

CalNex 2010

Overview of CARB-Sponsored Projects

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California Air Resources Board

California Environmental Protection Agency

ARB's Dual Responsibilities

- Air Quality – CARB's mission is to reduce pollutants that directly impact
 - Public Health
 - Public Welfare
 - Ecological Resources
- Climate Change – AB32 charges CARB with developing the main strategies for California to reduce and track trends in emissions of greenhouse gases that cause climate change (with global impacts on health, welfare, and resources)

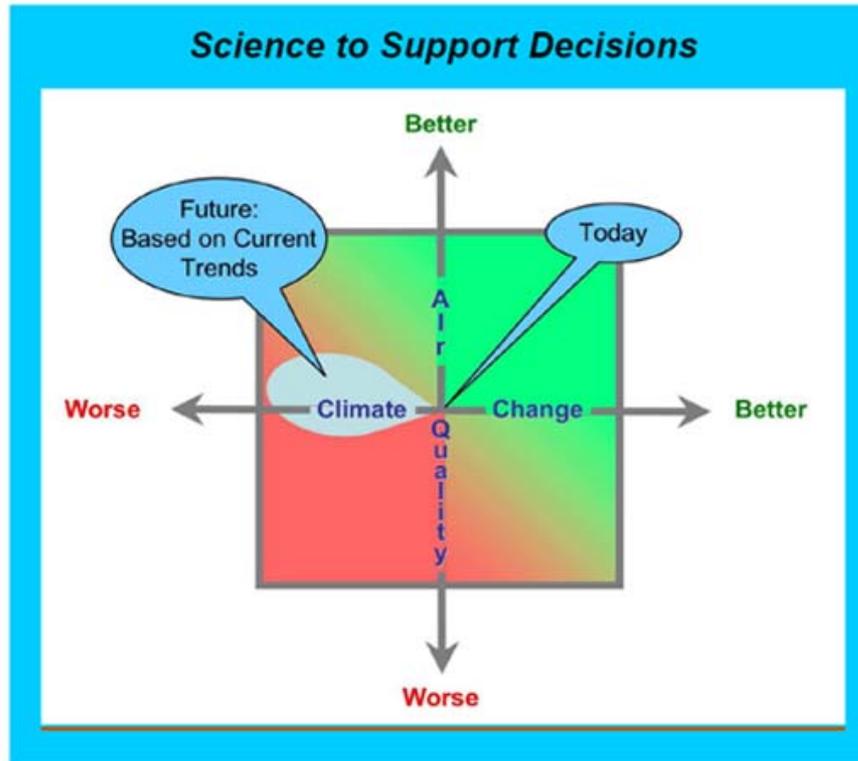
CalNex 2010

(Study in **Cal**ifornia of issues at the **nex**us of the air quality and climate)

- NOAA and collaborators bring state-of-the-science tools
 - WP-3D flying laboratory
 - Twin Otter aircraft for aerosols and radiative transfer
 - Offshore research vessel (R/V Ronald H. Brown)
 - High spatial resolution, comprehensive suite of complementary measurements
- California's historical baselines and on-going monitoring provide extensive background and contextual measurements



2010 CalNex White Paper



Research at the Nexus of Air Quality and Climate Change

Science Questions

- **Temporal and Spatial Variation of Emissions**
 - What are fine-scale, spatial and temporal structures of emissions for greenhouse gases, ozone and aerosol precursors?
- **Chemical Transformations and Climate Change Processes**
 - How important are nocturnal chemical processes in determining transport and / or loss of nitrogen oxides, reactive VOCs and ozone?
 - What are important precursor species and formation processes for secondary organic aerosols?
 - What are the differences in time-resolved, detailed speciation measurements of ozone precursor species between the Central Valley and South Coast Air Basin?
- **Transport and Meteorology**
 - What are proper oceanic boundary conditions for coastal and regional atmospheric chemistry modeling?
 - How best can we characterize and model air flow over coastal waters and the complex terrain of California?

