Spatially Allocating Airport-related Emissions for AQ Modeling: New Approach and New Data

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Acknowledgements

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Overview

• Background
• Approach and Implementation
• Data Inconsistencies
• Development of new locational data set
• Limitations
• Conclusions
Background

- Aircraft and other airport-related emissions inventoried at the county level (1999 NEI)
  - Commercial Aircraft (SCC=2275020000)
  - General Aviation (SCC=2275050000)
  - Air Taxi (SCC=2275060000)
  - Off highway, 4-stroke, airport support equipment (SCC=2265008005)
  - Others

- Air quality models need emissions at different resolutions

- Emission Processors generally use “spatial allocation” using spatial surrogates (see www.epa.gov/ttn/chief/emch/spatial)

- Airport locations used as a spatial surrogate
Background (cont.)

- New approach incorporated into Emission Modeling System for Hazardous Air Pollutants (EMS-HAP)
- Used for National Scale Air Toxics Assessments with the ASPEN model (www.epa.gov/ttn/atw/nata)
- Approach generalized and incorporated in SMOKE
- Issues with airport location data found and resolved
General Approach: Disaggregate Airport-Related Emissions Across Airports

Assign county-level SCC to appropriate allocation factors (air taxi, commercial, general, military)

Compute emissions for each record:
\[ E = E_{\text{county-level}} \times \text{Factor} \]

Add emission record for each airport in county

Allocation Factor File Data for 06007: Commercial Aircraft

<table>
<thead>
<tr>
<th>LOC ID</th>
<th>FIPS</th>
<th>SITE-NAME</th>
<th>LON</th>
<th>LAT</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIC</td>
<td>06007</td>
<td>Chico Muni</td>
<td>-121.8507</td>
<td>39.7973</td>
<td>0.55</td>
</tr>
<tr>
<td>OVE</td>
<td>06007</td>
<td>Oroville Muni</td>
<td>-121.6218</td>
<td>39.4862</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Inventory data:

<table>
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<th>FIPS</th>
<th>SCC</th>
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<th>EMIS</th>
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<tr>
<td>06007</td>
<td>22750200000</td>
<td>71432</td>
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Commercial aircraft
Source of Data for Airport Locations and Allocation Factors

- Bureau of Transportation Statistics (BTS) 2001 National Transportation Atlas Data
  - geographic point database of aircraft landing facilities in the United States and U.S. Territories
  - covers nearly 20,000 facilities
- Federal Aviation Administration’s Terminal Area Forecast (TAF) system
  - contains itinerant operations data for commercial aircraft, general aviation, air taxi and military
  - Covers about 4000 airports
Implementation in EMS-HAP and SMOKE is Flexible

• Can use SCCs in non-point (stationary area) or nonroad inventories
  – Airport–related emissions come from both non-point and nonroad in 1999 NEI for HAPs

• Can use for other sources (besides airports) if locational data is available
  – Marine ports, wastewater treatment facilities are possibilities
SMOKE Implementation

- Performed in SMKINVEN
- Ancillary allocation file called “Area-to-Point”- contains cross-reference and allocation factors
- GRDMAT uses geographic coordinates to assign records from the nonroad inventory to grid cells
EMS-HAP Implementation

- Performed in COPAX
- Ancillary Cross-reference file
- Four allocation factor files
  - General aviation
  - Commercial aircraft
  - Air taxi
  - Military aircraft
- Optional airport dimension/release parameter file for use with ISCST3
- Allocated emissions prepared as point sources
  - Modeled at lat/lon in ASPEN
  - Modeled as ISCST3 area sources, with dimensions provided by user
ISCST3 Area Source Representing Philadelphia International Airport

Philadelphia County

Delaware County

Aylen = 4000 m

Axlen = 1665 m

Philadelphia County

75°
Location Data Need to Be Consistent

Emissions Represented by the Inventory FIPS should represent the airport(s) to which emissions are being allocated

Inventory Record FIPS=06007

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Airports for 06007 in Allocation Factor File

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Are these emissions based on these airports?

Holds true regardless of the spatial allocation approach used
Some Data Were Initially Inconsistent: PHL inventoried in Philadelphia County

As a result, Philadelphia emissions allocated to PNE
Other Inconsistencies Found

- Compared Inventory airports contained in `county_air.mdb` (auxiliary file contained with the nonroad mobile data on EPA’s ftp site) with BTS airports

<table>
<thead>
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<th>NEI airport information: From <code>county_air.mdb</code></th>
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<tbody>
<tr>
<td>LOC_ID</td>
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<tr>
<td>---------</td>
</tr>
<tr>
<td>PHL</td>
</tr>
<tr>
<td>PNE</td>
</tr>
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Types of Inconsistencies

• Airport is located in two counties (PHL example)
• Airport is mistaken for a different nearby airport or air strip which is in a different county
• Airport is mis-located

Data Sources Used for Correction:
GIS airport boundary data from ESRI CD, airnav.com website and mapblast.com website
Example of Mistaken Airport Identity

Air strip in Houston County mistaken for PXE

Perry-Houston County Airport (PXE) is in Peach County
New Data Set Based on NEI Approach

- *County_air.mdb* used in all cases except where airports were mislocated
  - BTS coordinates replaced erroneous coordinates
  - Itinerant operations from *county_air.mdb*
- BTS filled gaps (counties with no airports)
Issues/Recommendations

• State/local-supplied data: don’t know the particular airports represented by FIPS code
  – Inventory airport-related emissions at airport locations as point sources as airports
• Certain airport-related SCCs (i.e., those from NONROAD model) county-level emissions are not based on airports
  – Improve allocation of NONROAD categories to counties/airports based on airport activities
• Airport-related emissions put into single grid cell based on a single latitude and longitude
  – Determine if/how airport-related emissions should be modeled in multiple grid cells for higher resolution modeling
Issues/Recommendations cont.

• Keep the data up-to-date; document data sources thoroughly
• Explore method for other source categories
Conclusions

• New approach and data developed to allocate county-level airport related emissions in the NEI to specific airports
• Incorporated into EMS-HAP and SMOKE
• Code general enough to apply to other sources with readily available location data
• Transparency of approach and NEI development (county_air.mdb) allowed for inconsistencies to be found and corrected
• Sources of spatial data are not perfect
The End