

# **An Initial Review on EPA 2011NEIv2 Mobile Source Inventory**

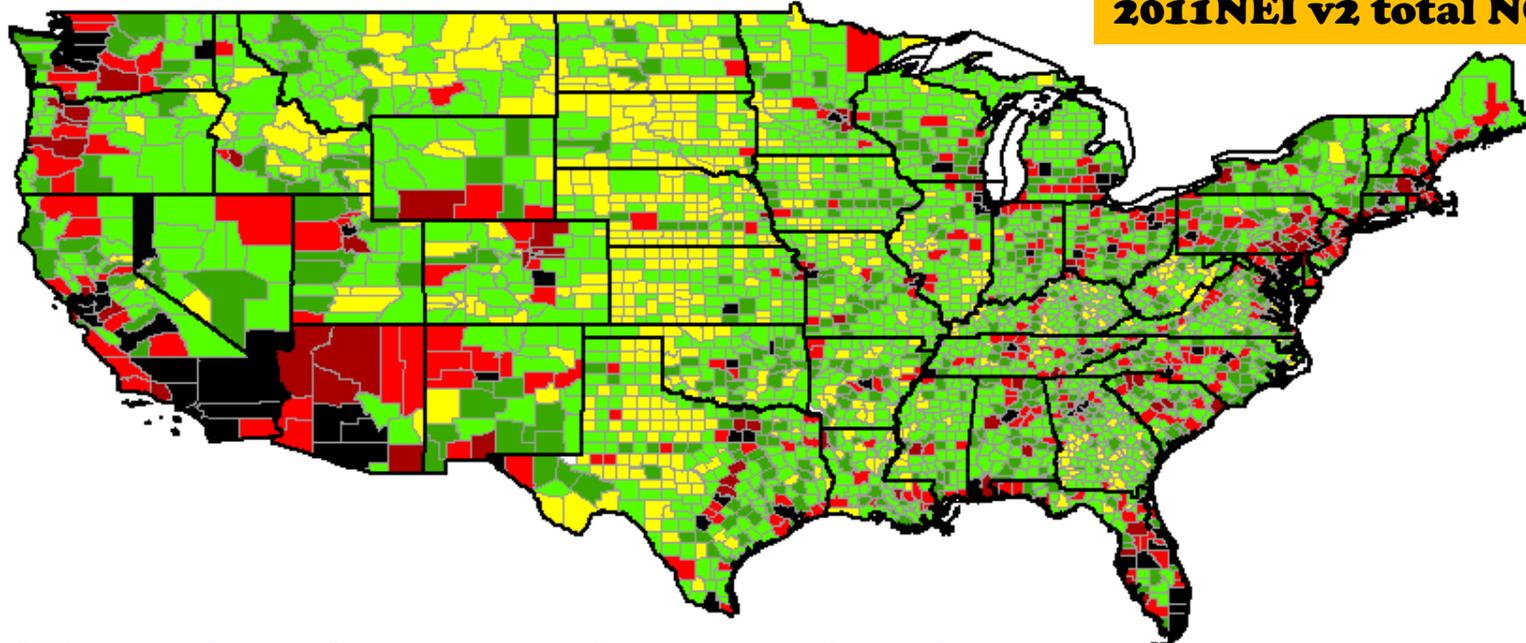
**Jin-Sheng Lin, Kristen Stumpf, and Sonya Lewis-Cheatham**  
**Virginia Department of Environmental Quality**

**MJO MOVES Workgroup conference call**  
**November 20, 2014**

# Background

- **2011NEI version1 released by EPA on September 30, 2013 (the night before the government shutdown)**
- **MARAMA (now MJO) MOVES Workgroup has been reviewing version1 and has recommended changes to EPA**
- **MOVES2014 released by OTAQ on July 31, 2014**
- **New updated MOVES2014 (October release) available on October 23, 2014**
- **2011NEI version2 inventory released by OAQPS on October 30, 2014**

### 2011NEI v2 total NOx



#### Legend

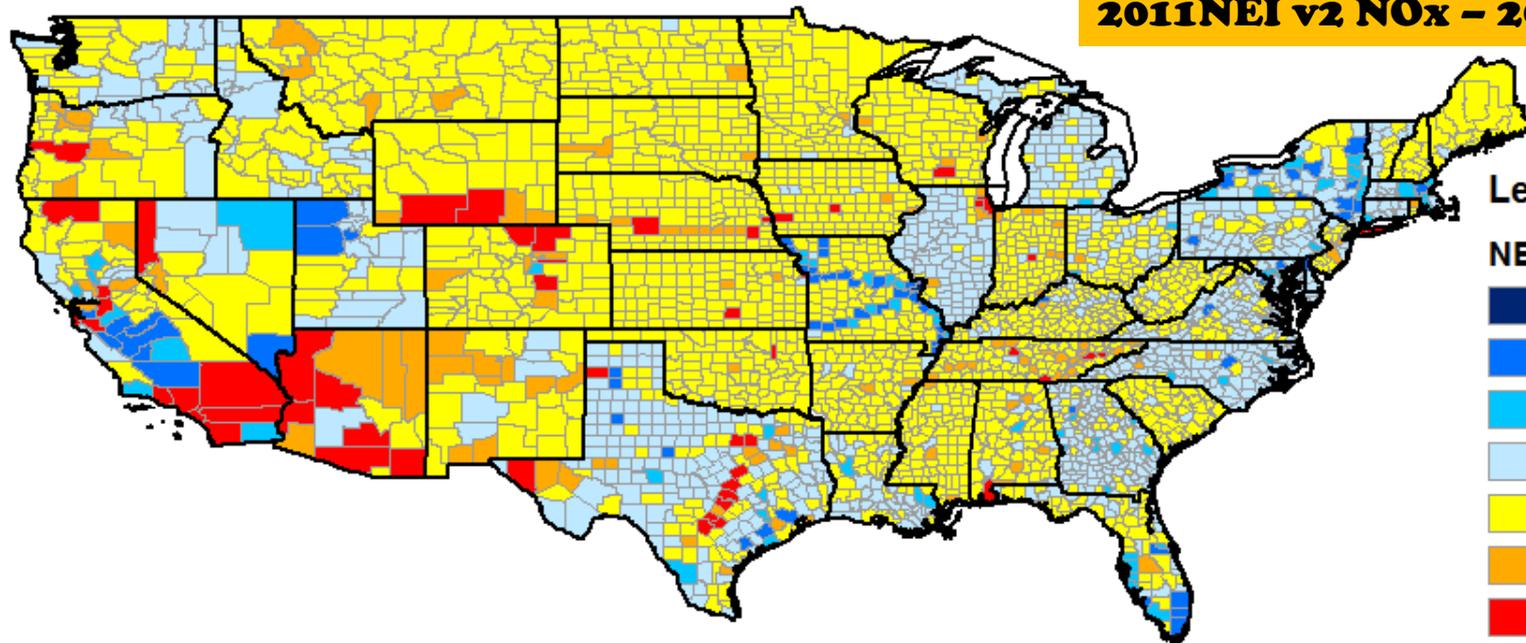
#### NEI v2

#### Onroad NOx

- 14 - 300
- 301 - 1,500
- 1,501 - 3,000
- 3,001 - 6,000
- 6,001 - 9,000
- 9,001 - 90,292

**NOx now lower for many southeastern and northeastern states  
State participation has improved quality of inventory**

### 2011NEI v2 NOx - 2011NEI v1 NOx



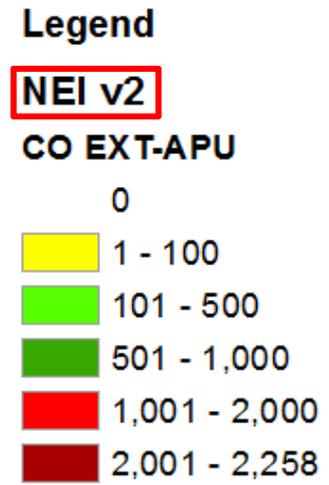
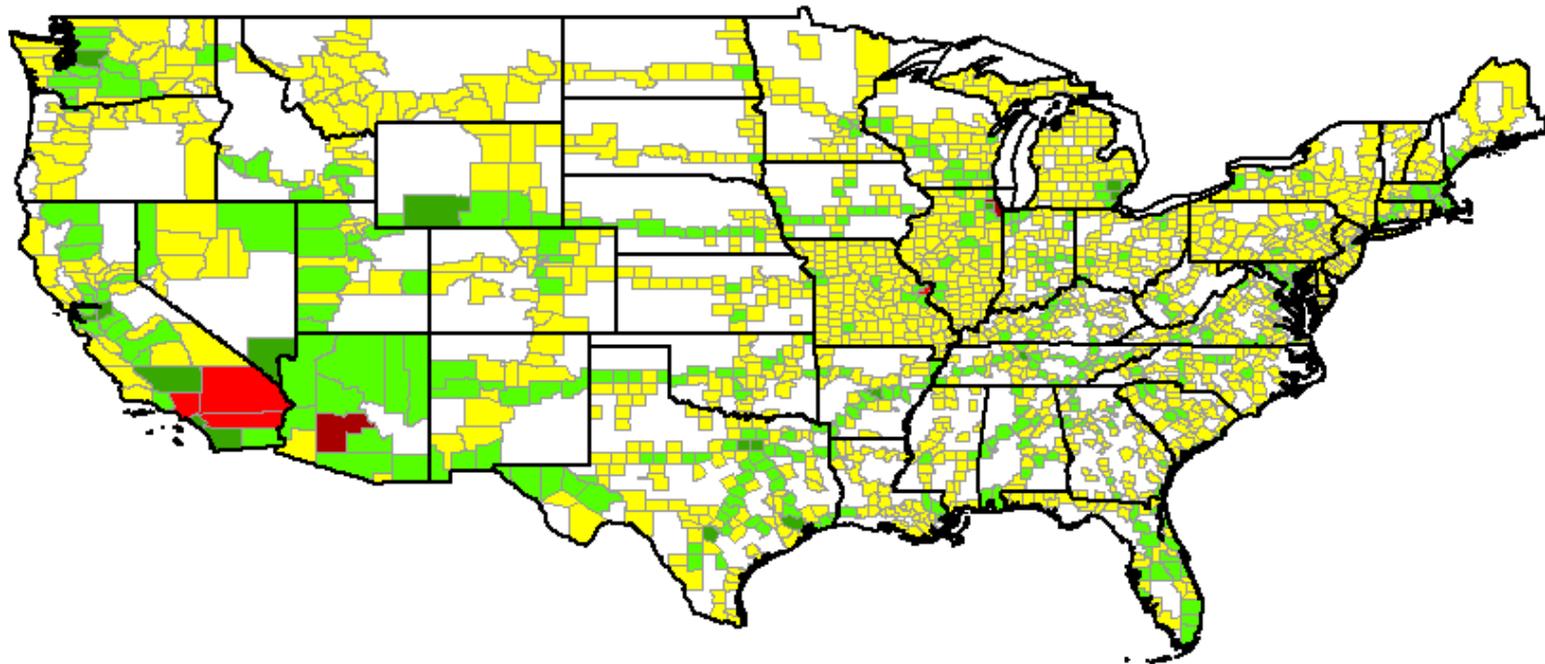
#### Legend

