

# MATES III

## EC/OC Methodology



**South Coast Air Quality Management District**  
**January 7<sup>th</sup>, 2004**

# Background

- Increased need for characterizing and quantifying atmospheric particulate matter ( $PM_{10}$  and  $PM_{2.5}$ )
- Diesel exhaust is significant contributor to PM and has been identified as a Toxic Air Contaminant
- EC has been used in studies as a surrogate for diesel exhaust

# MATES II: Methodology

- IMPROVE method for EC/OC measurements
  - Ambient air collected on PM<sub>10</sub> filter
  - Section of PM<sub>10</sub> filter heated in an oxygen-free carrier for the OC and then in an environment with a few percent oxygen for the EC for hydrocarbon volatilization and reduction for analysis via FID
  - Pyrolysis corrected via laser (TOR)
- Estimated diesel emissions from a combination of EC measurements, emission inventory data, and source apportionment techniques

# Current Measurements used to Estimate Diesel Emissions

- Particulate Matter Total Mass
  - $PM_{10}$
  - $PM_{2.5}$
- EC and OC
- Polycyclic Aromatic Hydrocarbons
- Unresolved Complex Mixture (Schauer, ARB)

# Why EC Measurements in MATES III?

- EC is a sizable fraction of diesel PM and has been used previously to estimate diesel exhaust emissions
- Historical EPA database of EC
  - Consistency with MATES II data
  - Trend analysis
- Methods are well-defined
  - Sampling ( $PM_{10}$  and  $PM_{2.5}$ )
  - Analysis (IMPROVE, NIOSH)
- Consistent with other studies (ARB, EPA, etc.)

# MATES III:

## Proposed EC/OC Measurements

- Similar to MATES II, use EC as one of the components to estimate diesel exhaust emissions
- Particulate filter samples for both  $PM_{10}$  and  $PM_{2.5}$  will be analyzed for metals, ions, total mass, OC, EC and total carbon
- EC and OC
  - $PM_{10}$ : Analyzed using IMPROVE method with some overlapping NIOSH analyses
  - $PM_{2.5}$ : Analyzed via NIOSH method with some overlapping IMPROVE analyses

# IMPROVE vs. NIOSH

- IMPROVE is a reflectance technique with lower peak temperature (550°C) of the oxygen-free heating stage with event driven hold times
- NIOSH is a transmittance technique with a higher peak temperature (850°C) in the oxygen-free heating stage with prescribed hold times (non-event driven)

