
Modeling for SIP Purposes

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California Regional Particulate Matter Air Quality Study (CRPAQS)

- Major field study conducted in 2000
- Funded by a public / private partnership
- Provided the fundamental science behind the annual PM_{2.5} plan and the current plan
- Provided the most comprehensive data and science in the country on understanding the origin and fate of PM_{2.5}
- Continues to be a cornerstone of PM_{2.5} research

Consistency with U.S. EPA Guidance

- *“Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze”*
- Additional implementation guidance

Consistency with U.S. EPA Guidance

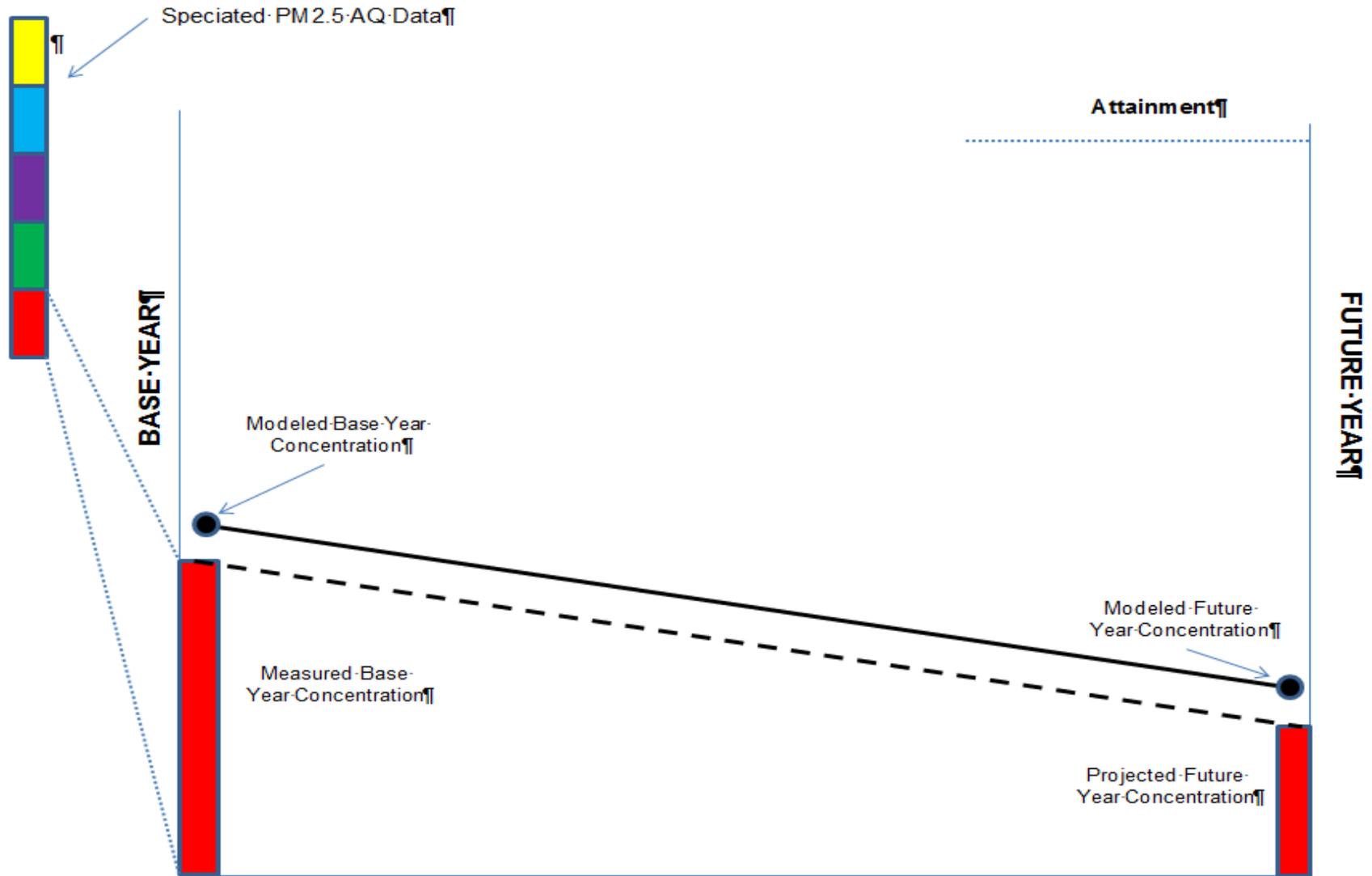
- Appropriate model(s) and other analyses
- Need for modeling protocol document
- Application and evaluation of model(s)
- Model attainment test
- Supplemental analyses
- Use of the best possible science

