

## FINE PARTICLES (PM<sub>2.5</sub>)

2008 January – December

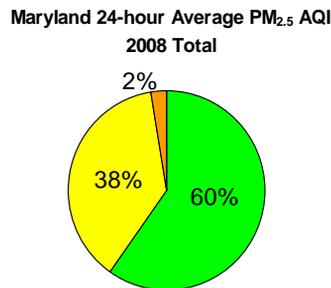
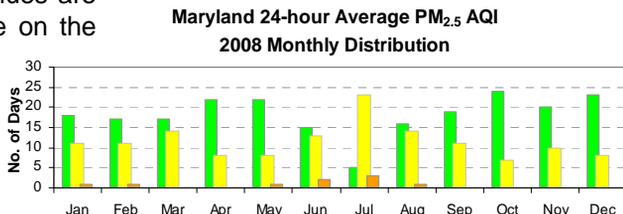
Fine particles, or PM<sub>2.5</sub>, is a year-round pollutant. Although it is active throughout the year, the Mid-Atlantic region commonly observes its highest PM<sub>2.5</sub> concentrations during the summer. This is because many PM<sub>2.5</sub> precursors can chemically react at a faster rate in warmer environments. Fine particle activity is assessed by determining the number of days that the 24-hour average PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS) is exceeded. This standard is exceeded when the Air Quality Index<sup>1</sup> (AQI, see color bar below) is greater than 100, and is then labeled as an exceedance day.

2008 was a below normal year for fine particle activity. Nine<sup>2</sup> exceedance days were observed which is approximately half of the average number of exceedance days that occurred between the five-year average of 2003-2007. The chart "Seasonal Comparison of Exceedance Days" (pg. 2) displays the monthly trends of 2008 compared with the recent five-year average. When PM<sub>2.5</sub> AQI values increase, it can affect visibility as well. The Haze Cam images on the right compare air quality conditions in Baltimore City. On May 10<sup>th</sup>, a good air quality day, Baltimore City (about 10 miles away) and the Key Bridge are clearly visible on the Haze Cam. In contrast, on June 7<sup>th</sup> PM<sub>2.5</sub> AQI values are high and it is difficult to see Baltimore City and the Key Bridge on the Haze Cam image.



### SEASONAL HIGHLIGHTS

Throughout the year, Maryland experienced 60% Good PM<sub>2.5</sub> AQI days, 38% Moderate days, and a mere 2% were within the Unhealthy for Sensitive Groups (USG) range, as shown by the pie chart to the right. This 2% accounted for nine exceedance days. The monthly AQI trend through the year is displayed by the bar chart "Maryland 24-hour Average PM<sub>2.5</sub> AQI 2008 Monthly Distribution." The year began in January with Good and Moderate days. At the end of the month, on January 29<sup>th</sup>, one USG day was observed with an AQI value of 102. This exceedance day was reported by the Oldtown air monitoring site. The table "Maryland's 2008 PM<sub>2.5</sub> Exceedance Days" lists each day that an AQI value was above 100 and is emphasized with its designated AQI color. Also, a map above the table displays the location of each air monitoring site in Maryland.



In February, very similar conditions occurred with one USG day again toward the end of the month with an AQI value of 107. During March and April, only Good and Moderate days were observed. Also, an increase can be seen in the number of Good days from March to April. May had comparable numbers of Good and Moderate days to April, but the third USG day of 2008 was observed on the 3<sup>rd</sup> at the Hagerstown air monitoring site with an AQI value of 102. (continued on pg. 2)

### Air Quality Index (AQI)



<sup>1</sup> AQI based on the 2006 24-hr proposed PM<sub>2.5</sub> thresholds

<sup>2</sup> PM<sub>2.5</sub> data from official FRM measurements

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**SEASONAL HIGHLIGHTS**

(continued from pg. 1)

During June, Good and Moderate days were nearly equal with two USG days occurring. Comparatively, July showed a significant increase in the number of Moderate days. This increase allowed Moderate to be the most common AQI category of the month and showed that July had experienced the worst PM<sub>2.5</sub> concentrations of the season. Fine particles reached levels of USG on July 17<sup>th</sup>, 18<sup>th</sup>, and 29<sup>th</sup>. On these days, four to five air monitoring sites reported exceedances of the standard. This indicates that these events were not as localized as the other exceedance days were. The last USG day occurred in August at the Fairhill air monitoring site with next four months observing predominately Good PM<sub>2.5</sub> days.



