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PM2.5 Data Analysis Techniques - Feb 14-16, 2000 SA Workshop

May 22-25 Workshop

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Source Apportionment Workshop

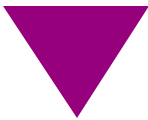
Feb 14-16, 2000 in RTP, NC

- **Goal of workshop: understand theory and use of PMF and UNMIX**
- **Components of workshop**
 - **Theory**
 - **"Case study" based on synthetically generated data set so answer was known**
 - **Case study based on real data from Phoenix**
 - **PMF theory and applications presented by Dr. Philip Hopke, Clarkson University**
 - **UNMIX theory and applications presented by Dr. Ronald Henry, University of Southern California**
- **This presentation will cover**
 - **Synthetic data set - basics of generation of data and conclusions**
 - **Useful materials for running UNMIX/PMF**

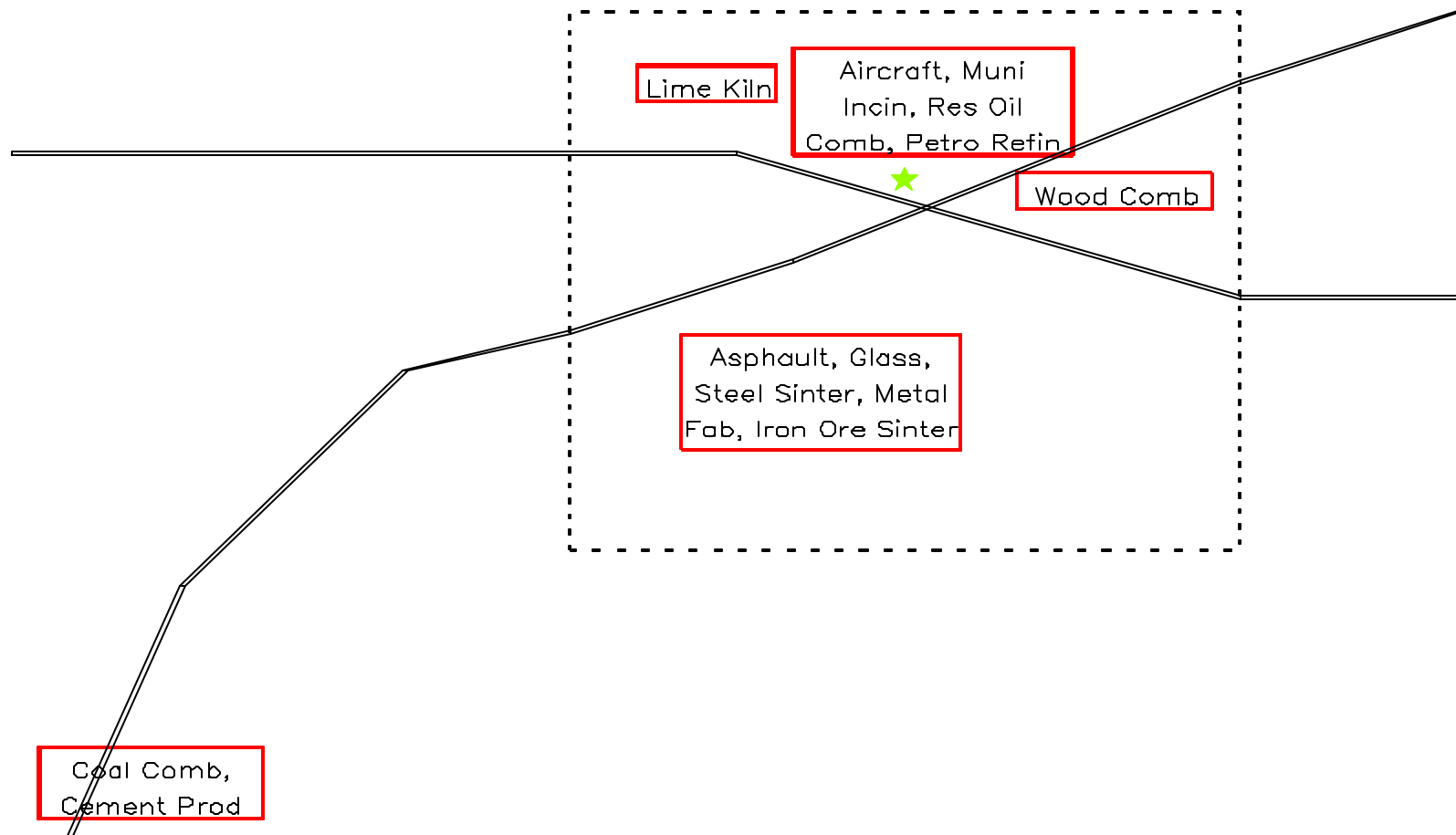


Overview of Synthetic Data Set Generation

- **ISC3ST dispersion model**
- **1984 DC meteorological data**
- **City layout - 16 unique sources**
 - **9 point sources (stacks)**
 - **4 industrial complexes**
 - **1 area source (included local traffic)**
 - **2 types of highways**
- **Average contribution by source category**
 - **67.1 ug/m³ overall average**
 - **28 ug/m³ area source**
 - **25.5 ug/m³ one of the highway sources**
 - **5.4 ug/m³ one of the point sources (resid. oil comb.)**
 - **1.5 ug/m³ another point sources (coal combustion)**
 - **remaining sources ≤ 1 ug/m³ each**



View of Point Sources, Industrial Complexes, and Highways in Palookaville





Overview of Synthetic Data Set Results

- Sources identified by both UNMIX and PMF (plus average contribution in ug/m3 for known/UNMIX/PMF)
 - ▶ Area source 28 / 28 / 26
 - ▶ Inner Highway 26 / 25 / 24
 - ▶ Resid. Oil Comb. 5 / 5 / 6
 - ▶ Muni. Incin. 1 / 4 / 1
 - ▶ Steel Sinter 0.8 / 6 / 1
