Modeling for SJV 2012 PM2.5 Plan

Planning and Technical Support Division
California Air Resources Board

Outline

- Modeling Approach
- Model Evaluation Process
- Results
- Summary

Use of Photochemical Modeling

- Part of weight of evidence approach to determine best attainment strategy
- Identify the most effective mix of pollutants to control
- Establish attainment targets

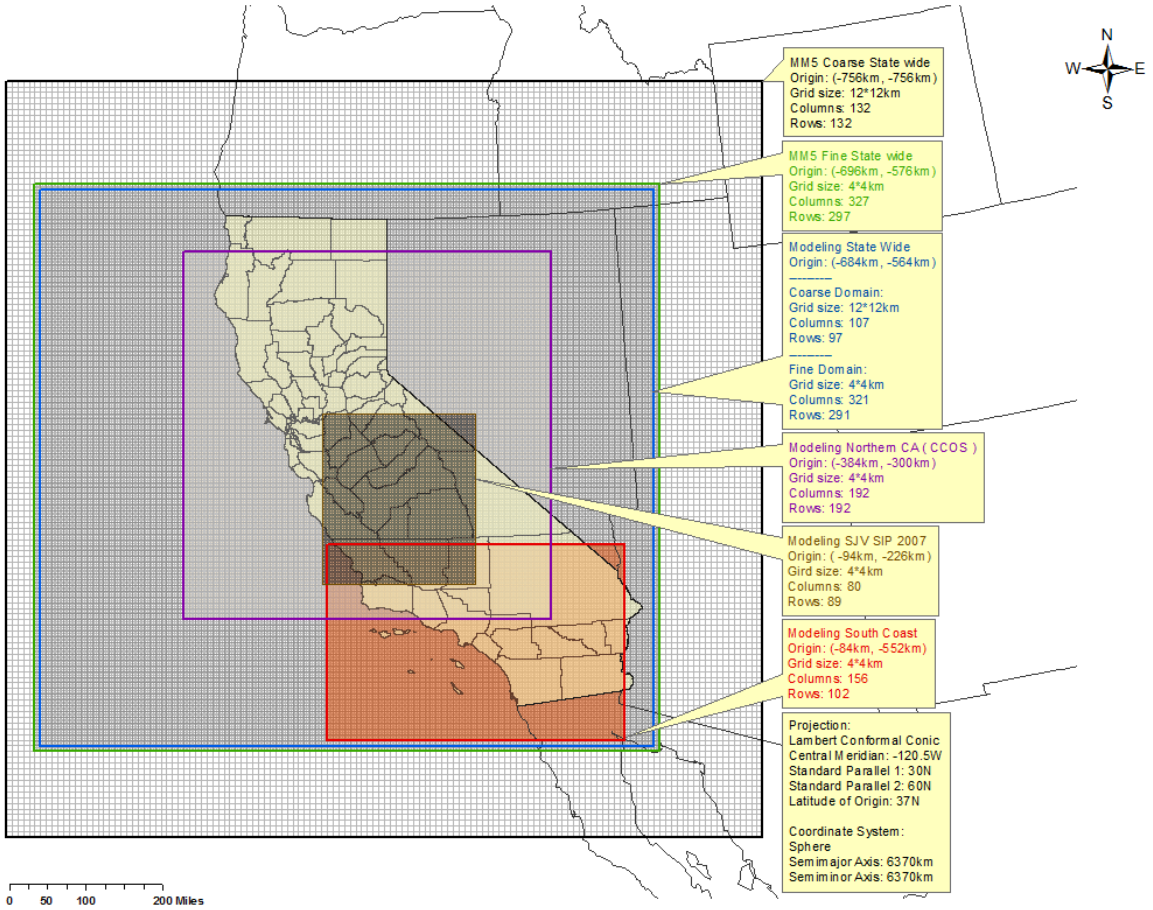
Approach to Modeling

- Consistent with U.S. EPA Guidance
- Model base and future year
- Modeling results used in a relative sense
  (Relative Response Factor)
- Attainment test combines measured data and modeling results to project air quality into the future
- Model application and evaluation of model performance is an iterative process

Models Used

- Meteorology
  - Mesoscale Model 5 (MM5)
  - Weather Research Forecasting (WRF)
- Air Quality
  - U.S. EPA CMAQ model
    (Community Multi-scale Air Quality)
  - With SAPRC-97 chemistry
    (Statewide Air Pollution Research Center)

Air-Quality Modeling Domains



Challenges of 24-Hour Modeling

- Modeling attainment test focuses on 16 highest days in winter
- Importance of correctly characterizing emissions during these selected periods:
  - Magnitude
  - Seasonal and diurnal patterns
  - Location
  - Chemical composition

