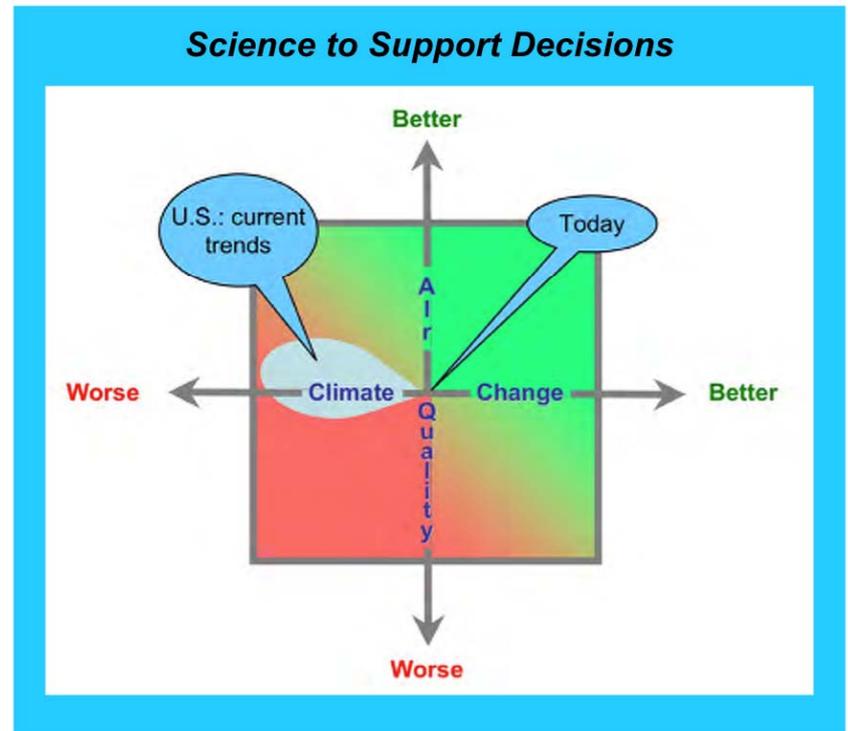


CalNex 2010: NOAA perspective

DAVID PARRISH
NOAA/ESRL
Chemical Sciences Division



2010 CalNex Science and Implementation Plan



Research at the Nexus of Air Quality and Climate Change

6 October 2008

2010 CalNex public meeting
February 5, 2009, Sacramento, CA

CaINex 2010: NOAA perspective

today:

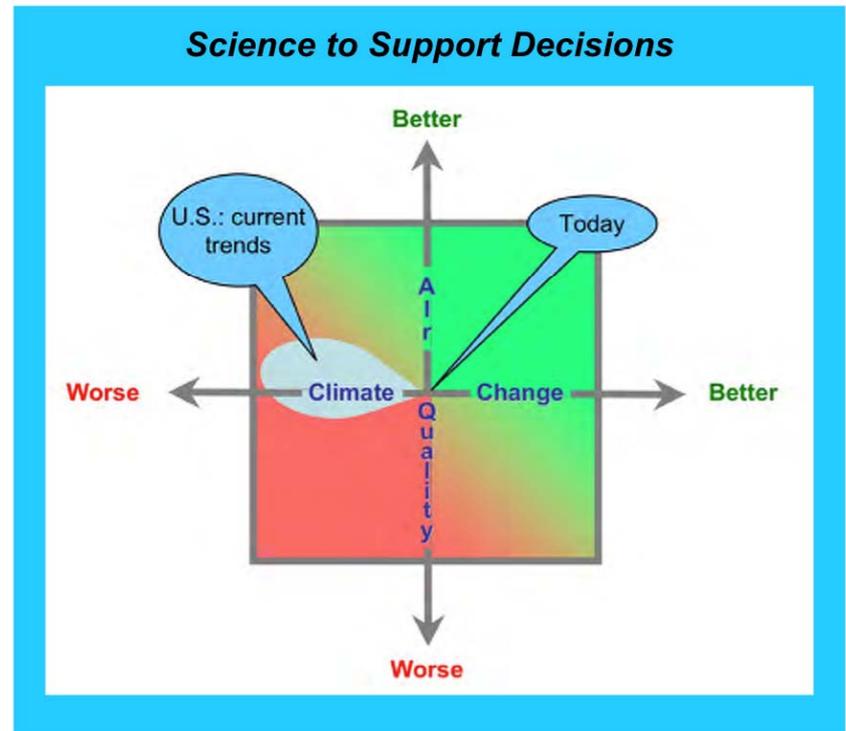
- Introduction to **CaINex 2010**
- Introduction to NOAA's interests and platforms
- Goal of this meeting
- Science issues

Why CaINex?