 - ▶ Asphalt Roofing 0.4 / 2 / 2
- Sources identified by UNMIX only
 - ▶ Palladium source (~3 ug/m3)
- Sources identified by PMF only (known/PMF)
 - ▶ Retro. Refin. 0.8 / 1
 - ▶ Lime Kiln 0.8 / 5
 - ▶ Coal Comb. (extra area) 1.5 / 2



Conclusions for Synthetic Data Set Results

- Largest 3 known sources correctly identified and associated mass close to simulated mass
- 4th largest known source, coal combustion, was not correctly identified by either analyst (presence of source withheld from analysts)
 - UNMIX did not find source
 - PMF has profile similar to source but it was identified as a different source (extra area source)
- 3-4 smaller known point sources identified but masses associated with them are larger than simulated masses



Useful Materials for Running UNMIX/PMF

- **EPA report summarizing workshop - final report to be completed by July 2000. Report includes**
 - ▶ summaries of technical exchange and major conclusions reached during the workshop
 - ▶ copies of each presentation

- **Paper on Basics of PMF**
 - ▶ "A Guide to Positive Matrix Factorization" by Hopke
 - ▶ copy included in EPA report

- **User's Guide for UNMIX**
 - ▶ "UNMIX Version 2 Manual" by Henry

- **Paper on synthetic data generation and PMF/UNMIX results**
 - ▶ in progress, draft by Sept 2000
 - ▶ by Eberly, Coutant, Hopke, Henry

- **Synthetic data set and data set with "answers"**
 - ▶ contact Shelly Eberly



Useful Materials for Running UNMIX/PMF

- Paper on PMF results for Phoenix
 - "Identification of sources of Phoenix aerosol by positive matrix factorization" by Hopke
 - submitted to JA&WMA January 2000
 - copy included in EPA report
 - Paper on UNMIX results for Phoenix
 - in progress
 - by Henry, Norris, Lewis
 - Phoenix data
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- In future, hopefully much of this material will be available at data analysis web site.