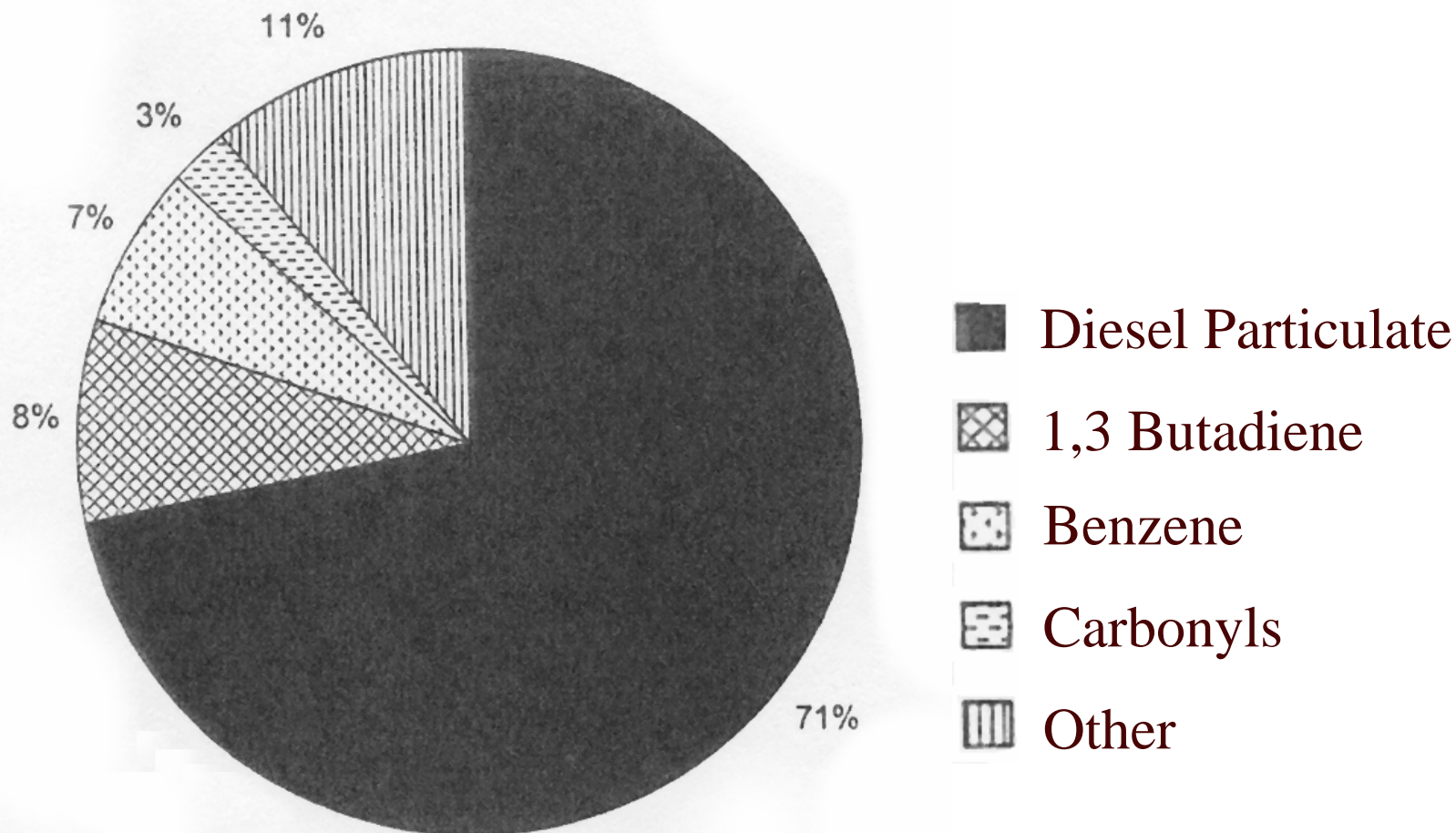
# Summary

- $PM_{10}$  and  $PM_{2.5}$  EC/OC measurements need to be included into MATES III
- Diesel exhaust is proposed to be estimated by EC analyzed by both IMPROVE and NIOSH methods
  - Provides correlation with past data
- When combined with detailed emissions inventory, should provide an accurate estimate of diesel emissions



# MATES II (1997)

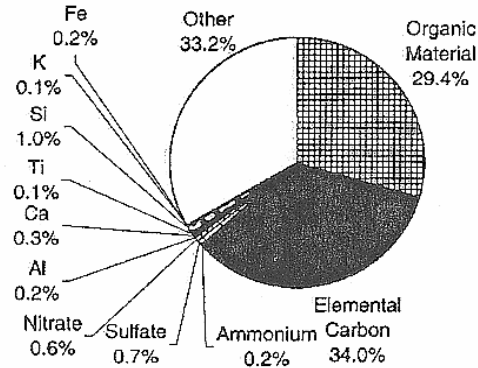
Basinwide Cancer Risks\* ~1,400 in 1,000,000



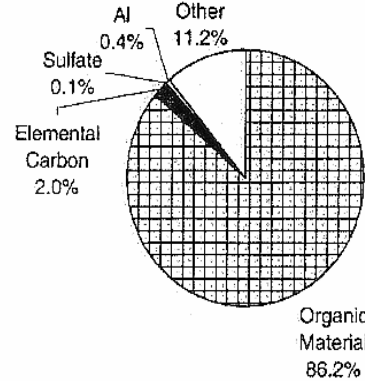
\*Based on the average of pollutant concentrations measured at the fixed monitoring sites

