

Key Results: Aerodyne Mobile Laboratory Deployment MCMA-2006, MAX-MEX, MILAGRO

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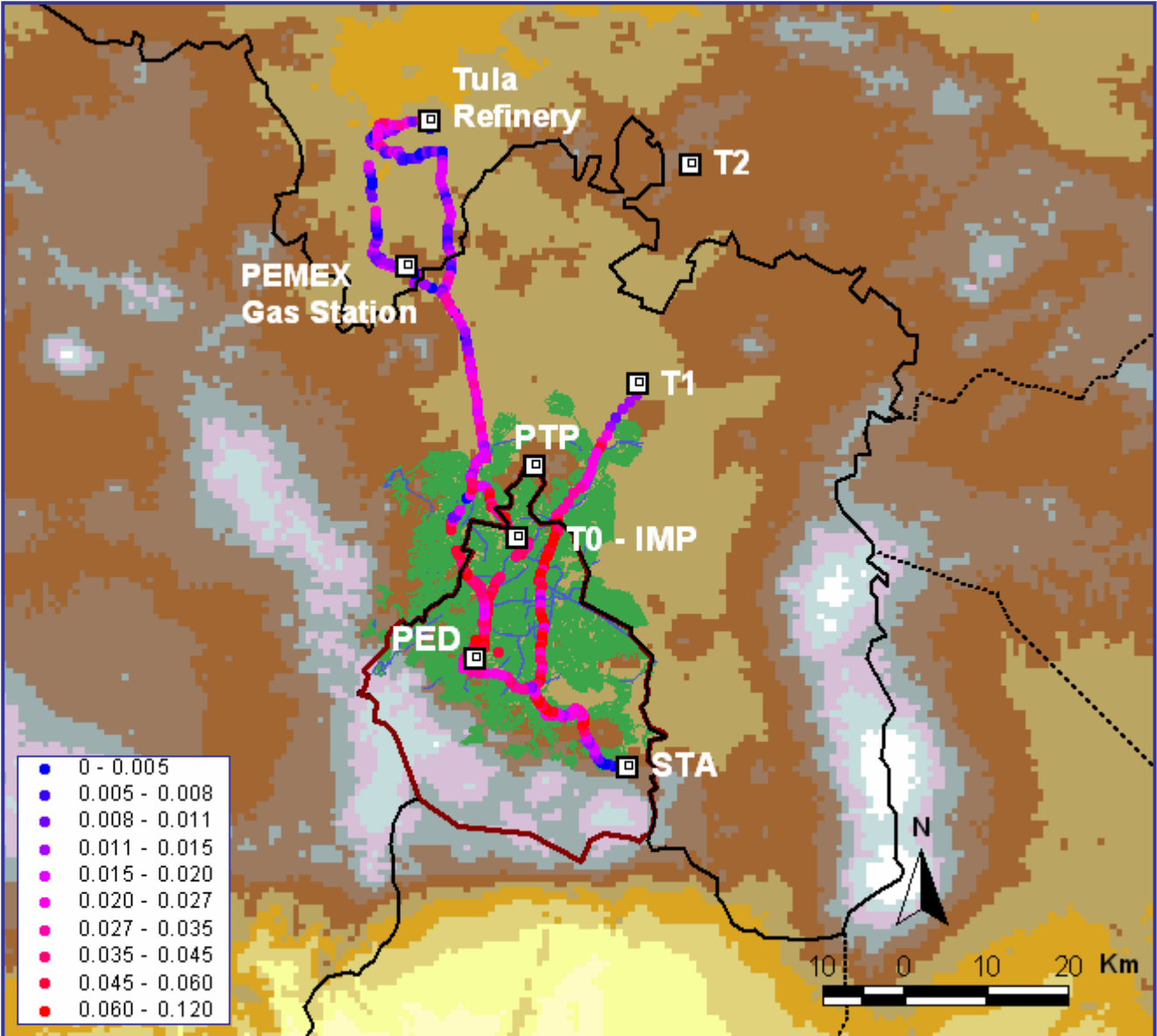
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Aerodyne's MILAGRO Objectives