#### NEI v2 - NEI v1

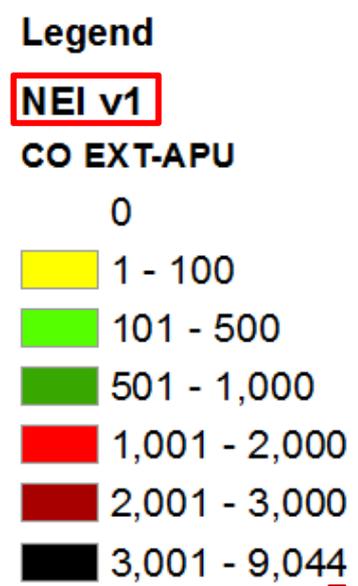
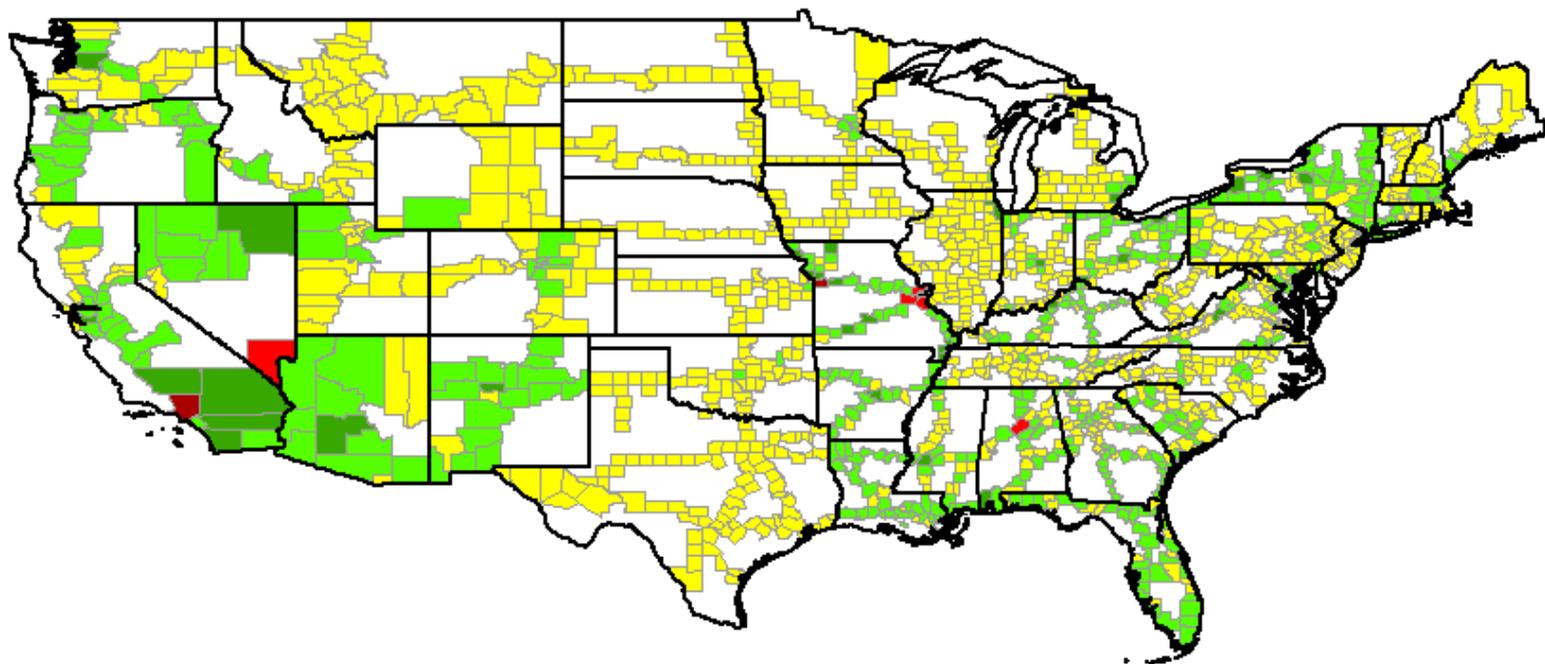
- 19,925.6 - -10,000.0
- 9,999.9 - -1,000.0
- 999.9 - -500.0
- 499.9 - 0.0
- 0.1 - 500.0
- 500.1 - 1,000.0
- 1,000.1 - 9,969.9

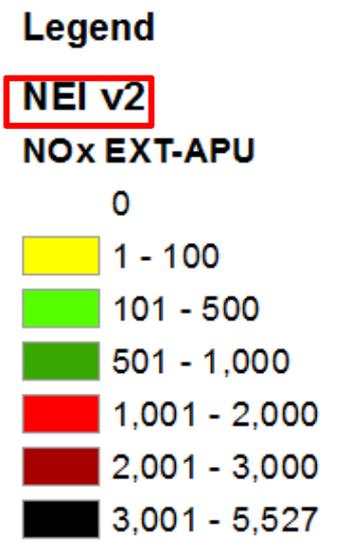
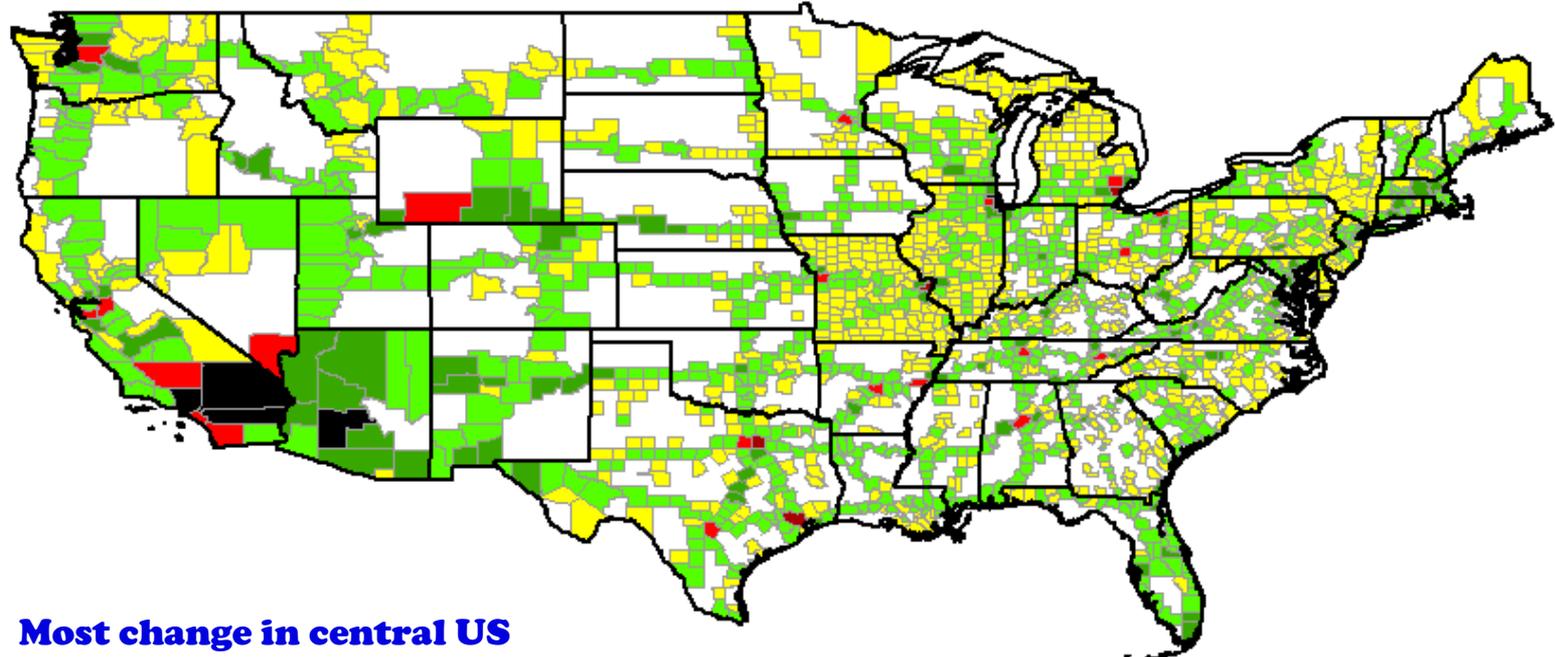
# **Extended Idling by Pollutant Version2 vs Version1**

**EXT-APU: Extended Idling -- Auxiliary Power Unit**

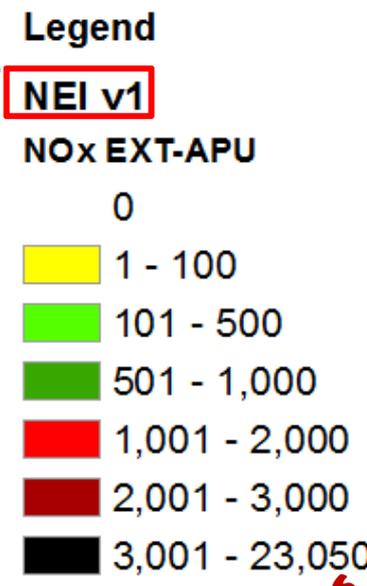
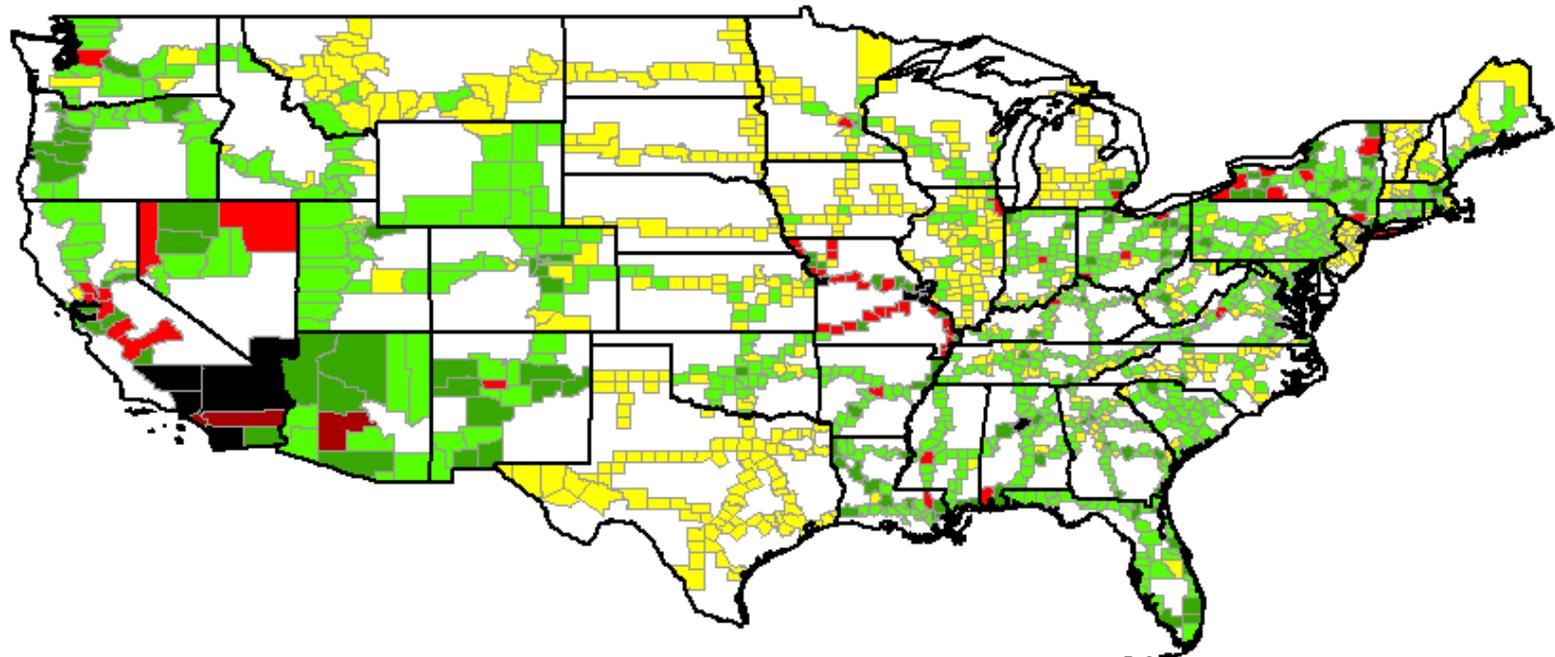


