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Office of Heavy Vehicle Technologies

OHVT's Gasoline/Diesel PM Split Study

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CENTER FOR TRANSPORTATION TECHNOLOGIES AND SYSTEMS

DOE/NREL Environmental Science Program



**PROGRAM MANAGER:
Dr. Michael Gurevich,
DOE Office of Heavy
Vehicle Technologies**

Issues

- ozone
- particles
- air toxics
- regional haze
- health effects

DOE/NREL Environmental Science Program

Our Goal

Understand atmospheric impacts and potential health effects that may be caused by the use of petroleum-based fuels and alternative transportation fuels from mobile sources.



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Does soot come from spark-ignition vehicles? [from the tailpipe of relatively new Toyota Prius (Hybrid Vehicle)]



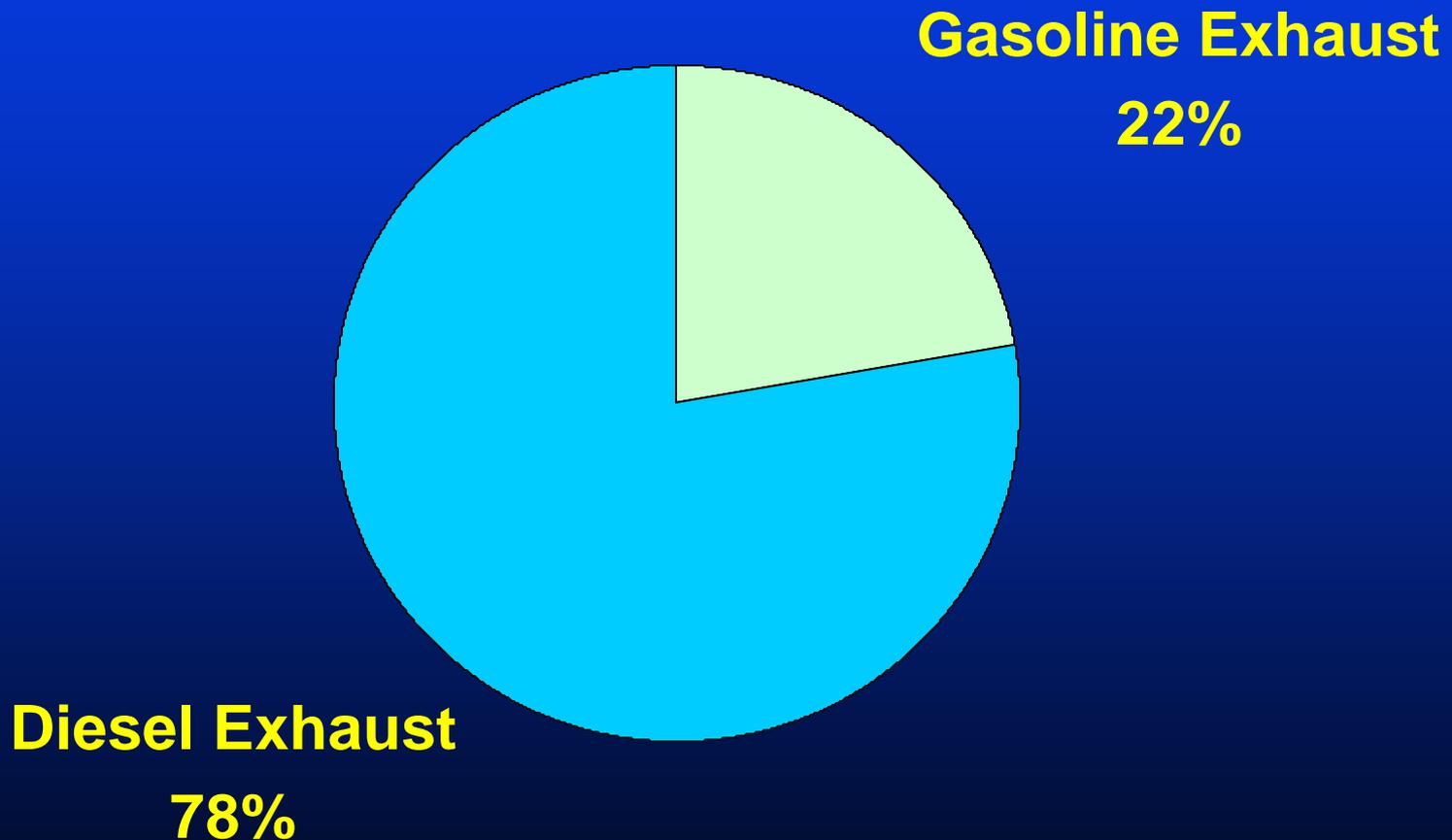
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Gasoline/Diesel PM Split Study

