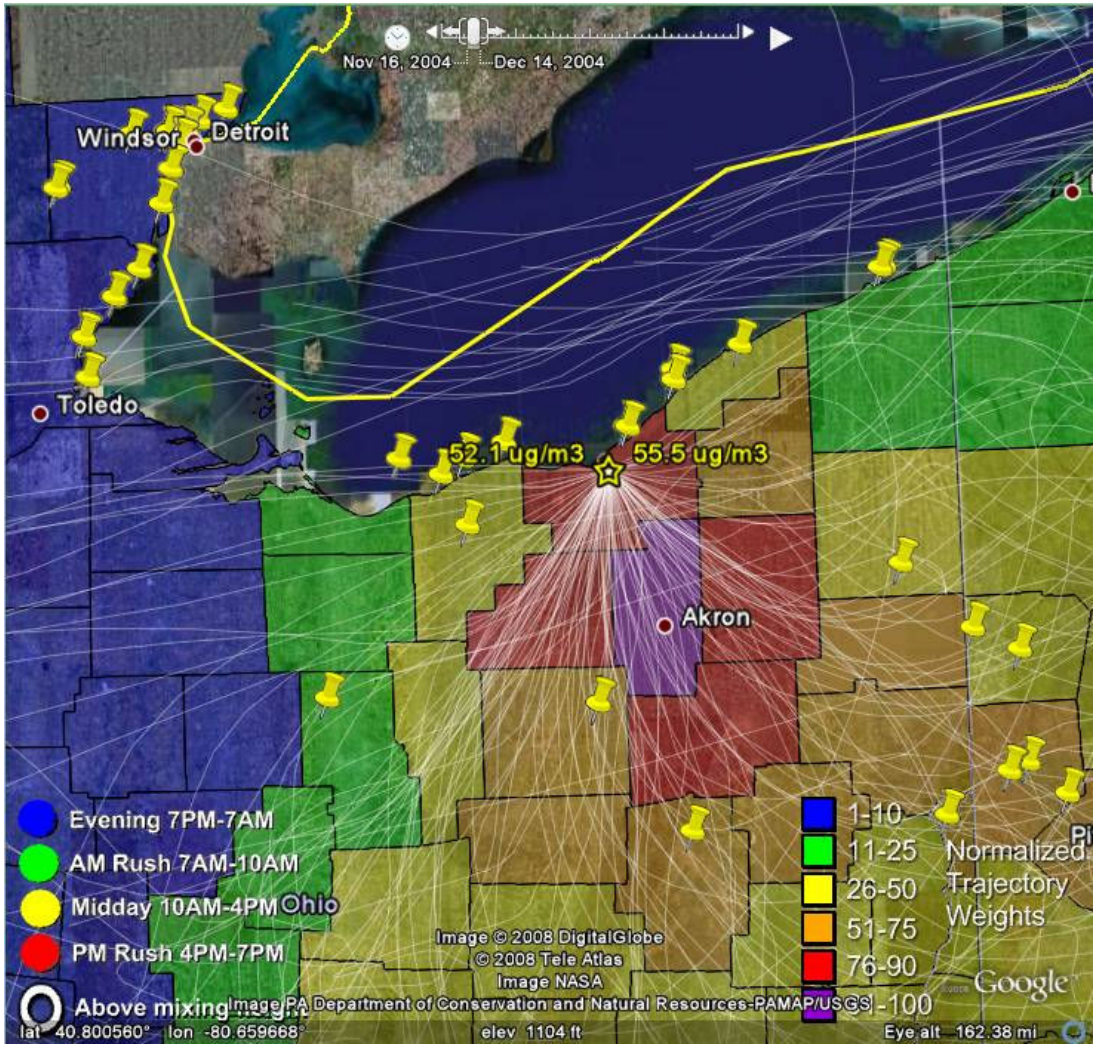
- 9/10/05: 41.6 μg/m^3
- 9/13/05: 43.1 μg/m^3
- 9/22/05: 40.5 μg/m^3
- 7/19/06: 45.1 μg/m^3
- 5/30/07: 43.2 μg/m^3
- 6/2/07: 42.6 μg/m^3
- 9/6/07: 39.4 μg/m^3

Cleveland, OH – Cold Season



- 3/4/04: 46 μg/m^3
- 10/4/05: 54.4 μg/m^3
- 3/30/06: 36.1 μg/m^3
- 12/19/06: 41.2 μg/m^3

Cleveland, OH – Warm Season



- 3/4/04: 46 μg/m^3
- 10/4/05: 54.4 μg/m^3
- 3/30/06: 36.1 μg/m^3
- 12/19/06: 41.2 μg/m^3

September 10, 2005

July 6, 2007