**In version2, EXT is no longer restricted to only rural interstates**

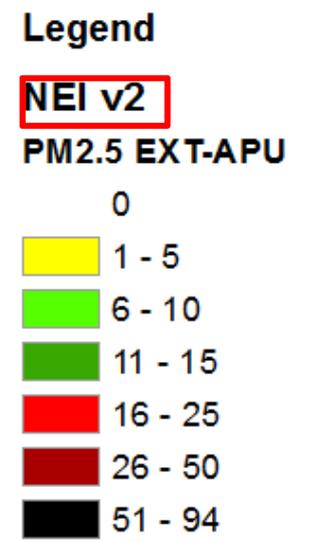
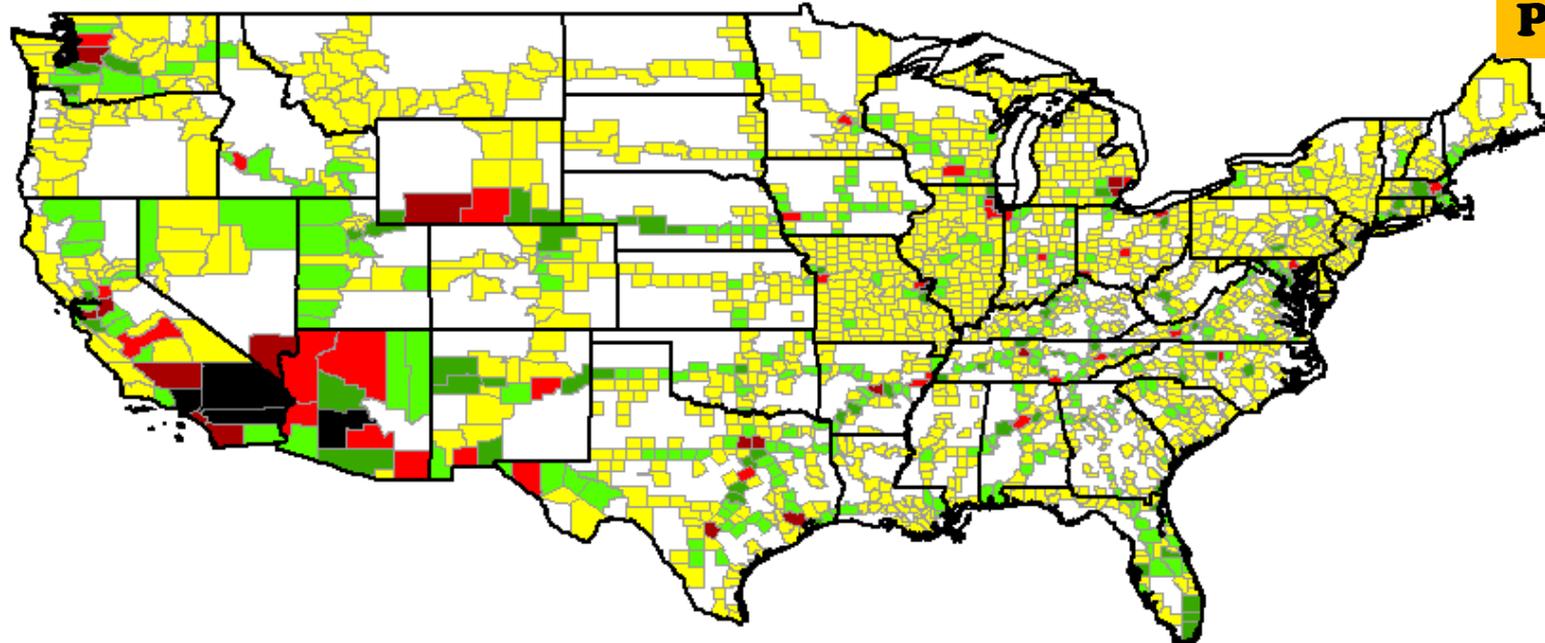




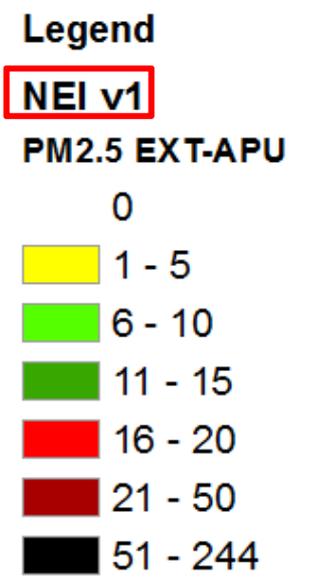
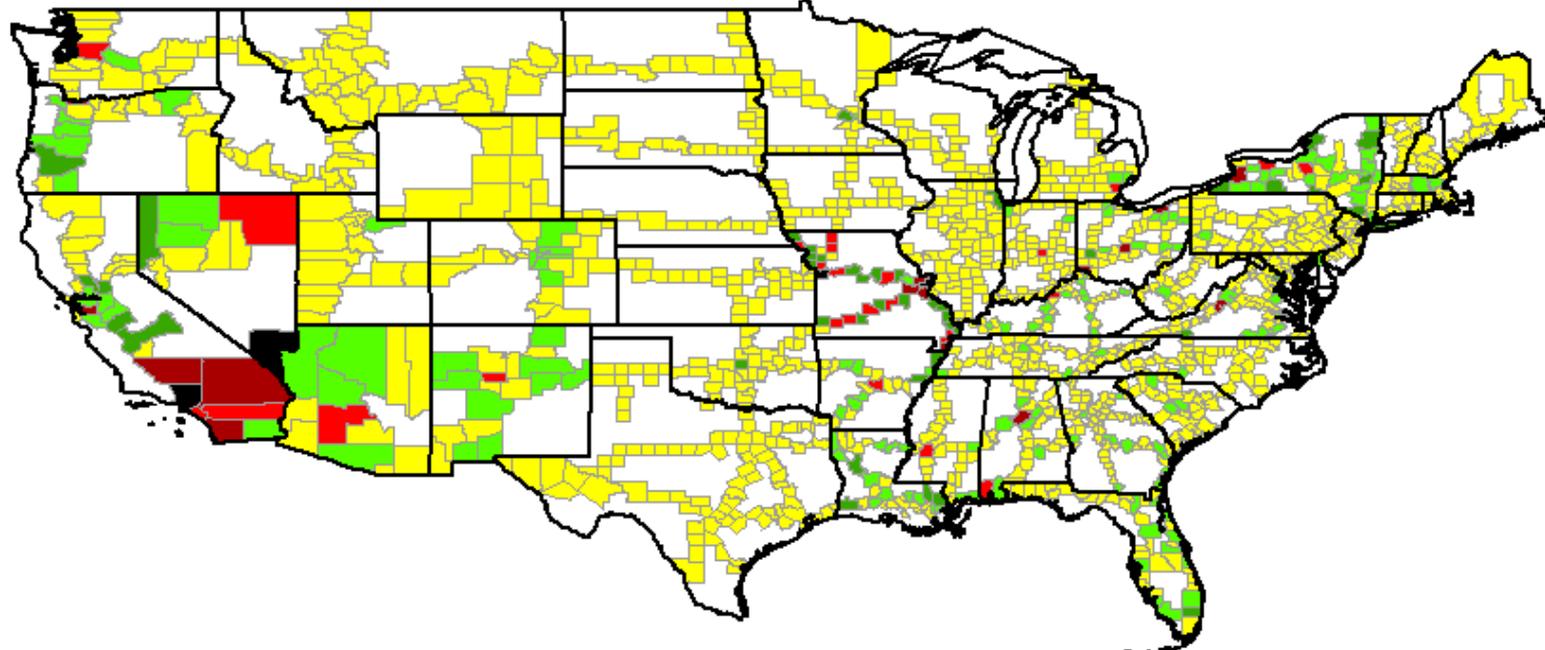
**Most change in central US**  
**Some changes reflect re-distributions of idling hours by states**

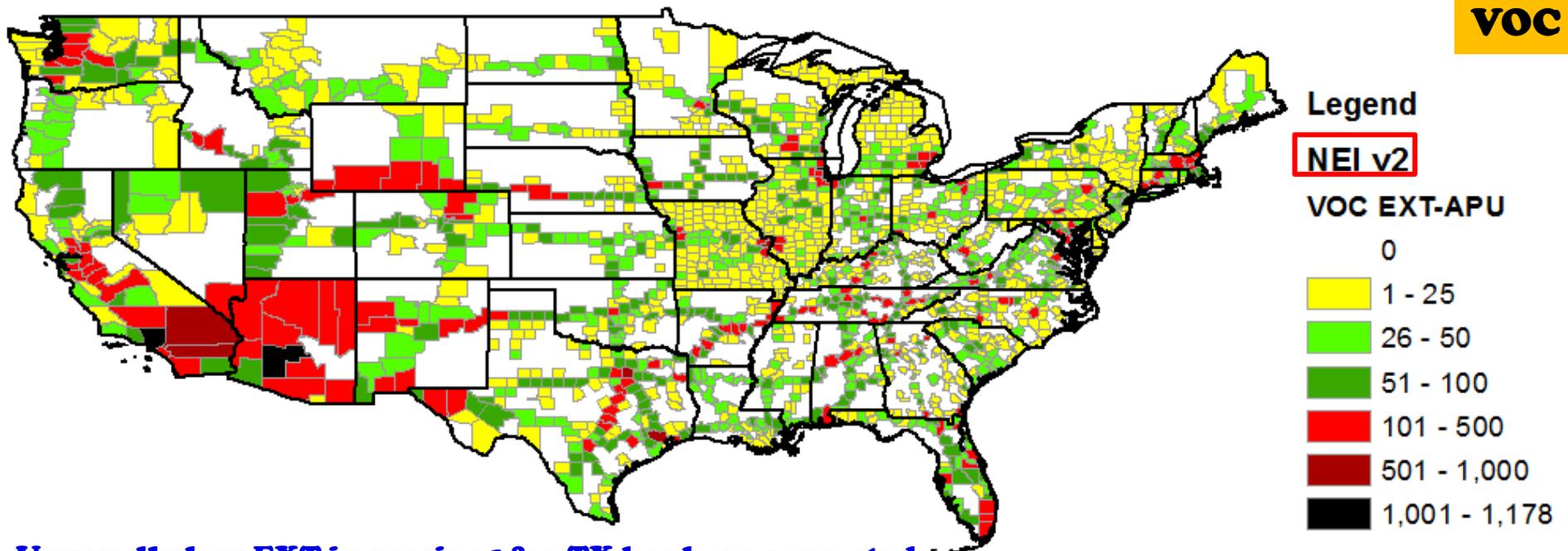


# Primary PM2.5

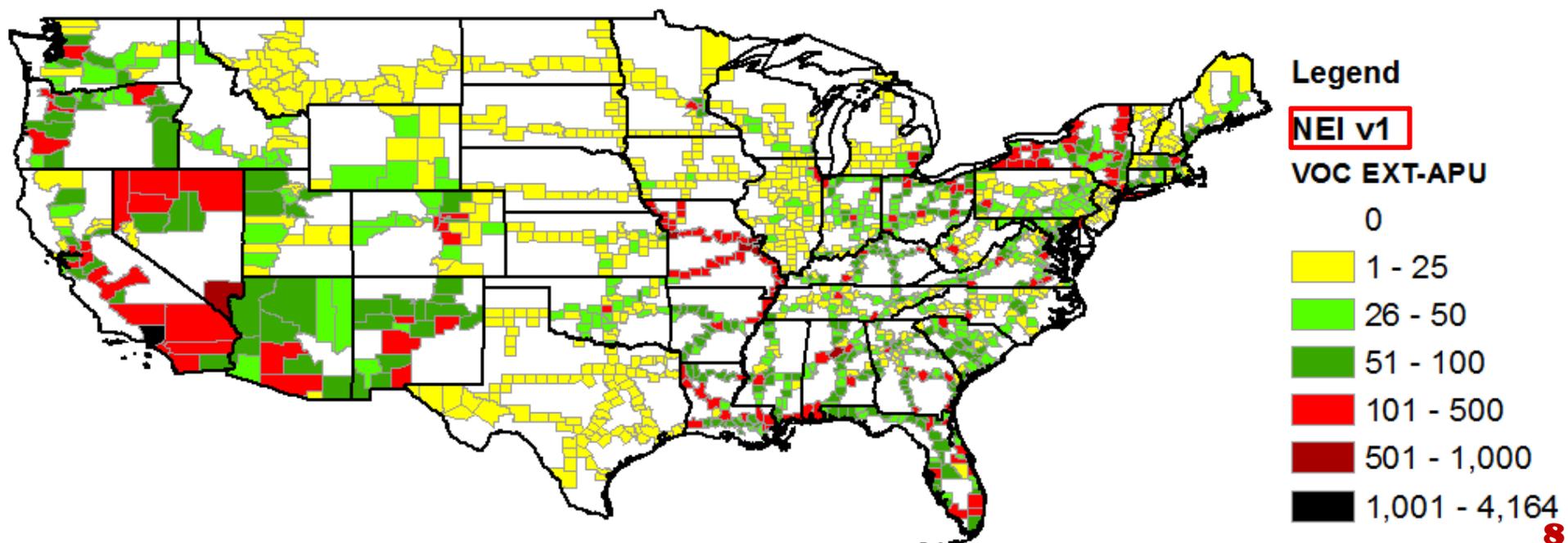


**WA, IL, MO, and MI now have EXT in every county (May 27 joint GA-VA presentation)**  
**NY EXT is now lower and more in line with neighboring states**





**Unusually low EXT in version1 for TX has been corrected**



# Summary on Extended Idling

- **EXT in version1 was based on VPOP and restricted to only rural interstates**
- **EXT in version2 is now based on idling hours and states are free to submit their own data to EPA**
- **EXT can now be in any county a state chooses**
- **Idling hours in version2 cannot be fully evaluated until modeling inventory (database, lookup tables and inputs to SMOKE) are made available**

**Expected release date? EPA please comment**

# Percent Makeup

**Activities (VPOP or VMT) and pollutants by  
“Composite” SCC6  
(composite vehicle type)**

**Fuel Type  
Road Type  
SCC6**

# Graphical Settings

- **Percent makeup:**

$$\% = (\text{individual subtotal} / \text{total}) * 100$$

**where subtotal is activity (VPOP/VMT) or pollutant by vehicle type, fuel type, or road type**

- **Data are plotted by county (on x axis) and grouped by state**

- **Two adjacent vertical lines demarcate data boundary for the state labeled on the right**