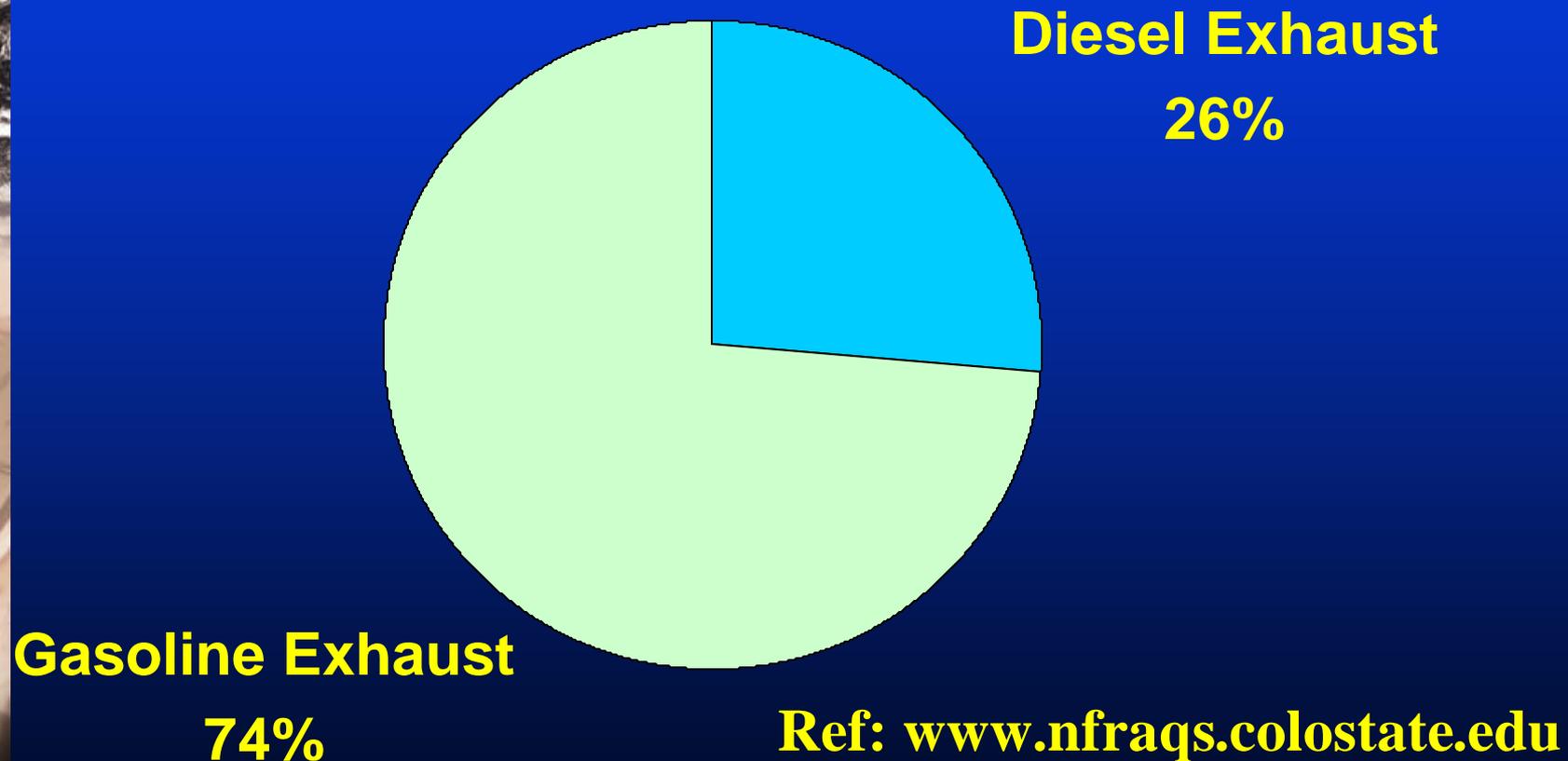
Objective: To quantify the relative contribution of PM emissions from gasoline- and diesel-powered engines in the South Coast Air Basin

