



Emissions Inventory: Lessons Learned and Future Plans for PM_{2.5}, Haze, and Ozone

VISTAS-SESARM
MARAMA meeting
February 10, 2009



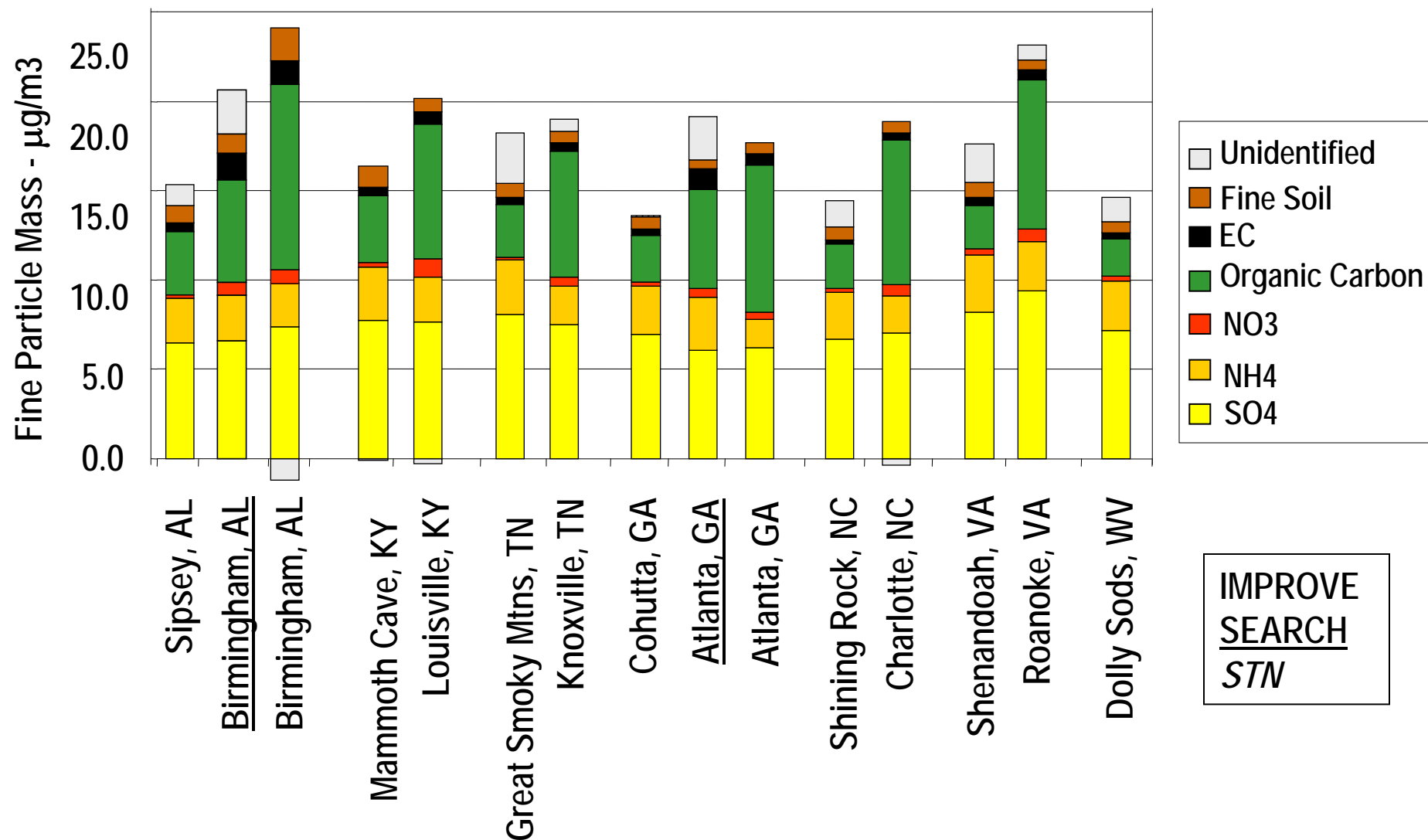
Lessons Learned in the Regional Haze Program



- Class I areas in the Southeast are not remote, located near $PM_{2.5}$ and ozone non-attainment areas
 - Urban and Class I areas have common regional pollutant contributions (SO_4 , carbon)
 - Urban areas have additional local increment (NO_3 , OC, EC, metals)
 - Emissions controls to address $PM_{2.5}$ nonattainment areas will also reduce $PM_{2.5}$ and improve visibility in Class I areas
 - Integrated air quality management approach needed for ozone, $PM_{2.5}$, and haze