**WEATHER & AIR QUALITY**

During 2008, temperature trends across the U.S. were generally close to the climatological average. U.S. maps on pg. 3 display anomalies from the long-term average of 1950-2007 for temperature and precipitation conditions in 2008. Less than average temperatures, or a cooler trend, appeared to exist in the central U.S. and within the Northwest. Southern California and scattered regions in the Mid-Atlantic showed a warming (above normal) trend. Anomalies show that precipitation had very strong differences from the climatological average. Much wetter, or above normal, conditions were observed from the Great Plains through the Great Lakes region and into New England. Missouri and New Hampshire appeared to experience the largest increase in precipitation statewide, with as much as 20 inches more than normal. Distinctly dry conditions existed as well. These trends occurred along the West Coast and central Texas.

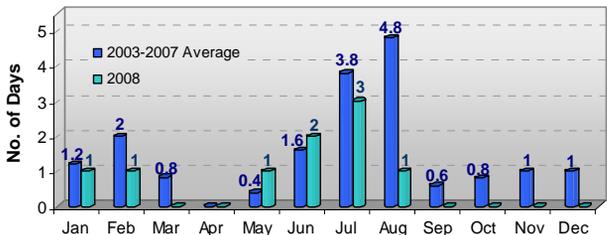
In Maryland, temperatures were generally near normal except for the Eastern Shore. The Eastern Shore showed a slight warming trend on the magnitude of about 1°F. Also, more rainfall occurred across most of the state by approximately 2-4 inches in 2008. By comparing these weather conditions with the chart “Seasonal Comparison of Exceedance Days” to the left, it appears that the near normal temperature and precipitation conditions allowed for a similar trend in the monthly distribution of exceedance days.

During 2008, the number of exceedance days per month was close to normal. However, on an annual basis, this was not true. A decrease occurred in the annual number of exceedance days from an average 18 (continued on pg. 3)

Maryland's 2008 PM<sub>2.5</sub> Exceedance Days

Date	No. of Monitors	Monitor with Highest AQI	24-hour Average PM <sub>2.5</sub> AQI
29-Jan	1	Oldtown	102
23-Feb	2	Oldtown	107
3-May	1	Hagerstown	102
7-Jun	1	Essex	105
14-Jun	1	Rockville	102
17-Jul	5	Oldtown	110
18-Jul	4	Fairhill	112
29-Jul	4	HU-Beltsville	110
30-Aug	1	Fairhill	102

Seasonal Comparison of Exceedance Days



**Air Quality Index (AQI)**



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### WEATHER & AIR QUALITY

(continued from pg. 2) days to nine in 2008. In 2008, four months showed a trend of observing approximately one exceedance day less than usual per month. Additionally, August indicated the most variation from average conditions. Historically in August, the expected number of exceedance days was about five whereas only one occurred in 2008. This decrease may be due to two tropical systems that made landfall along the Gulf Coast during this month. The 2008 hurricane season was very active and was noted as the first year in which at least one major hurricane existed per month in the Atlantic Ocean Basin between July to November. These hurricanes, or their remnants once they reached the Mid-Atlantic, would have an indirect affect on fine particle accumulation. By introducing strong winds to the region, PM<sub>2.5</sub> could have dispersed more easily. As the remnants of the storms passed, they would also displace the usually dominant Bermuda high pressure system that remains over the region during the summertime. These affects of the leftover hurricanes would allow for a well-defined change in airmass ridding any accumulating pollutants from the area.