Participants: BAR and SCAQMD (LD vehicle recruitment); Ralph's Grocery Distribution Center, CTA (HD truck recruitment); EPA (LD dynamometer measurements); WVU (HD vehicle dynamometer measurements); DRI and U WI-Madison (source & ambient measurements, source apportionment)

Denver Area Mobile Source PM_{2.5} Emissions Inventory as Predicted by EPA Models — 8.6 Tons per Day

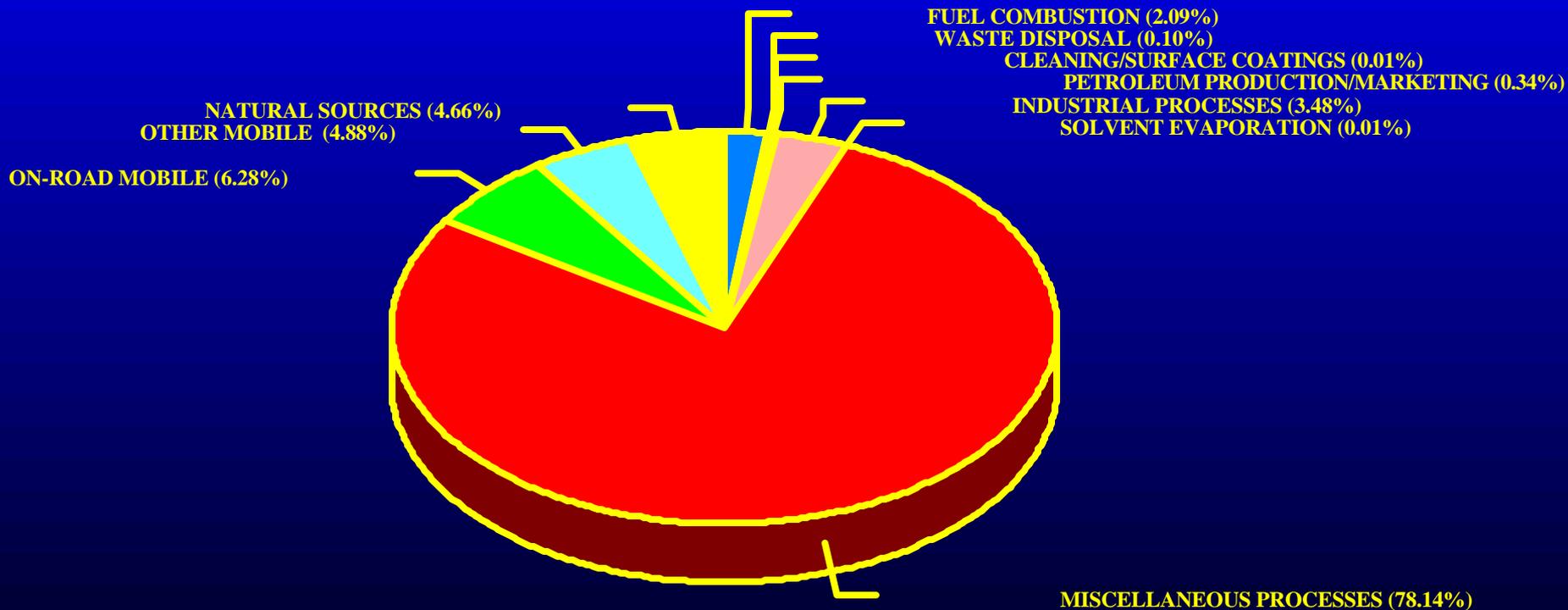


“Actual Measured” Ambient PM_{2.5} Data, Mobile Source Apportionment in Denver Area



