Dickerson Cessna 9:55-10:10

HIKERS and BIKERS
Move to the side of the road when a vehicle approaches
UMD Cessna provides regional context
From Tad Aburn, MDE: Key Policy-Relevant Science Questions

What does the science tell us about the pollutants and \textbf{scale} of the control areas (local, super-regional, national) needed to address the new ozone and fine particle standards over the next ten years? How does this relate to the controls needed to address other key concerns like NO$_2$, SO$_2$, Hg and regional haze?
We compare upwind morning flights (Cumberland, Frederick, and Luray) to downwind afternoon (Aldino, Easton, Massey) flights.

Will show $O_3$, CO, SO$_2$, and NO$_2$.

Also have met, aerosol counts, $b_{sp}$, BC, and VOC’s.
UMD Cessna 402B NO\textsubscript{2} data
Discover -AQ Upwind and downwind flights

[Graph showing altitude vs. NO\textsubscript{2} (ppbv) with various data points and trend lines labeled as PM Median, PM q25, PM q75, AM Median, AM q25, AM q75.]
Conclusions:

1. Pollutant concentrations change from upwind to downwind (of Balt.) and from morning to afternoon.
   - Greater concentrations of primary pollutants (CO, SO₂, NO₂) in the shallow morning PBL.
   - Greater concentrations aloft in afternoon, downwind.
   - Greater concentrations of O₃ (5-15 ppb) at all altitudes below ~2000 m in afternoon, downwind.

2. NO₂ was much greater (~150 vs <50ppt) in LFT in afternoon downwind. Baltimore and Washington are pumping NOx into LFT and exporting it downwind.

3. The Baltimore urban area adds about 10 ppb to the incoming background of 65 ppb O₃. Policy-Relevant Regional Signature.
Next Steps:

1. Examine P-3 profiles at fixed locations as a function of time of day.

2. Determine if NO$_2$ aloft is transport, chemistry or both.

3. Parse the data by back trajectories – where is air coming from?

4. See what CMAQ gives for the increase from Cumberland and Frederick to Aldino and Easton.

5. Why is there more O$_3$ over the Bay?
The End

Fear the Turtle!
Propene Dichlorodifluoromethane Chloromethane 1,2-Dichloro-1,1,2,2-tetrafluoroethene Chloroethene 1,3-Butadiene Bromomethane Chloroethane Trichlorofluoromethane Ethanol Acetonitrile Acrolein Acetone Acrylonitrile 1,1-Dichloroethene Methylene Chloride Carbon disulfide Isopropyl Alcohol 1,1,2-Trichloro-1,2,2-trifluoroethane Trans-1,2-Dichloroethene 1,1-Dichloroethane Vinyl Acetate 2-methoxy-2-methyl-Propane Methyl ethyl Ketone (2-butanone) Cis-1,2-Dichloroethene Hexane Chloroform Ethyl Acetate Tetrahydrofuran 1,2-Dichloroethane 1,1,1-Trichloroethane Benzene Carbon tetrachloride Cyclohexane 1,2-Dichloropropene Bromodichloromethane Trichloroethene 1,4-Dioxane Heptane Cis-1,3-Dichloro-1-Propene Methyl Isobutyl Ketone Trans-1,3-Dichloro-1-Propene 1,1,2-Trichloroethane Toluene Dibrochloromethane Methyl butyl Ketone (2-Hexanone) 1,2-Dibromoethane Tetrachloroethylene Chlorobenzene Ethylbenzene m & p-Xylene Bromoform (Tribromomethane) Styrene 1,1,2,2-Tetrachloroethane o-Xylene 1-Ethyl-4-Methylbenzene 1,3,5-Trimethylbenzene 1,2,4-Trimethylbenzene Benzyl Chloride 1,3-dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene 1,2,4-Trichlorobenzene Hexachloro-1,3-Butadiene
Column $\sim 1.5 \times 10^{15} \text{ NO}_2 \text{ cm}^{-2}$
Thanks to many.

October 2011 RAMMPP meeting at MD Dept. Environ. on DISCOVER-AQ
Flight #9  Thursday 7-21-2011

CMAQ NO₂ Curtain with Weinheimer NO₂
R=0.70

CMAQ NO₂ Curtain with Cohen NO₂
R=0.75

CMAQ agrees relatively well with both NO₂ datasets
Downwind afternoon,
Over Baltimore suburbs some, but not all of the elevated reservoir has mixed downward.

Column $\sim 4.5 \times 10^{15}$ NO$_2$ cm$^{-2}$