2010 CaINex public meeting
February 5, 2009, Sacramento, CA



2010 CaINex Science and Implementation Plan



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CaINex 2010: NOAA perspective

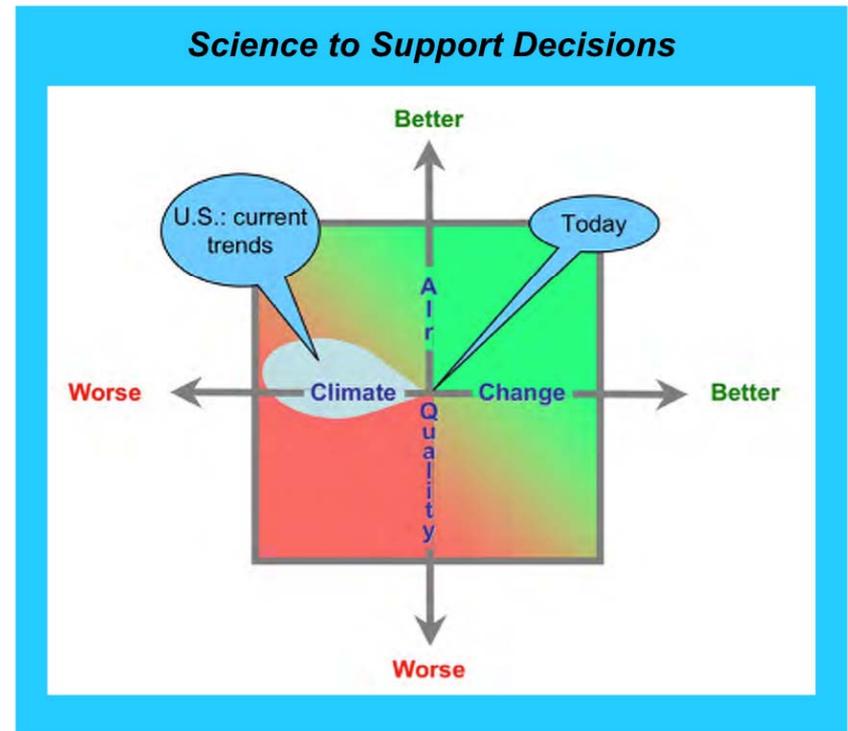
1) Management and Mitigation Strategies for these two issues are strongly linked.

2) Sources and Processes for these two issues are the same (nearly).

Why California?



2010 CaINex Science and Implementation Plan



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6 October 2008

CalNex 2010: NOAA perspective

Study Rationale

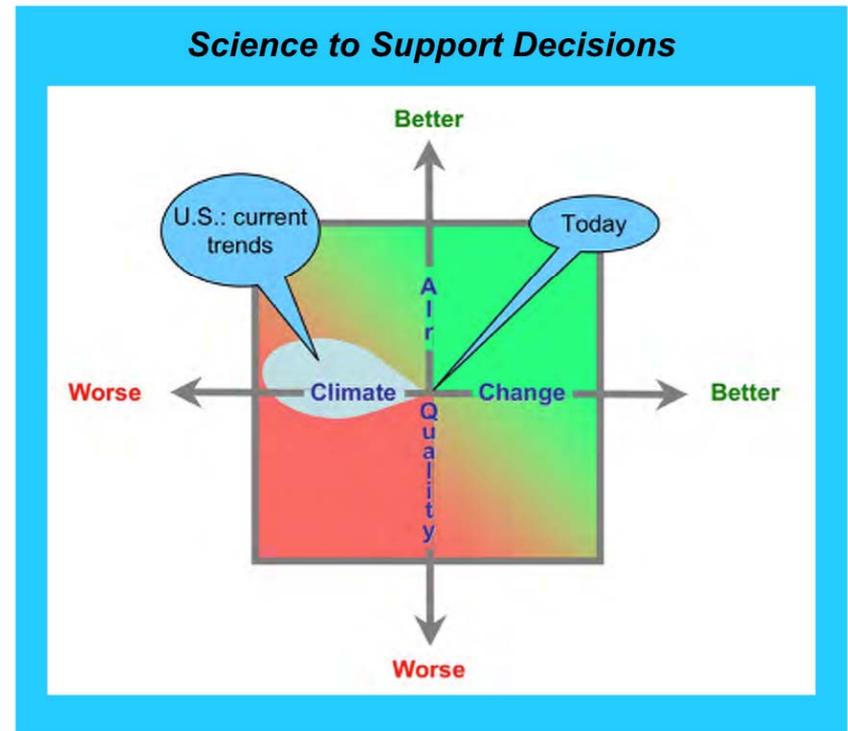
- *California has traditionally led the nation in addressing Air Quality issues.*
- *California has recently taken the lead in beginning to address Climate Change.*
- *NOAA is developing a new research initiative addressing Air Quality and Climate Change linkages.*