PM-10 Emissions, South Coast Air Basin

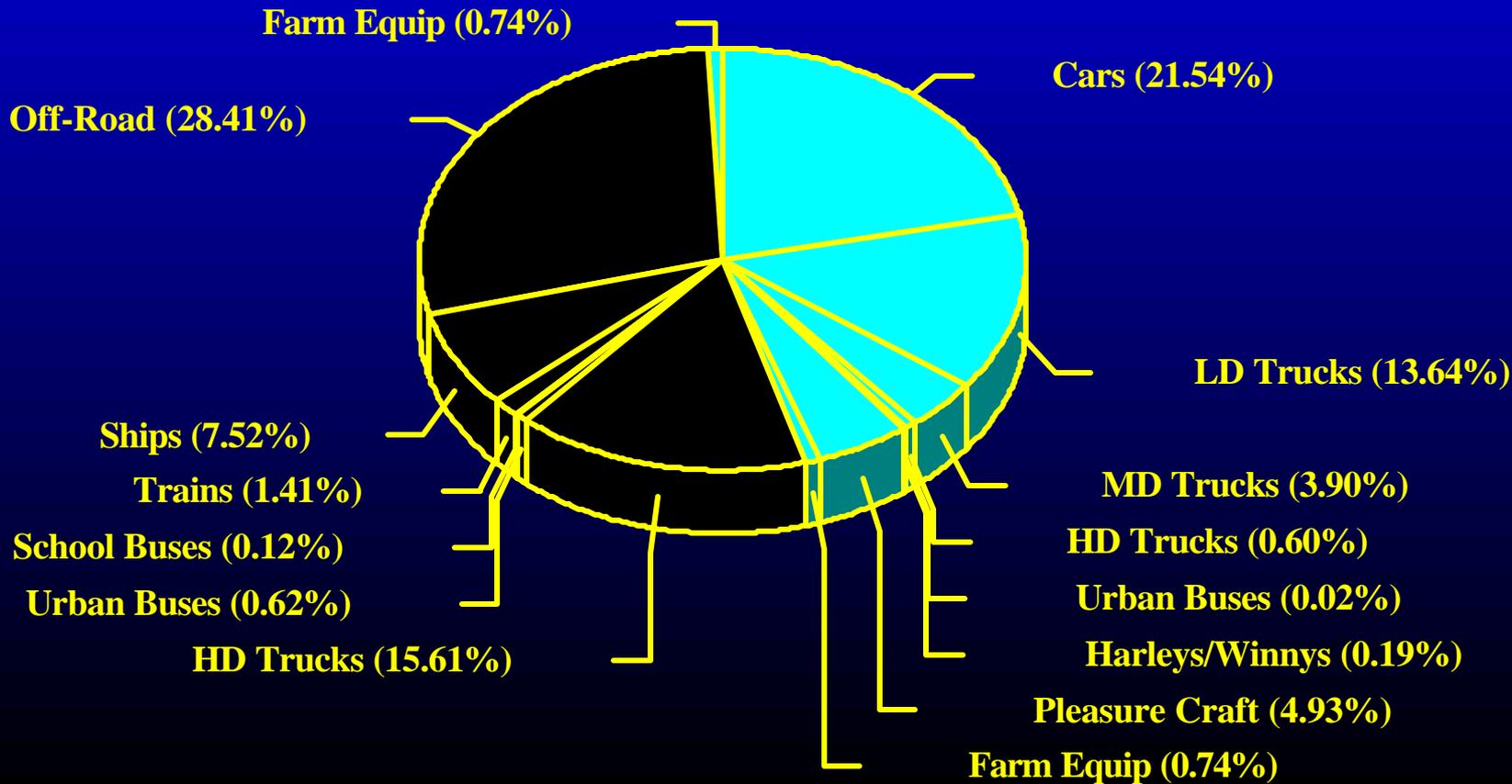
374 tons/day, Year 2000



(Residential Fuel Combustion, Farming Operations, Construction & Demolition, Road Dust, Fires, Waste Burning & Disposal, Utility Equipment, Cooking, Misc.)

Mobile Source Exhaust PM-10 Emissions, 42 tons/day, South Coast Air Basin, Year 2000

Gasoline versus Diesel Emissions



Gasoline/Diesel PM Split Study – Four Phases

- Review of previous mobile source apportionment studies in Los Angeles and Denver (Battelle Columbus – completed April 2000)
- Study plan formulated (W. White and R. Gunst) and reviewed by government and industry groups
- Field Study – Source and ambient sampling – June - September 2001
- Analysis and Reporting of Data – To be completed September 2002

Gasoline/Diesel PM Split Study – Light-Duty Sample

Light-Duty Vehicle Testing and Procurement				
Category	Model Year	Odometer (miles)	Number of Vehicles 1	Number of Composites 2
1	1996 and newer	low mileage (< 50,000)	4	1
2	1993-95	low mileage (< 75,000)	4	1
3	1996 and newer	high mileage (> 100,000)	4	1
4	1990-92	lower mileage (< 100,000)	4	1
5	1993-95	higher mileage (> 125,000)	8	2
6	1990-92	> 125,000	9	3
7	1986-89	> 125,000	6	3
8	1981-85	> 125,000	6	3
9	1980 and earlier	> 125,000	6	3
10	Smoker	no model year or odometer criteria	6	6
11	LD Diesel	no model year or odometer criteria	2	2
		TOTAL	59	26
Footnotes				
1. Schedule testing of vehicle in order of for categories 1-4 as much as possible in order to facilitate compositing.				
2. Media composites for Categories 1 through 4 and laboratory composites for all other categories.				



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Gasoline/Diesel PM Split Study – June 4 -22, 2001

Initial LD Vehicle Screening and Testing



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Gasoline/Diesel PM Split Study – Light-Duty Vehicles Tested Over Unified Driving Cycle



