



Quality Assurance of Emissions Modeling Process

Track Two: Breakout Five

New Orleans

4-6 May 2004

Wednesday 13:30-15:00

Purpose

- ⇒ Develop a national wildfire emissions inventory for 2002 that is applicable to RPOs, useful for smoke management, and is capable of detecting change.

Desired Outcome

- ⇒ Develop QA protocol for wildfire emissions inventory.

Questions

- ⇒ What have we learned from evaluations to date?
- ⇒ What are existing QA methodologies?
- ⇒ What is the purpose of QA?
- ⇒ Can existing measurements be used for model evaluation?
- ⇒ What additional measurements are needed?
- ⇒ What types of field audits and QA procedures can be used to assure the quality of the inventory and assess its accuracy?

What have we learned to date?

Emission Inventories

- ⇒ Fuel load adds uncertainty (extremely scale dependent)
- ⇒ Size of burn adds uncertainty (largely scale dependent)
- ⇒ Consumption depends on fuel condition and strata and complete vs. incomplete (mosaic)
- ⇒ Not enough speciation in emission factors
- ⇒ Emission models less sensitive to emission factors than fuel consumption
- ⇒ Combustion phase influences emissions
- ⇒ Anthropogenic emissions (toxics, etc.) neglected (avoided in regional haze but important for health impacts)

What have we learned to date?

Dispersion Models (smoke management scale)

⇒ Plume trajectory

- ▣ Good agreement with satellite and airborne observations (top dimension of plume)
- ▣ Affected by plume height

⇒ Concentrations

- ▣ Largely unknown
- ▣ Surface concentrations near source appear reasonable if meteorology is good and plume height calculated correctly
- ▣ At large distances from source other factors affect accuracy of concentrations

⇒ Near misses from point observations challenge evaluations

⇒ NWP models have problems in boundary layer

What have we learned to date?

Photochemical (Grid) Models (regional haze)

- ⇒ Plume trajectory
 - Depends on grid size
 - Affected by plume height, which often is approximated poorly
- ⇒ Concentrations
 - Depends on grid size
 - Affected by plume height
 - Re-suspension into grid after deposition causes downwind concentrations to be too high
- ⇒ Spatial average of grid agree best with time-averaged observations (i.e., day-to-day variation poorly correlated with point observations)
- ⇒ Cannot create temporal averages of fires (under predicts on days with fires and over predicts on days without fires).
- ⇒ Don't know sensitivity of models related to physics vs. chemistry

What are existing QA methods?

- ⇒ Coordinates and spatial where is the fire
 - ▣ GIS analysis
- ⇒ Plotting and visually checking for reasonableness
- ⇒ Fuels
 - ▣ Stand scale – audit 1% of units
 - ▣ Investigating methods of regional correlation to stand-specific information (need to understand and describe the correlation)
- ⇒ Combustion efficiency
 - ▣ Define fuel load and moisture with consumption estimates

Purpose of QA?

- ⇒ Emissions accounting
 - ▣ Credit trading
 - ▣ Go/no-go decisions
 - ▣ Emission reductions (reasonable progress)
- ⇒ Modeling dispersion (site & time impacts)
- ⇒ Modeling haze detect change
 - ▣ Amount of change determines monitoring protocol
 - ▣ What level QA is dictated by the sensitivity of the model

Can existing measurements be used?

- ⇒ Measurements can be used to show cumulative trends
- ⇒ Difficult to determine the influence of fire in a grid model without complimentary trajectory analysis
- ⇒ Density and quantity of measurements depend on sensitivity of models and level of change detection needed
- ⇒ Background levels need to be understood

What additional measurements are needed?

- ⇒ Water-soluble potassium
- ⇒ Is spatial array adequate???
- ⇒ Value in both filter-based and light-based measurements but don't know the ratio that is needed
- ⇒ Sensitivity tests are mandatory to determine if existing measurements are adequate

What types of field audits and QA procedures can be used?

- ⇒ Consistent collection method
 - ▣ Ensure complete story from all 34 databases
 - ▣ Consistent between state and RPO or at least defined differences
- ⇒ Make sure fires located where fuel exists
- ⇒ Documentation / transparency
 - ▣ Define assumptions and methods, for example:
 - Calculate emissions from AP-42 and area
 - Calculate emissions with FOFEM or CONSUME
 - etc.
- ⇒ Moving toward consistent set of inputs with options for calculating emissions

Conclusions

- ⇒ Any data is good data !!!
- ⇒ We have a good idea of what's important to produce reasonable results but we need additional testing (sensitivity and verification) to develop more confidence.