- **Focus on 2011NEI version2**

# VPOP/VMT Activity by CSCC6

## **“Composite” SCC6:**

- (1) Non-Diesel Passenger Cars**
- (2) Non-Diesel Passenger Trucks/Buses**
- (3) Non-Diesel Motorcycles**
- (4) Diesel Passenger Cars**
- (5) Diesel Trucks/Buses**

**Percentages from (1) to (5) should add up to 100**

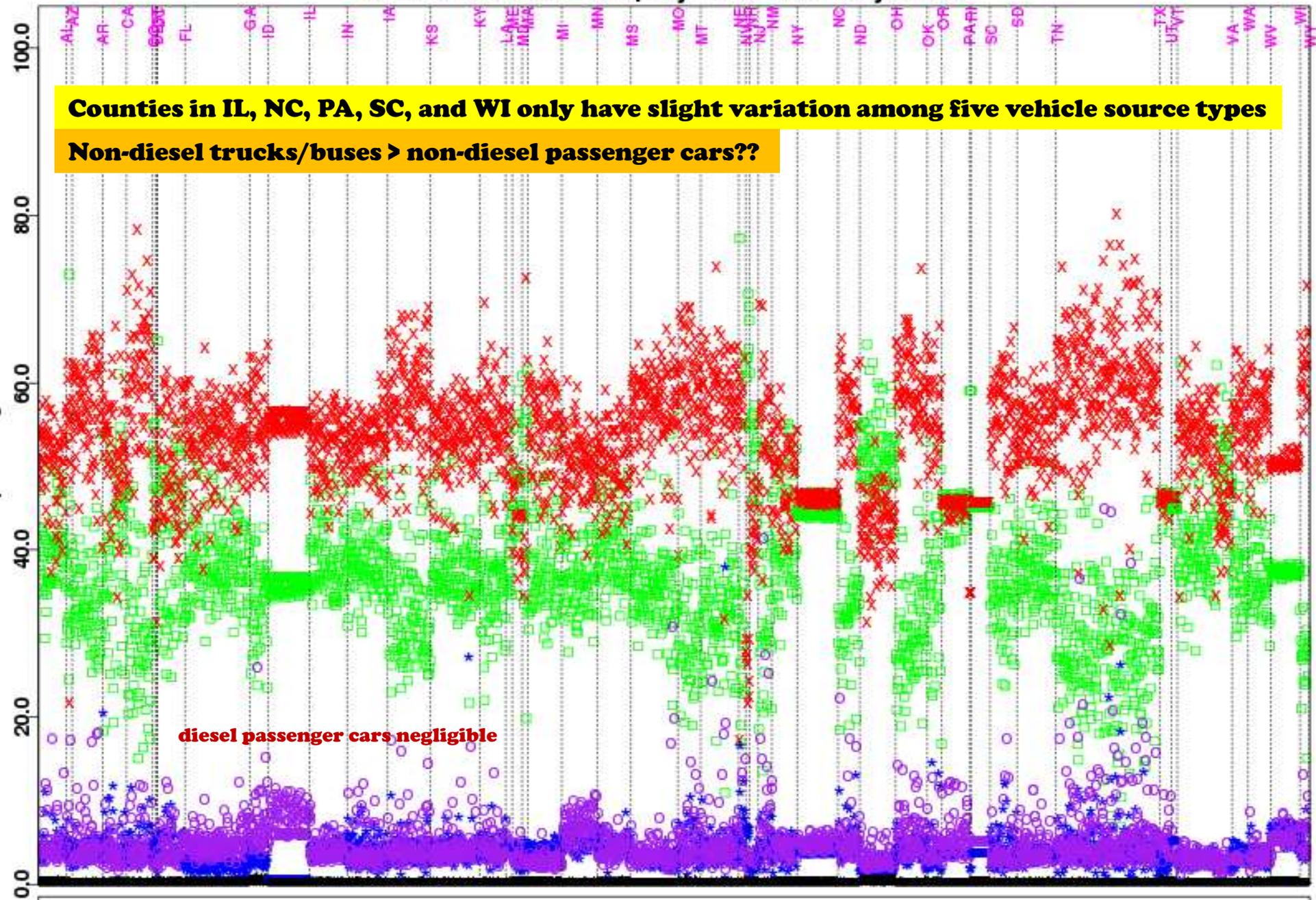
# VPOP Percent Makeup by CSCC6 and by State

Counties in IL, NC, PA, SC, and WI only have slight variation among five vehicle source types

Non-diesel trucks/buses > non-diesel passenger cars??

diesel passenger cars negligible

□ Non-Diesel Passenger Cars    X Non-Diesel Trucks/Buses    \* Non-Diesel Motorcycles    + Diesel Passenger Cars    ○ Diesel Trucks/Buses

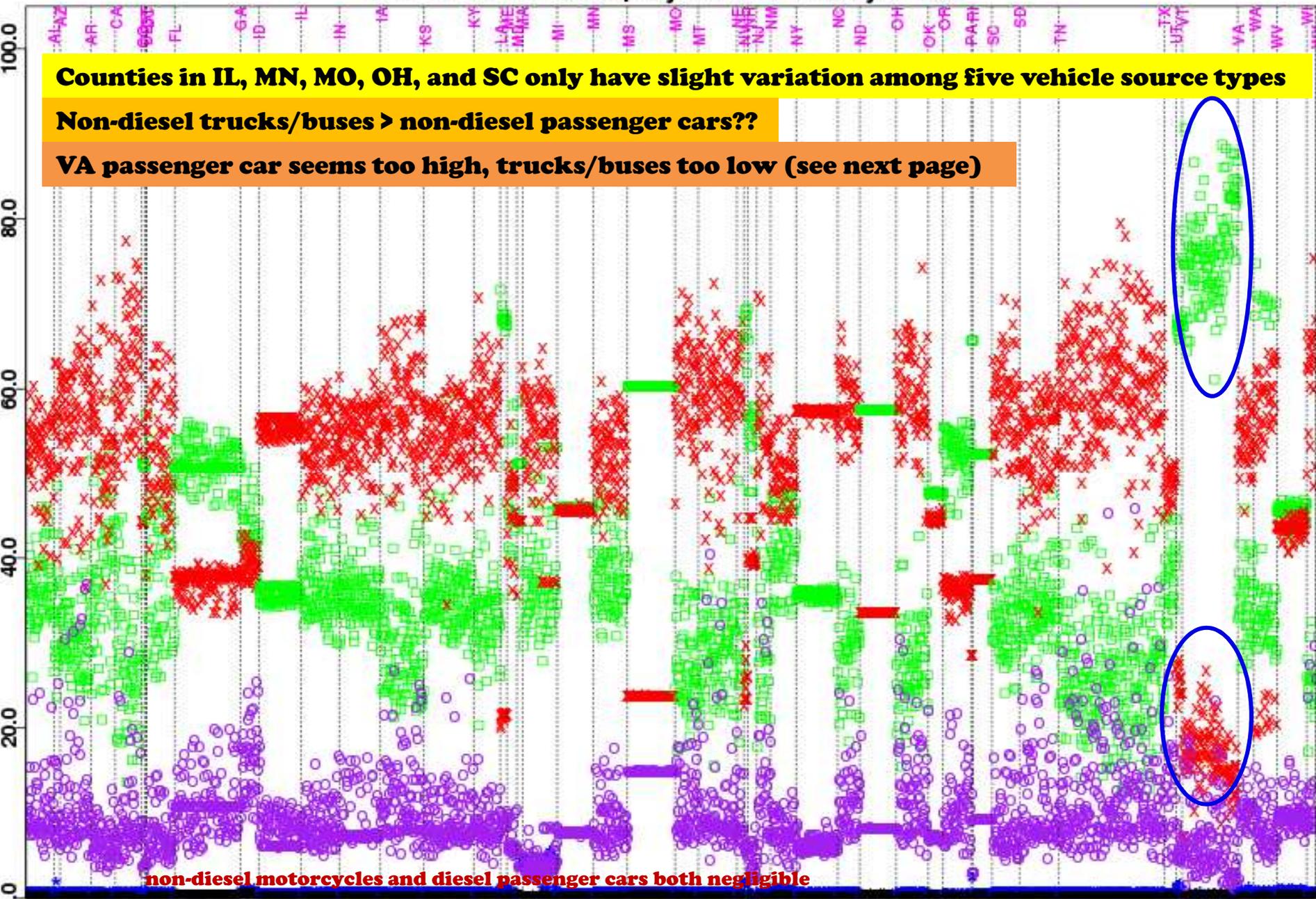


# VMT Percent Makeup by CSCC6 and by State

**Counties in IL, MN, MO, OH, and SC only have slight variation among five vehicle source types**

**Non-diesel trucks/buses > non-diesel passenger cars??**

**VA passenger car seems too high, trucks/buses too low (see next page)**



non-diesel motorcycles and diesel passenger cars both negligible

□ Non-Diesel Passenger Cars    × Non-Diesel Trucks/Buses    ★ Non-Diesel Motorcycles    + Diesel Passenger Cars    ○ Diesel Trucks/Buses

# Finding Cause for Irregular VA VMT

- ❑ VA provided EPA with VPOP & VMT by SCC in FF10 format for NEI submittal
- ❑ VA activity data was generated by MOVES2010
- ❑ Used conversion below to calculate VMT percentage by CSCC6 and compare with EPA 2011NEI version2

## Manual SCC Conversion

SCC7	Class	Description	CSCC6
2201001	LDGV	Light Duty Gasoline Vehicles	Non-diesel Passenger Cars
2201020	LDGT1	Light Duty Gasoline Truck 1 and 2	Non-diesel Trucks/Buses
2201040	LDGT2	Light Duty Gasoline Truck 3 and 4	Non-diesel Trucks/Buses
2201070	HDGV	Heavy Duty Gasoline Vehicles 2B thru 8B and Gasoline Buses	Non-diesel Trucks/Buses
2201080	MC	Motorcycles	Non-diesel Motorcycles
2230001	LDDV	Light Duty Diesel Vehicles	Diesel Passenger Cars
2230060	LDDT	Light Duty Diesel Trucks 1 thru 4	Diesel Trucks/Buses
2230071	2BHDDV	Heavy Duty Diesel Vehicles Class 2B	Diesel Trucks/Buses
2230072	LHDDV	Heavy Duty Diesel Vehicles Class 3, 4, and 5	Diesel Trucks/Buses
2230073	MHDDV	Heavy Duty Diesel Vehicles Class 6 and 7	Diesel Trucks/Buses
2230074	HHDDV	Heavy Duty Diesel Vehicles Class 8A and 8B	Diesel Trucks/Buses
2230075	BUSES	Heavy Duty Diesel Buses (School and Transit)	Diesel Trucks/Buses

# Re-creation of VMT by CSCC6

**Original VMT in FF10 generated by MOVES2010**

**Matches VMT by CSCC6 in 2011NEI version2!**



**□ EPA used VA MOVES2010-based FF10 which appears to be inconsistent with MOVES2014-based VMT allocation by CSCC6.**

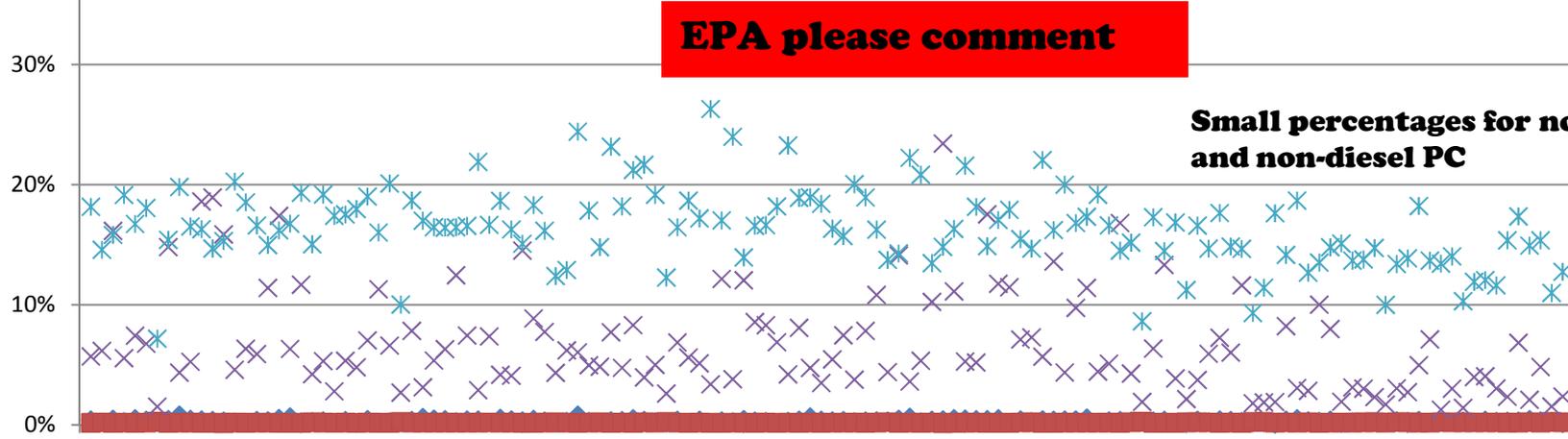
**□ How were activity data by CSCC6 for other states developed?**

