EVALUATION OF THE PRIMARY ORGANIC CARBON EMISSION INVENTORY FOR THE EASTERN UNITED STATES

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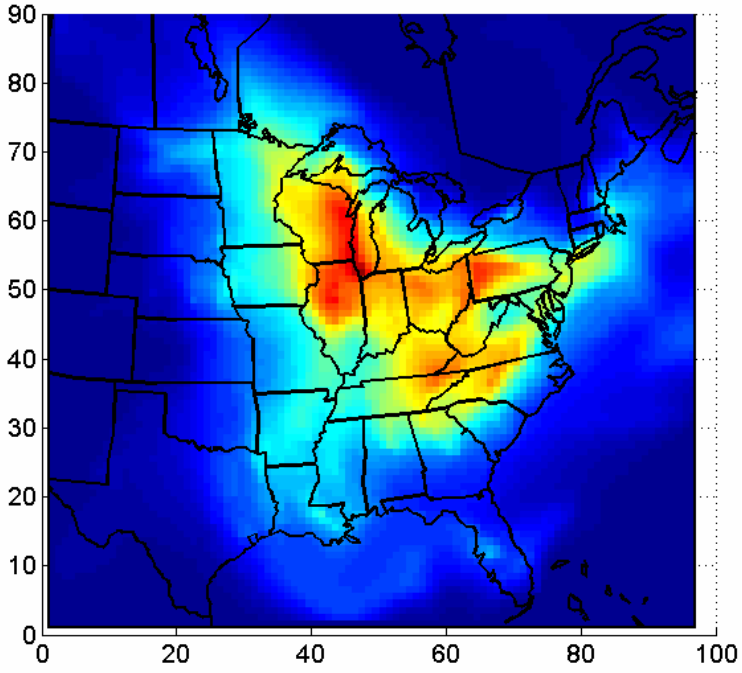
Approach

- Compare contributions of different sources to primary organic carbon
  - Chemical Transport model and emission inventory
  - CMB with molecular markers
- More information
  - CMB: 10B-3
  - CTM: 7PG-36

Simulating July 2001 Intensive with a Chemical Transport Model

Modeling Domain

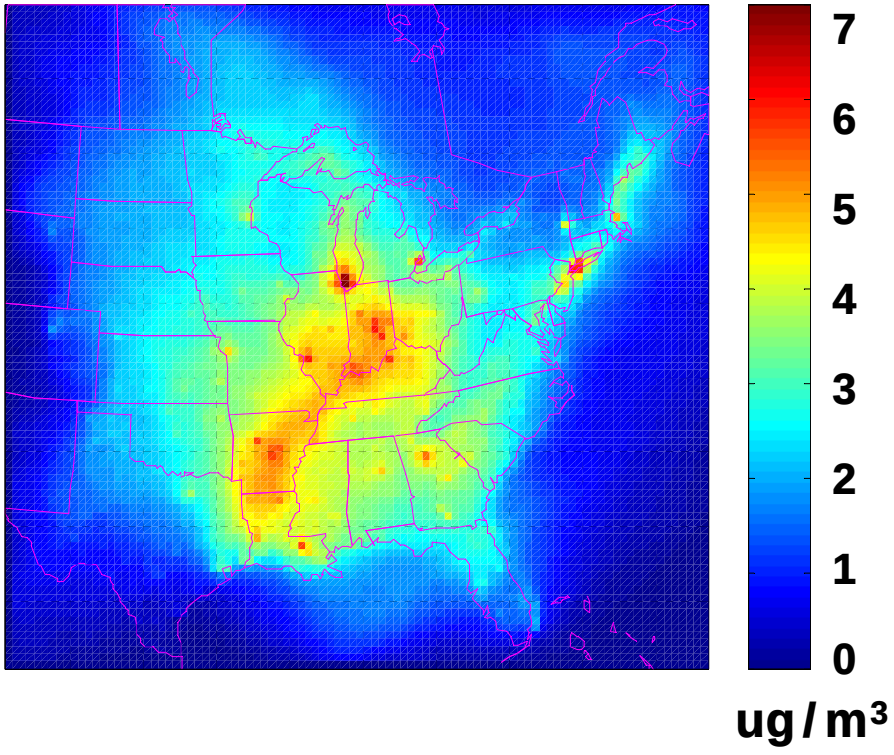


- Photochemical transport model: PMCAMx+
- Grid
  - 36x36 km grid
  - 14 levels up to 6 km
- Aerosol
  - 10 size sections
  - 13 species
- LADCO Base E Inventory
  - NEI 1999 V2
  - Update activity data for power plants from CEM
  - Mobile6 for vehicles
- Meteorology
  - MM5
- July 12-28, 2001

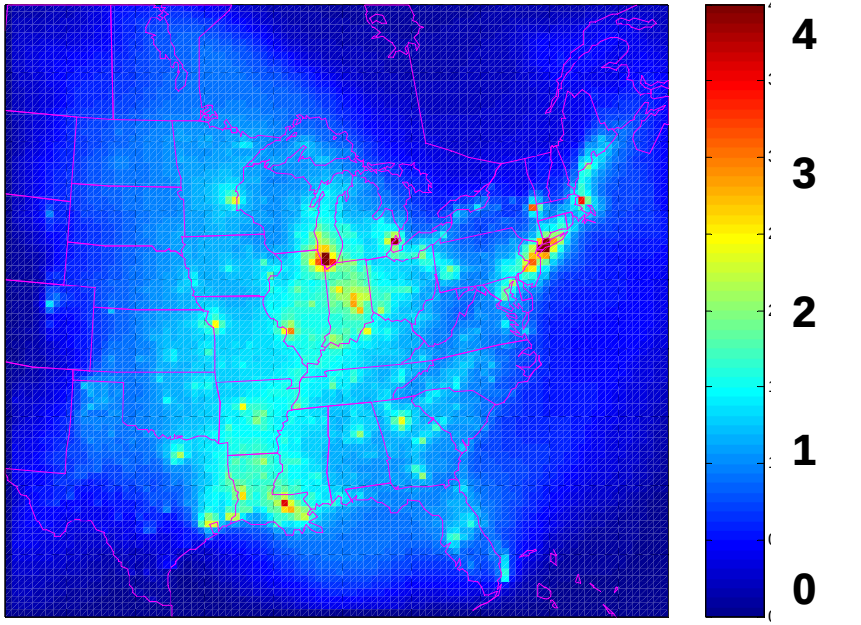
Average $PM_{2.5}$ Organic Matter

(July 12-28 2001)