CalNex addresses NOAA's and California's Science Interests

What are NOAA's interests?



2010 CalNex Science and Implementation Plan

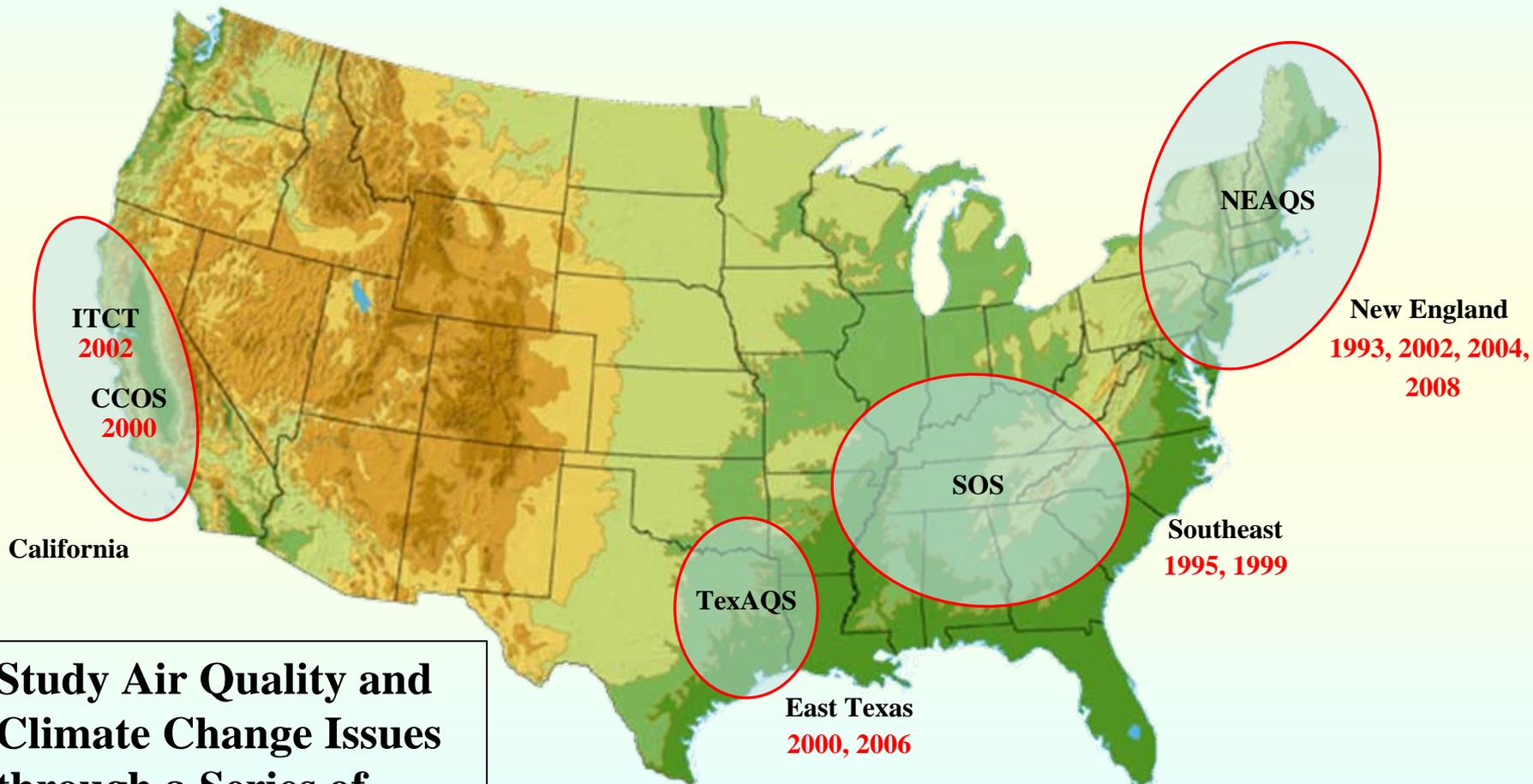


6 October 2008



NOAA/ESRL Regional Intensives

Chemically and Meteorologically Diverse



Study Air Quality and Climate Change Issues through a Series of Regional Intensives