Model Application and Evaluation

- Does the model replicate the observed nature of the PM2.5 problem?
- Iterative process which requires:
  - Evaluating predictions for each PM2.5 component
  - Diagnosing causes of model performance problems
  - Re-generating meteorology and/or emissions inputs
  - Re-evaluating model predictions

Model Performance

- On-going evaluation
- Identified emission categories that needed refinements
- Expected to meet U.S. EPA metrics for adequate model performance

Focused Review of Emission Categories

- Residential wood combustion
- Fugitive dust
- Mobile sources
- Economic forecasts/population growth

Residential Wood Combustion

- Model under-predicted the measured amount of organic carbon
- Ambient data indicated large contribution from residential wood burning
- Reevaluated emissions to better characterize:
  - How much is burned
  - During which months
  - Time of day

Farming Operations

- Integrated more recent data:
  - Emission factors from almond harvesting research
  - Activity information from Farmland Mapping and Monitoring Program
  - Spatial redistribution based on USDA's satellite derived data

Mobile Sources

- Revisited spatial allocation process for diesel and gasoline vehicles
- Assessed seasonal variations in activity
- Redistributed aircraft emissions to airport locations

Economic Forecasts

- Updated economic forecasts and population growth rates available
- Worthwhile to look at the potential impact of different forecasts

Current Modeling Status

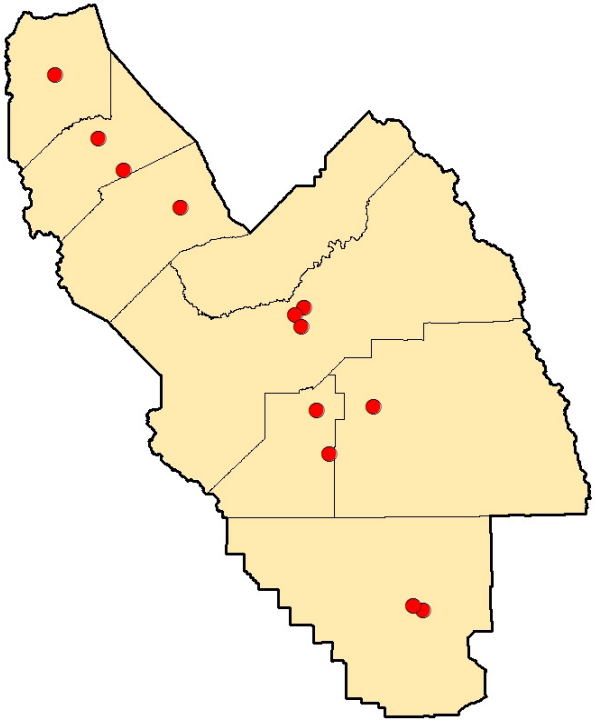
- Completing modeling runs
- Finish model performance evaluation

Findings from Modeling Runs

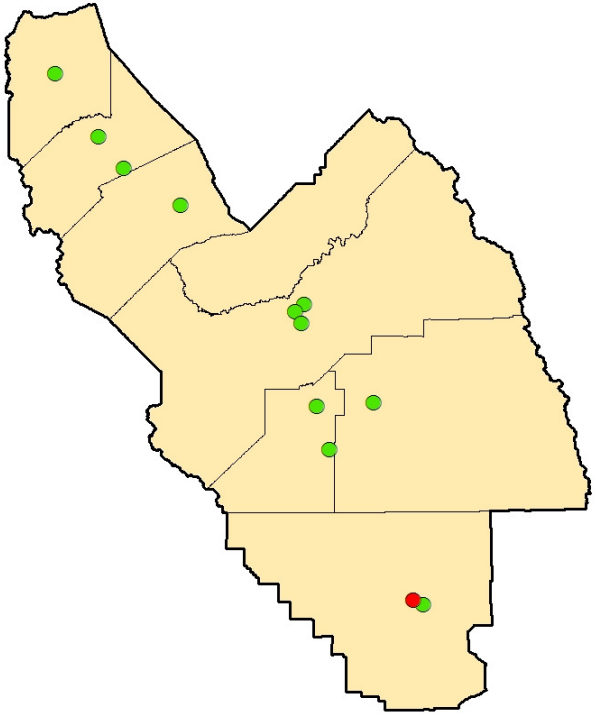
- PM2.5 most effective precursor to control, followed by NOx
- Model very responsive to controls for wood burning, cooking, and diesel sources.
- Under winter stagnation conditions, sources nearest monitors have greatest impact

Attainment Assessment

2011 Measured 24-Hour Design Values



2019 Predicted 24-Hour Design Values



Nonattainment

Attainment

Summary

- Modeling nearing completion pending final model performance evaluation
- Remaining focus of attainment demonstration is on addressing Bakersfield area