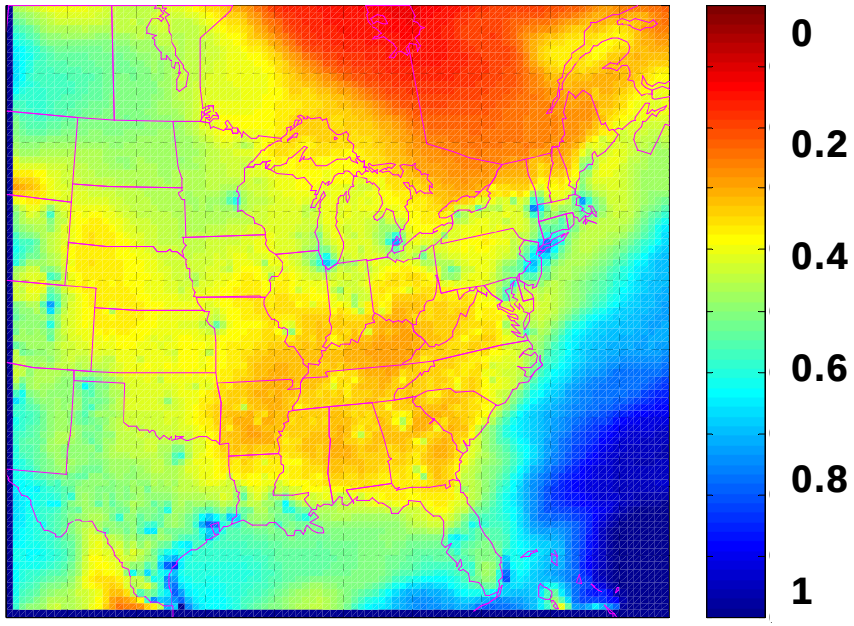
Total OM



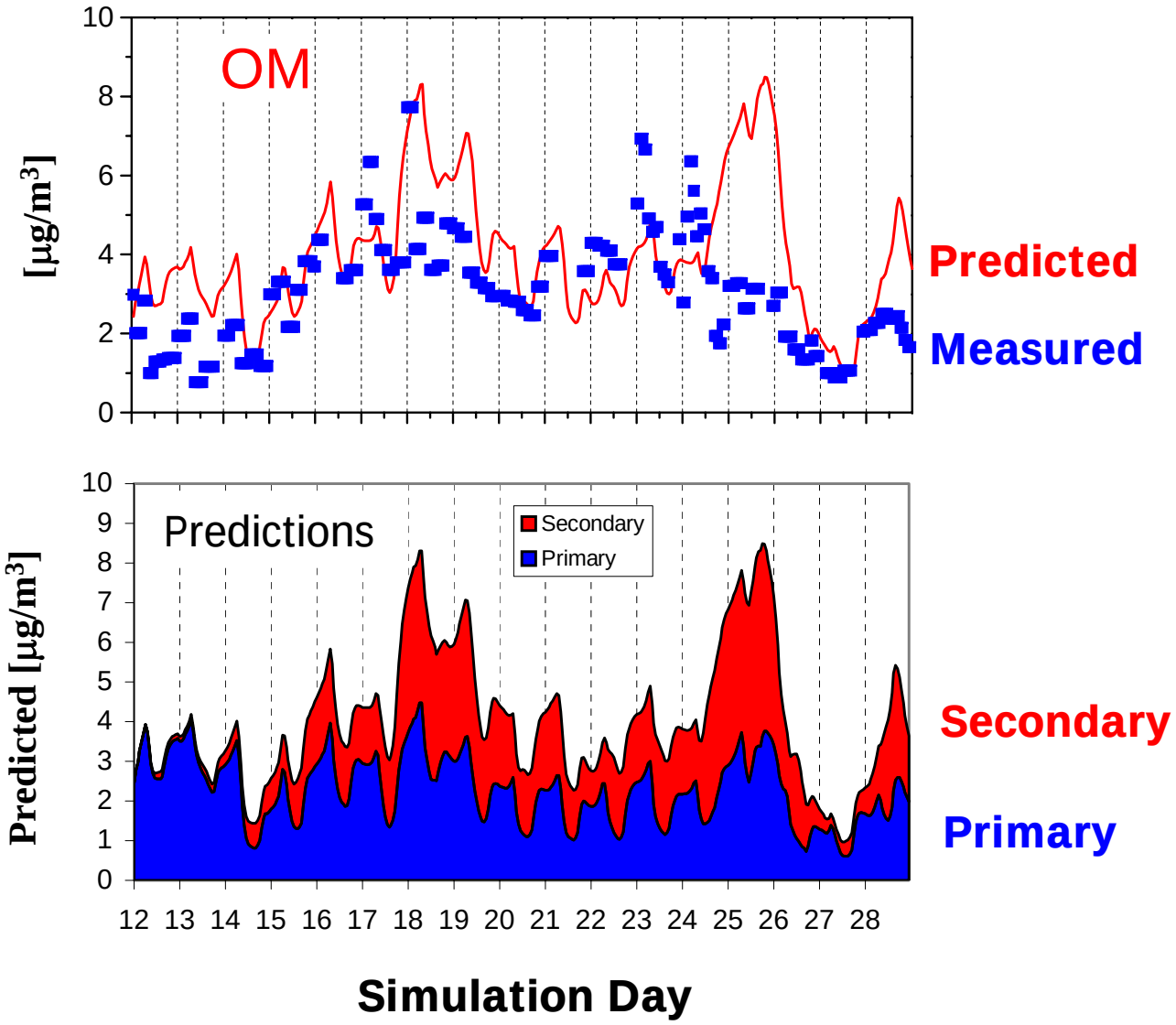
Primary OM



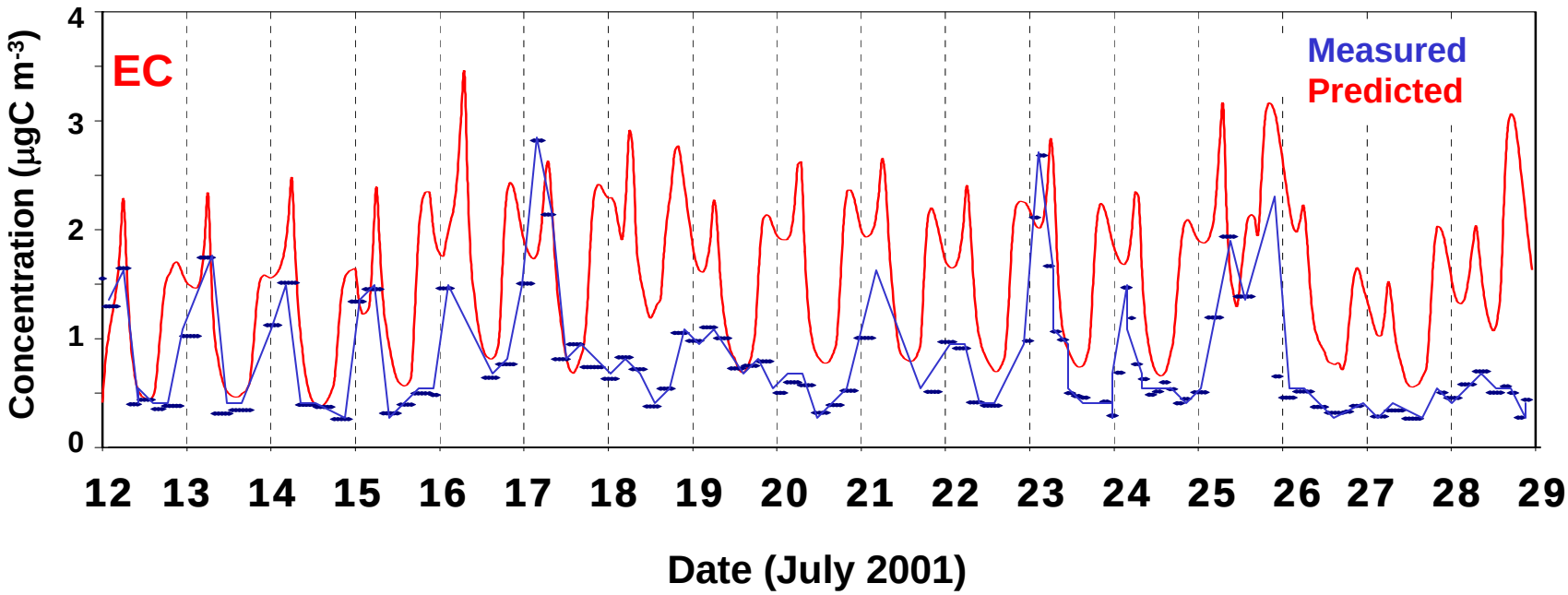
Primary OC as fraction of Total



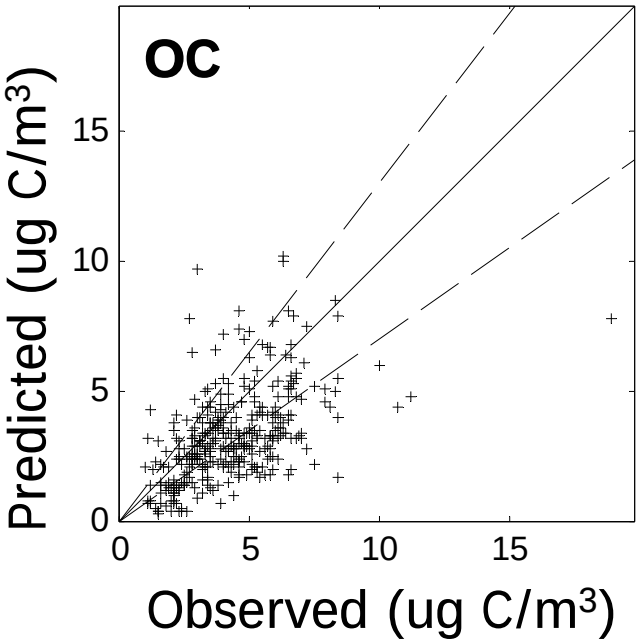
Model Evaluation in Pittsburgh

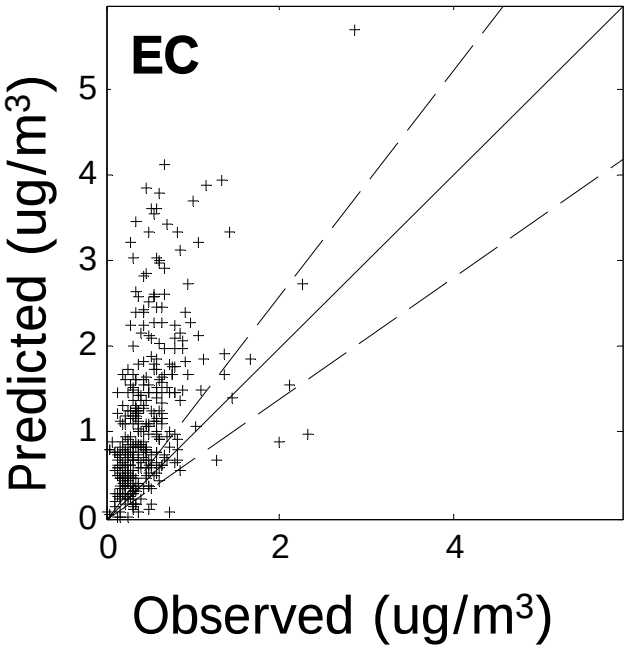


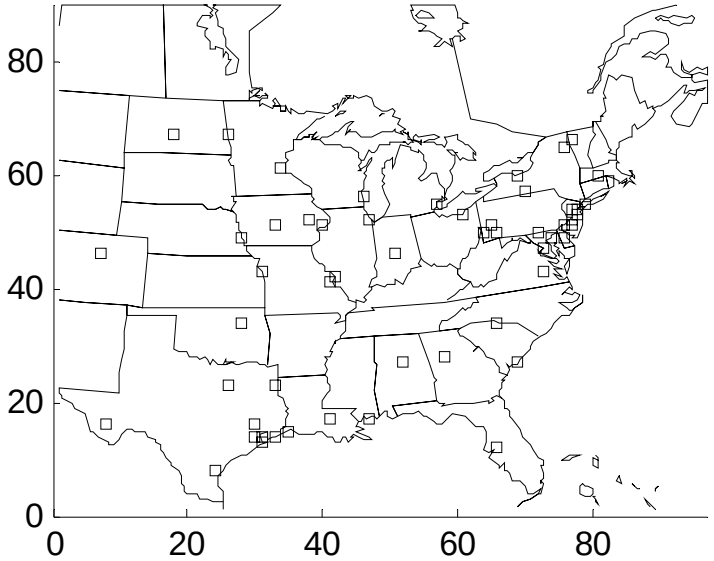
EC evaluation for Pittsburgh



Comparison of PMCAMx Predictions with STN Data



