Temporal and Spatial Variability of Mercury, pH, and Non-Sea Salt Sulfate Fluxes associated with anthropogenic emissions in the Pensacola Bay Region

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History

• Project started in November 2004 with collectors at Ellyson, Pace, and Molino.
• Monitoring of atmospheric wet deposition of Hg. Initially funded by EPA. Since January 2008 by the Electric Power Research Institute
• National Atmospheric Deposition Program: NADP - MDN
• Power plant installed scrubber and other controls.
• Beach station became active in September 2009
Source: USGS Map Seamless Server, [http://www.usmarshals.gov](http://www.usmarshals.gov), and Microsoft Bing
Total Pounds Released 2010 = 946,181 (-90%)

Source: EPA Toxic Release Inventory (TRI) explorer
Equipment

Rain Gauge
Temperature and pressure sensor
Data logger
Backup Battery
Sampling and Analysis

- Samples collected after each storm event greater than 0.1 inches
- University of West Florida analyzed samples for pH, Sulfate, Nitrate+nitrite, Chloride, Phosphate, Sodium, Ammonia, Potassium, Magnesium, and Calcium
- Florida State University analyzed Mercury and Trace Metals.
## Data Collected

<table>
<thead>
<tr>
<th></th>
<th>Since Beginning of the Project (November 2004)</th>
<th>Using Four Collectors (September 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PE Bottles</td>
<td>1,155</td>
<td>397</td>
</tr>
<tr>
<td>Total Teflon Bottles</td>
<td>2,062</td>
<td>730</td>
</tr>
<tr>
<td>Total Bottles</td>
<td>3,217</td>
<td>1,127</td>
</tr>
<tr>
<td>Storms Collected</td>
<td>386</td>
<td>101</td>
</tr>
<tr>
<td>Records with Climatological Information (Airport and Dataloggers)</td>
<td>61,344</td>
<td>18,263</td>
</tr>
</tbody>
</table>
Climate Findings

• Major storms
• Summer Storms vs Winter Storms
• Wind Direction
• Wind Speed
High Intensity Storms
P = 0.090
n = 258
n = 54

P = 0.844
n = 225
n = 51

P = 0.060
n = 225
n = 58

P = 0.721
n = 62
n = 15
P = 0.007
n = 264
n = 58

P = 0.018
n = 228
n = 53

P = 0.081
n = 233
n = 57

P = 0.143
n = 57
n = 15
Monthly Analysis

Boxplot of pH

Panel variable: Site
Since September 2009

Scatterplot of pH vs Hg

Panel variable: Site
Since September 2009

Scatterplot of pH vs Hg

Panel variable: Site
Since September 2009
Since September 2009

Scatterplot of pH vs Sulfate

Panel variable: Site
Scatterplot of pH vs Wind_Direction

Panel variable: Site
Scatterplot of Sulfate vs Wind_Speed

Panel variable: Site
Aviation Routing Weather Report

Probability Plot of pH
Lognormal

- pH
- Percent
- Weather
- "-RA BR"
- "-RA"
- "-TSRA BR"
- "-TSRA H2"
- "-TSRA FG"
- "+RA BR"
- "BR"
- "RA BR"
- "RA"
- "TS BR"
- "TS+RA BR"
- "TS+RA FG"
- "TSRA BR"
- "VCTS -RA"
Aviation Routing Weather Report

Probability Plot of Hg
Lognormal

- Percent
- Hg ppt

Weather
- "-RA BR"
- "-RA"
- "-TSRA BR"
- "-TSRA Hz"
- "-TSRA BR"
- "+RA BR"
- "BR"
- "RA BR"
- "RA"
- "TS BR"
- "TS+RA BR"
- "TS+RA FG"
- "TSRA BR"
- "VCTS -RA"
Conclusions

• There is an apparent relation between pH and total mercury concentration on the three sites located close to the power plant and other major plants in Pensacola.

• Rain events with high intensity at the beginning of the storm, appeared to have higher pH than storms with low intensity.

• Samples collected during the summer had significant lower pH values and higher total mercury concentrations compared with samples collected during the winter.
Thank you

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