**□ How did activity allocation methods (internal to MOVES) change between MOVES2010 and MOVE2014?**

- ◆ Non-Diesel MC
- Diesel PC
- ▲ Non-Diesel PC
- × Diesel TK
- × Non-Diesel TK

**EPA please comment**

**Small percentages for non-diesel MC and non-diesel PC**



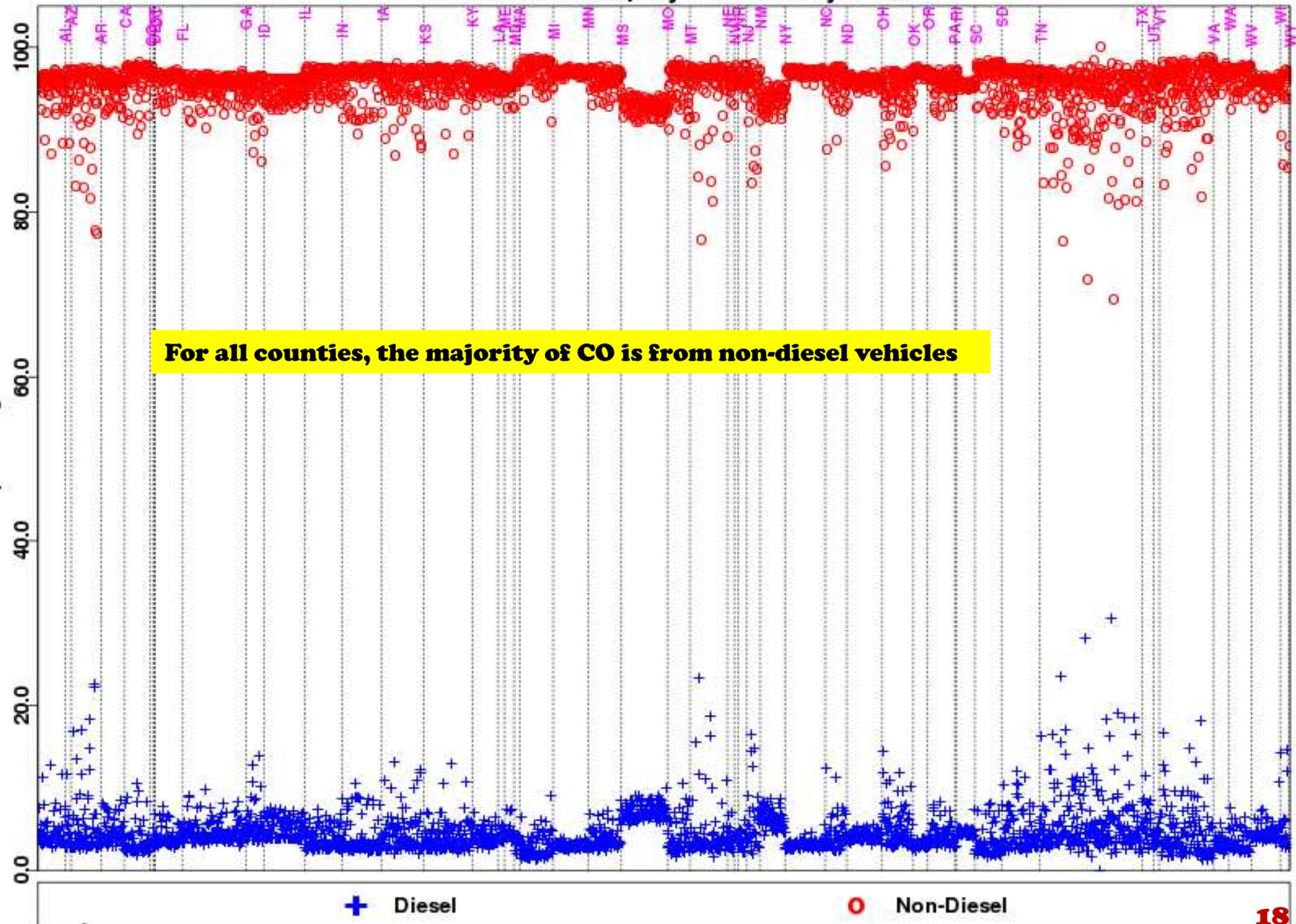
**county**

# **Pollutants by Fuel**

**Diesel and Non-diesel**

**Percentage from diesel and non-diesel should add up to 100**

# CO Percent Makeup by Fuel and by State



**For all counties, the majority of CO is from non-diesel vehicles**

**+** Diesel      **o** Non-Diesel

# NOx Percent Makeup by Fuel and by State

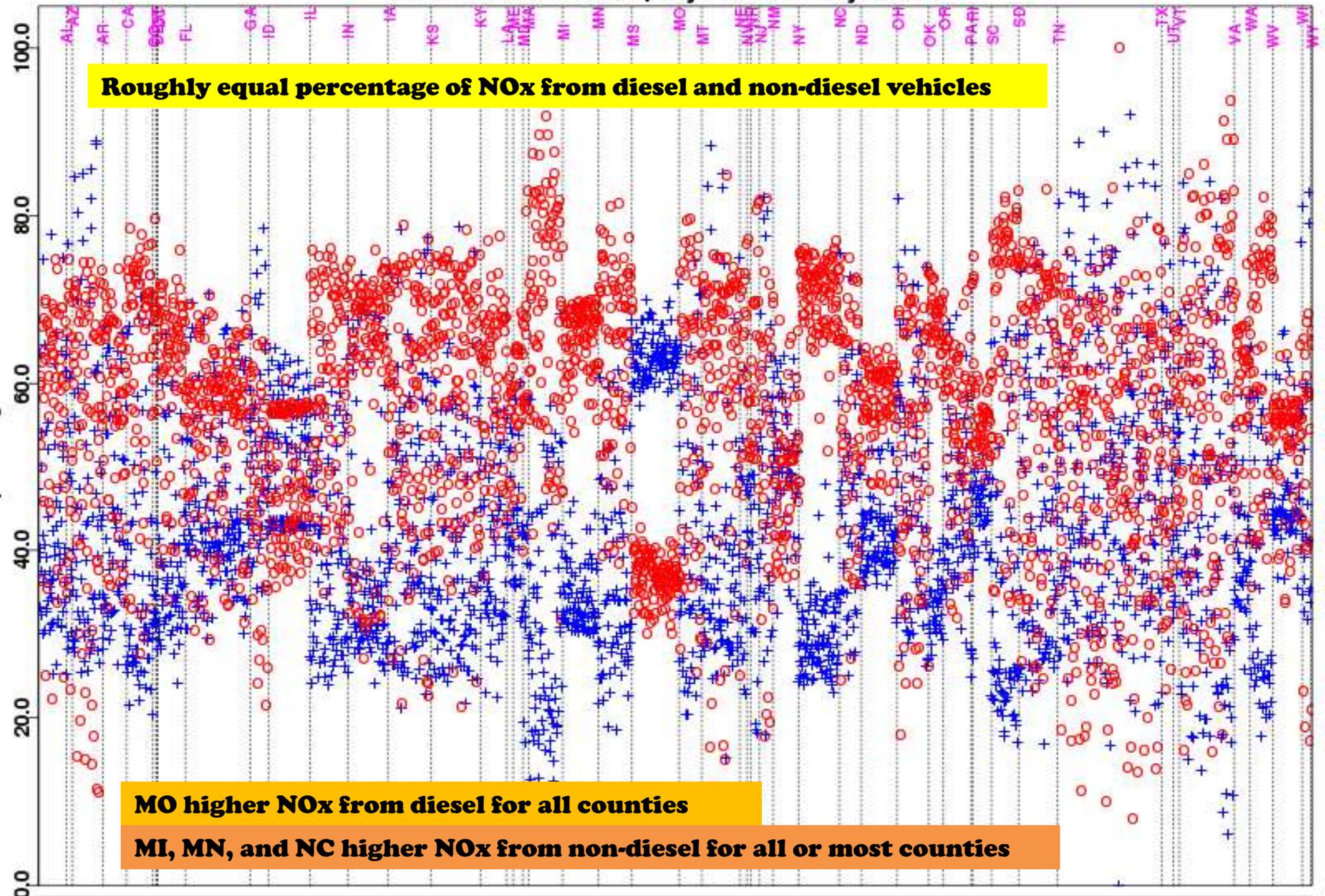
**Roughly equal percentage of NOx from diesel and non-diesel vehicles**

**MO higher NOx from diesel for all counties**

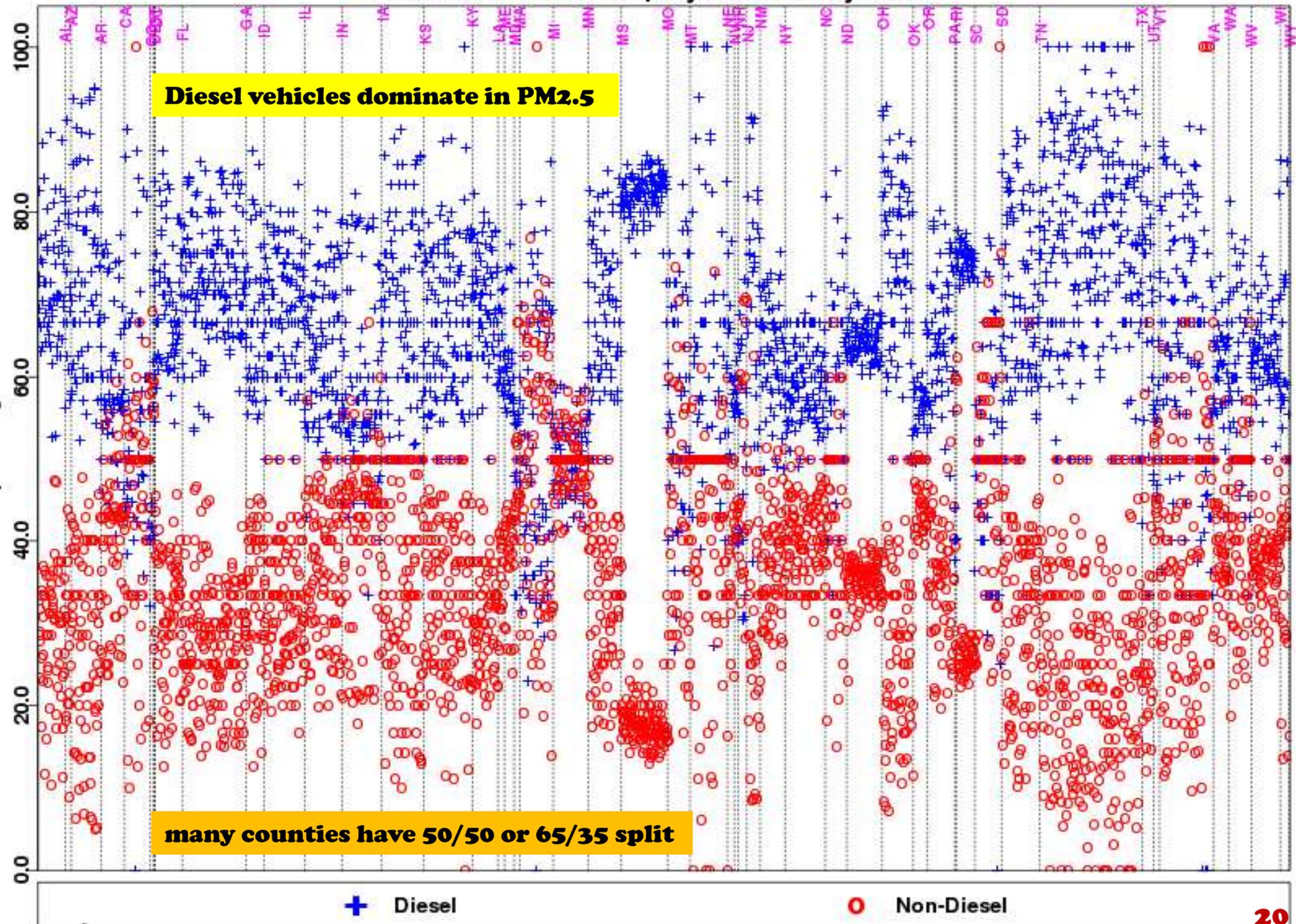
**MI, MN, and NC higher NOx from non-diesel for all or most counties**

