Comment on Van Metre and Mahler 2014: "PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas"

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<th>Journal:</th>
<th>Environmental Science &amp; Technology</th>
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<tr>
<td>Manuscript ID:</td>
<td>es-2014-044408</td>
</tr>
<tr>
<td>Manuscript Type:</td>
<td>Correspondence/Rebuttal</td>
</tr>
<tr>
<td>Date Submitted by the Author:</td>
<td>10-Sep-2014</td>
</tr>
<tr>
<td>Complete List of Authors:</td>
<td>O'Reilly, Kirk; Exponent Inc.,</td>
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Comment on Van Metre and Mahler 2014: “PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas”

Kirk O’Reilly

This comment on Van Metre and Mahler 2014\textsuperscript{1} continues an ongoing post-publication discussion with the authors.\textsuperscript{2-7} Consistent with their prior papers,\textsuperscript{8-11} Van Metre and Mahler described results in a way to promote a preconceived narrative instead of fully informing the reader. This is demonstrated in part by the references being dominated by papers generated by a small group of researchers\textsuperscript{12-14} who support their hypothesis concerning the role of refined tar pavement sealers (RTS) as a source of polycyclic aromatic hydrocarbons (PAHs) in urban sediments while ignoring the body of literature describing PAH sources.\textsuperscript{14-19} By not citing papers providing independent analyses and those that have raised questions about the authors’ claims,\textsuperscript{2-7,20} the reader is not informed of the non-USGS data analyses and the findings that call aspects of their work into question. Van Metre and Mahler also fail to discuss their role in advocating for the product ban that their work evaluates,\textsuperscript{21} or that many of the sampling locations were adjacent to an electrical power plant that closed soon after the ban\textsuperscript{22} an important fact that supports a different causal analysis relating to the analytical findings in their work.

For an article published in \textit{Environmental Science and Technology} (ES&T),\textsuperscript{1} the limited amount of data that even suggest support for the author’s claim is surprising. The results of only two sediment cores that contain pre- and post-ban samples are included. In one case, LBL-4, the range of total PAH concentrations in the two post-ban samples is the same as that for the last three pre-ban samples. In the other, LBL-1, the supposed decrease in PAH concentration began prior to the RTS ban. Two samples from four other locations were also discussed. The post-ban PAH concentrations were higher at one location and lower at the other three, but a trend cannot be determined with only two data points from each location, collected 12 years apart.

A simple evaluation raises significant questions concerning the author’s conclusions. If the ban was the primary factor responsible for the change in measured PAH concentrations, one would expect the PAH contribution from RTS to decrease while the mass contribution of other sources remains about the same. Using the mean data presented in Table 7-S,\textsuperscript{1} there was a 69 percent reduction in the mass contribution of non-RTS-related PAHs and a 55 percent reduction in the mass contribution of RTS sources. Because there is no reason that the RTS ban would reduce the contribution of non-RTS sources, this finding does not support the authors’ interpretation that differences in measured PAHs concentrations are the result of the ban.

The authors present results from EPA’s CMB model to support their claim but fail to inform the reader of concerns that have been raised\textsuperscript{2-7} about their selection of input parameters and whether the model has the ability to accurately characterize the multiple sources that make up urban background. In 2010, Van Metre and Mahler\textsuperscript{11} reported modeling some 200 combinations of PAH sources, and even though model outputs are highly sensitive to source inputs,\textsuperscript{5,23} they
discussed the details of only four runs that appear to support their hypothesis. Repeated efforts to obtain the full set of model results have failed. Having identified model conditions that produce the authors’ desired output, it is not surprising that similar results were obtained when the model was applied to sediments from the current study. As noted in prior critiques, the results of principal component analysis indicate that the source profiles used by the authors as CMB input were insufficient to properly model the contribution to sediment samples.

The RTS source profiles used by Van Metre and Mahler were developed by averaging the analytical results of dust samples collected from parking lots that were assumed to be sealed with RTS. To evaluate their interpretation of the results, I ran CMB using Van Metre and Mahler’s Model A but replacing the parking-lot dust profile with PAH profiles of samples from either RTS test plots or fresh RTS obtained from Mahler et al (2004). As a negative control, I included a CMB run without an RTS source profile. In each case, the Pearson correlation between measured and modeled PAH concentrations was greater than 0.98, indicating that the CMB’s ability to fit the data was similar regardless of which RTS source profile was used (Table 1).

The critical finding is that RTS was indicated as a source only when the parking-lot dust PAH profile was used as a model input, but not when data that unquestionably represented RTS were used. The modeled source contribution of the fresh or test-plot RTS profiles was zero. Van Metre and Mahler argued that using fresh RTS as a source profile was not appropriate, because the material is known to weather in the environment. While this is true for RTS, it also true for all the other source profiles used. Using a weathered profile for RTS and unweathered profiles for the remaining sources is likely a major reason that Van Metre and Mahler’s application of CMB suggests an elevated RTS contribution to the typical weathered PAH profile of urban sediments.

Finally, Van Metre and Mahler fail to inform the reader about the questionable relationship of politics and science in their work. Examples include the authors’ hosting a news conference with a congressman when their article was first posted on ES&T’s website where the congressman’s stated goal was to use the published claims to push for a nationwide RTS ban. Potential problems with supposedly neutral government scientists using their research to promote personally favored policy have been raised by a number of authors.

Acknowledgement

The author has received funding from the Pavement Coatings Technology Council. The opinions are his own.
References


Table 1: The average CMB modeled source contributions for four model runs. The non-RTS source profiles\textsuperscript{11} were kept constant, while the RTS source profile was changed for each run.

<table>
<thead>
<tr>
<th>RTS Source Profile</th>
<th>Reference for the RTS profile</th>
<th>Model vs Measured Correlation [$r$]</th>
<th>Average CMB Modeled Contribution (%)</th>
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</thead>
<tbody>
<tr>
<td>Lot Dust</td>
<td>11</td>
<td>0.99</td>
<td>82 13 5 0.6 0.0</td>
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<tr>
<td>RTS Test Plot</td>
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<td>0.98</td>
<td>0.0 42 57 1.0 0.0</td>
</tr>
<tr>
<td>Fresh RTS</td>
<td>9</td>
<td>0.98</td>
<td>0.0 42 57 1.0 0.0</td>
</tr>
<tr>
<td>No RTS</td>
<td>--</td>
<td>0.98</td>
<td>-- 48 51 1.2 0.0</td>
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