PM2.5 constituents are similar at urban and nearby Class I Areas

2002 3rd Quarter Fine Particle Mass – Southern Appalachian Sites



IMPROVE
SEARCH
STN



Lessons Learned in the Regional Haze Program



- SO₂ most important contributor to PM_{2.5} and haze in the Southeast
 - Fortunately, high confidence in SO₂ inventory
 - In VISTAS states, point sources are 96% of total SO₂ inventory
 - Even assuming EGU controls under CAIR, in 2018 EGU are still largest contributors to SO₄
 - Second largest source category is coal-fired industrial boilers



Lessons Learned in the Regional Haze Program



- Organic carbon is major contributor to $PM_{2.5}$ and haze in the Southeast
 - Higher OC at urban monitors than Class I areas
 - Primary $PM_{2.5}$ from biomass or fossil fuels
 - Secondary organic aerosol, mostly biogenic
- Elemental carbon is important in $PM_{2.5}$ non-attainment areas, less so at Class I areas
 - Primary $PM_{2.5}$ from incomplete combustion of biomass or fossil fuels



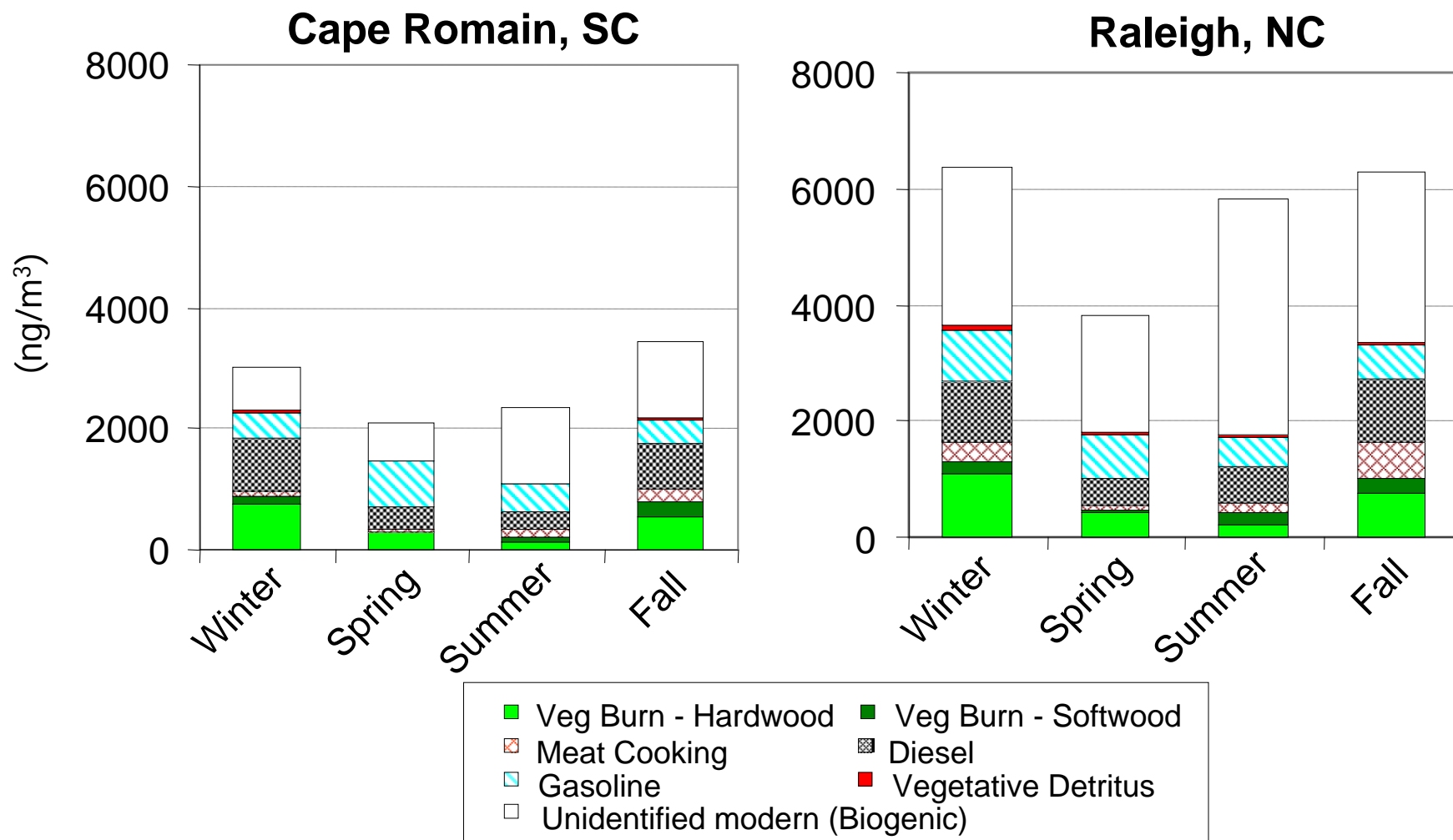
Lessons Learned in the Regional Haze Program