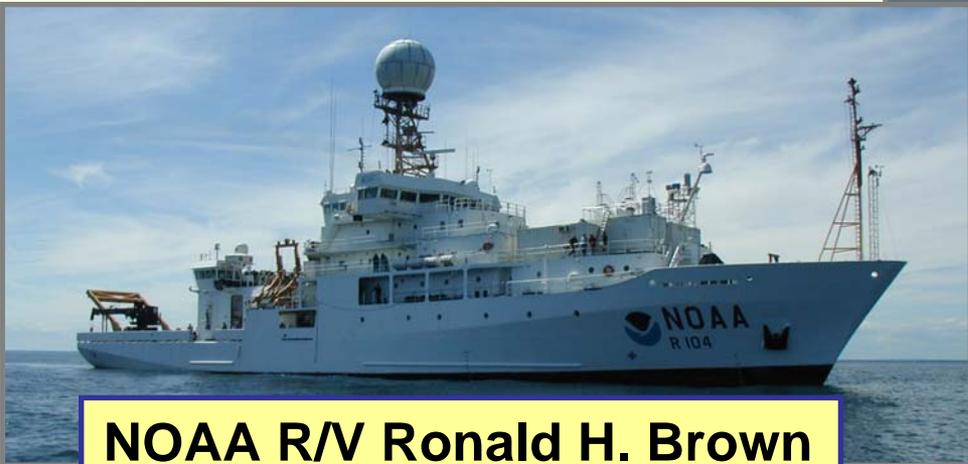
What will NOAA contribute to CalNex?



NOAA's Assets

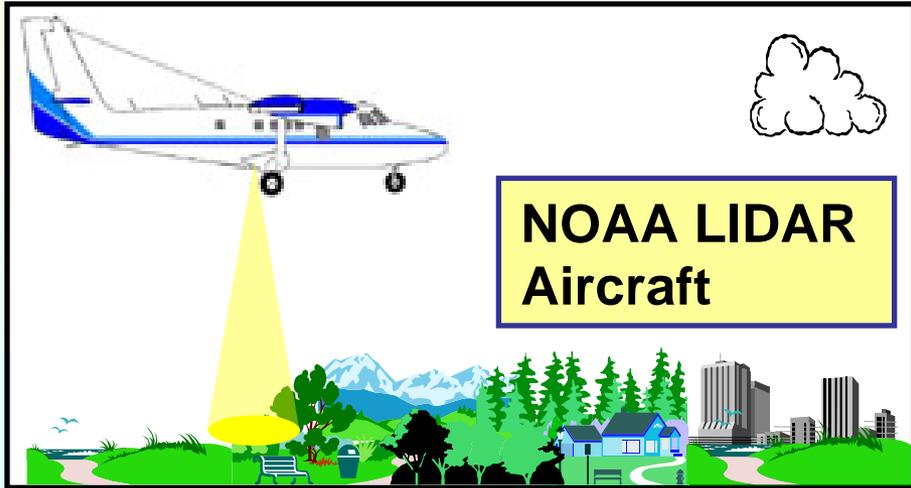


NOAA WP-3D



NOAA R/V Ronald H. Brown

Collaborate with Others on fielding Ground-based Remote and In Situ Instrumentation



