MDE Surface Observations

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Edgewood is above the EPA O₃ NAAQS of 75 ppb.

To achieve the NAAQS we need EPA to adopt federal rules to reduce O₃ transport into MD and reduce mobile emissions.

EPA prepared a technical analysis with 30 year average summer surface winds to show that Baltimore and surrounding counties are responsible for Edgewood O₃.

Discover-AQ provides a wealth of data to understand what is happening during these exceedance days and show that regional transport does contribute.

Note: 2011 data is preliminary and still needs to QA/QC.
In July Edgewood and Aldino had the most exceedance days (10 and 12).

Edgewood had 3 code red days.

- 8-hr avg. > 96 ppb
- Examine July 22.
July 22 - Overview

- Primary meteorological features
  - High pressure system off the coast
  - Max. temperature @ BWI at 106°F
  - NLLJ in the morning, stagnation in the afternoon
  - Transport regime was primarily from the west to northwest
  - An Appalachian Leeside Trough (APLT) near I95 corridor

Sources: NOAA MADIS, NOAA ARL, Airnow
O$_3$ (50 ppb) at Piney Run and other elevated sites in morning may have been transported to the Baltimore area and then mix down in the morning.
Surface winds show bay breeze between Essex and Padonia

No Bay breeze at Edgewood.
Elevated O₃ at Edgewood at 10:30 may have mixed down by the afternoon.

Sharp O₃ decrease at noon (Essex, Edgewood)
Elevated O₃ above Essex and Edgewood at 9:00 and 11:00 may have mixed down by 13:30.

O₃ from P3 only between 0.3-0.6 km
Surface O₃ circled in black.
Bay breeze at Essex may have been the trigger for thunderstorms early in the day.

Thunderstorm activity 1130-1230 EST.
- Storm cells appear to extend to Edgewood
- Cloud cover blocked out sun and stalled O₃ formation
- Dissipated just before 13 EST

Once clouds cleared...
- The bay breeze formed again near Essex
- O₃ was able to recover and reach high values later in the day.
Ceilometer at Beltsville also shows clouds around 12 EST (18 UTC).

Ceilometer data from MDE is not on the DISCOVER-AQ data site, but we can upload it if there is interest.
A zero and span check is performed daily – just a 2-point check at zero and large value
- $O_3$ (0 and 180 ppb)

Every other week a precision check is performed – this is a one point check
- $O_3$ (80 ppb)

Once a quarter an audit is performed at least 4 levels
- $O_3$ (0, 40, 80, 120, 180 ppb)

Once a quarter a calibration is performed at the same 4 levels

A log book is maintained for each site (entered electronically) recording any issues.

Even with all of these check in place, our Edgewood $O_3$ monitor was reading high in the beginning of July (thanks Doug and PSU!)
- We replaced the instrument 7-7-11.
NOy at Beltsville and Aldino

- Ecotech 9843 NOy monitor at Aldino.
- Thermo Electron 42i NOy monitor at Beltsville.
- These instruments report NOy, NO and the difference (NOy – NO)
- The difference is labeled NO₂ but is not true NO₂ (just a label).
  - A little confusing.
  - “NO₂” label is currently in Beltsville and Aldino archived DISCOVER-AQ data → should we change the label?
MDE O₃ monitors compared with research monitors.

- Slopes within 10% and $r^2 > 0.99$
Comparing MDE hourly O$_3$ with research monitors

- 75% of differences are within ± 5 ppb.
- Differences at Edgewood and Fairhill are smaller than at Padonia
  - 75% within ± 2
Some noisy minute O₃ found at Beltsville on July 20, 21, 22, 24, 25, 28, 29.

Occurs in morning.

No relationship with NOy → may be an instrumentation issue.

On the evening of July 21, hourly O₃ at Beltsville smaller than at Castnet site (though Castnet is 5 km SE of Beltsville).
Part of July 1-3 episode.

Daily max 8-hour O₃ → 107 ppb at Edgewood.

Contributors:

- High pressure system
- Max. temperature @ BWI at 91 °F
- Stagnant conditions throughout the day
- Appalachian Lee Side Trough (APLT)
- Bay breeze

Sources: AIRNow, NOAA-ARL, NOAA MADIS, HU, PSU, Hysplit, Laura Landry-MDE
Surface winds at Essex and Edgewood show onshore flow while winds at Padonia and Aldino show northwesterly winds.

Sodar at Edgewood also shows onshore flow.
Stagnation leads to high O$_3$ around the region.

Bay breeze contributes to code red O$_3$ at Edgewood, only code orange at Essex.

- Essex → 87 ppb O$_3$ Code orange (75-95)
- Edgewood → 107 ppb O$_3$ Code red (96-115).
Bay breeze impacts Padonia - Aldino

- Padonia: 92 ppb O₃ Code orange (75-95)
- Aldino: 98 ppb O₃ Code red (96-115)
O$_3$ gradient in P3 transects

09:52 - 11:27 EST

12:04 - 13:35 EST

14:02 - 16:21 EST

Could Bay breeze impact inner city Furley?

O$_3$ from P3 between 0.3 – 0.6 km
Surface O$_3$ circled in black.