# Composition of Particle Emissions <2.5mm from Major Southern California Sources

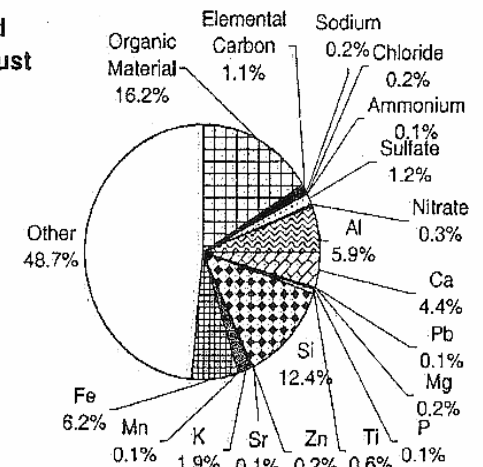
**Diesel Vehicles**



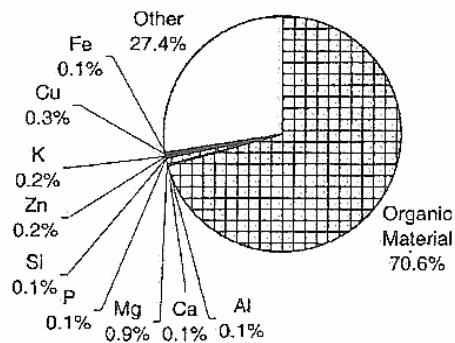
**Non-catalyst Vehicles**



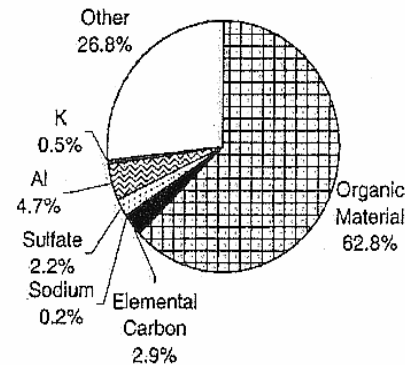
**Paved Road Dust**



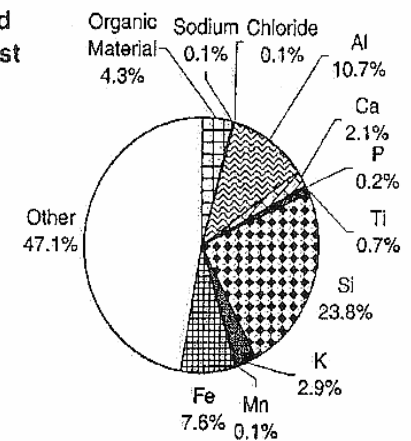