**+** Diesel

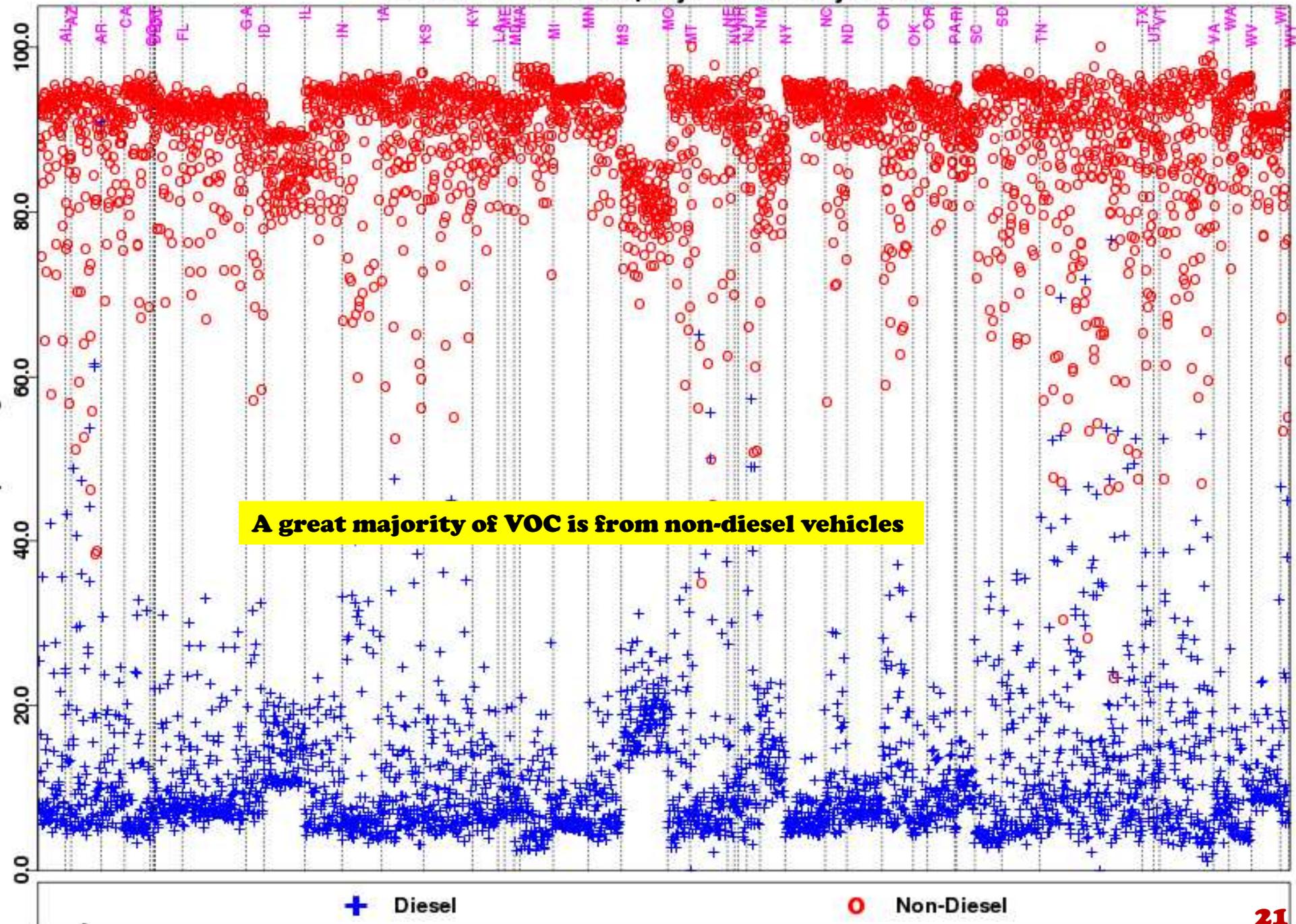
**o** Non-Diesel



# PM2.5 Percent Makeup by Fuel and by State



# VOC Percent Makeup by Fuel and by State



# Pollutants by Road Type

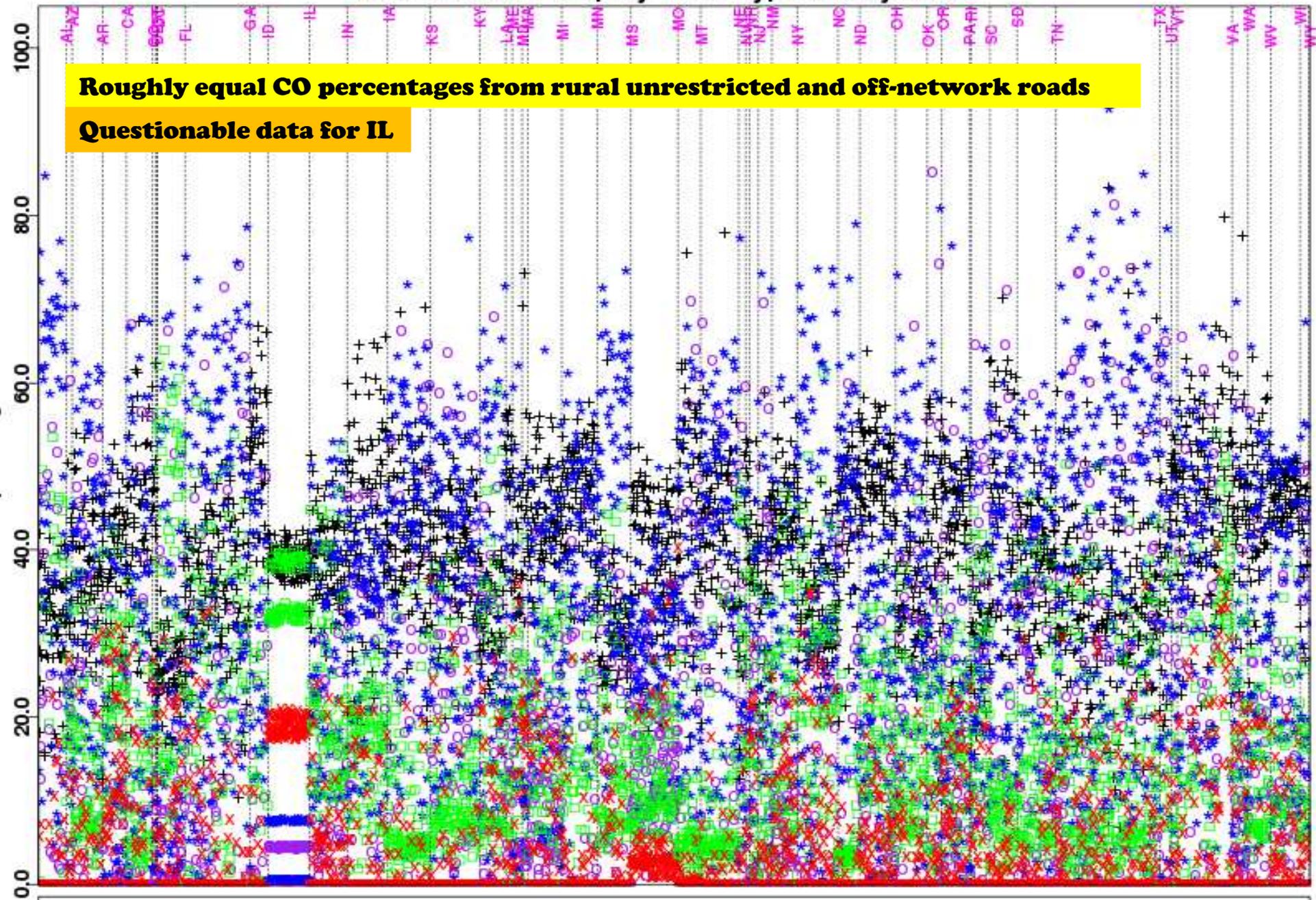
- (1) Off-network**
- (2) Rural Restricted Access**
- (3) Rural Unrestricted Access**
- (4) Urban Restricted Access**
- (5) Urban Unrestricted Access**

