

# **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](http://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](http://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)

Add emission record for each airport in county

Compute emissions for each record:  
 $E = E_{\text{county-level}} * \text{Factor}$

Inventory data

| FIPS  | SCC        | CAS   | EMIS |
|-------|------------|-------|------|
| 06007 | 2275020000 | 71432 | 0.1  |

Commercial aircraft

Allocation Factor File Data for 06007: Commercial Aircraft

| LOC ID | FIPS  | SITE-NAME     | LON       | LAT     | Factor |
|--------|-------|---------------|-----------|---------|--------|
| CIC    | 06007 | Chico Muni    | -121.8507 | 39.7973 | 0.55   |
| OVE    | 06007 | Oroville Muni | -121.6218 | 39.4862 | 0.45   |

# 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

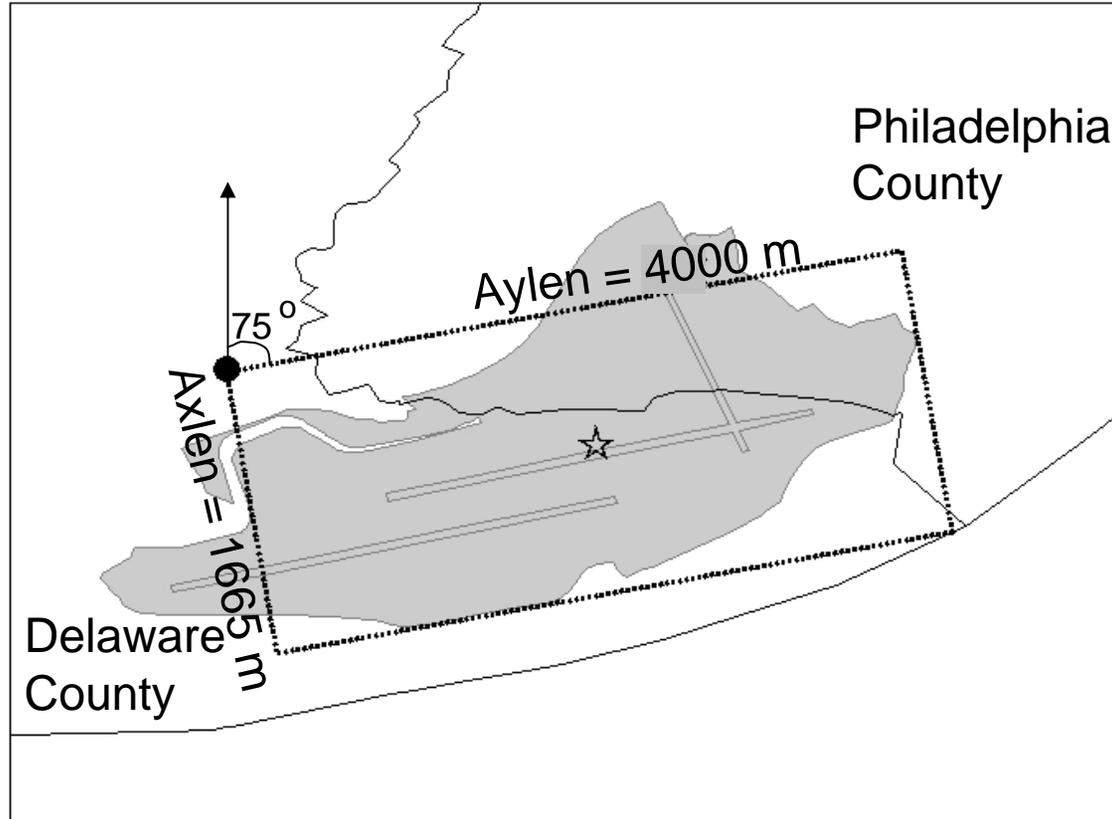
# SMOKE Implementation

- 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



# 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

| FIPS  | SCC        | CAS   | EMIS |
|-------|------------|-------|------|
| 06007 | 2275020000 | 71432 | 0.1  |

Airports for 06007 in Allocation Factor File

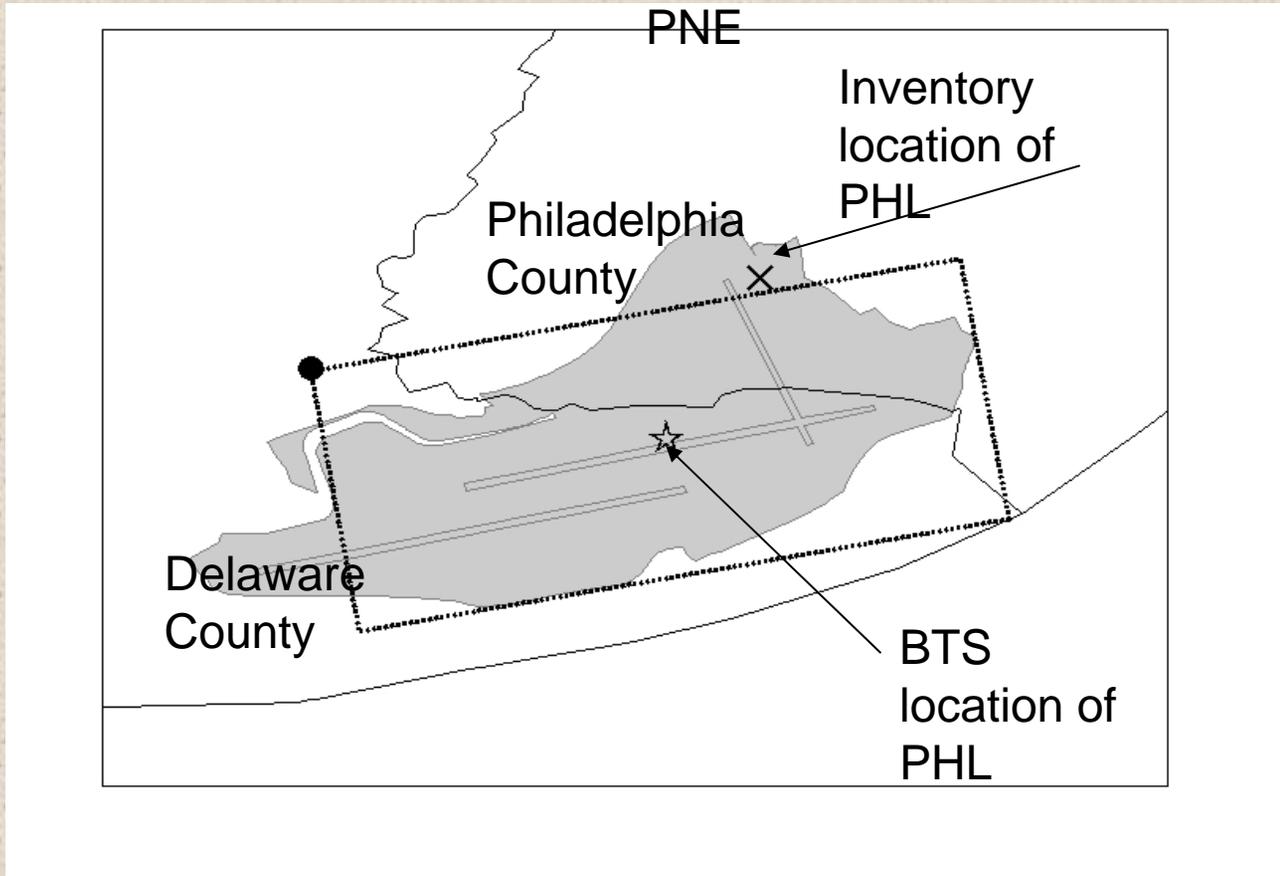
| LO CID | FIPS  | SITEN AME     | LON       | LAT     | Factor |
|--------|-------|---------------|-----------|---------|--------|
| CIC    | 06007 | Chico Muni    | -121.8507 | 39.7973 | 0.55   |
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*Are these emissions based on these airports?*