**Meat Charbroiling**



**Catalyst Vehicles**

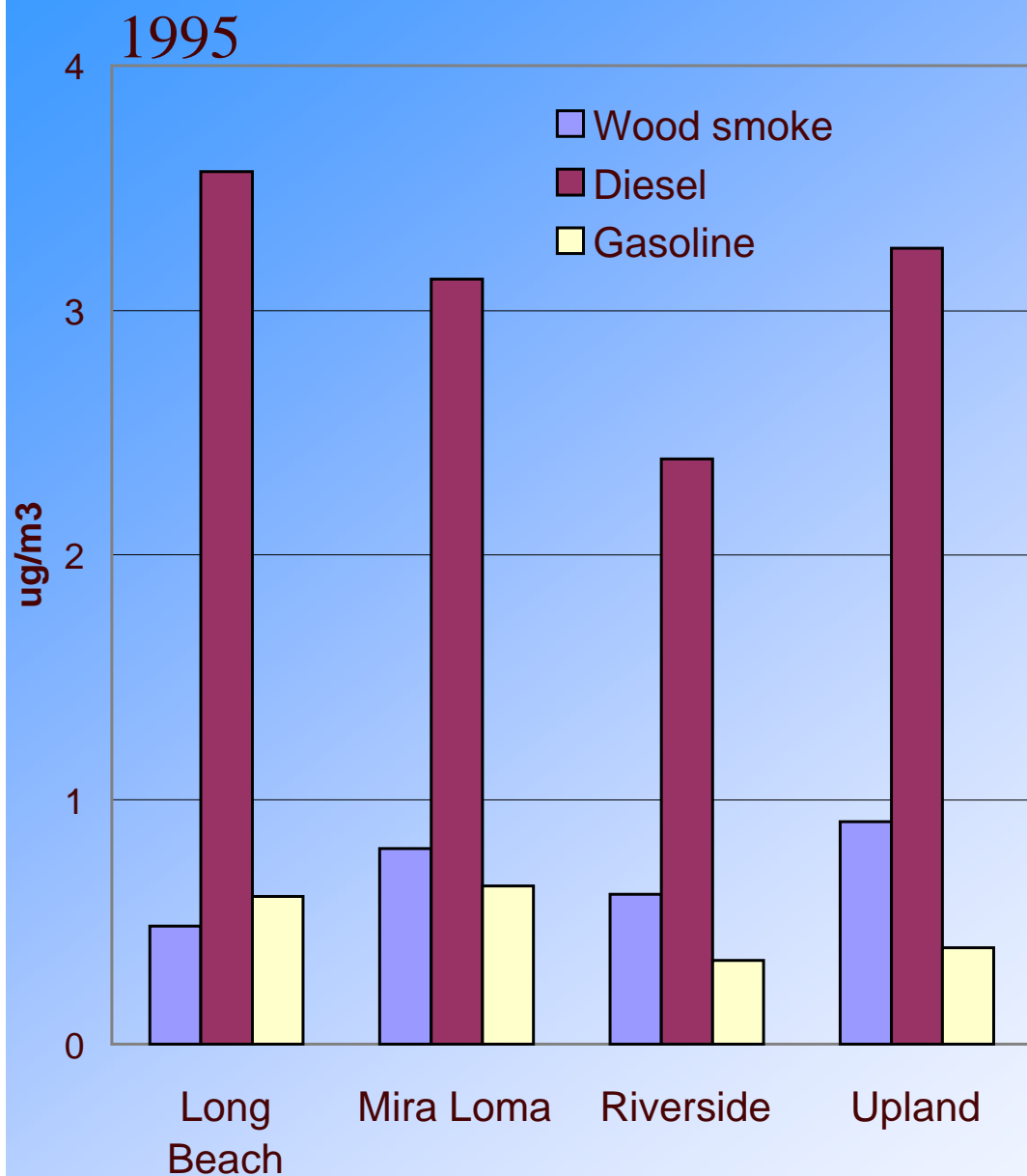


**Unpaved Road Dust**

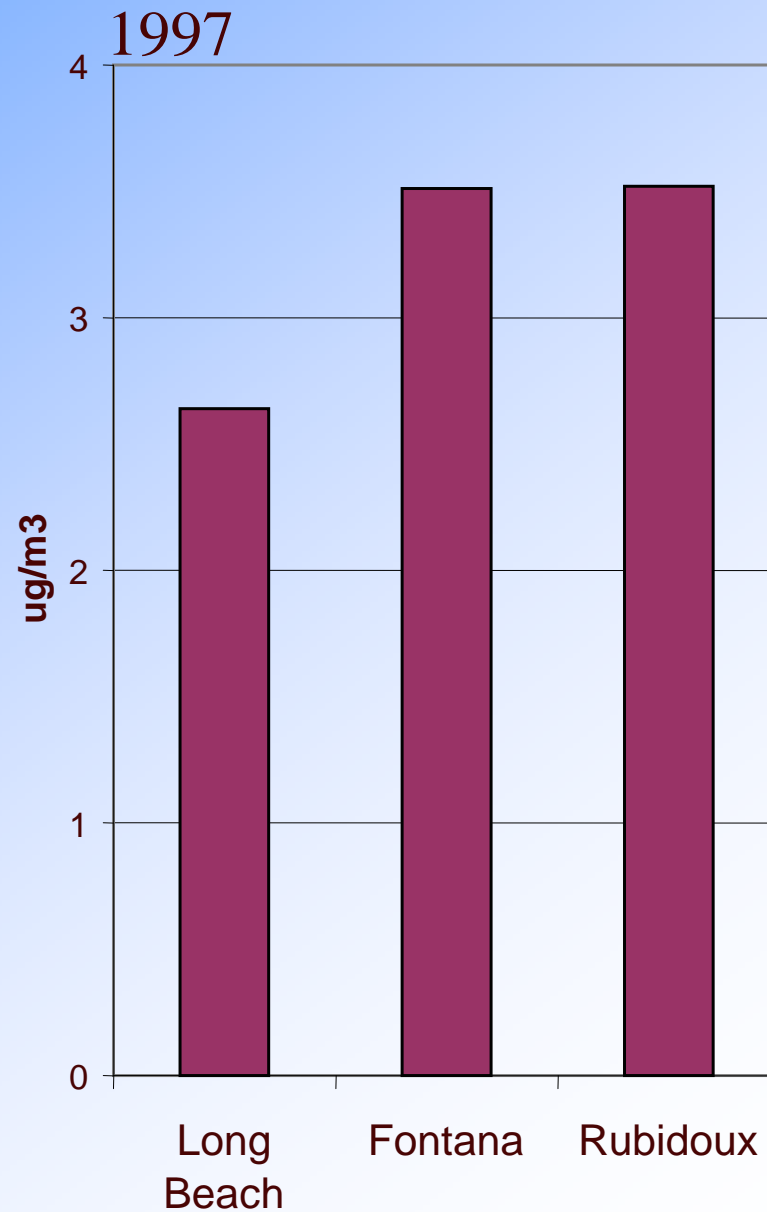


(Bhave *et al.*, 2001)

# Comparison of Studies



Manchester-Neesvig (2003)



MATES II (2000)

# IMPROVE vs. NIOSH