- Carbon inventory needs improvement!
 - Improved profiles for mobile, nonroad, point, and area sources
 - LADCO-NREL project to improve mobile profiles
 - Speciation of PM_{2.5} from point sources
 - Fire activity and emissions
 - Significant impacts to ozone, daily PM_{2.5}, haze
 - Biogenic emissions

CMB-C14 Apportionment of Total Carbon

Largest contributions from biomass burning, mobile, and unidentified modern carbon attributed to biogenic emissions





Lessons Learned in the Regional Haze Program



- NO_3 small contributor to $\text{PM}_{2.5}$ in Southeast
 - NO_x and NH_3 contribute to NH_4NO_3
 - NH_4NO_3 may be elevated on some winter days
 - NO_x fairly good inventory
 - incomplete combustion of fossil fuels, biomass, livestock, biogenic
 - NO_x emissions important for ozone
- NH_3 inventory needs improvement!
 - Primarily from livestock and fertilizers, also human waste management systems
 - Large uncertainty in current assumptions



Lessons Learned in the Regional Haze Program



- “Soil” or “Crustal” minor contributor to $PM_{2.5}$ in Southeast except in local nonattainment areas
 - Need better $PM_{2.5}$ profiles
 - Industrial PM profiles include metals in “soil” category with crustals, leads model to over predict “soil”
 - Fugitive dust is issue for West, not populated east



Lessons Learned in the Regional Haze Program



- Emissions Inventories need to support Air Quality Modeling
 - Speciation of primary PM_{2.5}
 - Temporal allocation: how much simplification is too much?
 - Utility daily and annual profiles
 - Mobile profiles
 - NH₃
 - Improve spatial resolution of inventory data for modeling
 - E.g. fire, agricultural emissions, rail yards as point source emissions