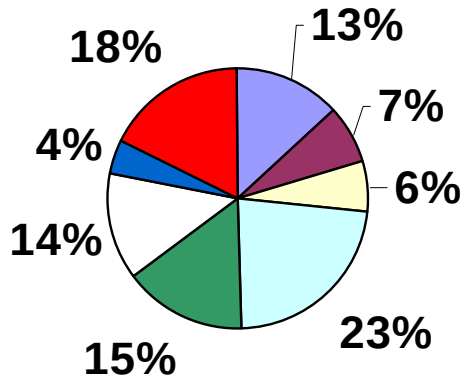


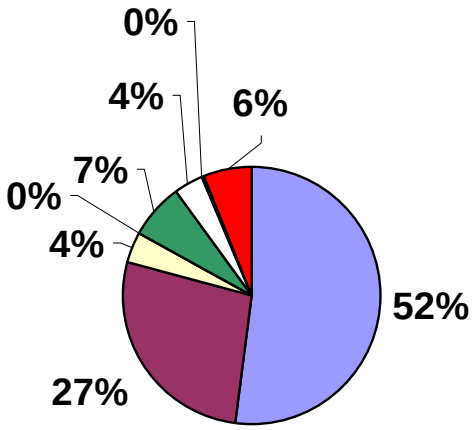


Base E Inventory

Source resolved PMCAMx simulations for Primary OC and EC

Total Domain OC





Total Domain EC

Methodology

1. Run PMCAMx for complete inventory

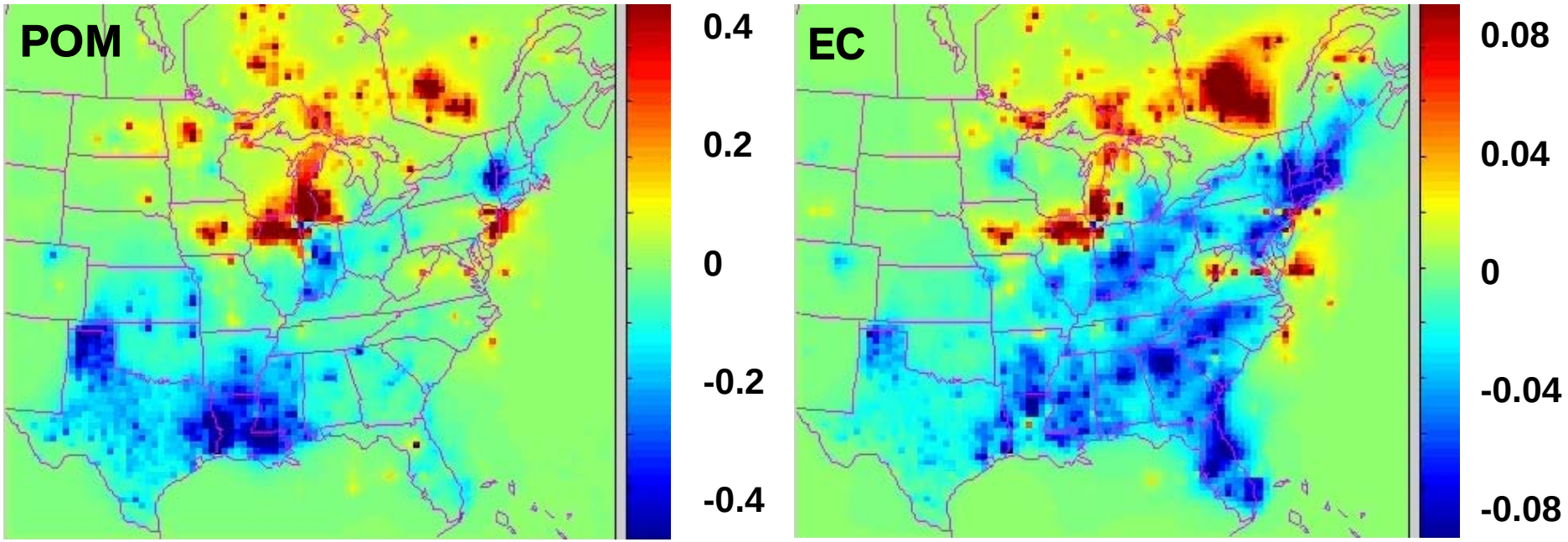
2. Run PMCAMx with Primary OC and EC from the following source categories:

- Non Road Diesel
- On Road Diesel
- Biomass
- Nat. gas
- Wood
- Gasoline
- Dust
- Other