NOAA LIDAR Aircraft

CaNex 2010: NOAA perspective

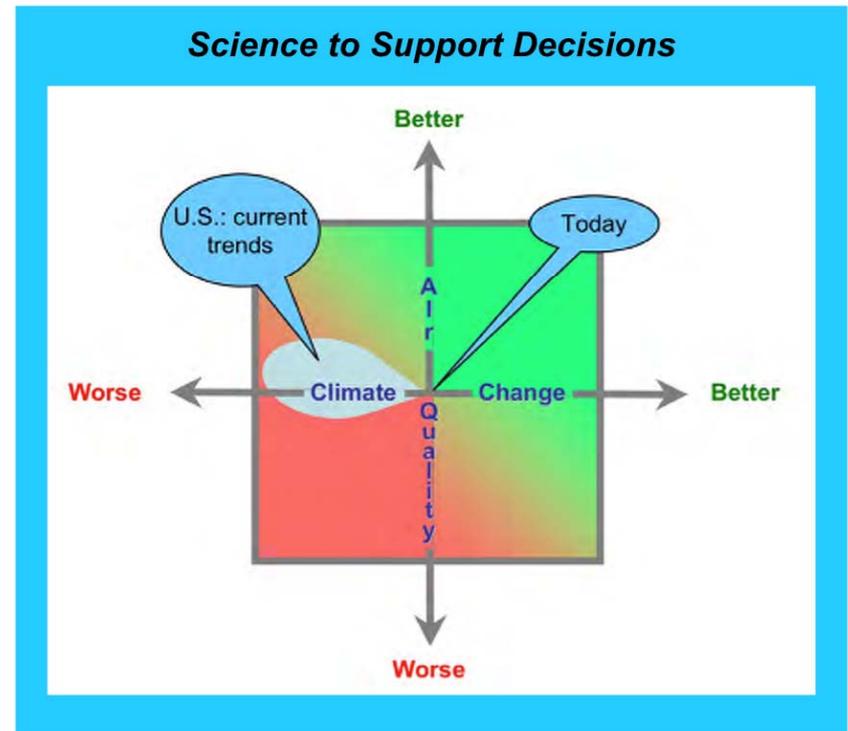
Science Issues

- *Emissions - top down tests*
- *Chemical Transformation and Climate Processes*
- *Transport and Meteorology*
- *Aerosol Properties and Radiative effects*
- *Forecast Model Evaluation*

Some illustrations



2010 CaNex Science and Implementation Plan



Research at the Nexus of Air Quality and Climate Change

6 October 2008



Emissions Quantification

Improved inventories are essential for predictive capability

Top-down tests of emission inventories:

- **Aerosol and ozone precursors,**
- **Greenhouse gases,**
- **Black carbon, of particular interest.**

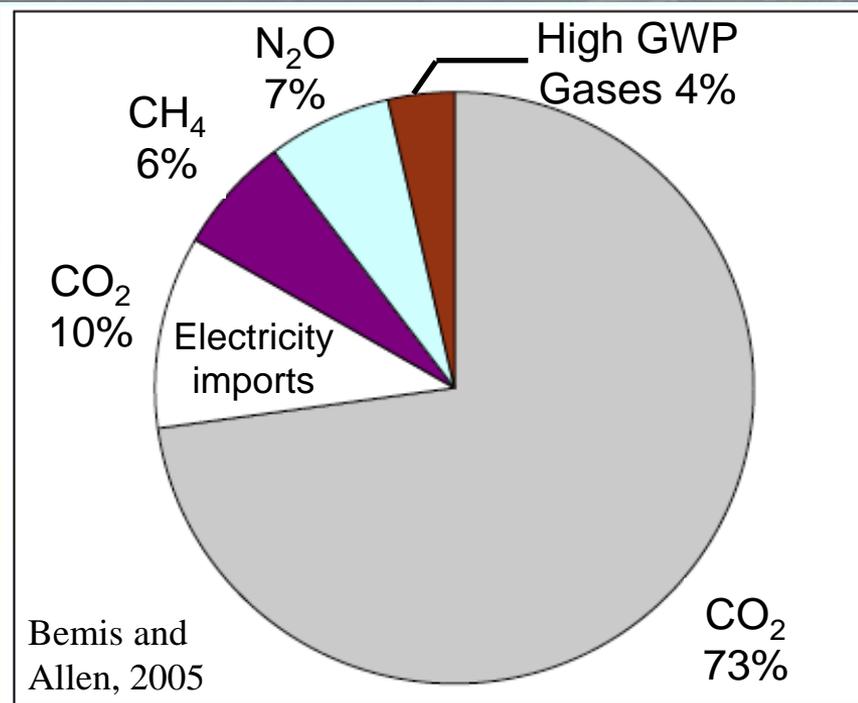
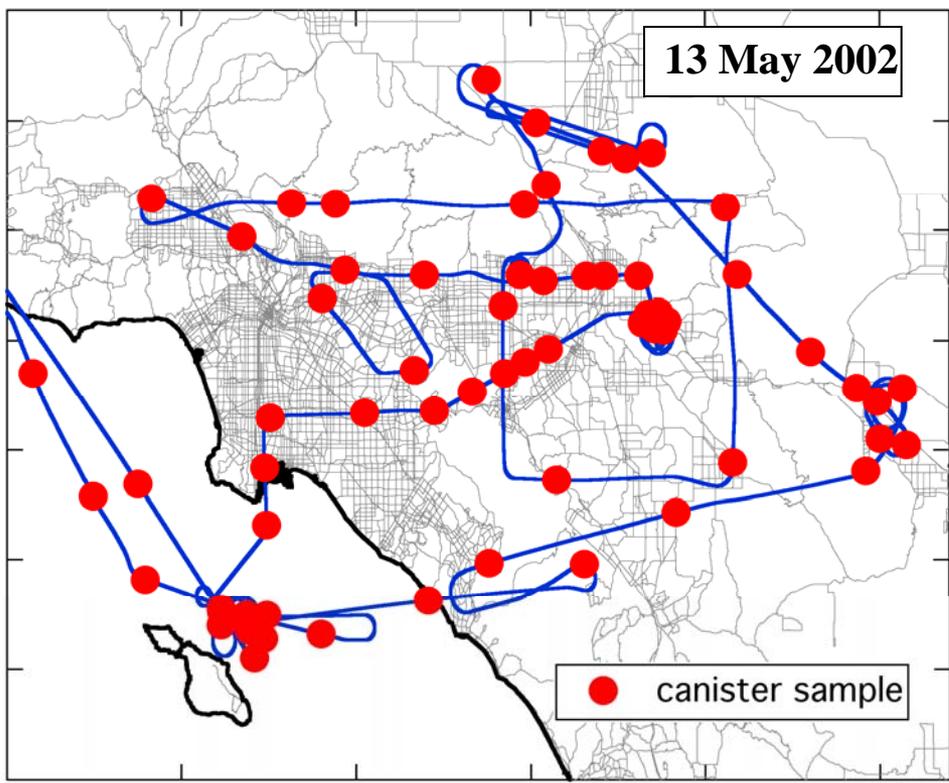