- Investigate sources and photochemical processing of gases and particles
 - Processing of emissions and secondary oxidant and aerosol formation
- Characterize on-road traffic emissions
 - For comparison with studies in 2003, 2002, and emission inventories
- Collaborate with other scientists through co-located sampling



Fixed Mobile Laboratory MILAGRO Monitoring Sites (On-road Ratios of H₂CO/CO₂ [ppb/ppm])



Pico Tres Padres



- Photochemical processing of city emissions and secondary aerosol generation
- Source-specific wind-advected plumes and particle nucleation and growth

MCMA-2006 / MAXMEX / MILGRO Mobile Laboratory Instrumentation



Trace Gases	Particulate Matter
CO, HCHO, NO ₂ , HNO ₃ , NH ₃ – QC-TILDAS (ARI)	PM ₁ Nonrefractory Organics/Inorganics – TOF-AMS (ARI)
CO ₂ – NDIR (3) (ARI)	PM _{2.5} Black Carbon – MAAP (ARI)
NO, NO _y – CL (MIT/MCE ²)	PM ₁ Number Density – CPC (ARI)
Acetaldehyde, Methanol, Benzene, Toluene, C ₂ Benzenes, C ₃ Benzenes, Acetonitrile, Hydrogen Cyanide, Alkenes PTR-MS (MSU)	PM _{2.5} Mass – Dust Trak (2) (ARI/LANL) PM _{2.5} Absorption – Photo Acoustic (LANL) PM _{2.5} Surface Area – Diff. Charger (MIT/MCE ²)
O ₃ – UV Absorption (ARI)	PM _{2.5} Surface PAH – Photo Ion. (2) (VT, MIT/MCE ²)
SO ₂ – UV Absorption (WSU)	PM _{0.6} Mobility Size – SMPS (ARI)
VOCs – Canister Samplers (EPA)	PM _{2.5} Characterization – SEM Filter Collector (DRI)

■ = Real-time Measurement (1 - 2 s)

■ = Near Real Time (30 - 120 s)