3. Run initial and boundary conditions

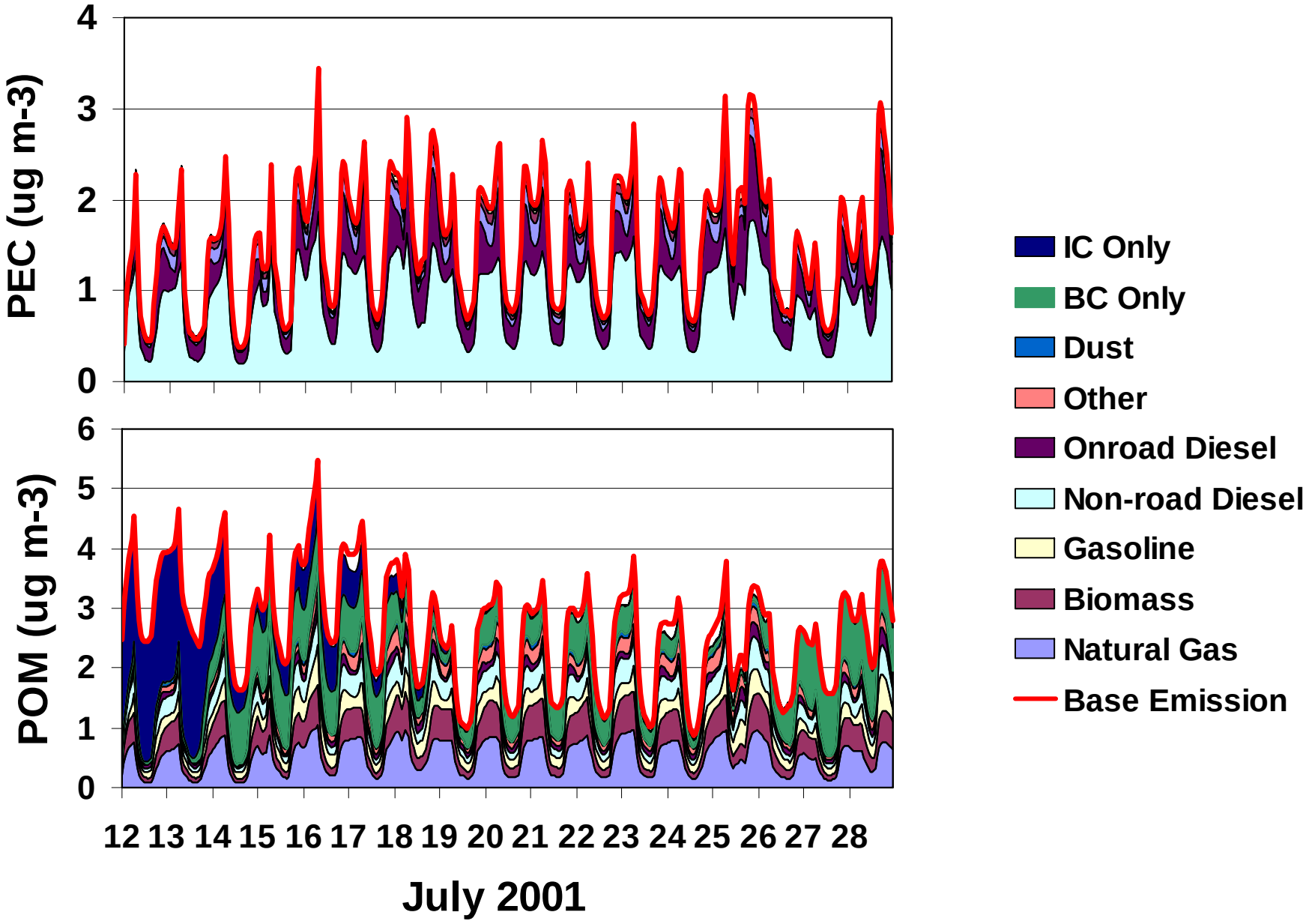
3. Evaluate Error

Average bias in source resolved PMCAMx simulations for Primary OC and EC

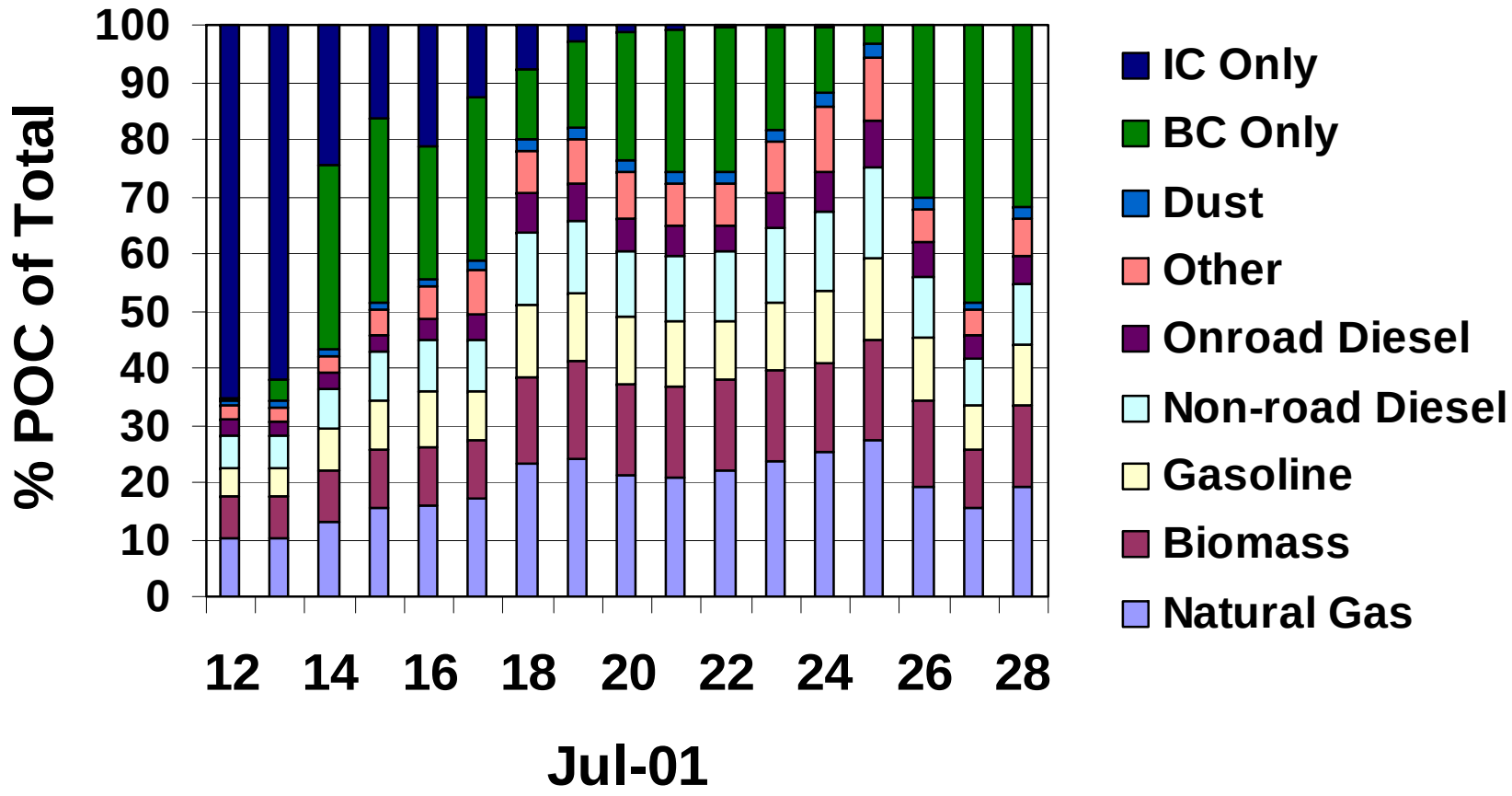


Absolute Error: Sum - Base