Emissions Quantification

Improved inventories are essential for predictive capability

Non-CO₂ Greenhouse Gas Emissions

- What can measurements tell us?



California greenhouse gas emissions

Global warming potential of greenhouse gases.

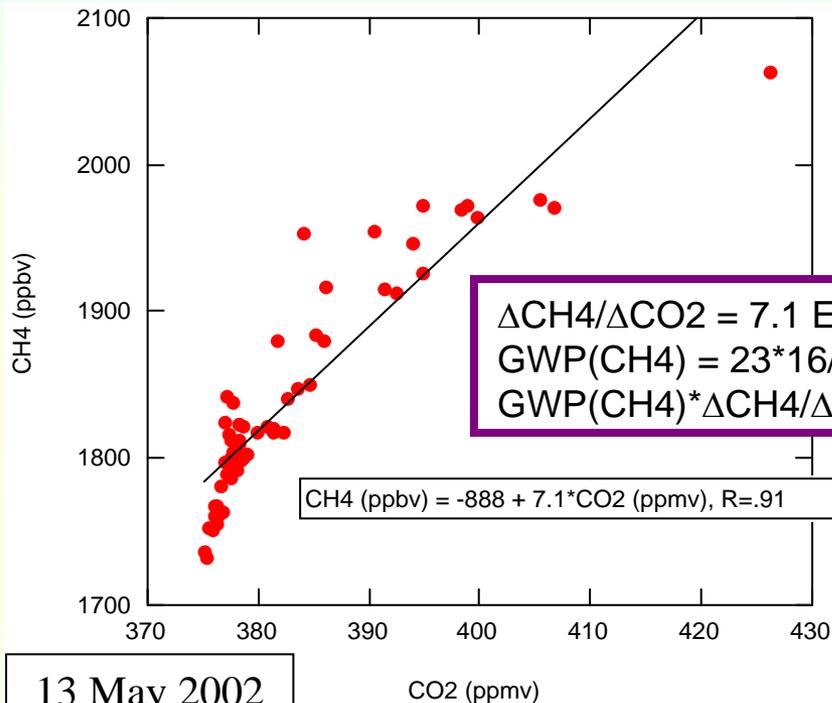
Gas	GWP	MW
CO ₂	1	44
CH ₄	23	16
HFC-134a	1300	102