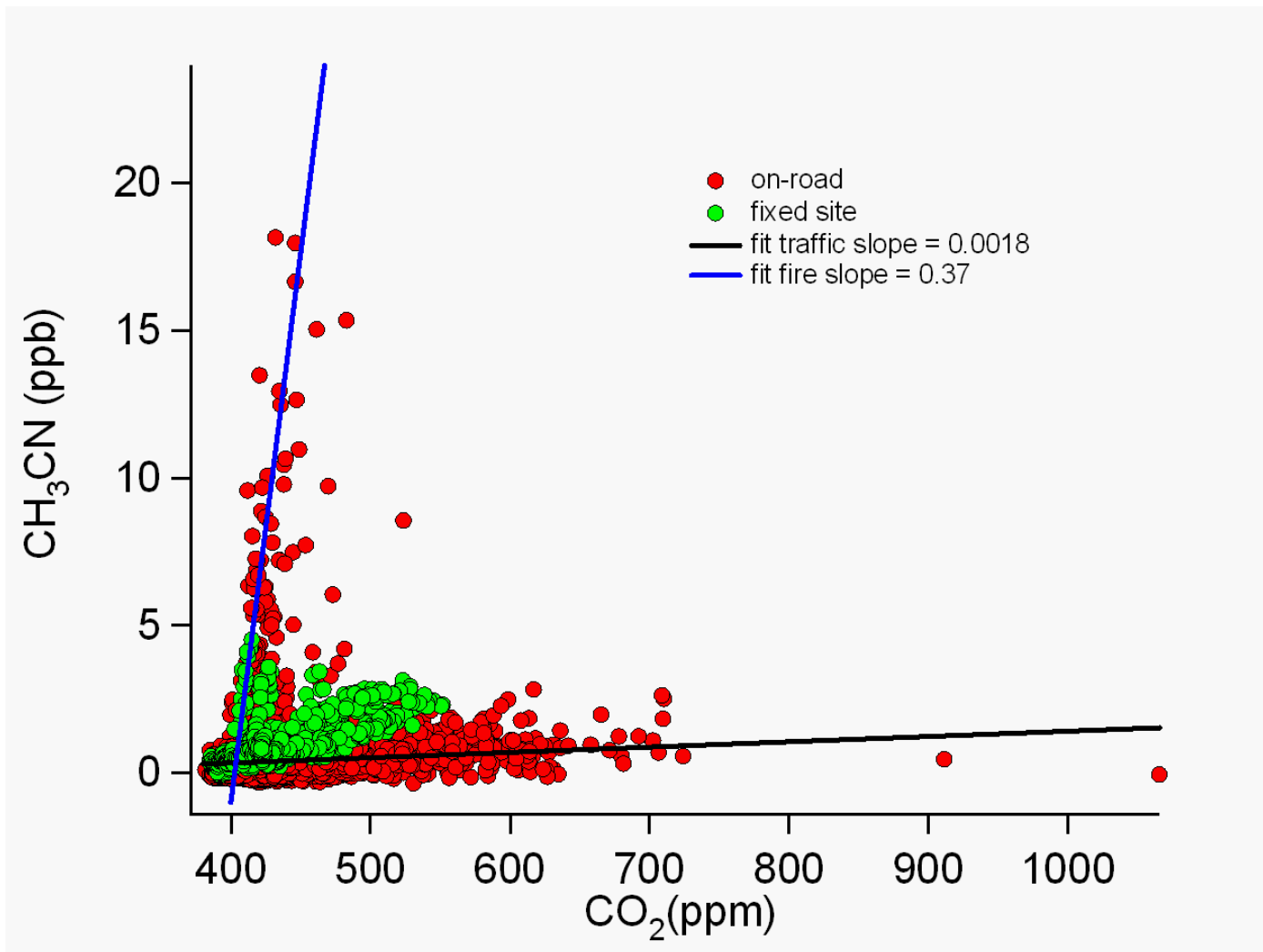
■ = Sample/Lab Analysis

CYANIDE – Biomass Burning and/or Urban Emission Tracer? ...

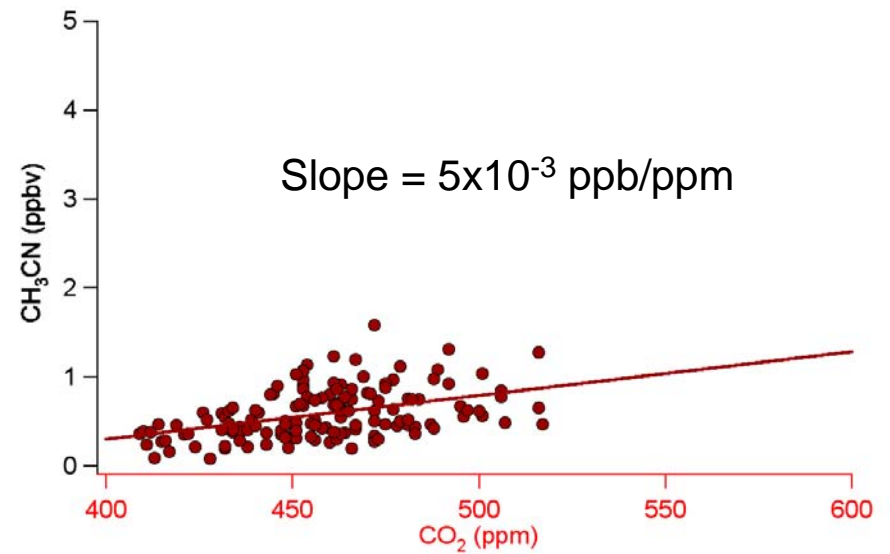
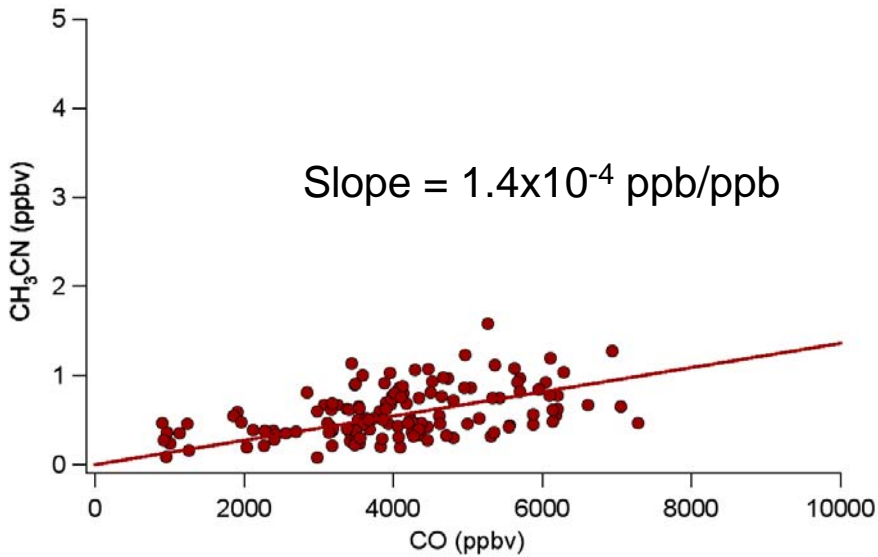
HCN – Hydrogen Cyanide
CH₃CN – Acetonitrile

