The Influence of Source Selection on Chemical Mass Balance Modeling Results: Implications for Source Control Policy

ABSTRACT

U.S. Chemical Mass Balance (CMB) model is often used to assess sources of polycyclic aromatic hydrocarbons (PAHs). The model works by finding a solution that best fits the chemical concentrations measured at the site. This involves making assumptions about the sources, and uncertainties in these assumptions can affect the results. The model's output depends on the quality of the source inputs.

INTRODUCTION

Chemical Mass Balance (CMB) Model

A receptor model used by the EPA – the CMB model seeks to find a solution that best fits the chemical concentrations measured at the site. To do this, the model uses source terms, known as source profiles, to simulate the contributions of various potential sources. These source profiles are then compared to the measured concentrations at the site to find the one that best fits the data. This process is repeated until the best fit is found.

METHODS

Inputs and Sources Used in CMB

Receptor: U.S. sediment samples collected at 0.5 cm below the surface.

CMB Sources: 11 or 12 PAHs out of 16 EPA Priority Pollutants PAHs

Other PAH sources include coal combustion source, vehicle related source (traffic tunnel and roadway), wood burning soot particles, and wood smoke.

RESULTS

CMB Modeling with Different RTS or Dust Source

The modeled contribution of each source to the sediments was estimated for each analytical run (Table 1). The modeled contributions were compared to the measured concentrations to assess the fit of the model. The modeled contributions for each source were then compared to the contributions from other sources to determine if the model was able to accurately predict the source contributions.

Table 1: CMB modeled contributions with different RTS or dust source

<table>
<thead>
<tr>
<th>Source</th>
<th>Contribution (mg/kg)</th>
<th>Model Contribution (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsealed lot dust</td>
<td>4.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Sealed lot dust</td>
<td>3.5</td>
<td>3.0</td>
</tr>
<tr>
<td>RTS scraping</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>RTS products</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Vehicle related</td>
<td>0.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

DISCUSSION

PAH emissions in urban areas are a combination of several sources. The CMB model is used to evaluate sources of PAHs in sediments. The CMB model was used to evaluate the influence of source selection on PAH concentrations in sediments.

REFERENCES


Acknowledgment

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