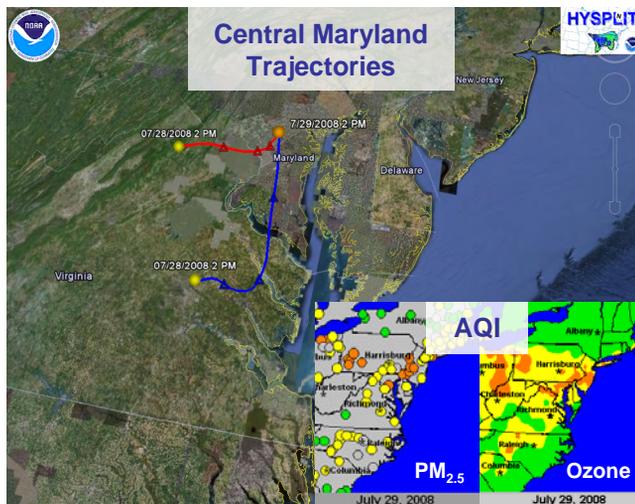
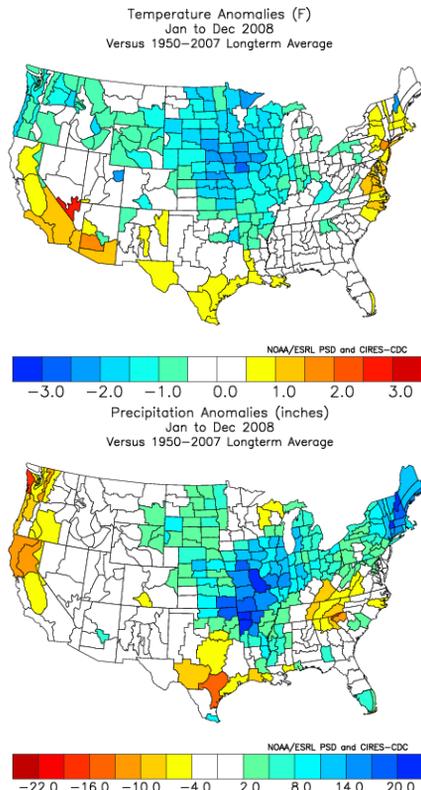
### FEATURED EVENT: July 29, 2008

This air quality episode was set in motion with the classic setup of a high pressure system dominating the Mid-Atlantic region. This system led to calm to light surface winds, sunny skies, and high temperatures that rose into the upper 80's to low 90's (F). Although conditions were relatively dry, fine particles accumulated due to limited mixing and air stagnation over the course of the day. This is shown in the image to the right. The red 24-hour back trajectory (initiated at 10 m above ground level, or AGL) indicates that the airmass moved westerly turning southwesterly with very little distance covered over the course of a day. The blue trajectory (500 m AGL) displays the predominantly southerly direction of winds aloft.

These patterns lead to the conclusion that both short range transport and local pollutants in the Mid-Atlantic played a part in the USG PM<sub>2.5</sub> AQI value of 110 seen on July 29<sup>th</sup>. The AQI maps to the right indicate the regional extent of this event for PM<sub>2.5</sub> and ozone pollution. Fine particle pollution decreased to Moderate AQI the next day with the development of stronger winds and late afternoon thunderstorms.

### MORE INFORMATION

Visit [www.cleanairpartners.net](http://www.cleanairpartners.net) for current air quality conditions and forecasts, or call the air quality hotline at 410-537-3247. References: [AIRNow](#), [NOAA ARL READY HYSPLIT Trajectory Model](#), [NOAA ESRL PSD Climate Analysis Branch](#)



### Air Quality Index (AQI)

0-50 Good	51-100 Moderate	101-150 USG	151-200 Unhealthy	201-300 Very Unhealthy	301-500 Hazardous
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