Time series of Primary OC and EC in Pittsburgh

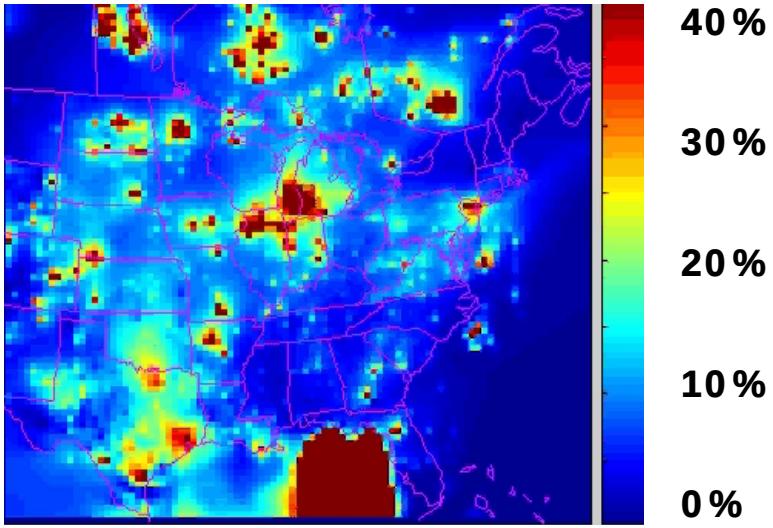


PMCAMx predicted Pittsburgh Primary OC

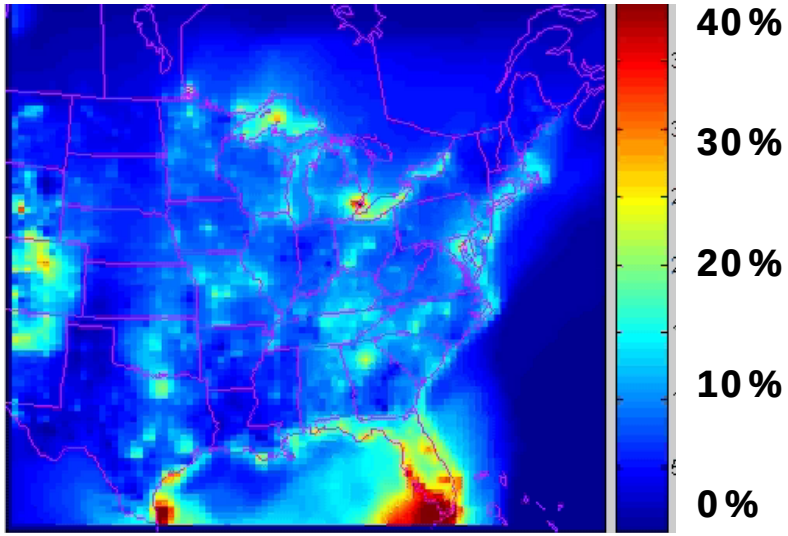


Spatial Variation of Relative Contribution of Different Source Classes to Primary OC