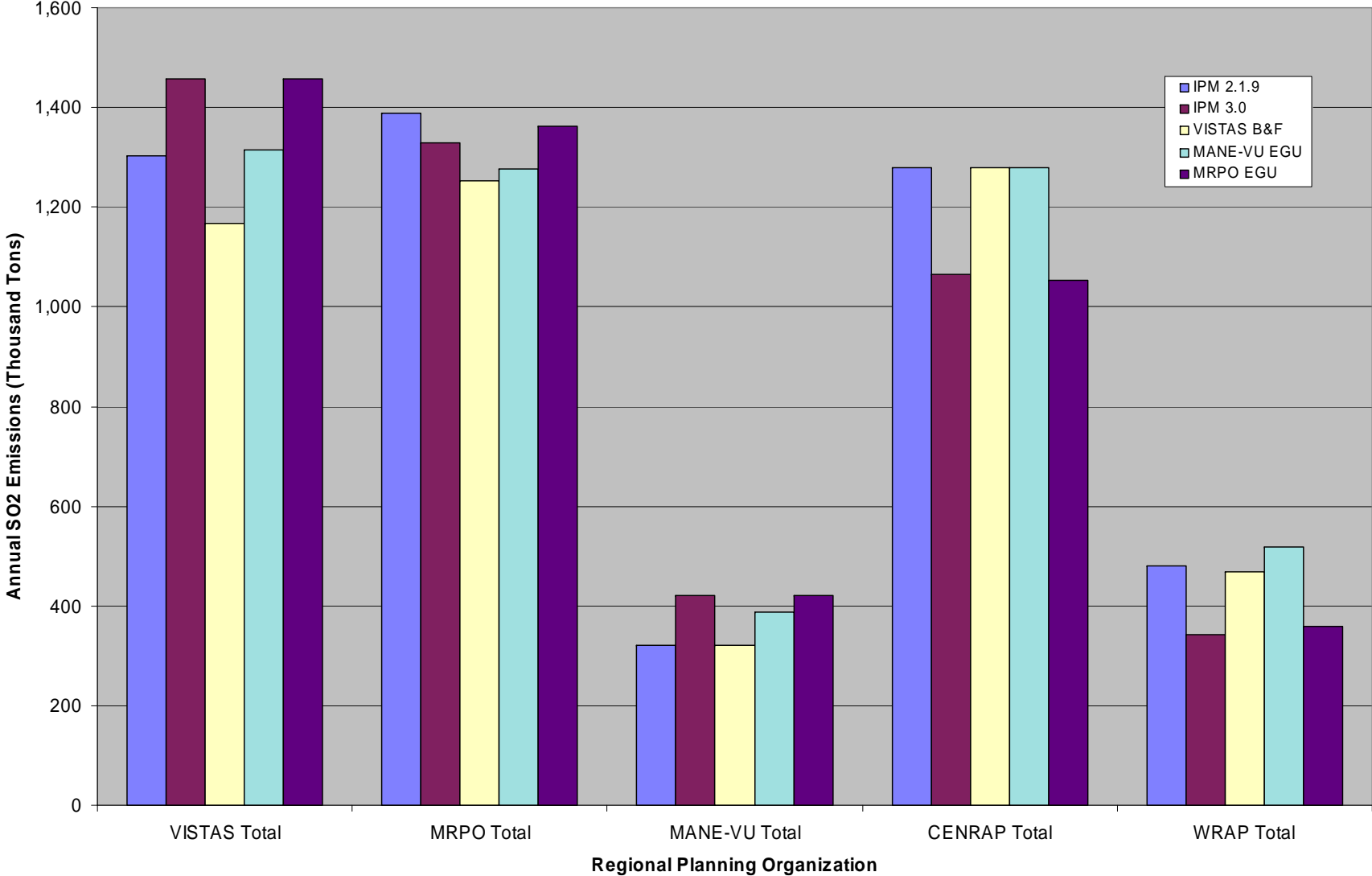


Lessons Learned in the Regional Haze Program



- Process and Policy
 - RPOs shared methods and inventories, but schedules didn't align across RPOs
 - Eastern RPOs used different utility projections
 - Range of 2018 forecasts reflects future uncertainties; we won't know which is most accurate until 2018
 - GA and NC have state rules for EGU controls
 - Consent decrees and federal court order require additional controls in AL, FL, KY, SC, TN, VA, WV
 - Eastern RPOs need to coordinate inventories better for next SIPs

Annual 2018 EGU Emission Totals





Planning for Next SIPs



- One-atmosphere modeling for ozone, PM_{2.5}, haze SIPs
 - One emissions inventory supporting all SIPs
 - VISTAS is currently reviewing bids in response to request for proposals re emissions inventory development
 - Contractor to support state inventory staff
 - Expect contractor selection by end of Feb 2009
 - Working with ERTAC to define improvements for base year inventory and projection methods
 - Expect to follow ERTAC recommendations unless issues



Planning for Next SIPs

Southeastern State



Air Resource Managers

- No one modeling base year will be representative for all Southeastern states
 - 2005 hurricanes in Gulf, more typical for NC, VA
 - 2007 record drought, large fires in GA and FL
 - 2008 still drought, large fire in eastern NC affected VA
- Assume that 2008 is focus for emissions development
 - 2008 inventory will not be available until 2010
 - Expect to do preliminary modeling with an initial 2005 inventory
 - Evaluate 2005 LADCO and NEI inventories for initial modeling
 - May use meteorology from more than one base year for modeling demonstrations, still to be evaluated

June 2008 fires in eastern NC





Planning for Next SIPs



- VISTAS Inventory priorities
 - EGU projections: what requirements, what controls, where, when
 - Fire: how much can we afford to do?
 - NH₃ emissions from agricultural sources
 - Mobile emissions improvements
 - Rail improvements per ERTAC
 - ERTAC recommendations re area source methods
 - Better international emissions
 - Cuban emissions added?
 - Work with EPA to benefits from their improvements



Planning for Next SIPs



- Mobile emissions plans
 - EPA recommends MOVES model but model is not yet available
 - MOVES will project inventory but will not be integrated with emissions models (why?)
 - Intend to continue to use MOBILE 6 for emissions modeling
- Biogenic emissions: still evaluating options
 - MEGAN has additional secondary organic aerosol formation
 - EPA updated SOA formation in CMAQ v4.7
- CONCEPT emissions model
 - Open source model
 - Conceptually more transparent than SMOKE model
 - But....need better documentation for other users
 - VISTAS states will continue to use SMOKE



Planning for Next SIPs



- Coordination with other regions
 - Need to do better than regional haze experience
 - Already cooperating to improve and standardize methods through ERTAC ad-hoc group
 - NH₃, EGU projections methods in 2009
 - Already cooperating through State Collaborative effort on common modeling platform
 - Build success through existing technical efforts