Emissions Quantification

Improved inventories are essential for predictive capability

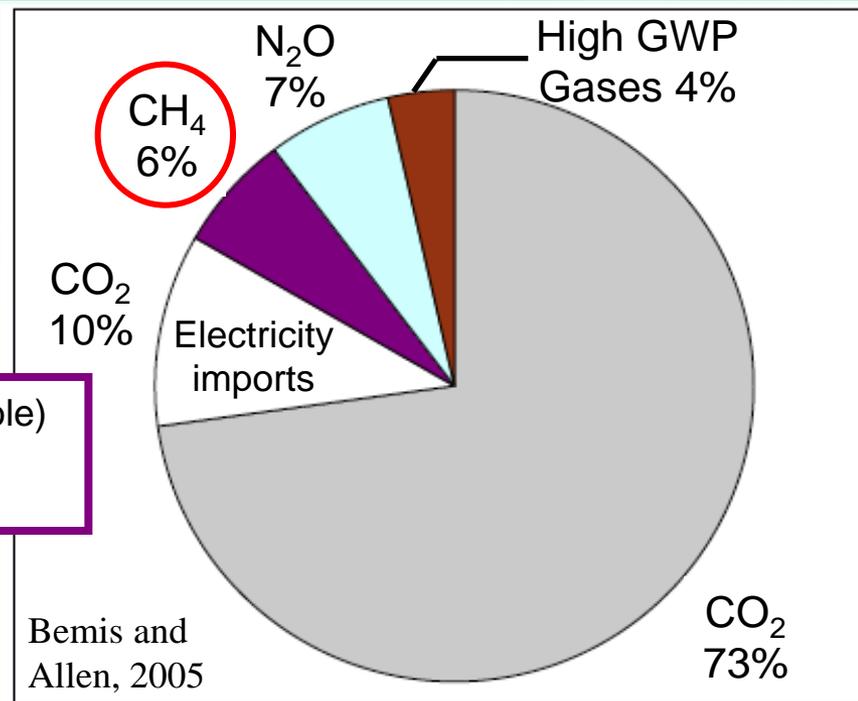
Non-CO₂ Greenhouse Gas Emissions



13 May 2002
 WP-3D flight
 Los Angeles

2010: Provide more extensive data set

- Spatial variability
- Agricultural contribution



California greenhouse gas emissions

Global warming potential of greenhouse gases.

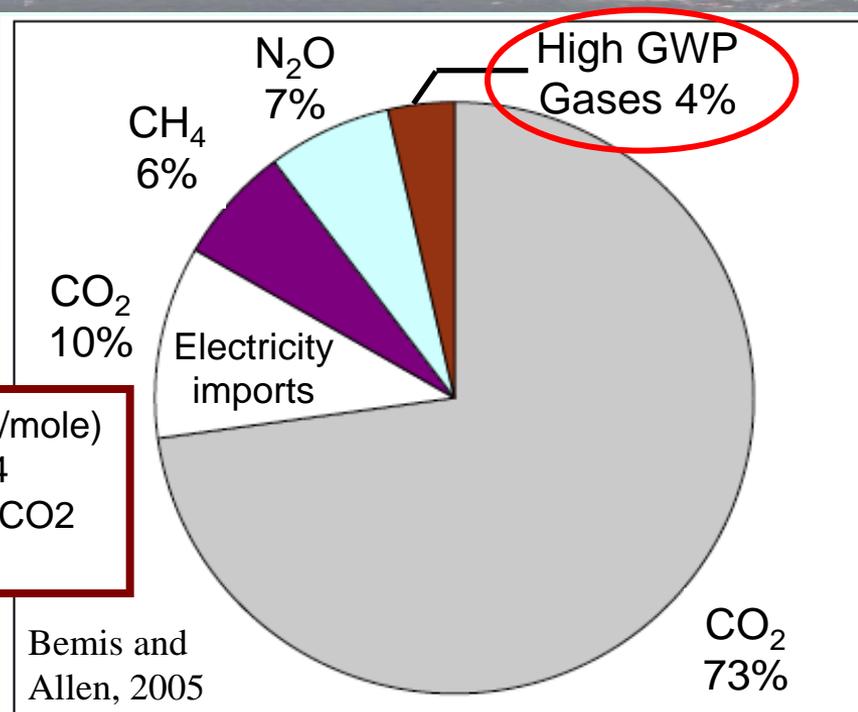
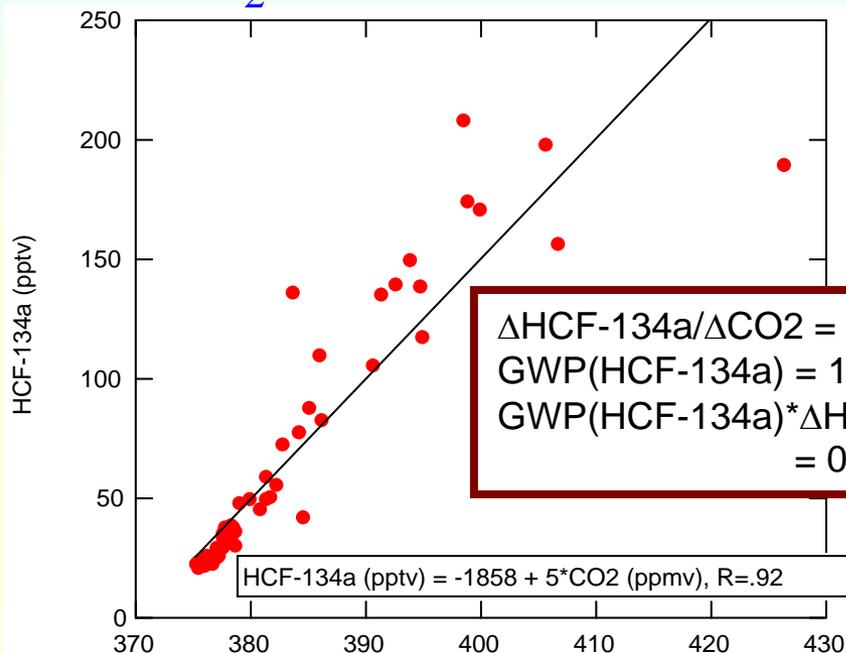
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Emissions Quantification