ARB-Sponsored Projects

- Emissions Inventory Improvement
 - VOCs in SJV and SoCAB – aircraft and ground grids
 - South Coast Sulfur monitoring network
- Chemical Transformations
 - Aerosols, VOCs, nocturnal chemistry in SoCAB
 - VOCs, NO_y, and free radicals in SJV
 - CH₂O aircraft measurements

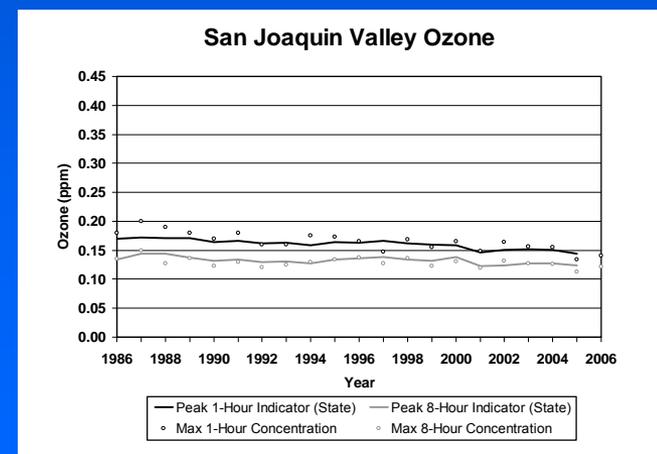
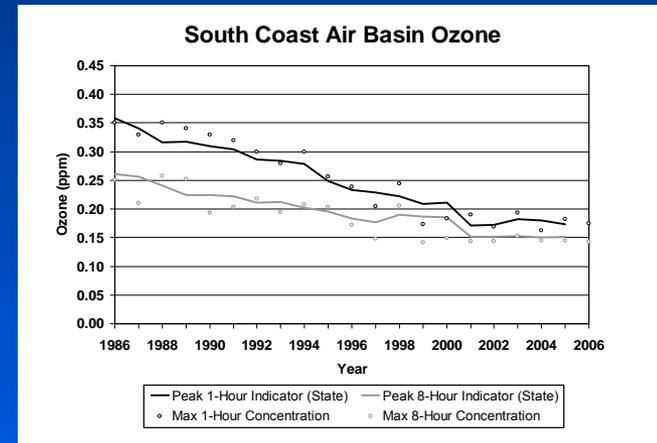
WP-3D Aircraft Chemical Measurements

- VOC & GHG speciation (Don Blake, UCI)
 - NOAA's WP-3D aircraft and ground-based grid canister sampling
 - Over 100 organic compounds and 27 halocarbons (CFCs, HCFCs, halons and other halocarbons)
- CH₂O measurements (Allen Fried, NCAR)



Ozone Precursors & Formation Chemistry in Central Valley and South Coast Air Basins

