San Joaquin Valley Ozone Meteorology, Statistics, Modeling, and Attainment Demonstration

Evan M. Shipp



Mountains & Bowl Shape Characterize SJVAB





Daytime Wind Flow for O₃ Season



Daytime Wind Flow Patterns



Nighttime Wind Flow for O₃ Season



Nighttime Wind Flow Patterns



Temperature Inversion















Southern Region O3 1-Hour Design Values (2002)







San Joaquin Valley Trend in Ozone Design Day

San Joaquin Valley Ozone Design Value



San Joaquin Valley Trend in Exceedances of 1-HR. Ozone National Standard

San Joaquin Valley APCD Days Over the Federal 1-Hour Ozone Standard



Questions on Ozone Meteorology and Air Quality



Why Use Ozone Models?

- Atmospheric chemistry and meteorology producing ozone is very complex
- Reductions in emissions do not result in proportional decreases in ozone



Application of Ozone Models

- Relationship between emissions and ozone
- Emissions reduction to achieve health standard
- Time sequencing for control measures



Photochemical Grid Model



SPECIFICATION OF THE GRID



Photochemical Grid Model Cell





Models Run in the SJV

- SARMAP Air Quality Model (SAQM)
- Community Multi-scale Air Quality Model (CMAQ)
- Comprehensive Air Quality Model with Extensions (CAMx)



Episode Must Be Representative of Historical Events

- Design Value
- Meteorology and Transport
- Emissions
- Time of Year



What information is needed to run an ozone model?

- Meteorology
- Emissions
- Other parameters



Steps for Applying an Ozone Model

- Data from large scale field program
- Prepare emissions and meteorology
- Evaluate the performance of the model
 - Pollutants and precursors
 - Meteorology
 - Process analyses



Modeling Attainment Demonstration

- Across the region emissions cuts
- Realistic control strategies
- Attainment is reached when all surface are less than the NAAQS (.12 ppm or 124 ppb)



Organizations Involved in Central CA SIP Modeling

- Air Resources Board
- Sacramento Metropolitan AQMD
- San Joaquin Valley APCD
- Bay Area AQMD
- University of Riverside
- Desert Research Institute
- National Oceanic and Atmospheric Administration
- ENVIRON Corporation



August 2, 2000 Meteorology

LC East Coordinates Ikul

















Model Episodes

- July 29-August 2, 2000
- September 16-20, 2000
- July 8-13, 1999
- June 14-15, 2000
- August 11-16, 2002



Episode Characteristics July 30-August 2, 2000

- Measured Concentration at Edison 151 ppb w/ Design Value 142 ppb
- Measured Concentration at Parlier only 129 ppb w/ Design Value 151 ppb
- Latest Simulation Peak about 140 ppb in Kern and Fresno County using hybrid meteorology
- Manter Fire in the vicinity of the peak concentration in southern region



Episode Characteristics September 16-20, 2000

- Central Region Ozone Maximum at Parlier Near Design Value at 165 ppb
- Southern Region Ozone Maximum at Arvin Near Design Value at 145 ppb
- Levels Below NAAQS in Northern Region
- Currently Severe Modeled Underprediction



August 2, 2000 (3 P.M. PST) Ozone w/ CALMET-MM5





Next Steps

- Choose Best Meteorological Field for July-August Episode
- Effort to Improve Performance for September 2000
- Use of Alternative Chemistry (SAPRAC)
- Emission Sensitivity Testing
- Attainment Demonstration



Contact Information

Evan M. Shipp E-mail: <u>evan.shipp@valleyair.org</u> Phone: (559) 230-5809