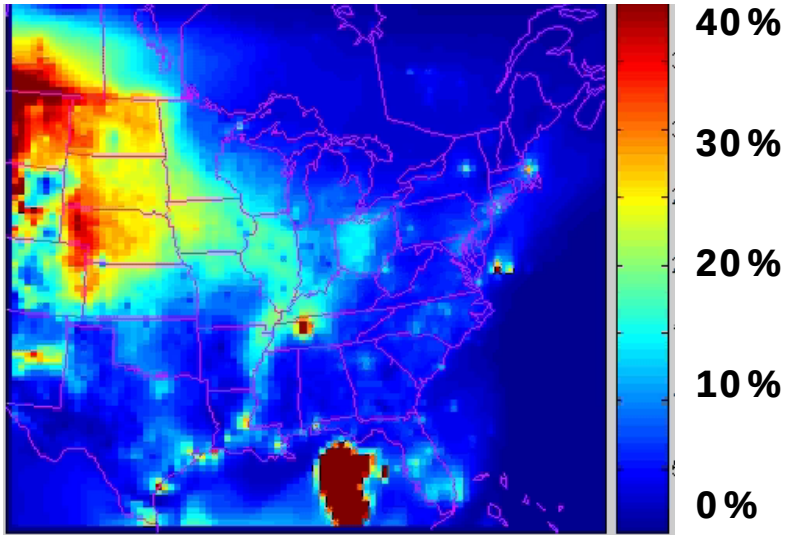
Natural Gas



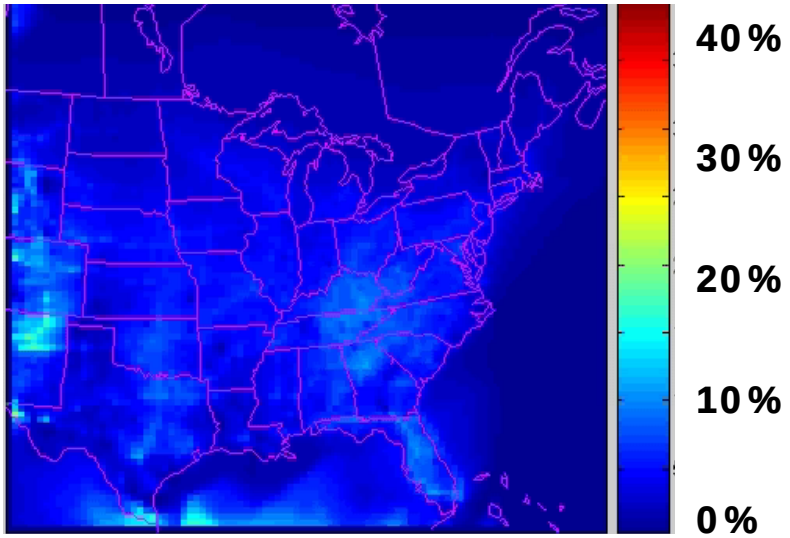
Gasoline



Non-Road Diesel

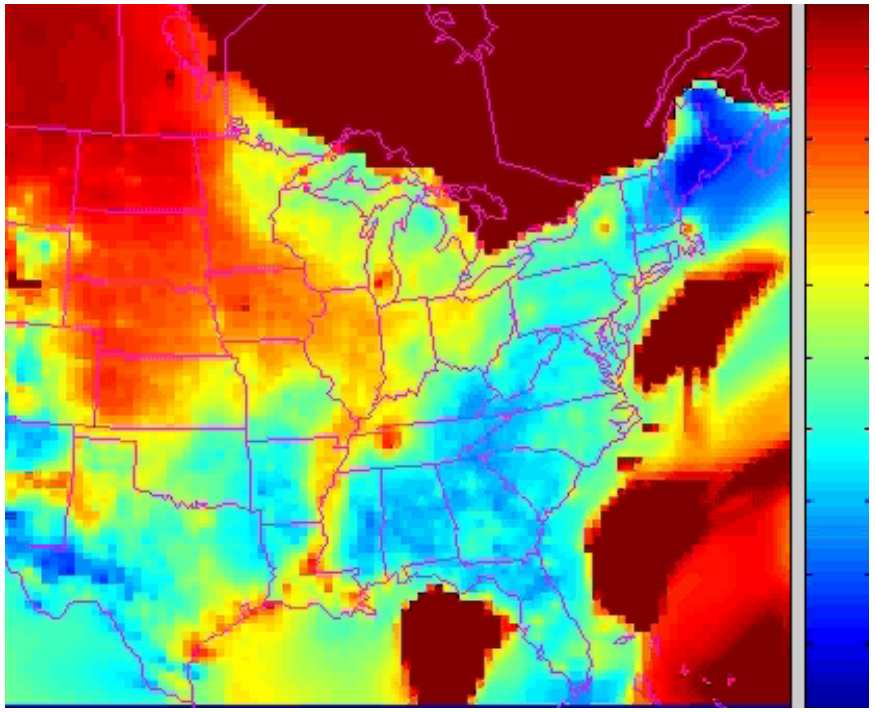


On Road Diesel

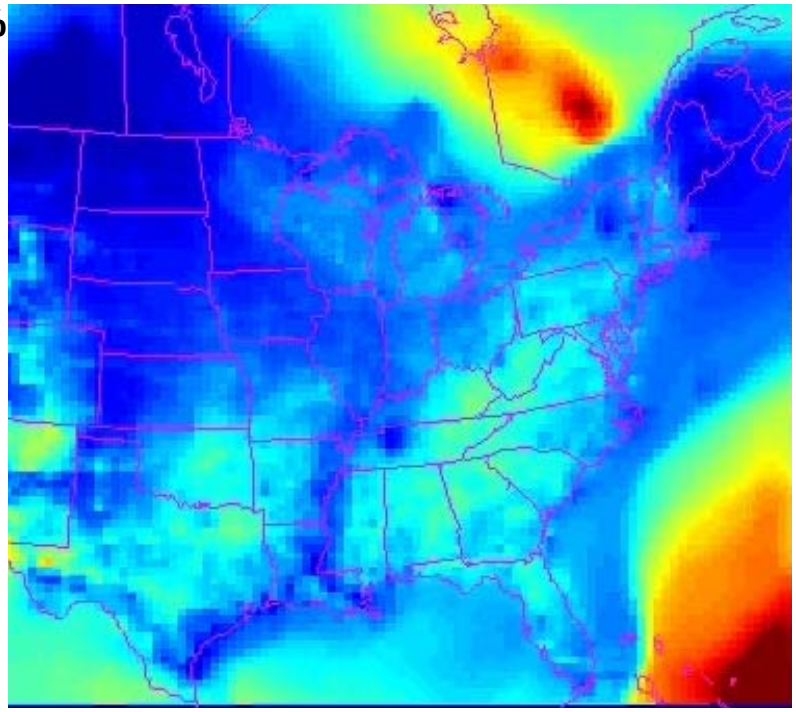


Diesel dominates EC throughout domain

Non-road Diesel EC

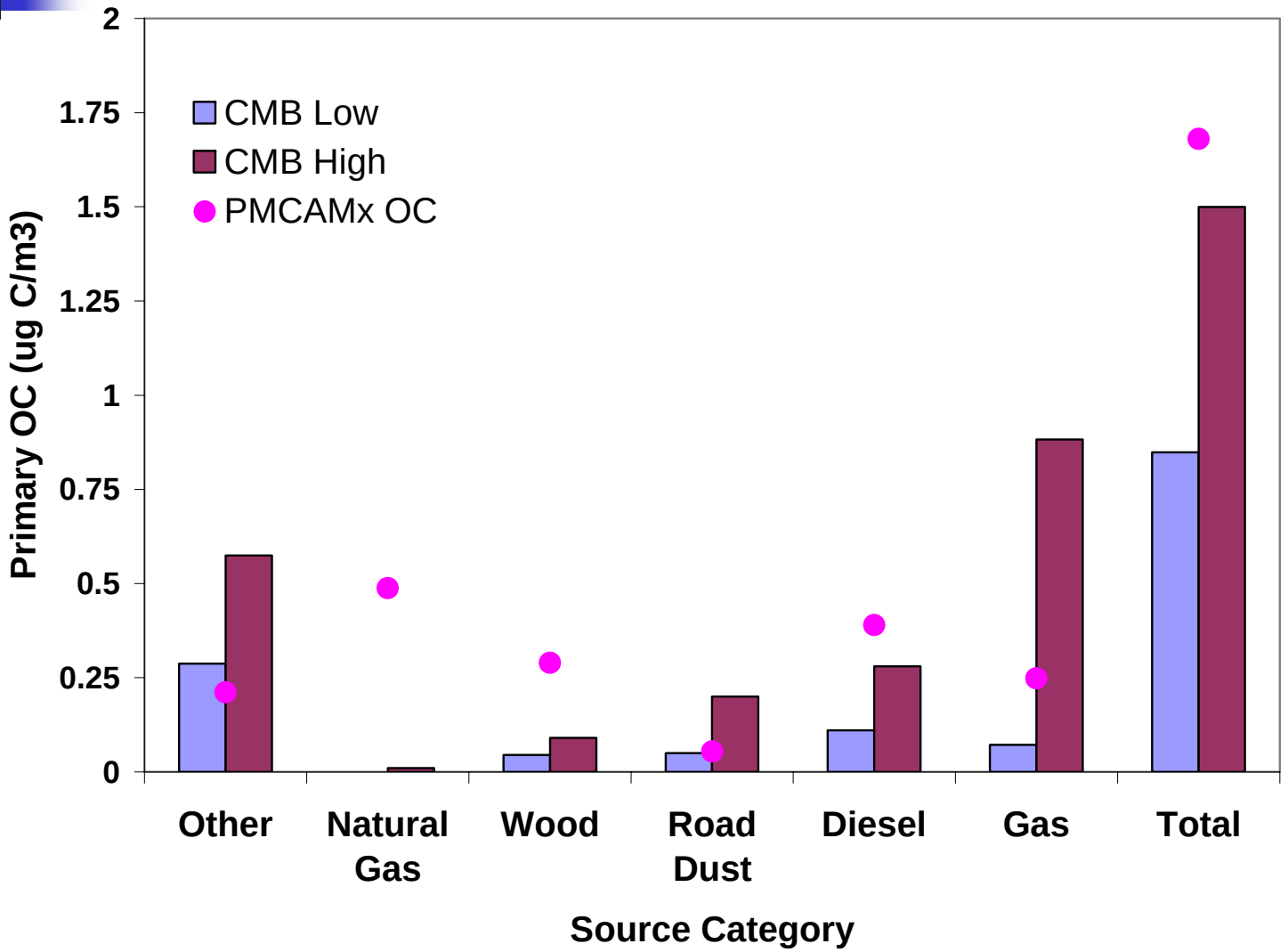


On-road Diesel EC



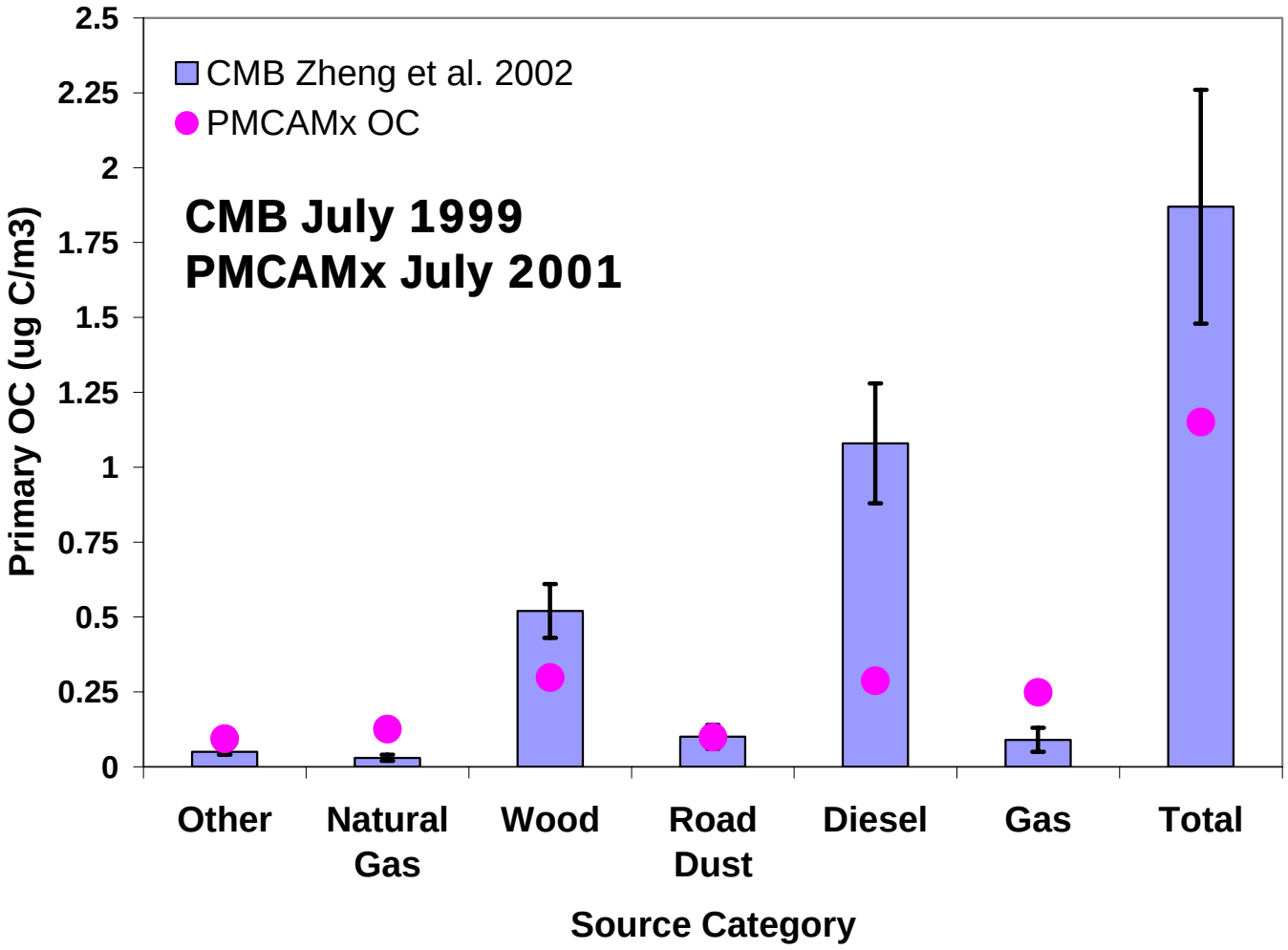
Comparison between source resolved PMCAMx and CMB using molecular markers