Fires	Vehicle Exhaust
Fuel Rich Smoldering Biomass CHNO Compounds → CN Compounds	Fuel Rich NO Reduction Catalyst NO → NH ₃ SO ₂ → H ₂ S NO/VOC → CN Compounds?

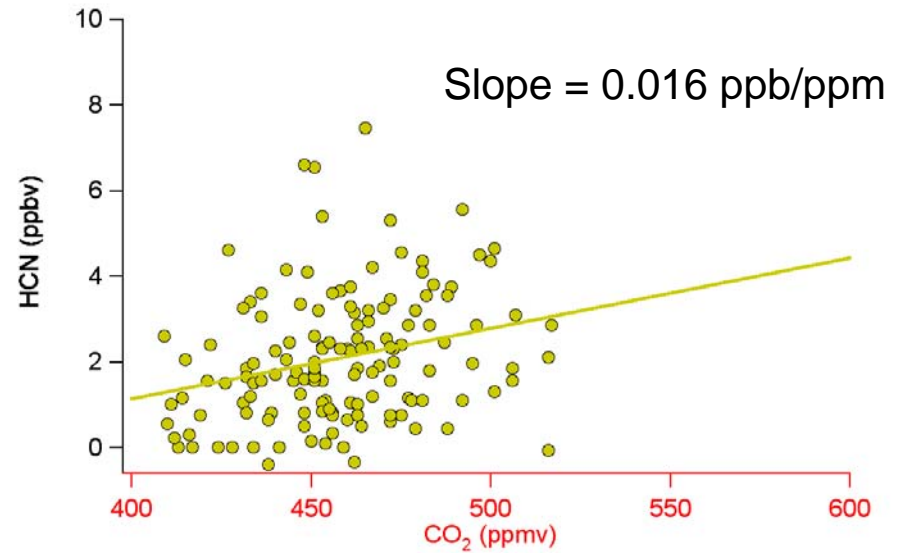
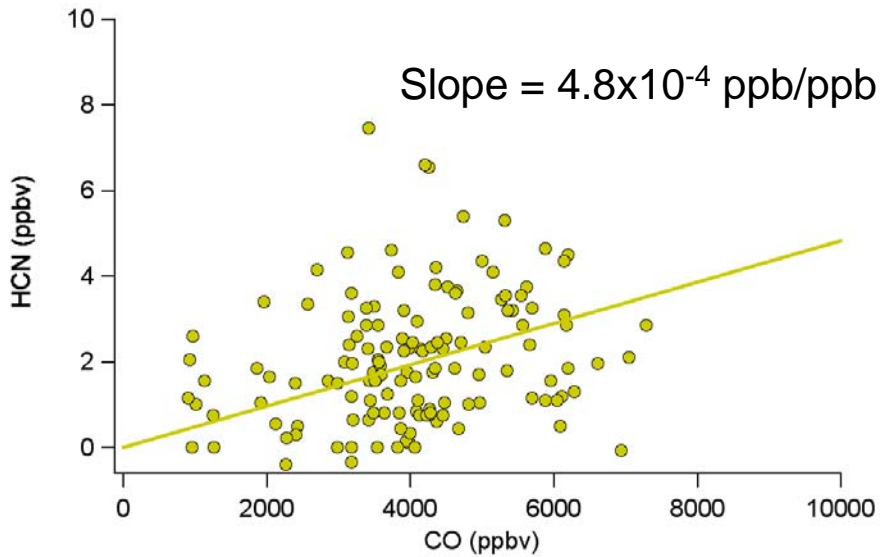
Acetonitrile Fire vs Traffic Emissions Mexicali