Weight of Evidence Approach for Attainment

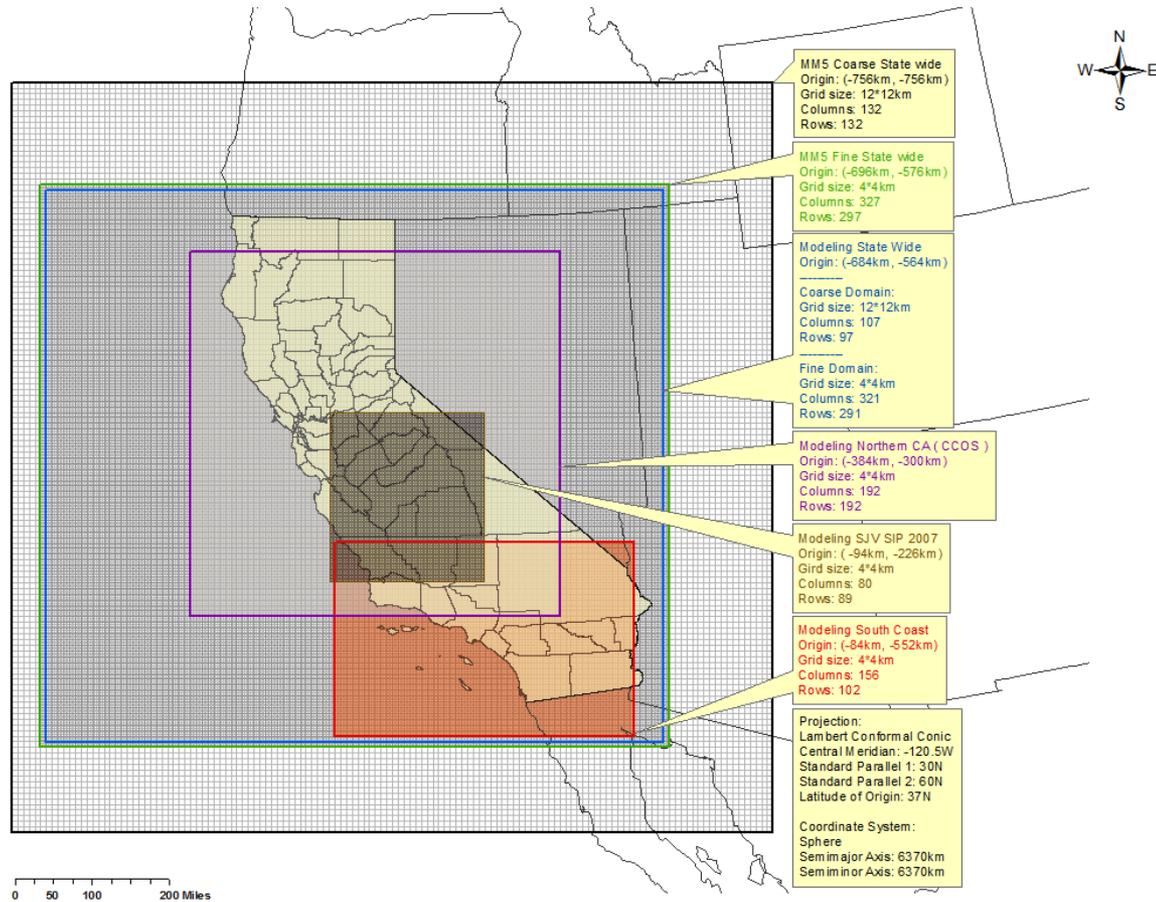
- Use all available technical information in a corroborative manner to determine best attainment strategy:
 - Grid-based photochemical modeling
 - Supplemental analyses:
 - Air quality trends
 - Emission trends
 - Source – receptor modeling (CMB, etc.)

Use and application of Photochemical Models

- Identifying the most effective mix of pollutants to control
- Establishing attainment targets
- Models are best used in a relative (rather than absolute) sense
 - Relative Response Factors (RRFs)
- Attainment test combines measures data and modeling to project air quality into the future
 - Speciated Model Attainment Test (SMAT)



Modeling Process



Modeling Process

(Meteorology)

- Predict weather variables for every grid cell every few seconds for an entire year:
 - Temperature
 - Winds
 - Relative humidity
 - Stability
 - Pressure
 - Many more...
- Runs can take months

Modeling Process

(Air Quality)

- Predict air quality for every grid cell every few seconds for a year
- Predict all components of PM_{2.5}:
 - *EC*
 - *OC*
 - *Ammonium nitrate*
 - *Ammonium sulfate*
 - *Others*
- Primary and secondary contributions
- Individual runs can take weeks

Modeling Process

(Quality Assurance)

- Does the model replicate the observed nature of the PM_{2.5} problem?
- Requires:
 - Iterative model runs
 - Re-generating meteorology and emissions inputs
 - Evaluating predictions for each specie
 - Focus evaluation on seasons / months contributing to high PM_{2.5}

Science Review

- Preparation of modeling protocol
- Peer review
- Stakeholder workshops
- Ongoing, thorough QA/QC throughout modeling process
- Board hearings

Ongoing Efforts to Improve Science

- Annual science meetings:
 - *International Conference on Atmospheric Chemical Mechanisms*
 - *International Aerosol Modeling Algorithms Conference*
- Field studies to improve modeling databases:
 - *U.S. EPA / ARB Advanced Monitoring Initiative (Feb. 2007)*
 - *ARCTAS (June 2008)*
 - *CalNex (May-July 2008)*
 - *DiscoverAQ (Jan-Feb 2013)*