**Percentages from (1) to (5) should add up to 100**

# CO Percent Makeup by Road Type and by State

**Roughly equal CO percentages from rural unrestricted and off-network roads**

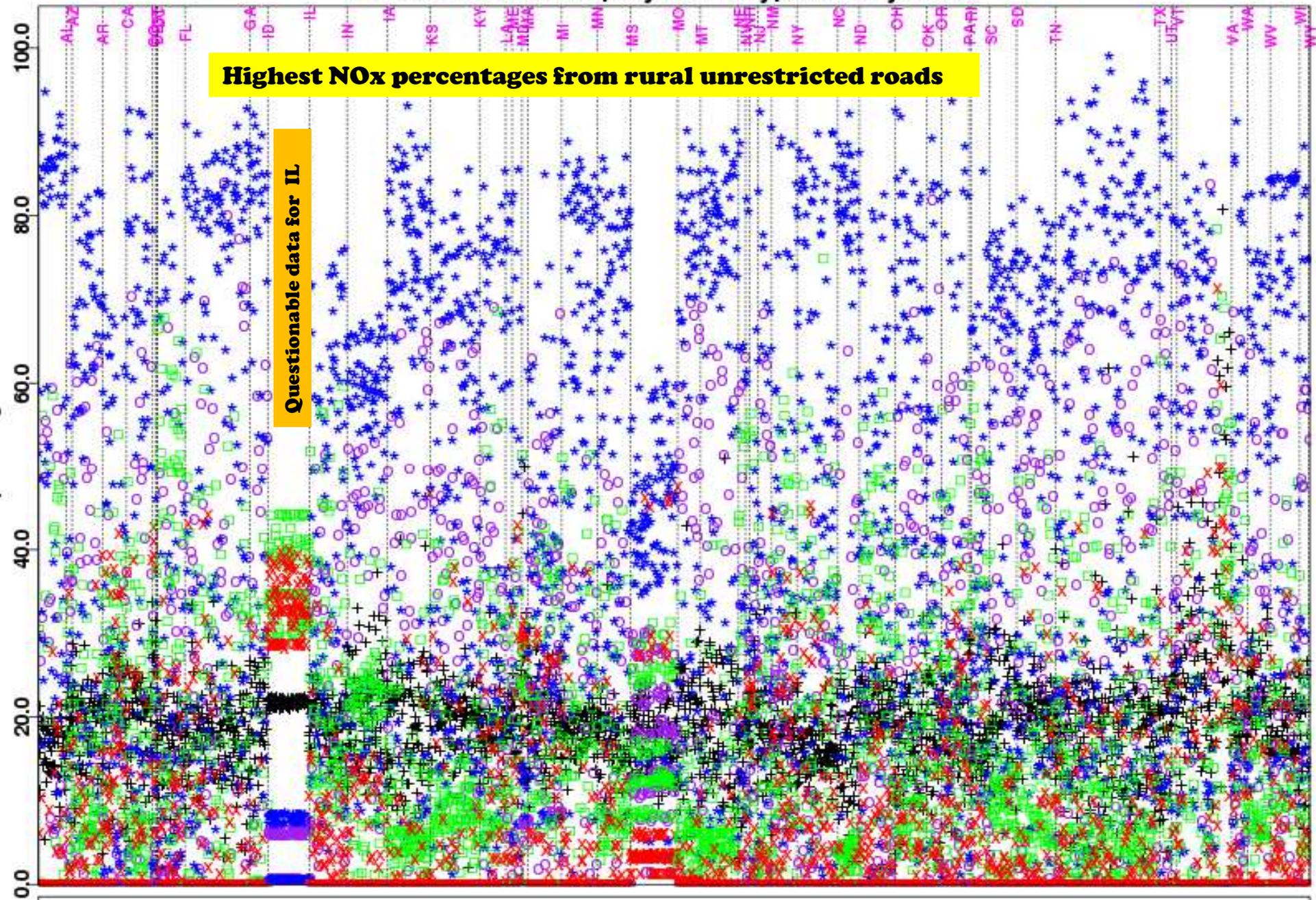
**Questionable data for IL**



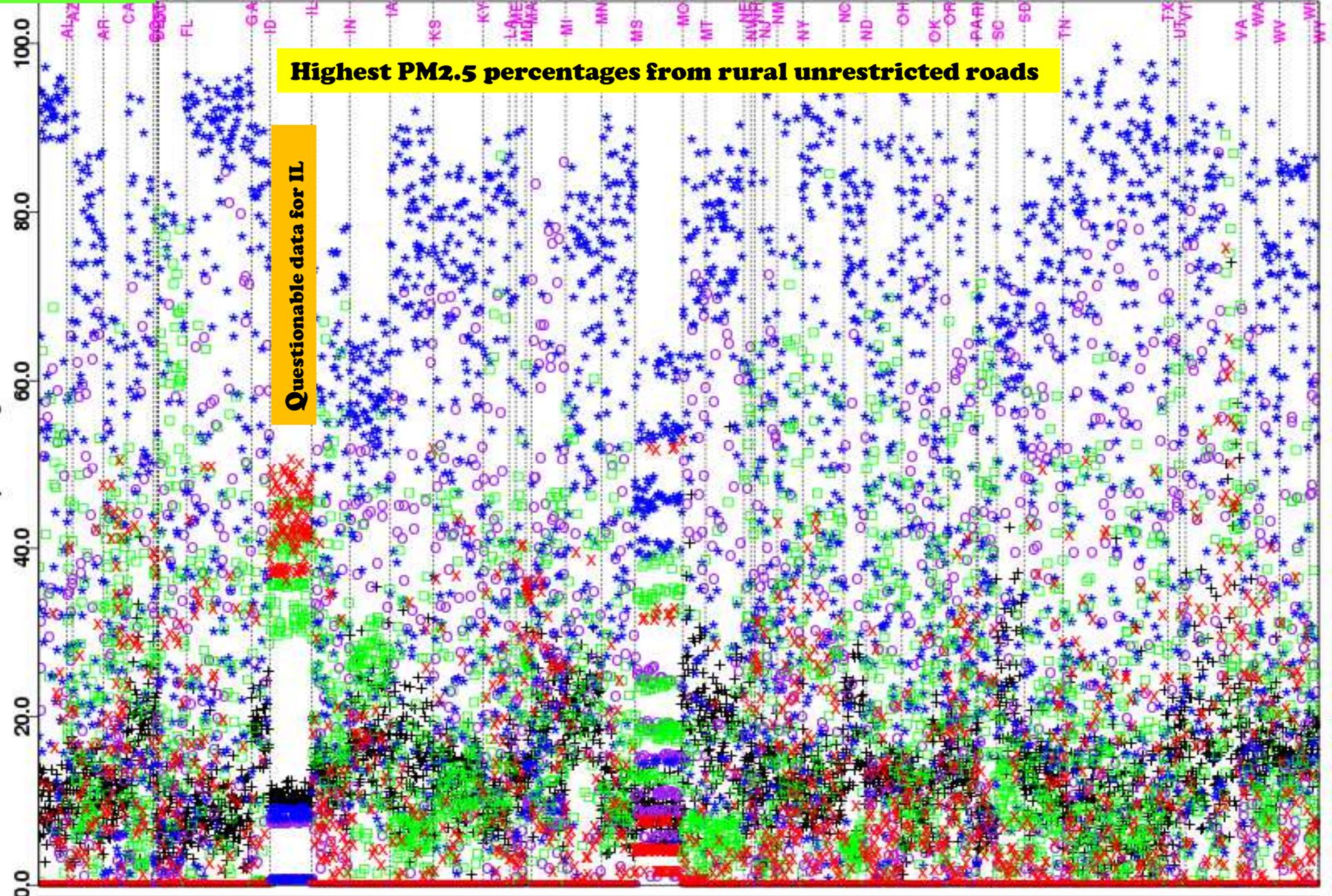
# NOx Percent Makeup by Road Type and by State

**Highest NOx percentages from rural unrestricted roads**

**Questionable data for IL**



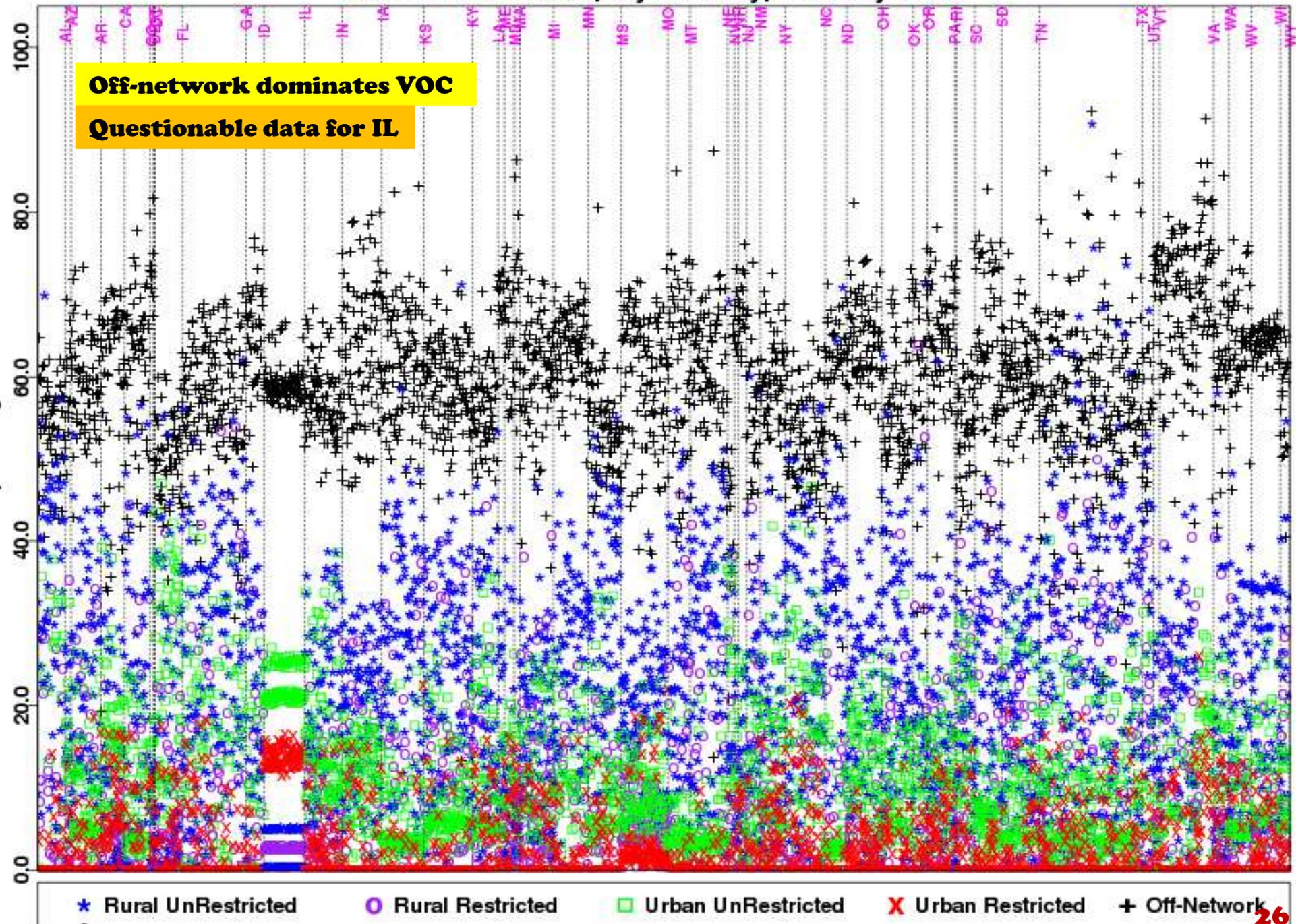
★ Rural UnRestricted    ○ Rural Restricted    □ Urban UnRestricted    × Urban Restricted    + Off-Network



Highest PM2.5 percentages from rural unrestricted roads

Questionable data for IL

# VOC Percent Makeup by Road Type and by State



# Pollutants by SCC6

**AAFFVVRRPP**

**AA: Mobile Source (22)**

**F F: MOVES Fuel Types**

**VV: MOVES Source Types**

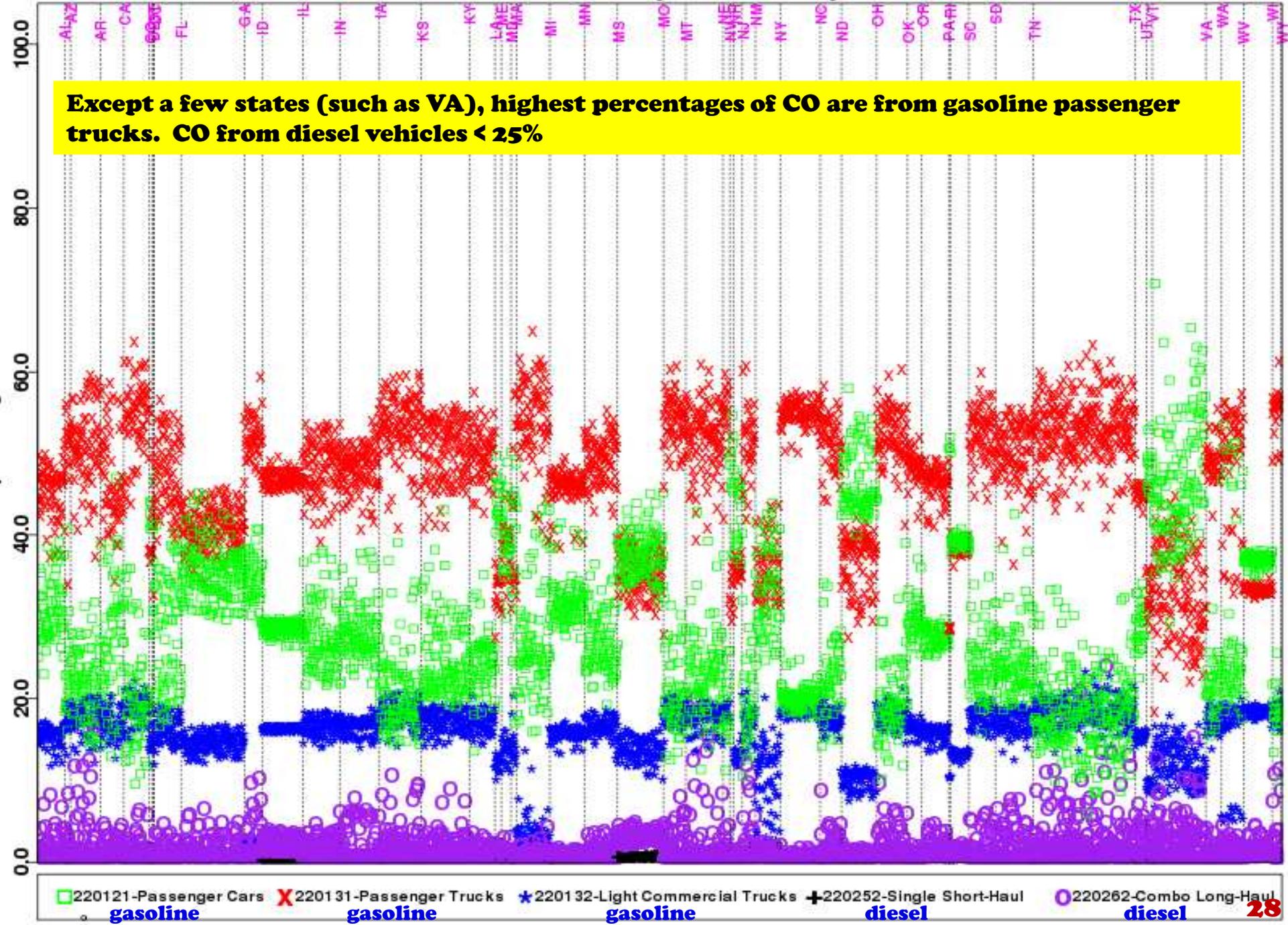
**RR: MOVES Road Types**

**P P: MOVES Emission Processes**

**Percentages in the plots may not add up to 100**

# CO Percent Makeup by SCC6 and by State

**Except a few states (such as VA), highest percentages of CO are from gasoline passenger trucks. CO from diesel vehicles < 25%**