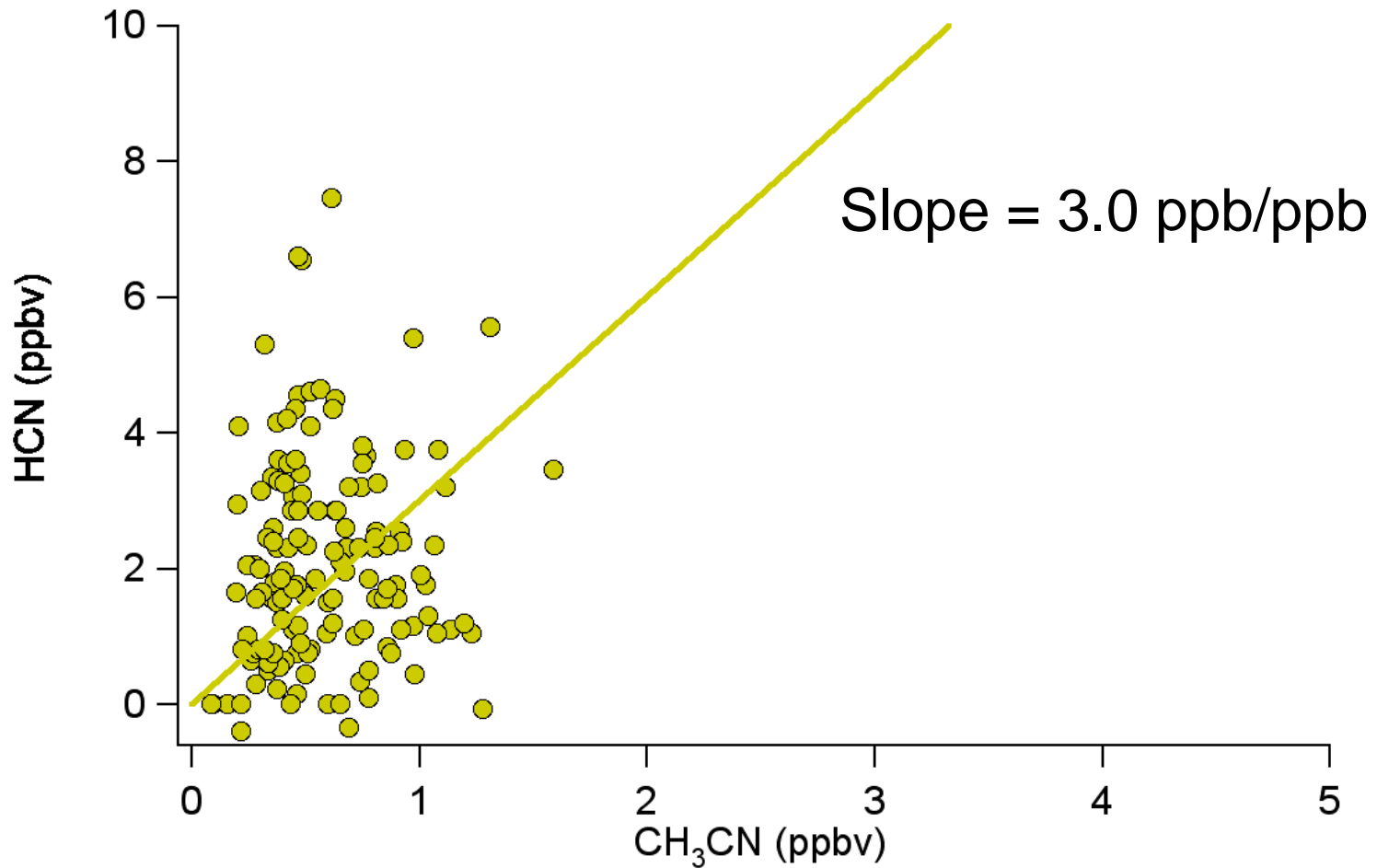
Acetonitrile Emissions Morning Traffic at To