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

## NEI airport information: From *county\_air.mdb*

| LOC_ID | APO RT_NAME              | FI PS ST | FIPS CNTY | CITY           | ST | YR.  | Sum Of ITN_AC | Sum Of ITN_AT | Sum Of ITN_GA | Sum Of ITN_MIL | X_CO ORD | Y_CO ORD |
|--------|--------------------------|----------|-----------|----------------|----|------|---------------|---------------|---------------|----------------|----------|----------|
| PHL    | PHILAD ELPHIA INTL       | 42       | 101       | PHILA DELPHI A | PA | 1999 | 279431        | 146511        | 48214         | 4241           | -75.2371 | 39.8821  |
| PNE    | NORTH EAST PHILAD ELPHIA | 42       | 101       | PHILA DELPHI A | PA | 1999 | 0             | 0             | 117209        | 13665          | -75.0088 | 40.0840  |

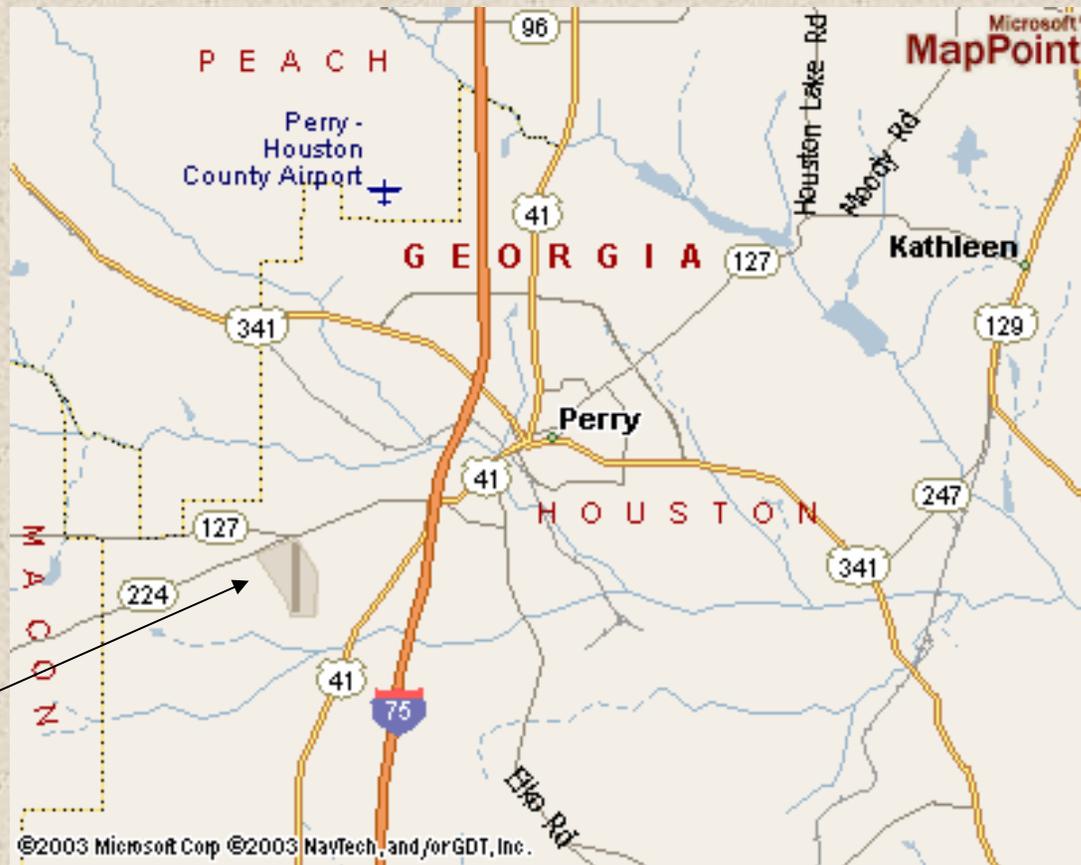
# Types of Inconsistencies

- 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](http://airnav.com) website and [mapblast.com](http://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