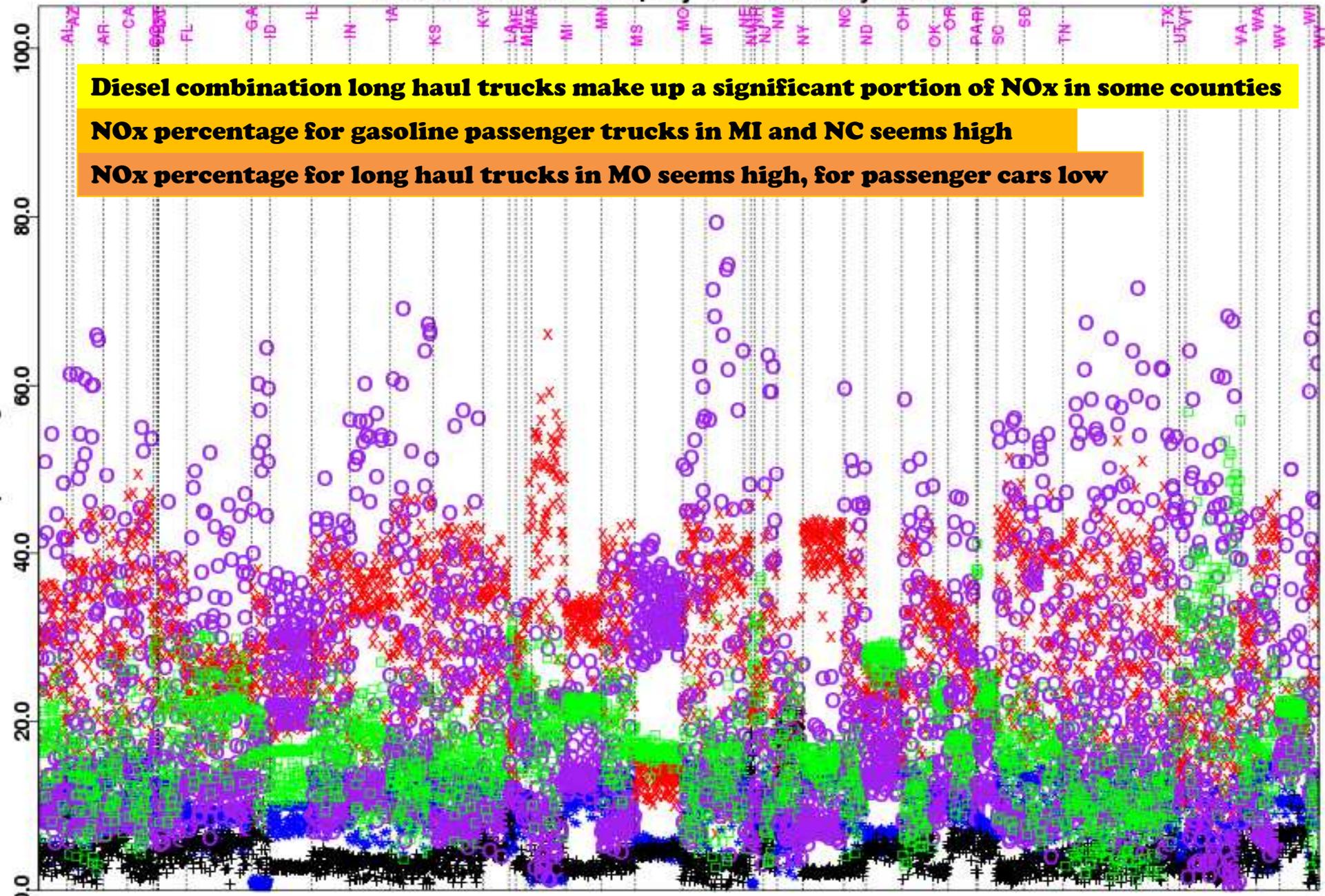


# NOx Percent Makeup by SCC6 and by State

**Diesel combination long haul trucks make up a significant portion of NOx in some counties**

**NOx percentage for gasoline passenger trucks in MI and NC seems high**

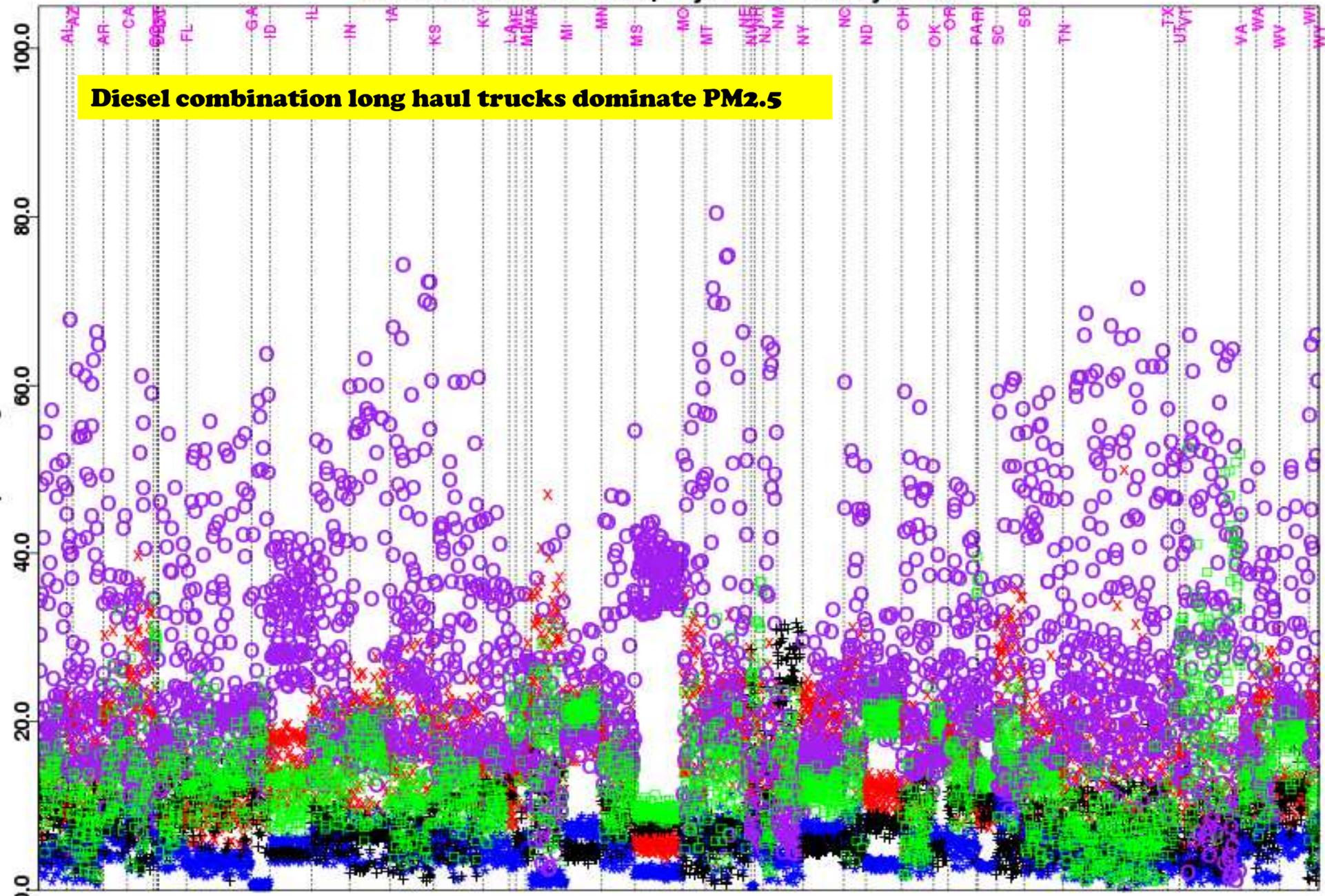
**NOx percentage for long haul trucks in MO seems high, for passenger cars low**



■ 220121-Passenger Cars X 220131-Passenger Trucks ★ 220132-Light Commercial Trucks + 220252-Single Short-Haul ○ 220262-Combo Long-Haul  
○ gasoline X gasoline ★ gasoline + diesel ○ diesel

# PM2.5 Percent Makeup by SCC6 and by State

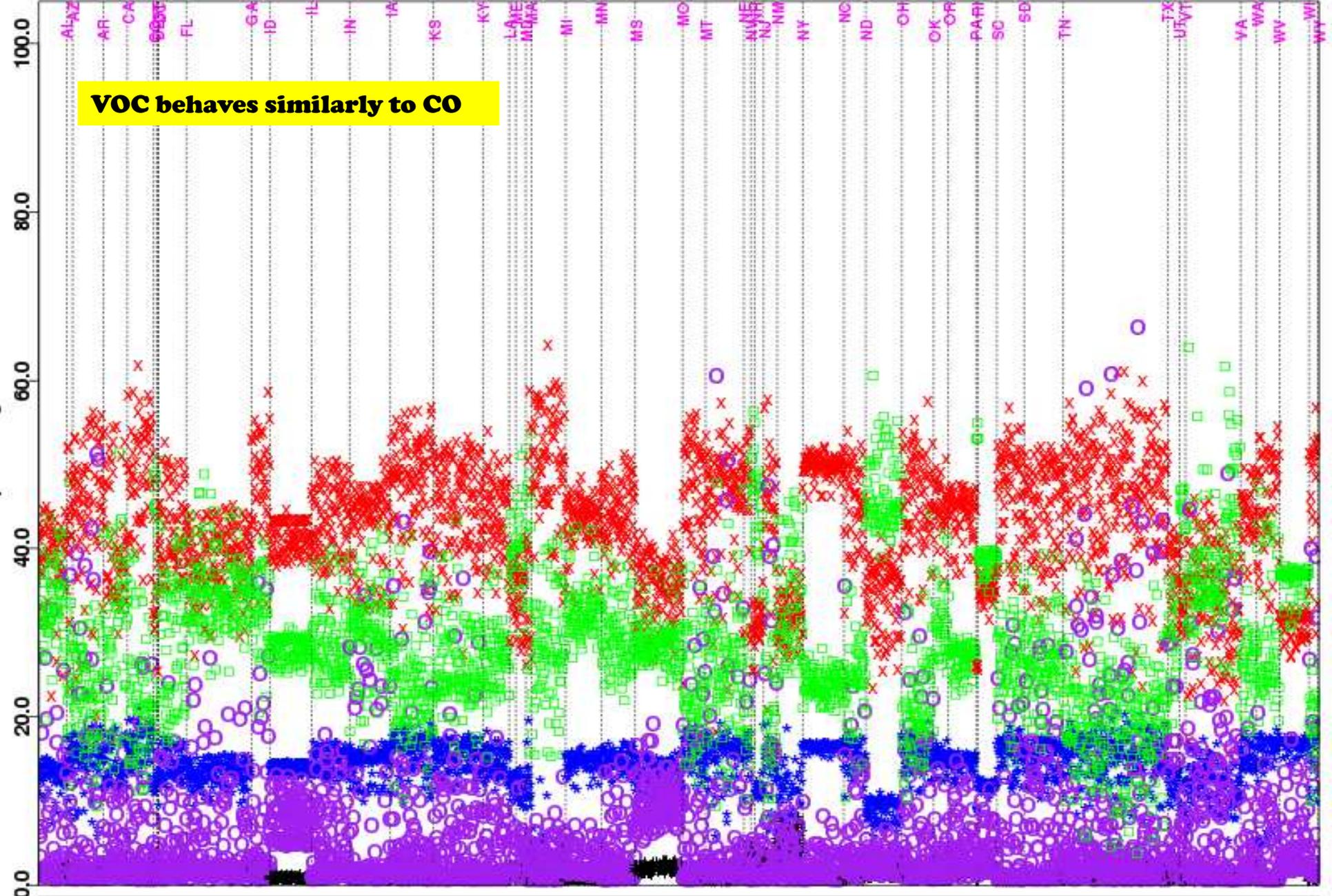
**Diesel combination long haul trucks dominate PM2.5**



- 220121-Passenger Cars gasoline
- 220131-Passenger Trucks gasoline
- 220132-Light Commercial Trucks gasoline
- 220252-Single Short-Haul diesel
- 220262-Combo Long-Haul diesel

# VOC Percent Makeup by SCC6 and by State

**VOC behaves similarly to CO**



■ 220121-Passenger Cars X 220131-Passenger Trucks ★ 220132-Light Commercial Trucks + 220252-Single Short-Haul ○ 220262-Combo Long-Haul  
gasoline gasoline gasoline diesel diesel

# Summary on Activity/Pollutant Makeup

- **VMT from gasoline motorcycles and diesel passenger cars is negligible**
- **Majority of CO is from non-diesel vehicles, and from rural unrestricted and off-network roads**
- **NOx from diesel and non-diesel vehicles is roughly equal, and is highest from rural unrestricted roads**
- **Majority of PM2.5 is from diesel vehicles, and from rural unrestricted roads**
- **Majority of VOC is from non-diesel vehicles, and from off-network roads**
- **Diesel combination long haul trucks make up a significant portion of NOx in some counties, and dominate PM2.5 emissions for most counties**

# Recommendation

- **EPA should examine questionable activity and emission data for selected states and revise as appropriate.**
- **Activity data (VPOP and VMT) by SCC (or FF10 for SMOKE-MOVES) should be obtained directly from MOVES2014 model output. The use of multiple methods leads to inconsistent results (as demonstrated in this study)**
- **Again for consistency, EPA should no longer request activity data by SCC from states.**