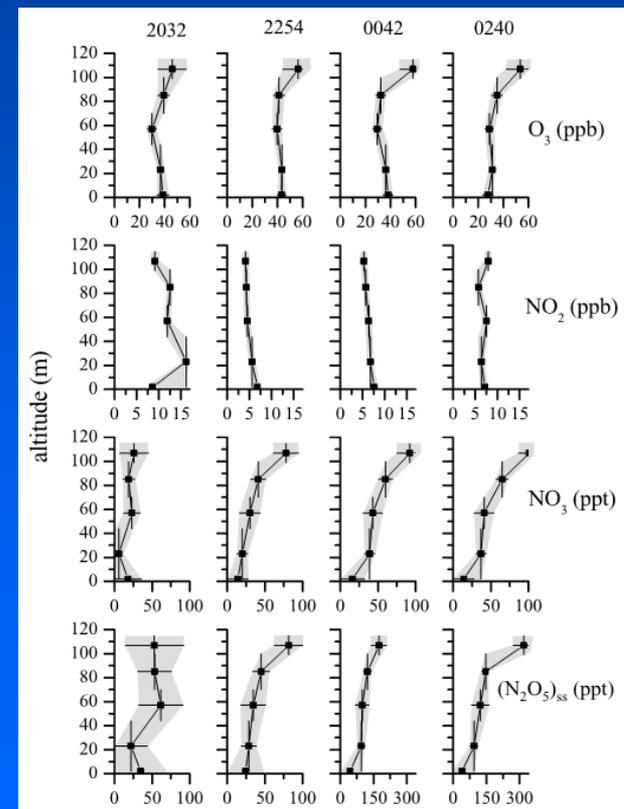
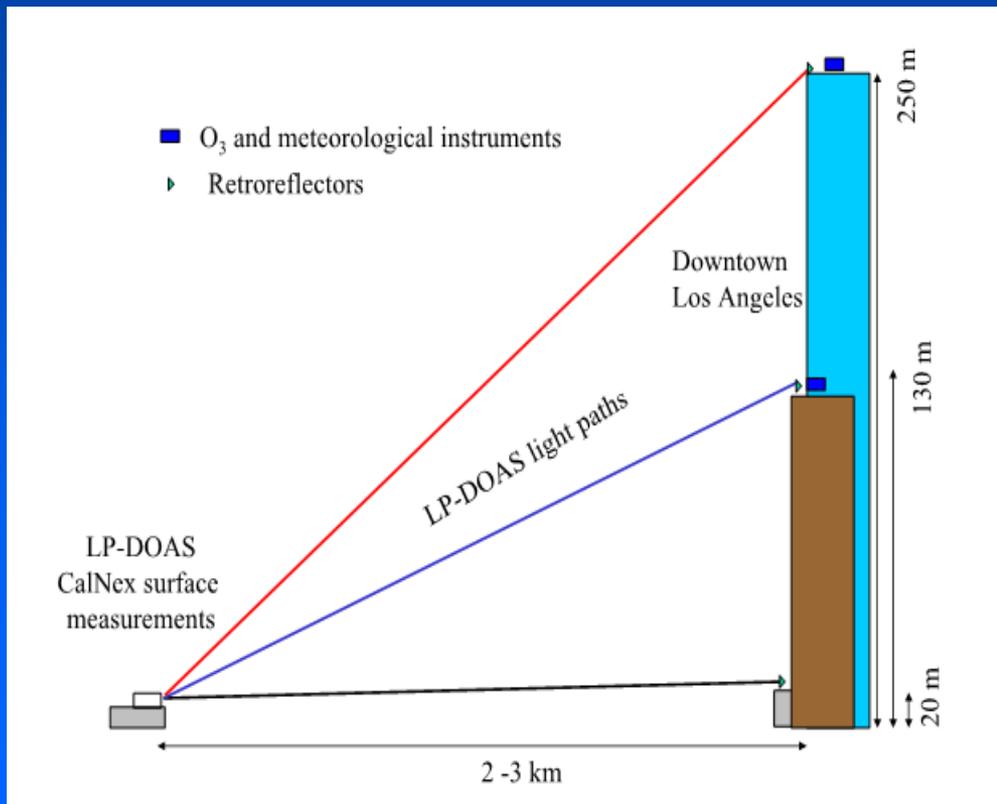
- Observed downward trend in South Coast concentrations; lack of comparable downward trend in SJV.
- What factors may account for different trends between the basins?
 - Boundary conditions?
 - Emissions differences?
 - VOC reactivity differences?
 - Meteorological differences?
 - Spatial extent and time scales for reactions?
- Measurements of precursors and key radical species at sites in both basins.
- Concurrent flights by NOAA's planes to link the measurements.