HCN Emissions Morning Traffic at To



HCN vs CH₃CN



Other ARI/Collaborators Presentations

G-1 Trace Gas and Fine PM Correlations

John Jayne – Session 2, 15:00 Tuesday

Pico Tres Padres Urban Plume Evaluation

Scott Herndon – Session 4, 9:15 Wednesday

Mobile Emissions/Ozone Production Sensitivity Analysis

Miguel Zavala – Session 4, 12:25 Wednesday

Ambient and PM Characteristics and Sources

Doug Worsnop – Session 6, 14:30 Wednesday

Primary Carbonaceous Aerosol Processing at T0

Tim Onasch – Session 6, 15:00 Wednesday

Aerodyne AMS Single Particle Characterization

Eben Cross - Poster

PM PAH and Surface Area

Dwight Thornhill - Poster

MCMA EI Development and Evaluation

Miguel Zavala - Poster



UC Boulder Presentations

Forest Fire Emission Analysis

Peter DeCarlo – Session 2, 15:10 Tuesday

Ambient PM Analyses 2003 and 2006

Jose Jimenez / Dara Salcedo – Session 4, 14:45 Wed

High Resolution AMS PM Characterization

Allison Aiken – Poster

Fast C-130 Airborne PM Analysis

Peter DeCarlo - Poster



MCMA Air Pollution



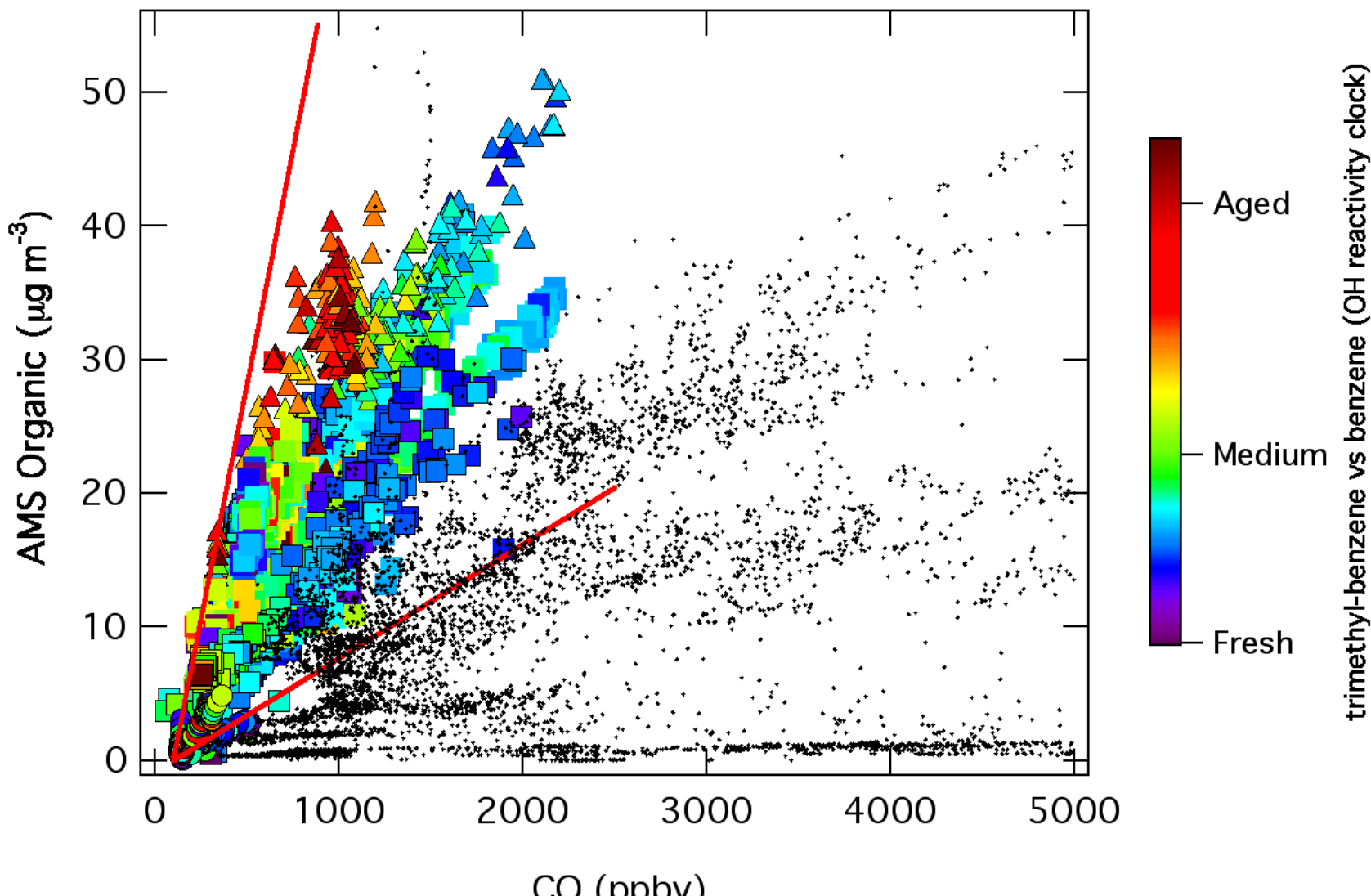
AMS to CO Summary (PTP vs T0)