Pittsburgh July Average Primary OC by Source Class July 16-28, 2001



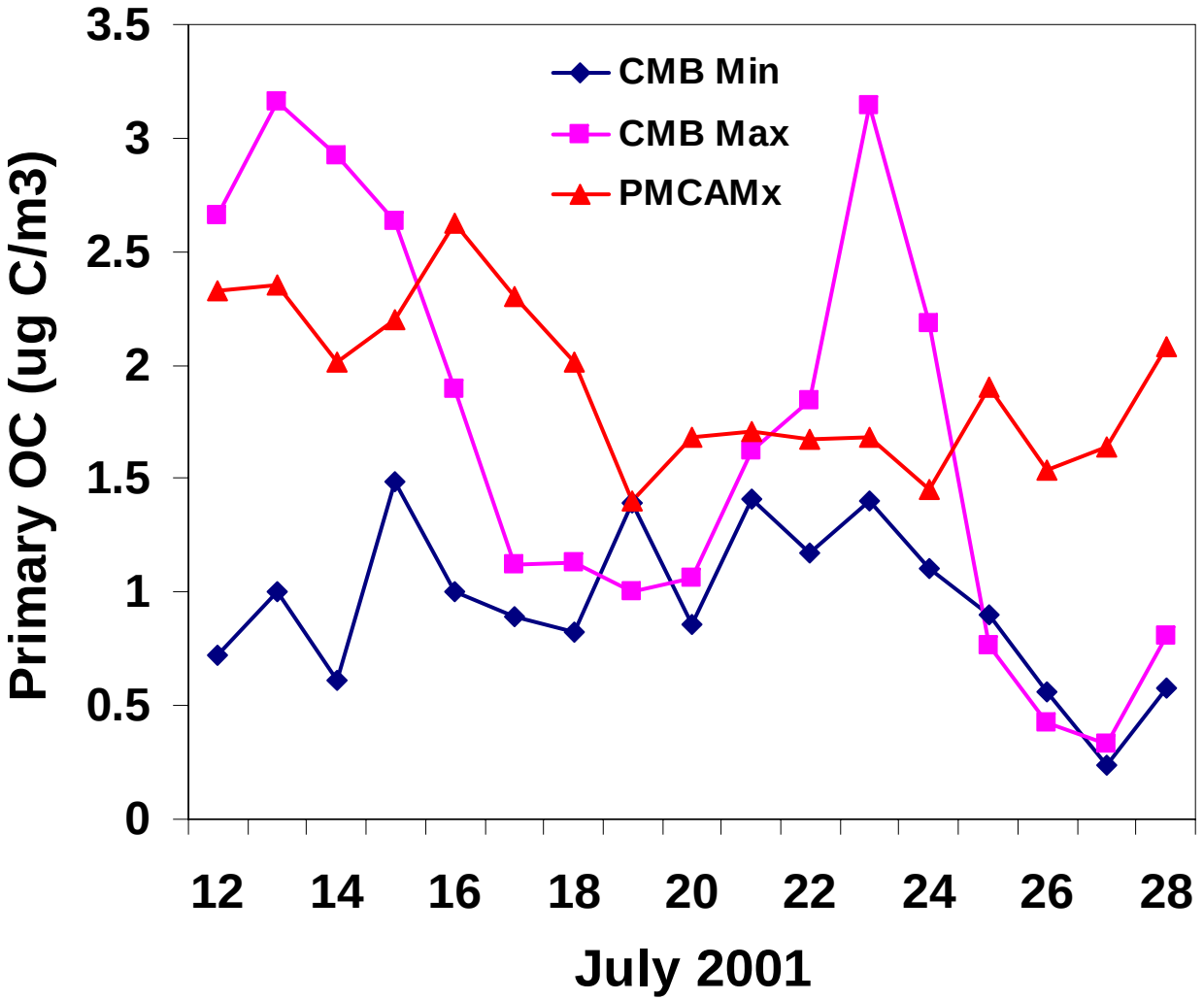
Use Inventory Average for Distribution of Sources for Boundary Condition POC

Atlanta July Average Primary OC by Source Class



Use Inventory Average for Distribution of Sources for Boundary Condition POC

No correlation of daily apportionment estimates



Conclusions

- Some agreement between CMB and PMCAMx for monthly average source contributions
- Problem categories vary regional
  - Atlanta – diesel
  - Pittsburgh – natural gas, biomass
- No agreement on daily basis
- Overall model-measurement agreement in OC likely due to offsetting errors
- PMCAMx EC is a factor of 3-4 higher than observed in urban areas
  - Both on- and non-road diesel contribute

Acknowledgements

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