Los Angeles Supersite

Nocturnal Chemistry in the Boundary Layer

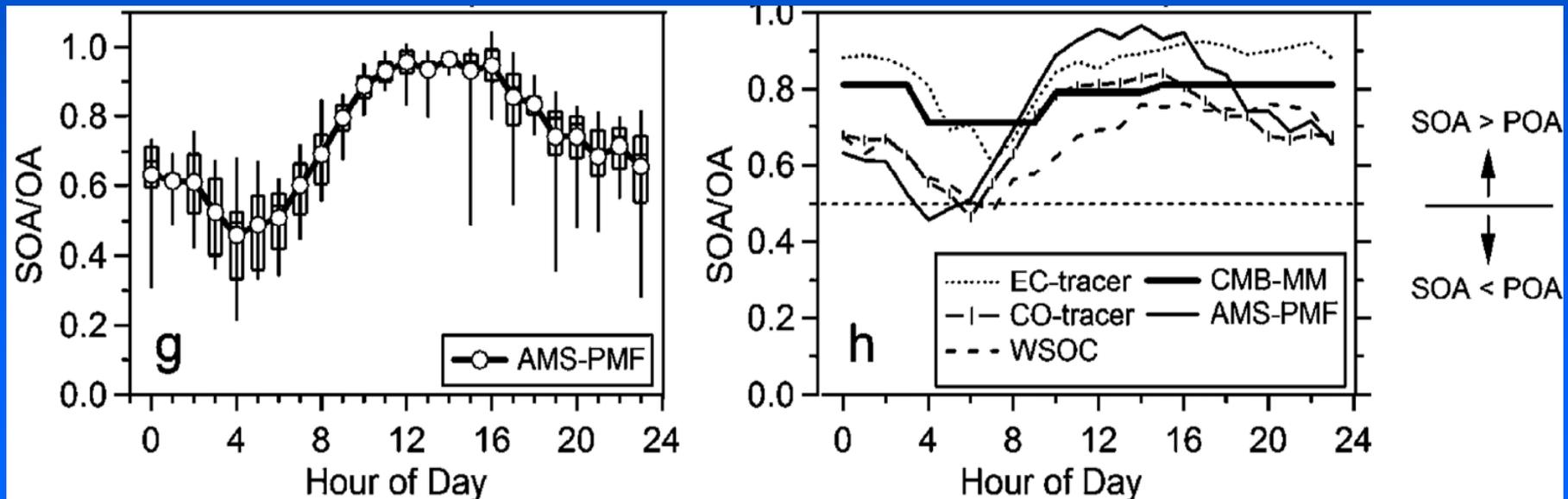
- Vertical distribution of O_3 , NO_2 , NO_3 , HONO, HCHO; SO_2
Jochen Stutz (UCLA)- long-path DOAS, continuous measurements



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Aerosol Sources and Ozone Precursors

- Non-refractory organic and inorganic components of PM
Jose-Luis Jimenez (CU) - HR-ToF-AMS, PAM
- Speciated VOC
Joost deGouw (CIRES)



Chemistry of the San Joaquin Valley

- Comprehensive speciation of VOCs in the SJVAB
- Coupling of HO_x , NO_x , O_3 and VOC photochemistry under conditions typical of the SJVAB
- Fate of NO_x and VOC oxidation products at night
- Factors affecting time scales for production and removal of 1st, 2nd, 3rd generation products of VOC and NO_x oxidation
- Effect of VOC reactions on photochemical production and loss of ozone, OH , NO_y species, and aerosols



San Joaquin Valley Supersite

- Ron Cohen (UCB)