▲ Pico de Tres Padres (aged)

◆ T0, Preliminary (fresh)

— Range, G1 – Results

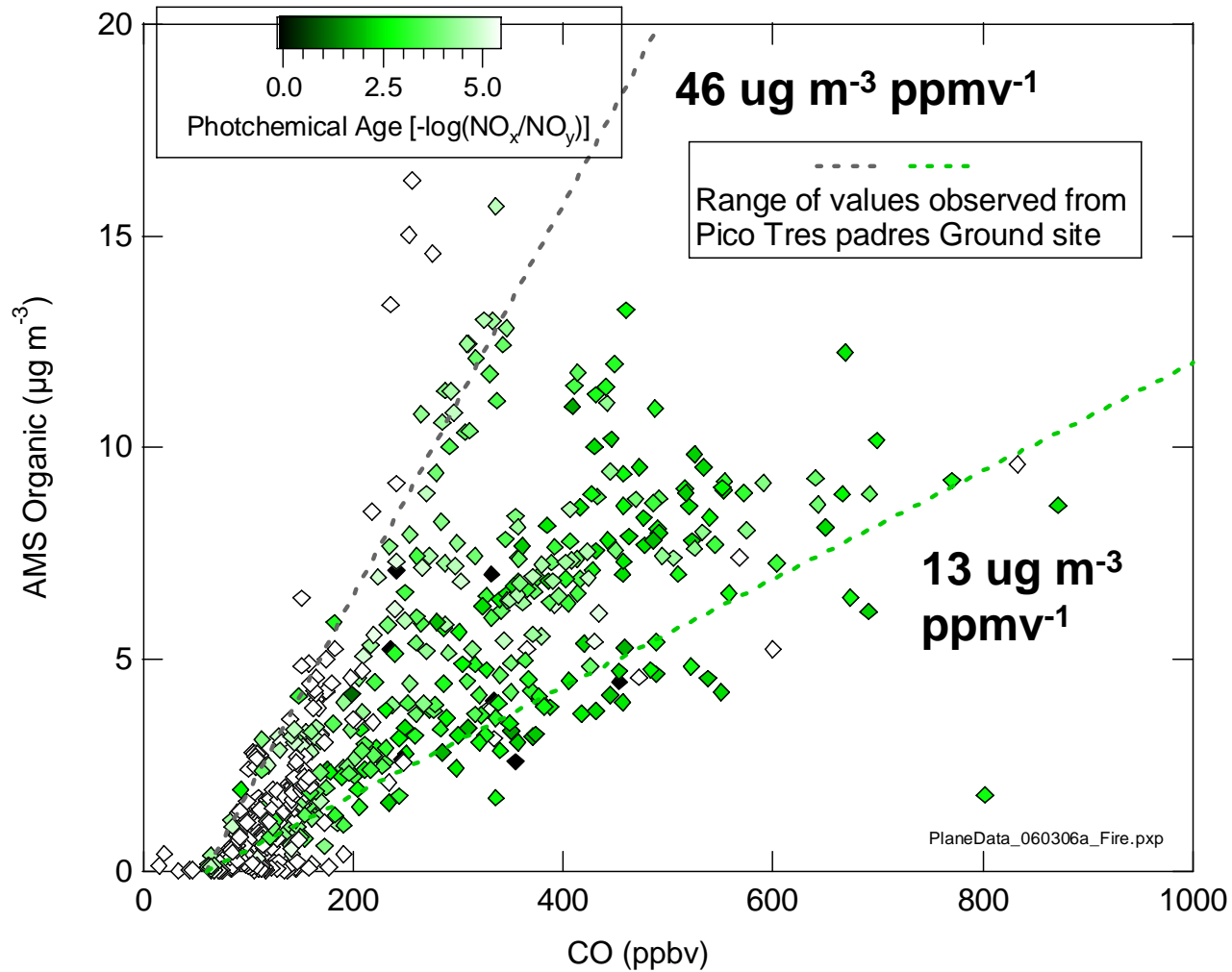
High, Lo Slopes 70, 8.5 ($\mu\text{g m}^{-3} \text{ppmv}^{-1}$)