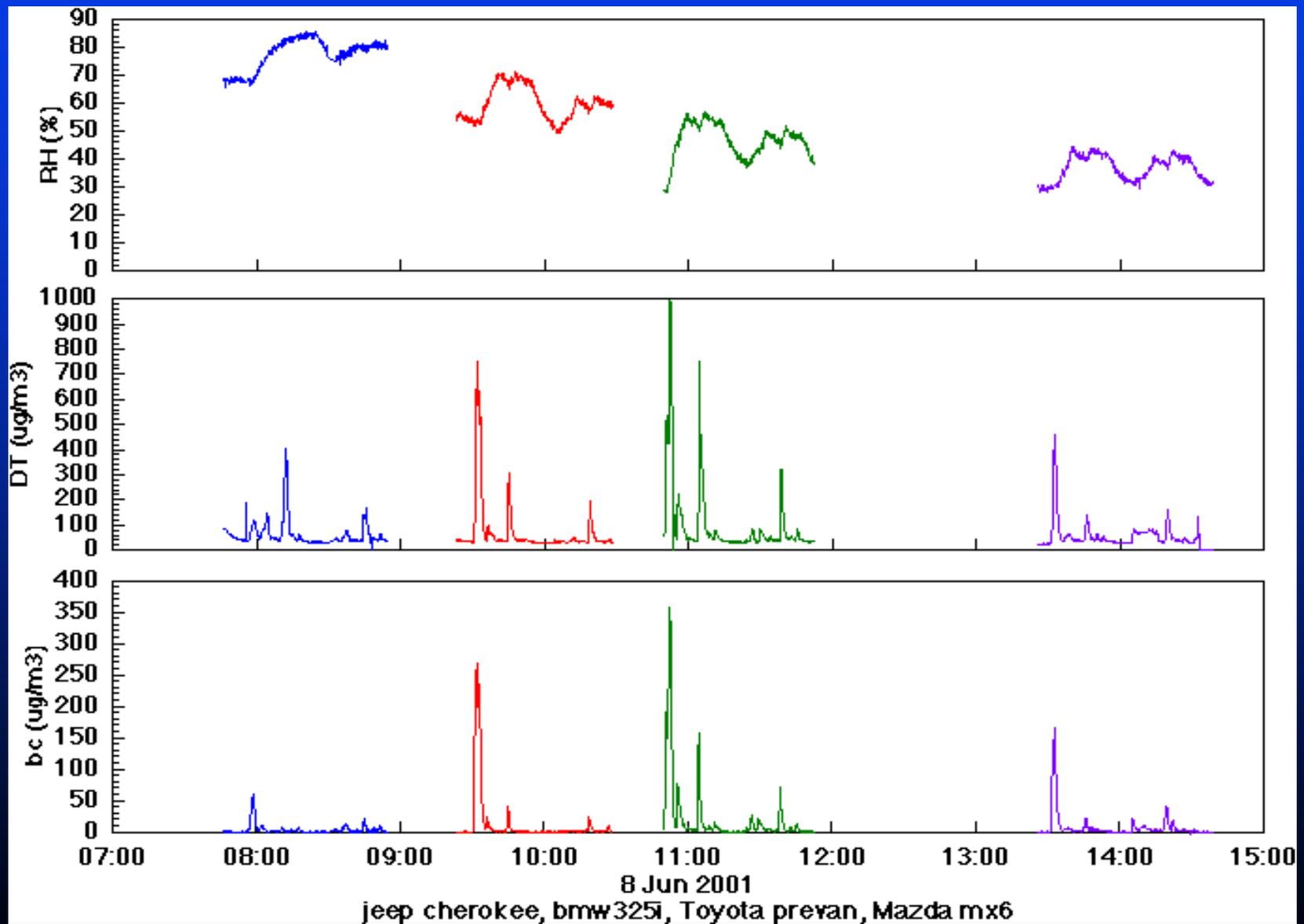
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Gasoline/Diesel PM Split Study – Exhaust Sampling Systems



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Gasoline/Diesel PM Split Study – Data from June 8



Gasoline/Diesel PM Split Study – Heavy-Duty Sample

Heavy-Duty Vehicle Procurement and Testing

- 15 newer and 15 older model year heavy-duty vehicles will be tested over a variety of test cycles: City-Suburban Route (CSR); Urban Dynamometer Driving Schedule (UDDS); Manhattan Cycle (MC); and idle tests. Some vehicles will be given both cold- and hot-start tests.
- In addition 2 transit buses (one new and one old) will be tested.
- As of last week, 14 vehicles were tested.

Gasoline/Diesel PM Split Study

Preliminary Findings – LD Vehicles

- Significant amounts of black carbon (soot or “elemental” carbon) to total carbon ratios, similar to those found in the Colorado study
- A large fraction of PM emissions from normal vehicles (~95% of the fleet) occurs during cold starts and commanded enrichment
- “Normal” vehicles’ PM emissions are generally 1-3 orders of magnitude lower than emissions from smokers and LD diesel vehicles.