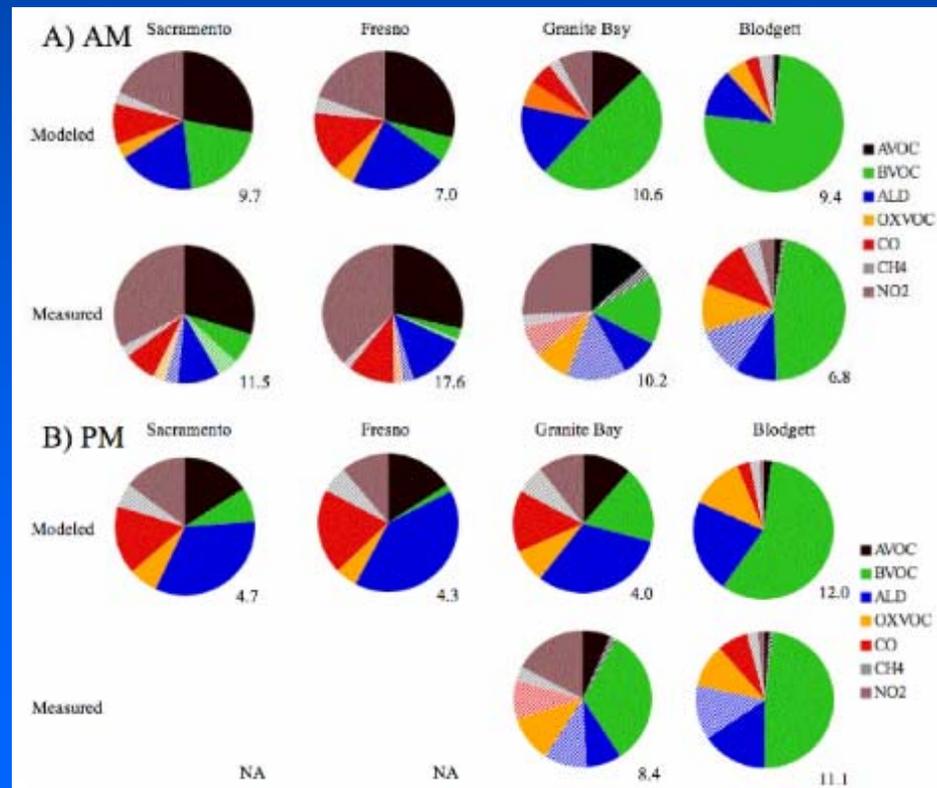
NO, NO₂, total peroxy nitrates, total RONO₂, HNO₃

- Allen Goldstein (UCB)

Broad suite of VOCs - anthropogenic, biogenic, and oxygenated gases

OH loss rate as a function of compound group

-Steiner et al., (2008)



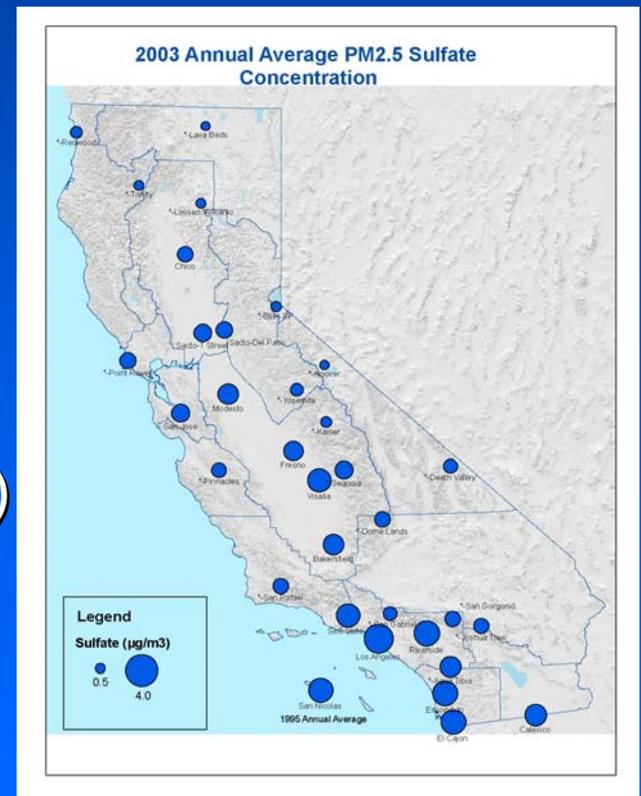
San Joaquin Valley Supersite

Enhanced Chemical Measurements

- William Brune (PSU):
OH, HO₂, total OH reactivity, naphthalene, potential aerosol mass
- Frank Keutsch (UWM):
Formaldehyde, glyoxal, and larger α -dicarbonyls
- Joel Thornton (UW):
speciated acyl peroxy nitrates (PAN, PPN, MPAN, others)
- Paul Wennberg (Caltech):
HNO₃, organic acids, and peroxides

South Coast Sulfur Monitoring Network

- High precision trace SO₂ monitors at seven sites for information on relative contributions from land-based and oceanic emission sources (e.g., on-road, maritime shipping, geogenic or biogenic sources, transport)
- Continuous sulphate analyzers
- Ancillary information (meteorology...)



Thank You