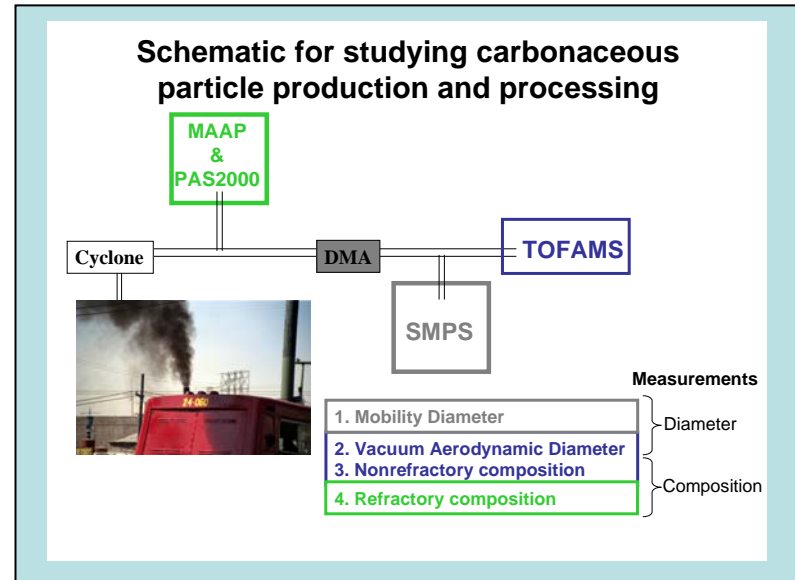
G-1 Trace Gas / PM Composition Correlations

Goal – To Identify, Characterize and Separate Aged Urban Plume and Biomass Burning Contributions

March 6th Data – Larger Slopes Represent More Processed Plume



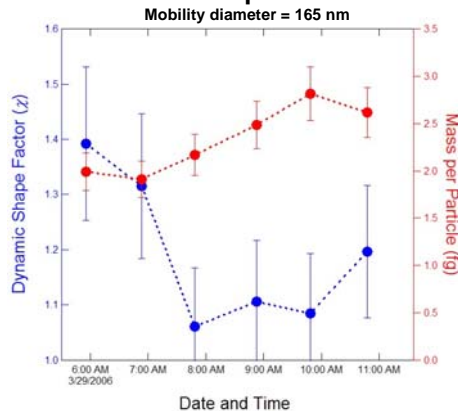
Carbonaceous Aerosol Processing in the MCMA



Primary PM sources



Evolution of Mass and Shape of Combustion Particles



- As the morning progresses, particles become larger (higher mass) and more spherical
- Primary soot particles are getting rapidly coated with photo-oxidation products, changing their surface chemistry and shape



Transport and Processing

Acknowledgements

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