Improved inventories are essential for predictive capability

Non-CO₂ Greenhouse Gas Emissions



California greenhouse gas emissions

13 May 2002

2010:

- Provide more extensive data set
- Investigate spatial variability
- Add N₂O to measurement capability
- Collaborate with others doing similar analyses with different perspectives.

Global warming potential of greenhouse gases.

Gas	GWP	MW
CO ₂	1	44
CH ₄	23	16
HFC-134a	1300	102



Chemical Transformation

Aim to understand on a process level for predictive capability

Investigate:

- Secondary organic aerosol formation
- NH_4NO_3 formation
- Photochemistry; ozone formation
- Role of nighttime chemistry
- Halogen activation

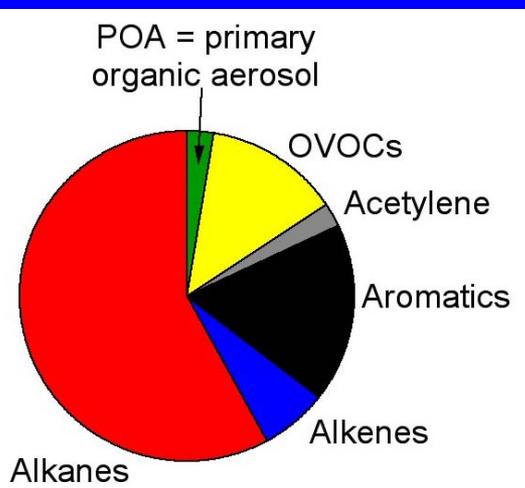


Chemical Transformation

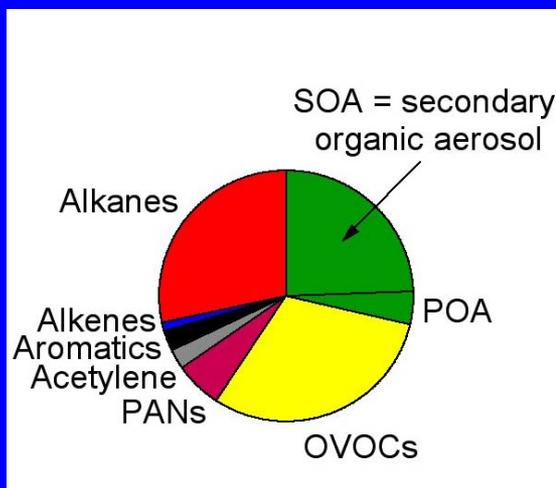
Aim to understand on a process level for predictive capability

Sources of Organic Aerosol in Polluted Air

At time of emission



After 2 days



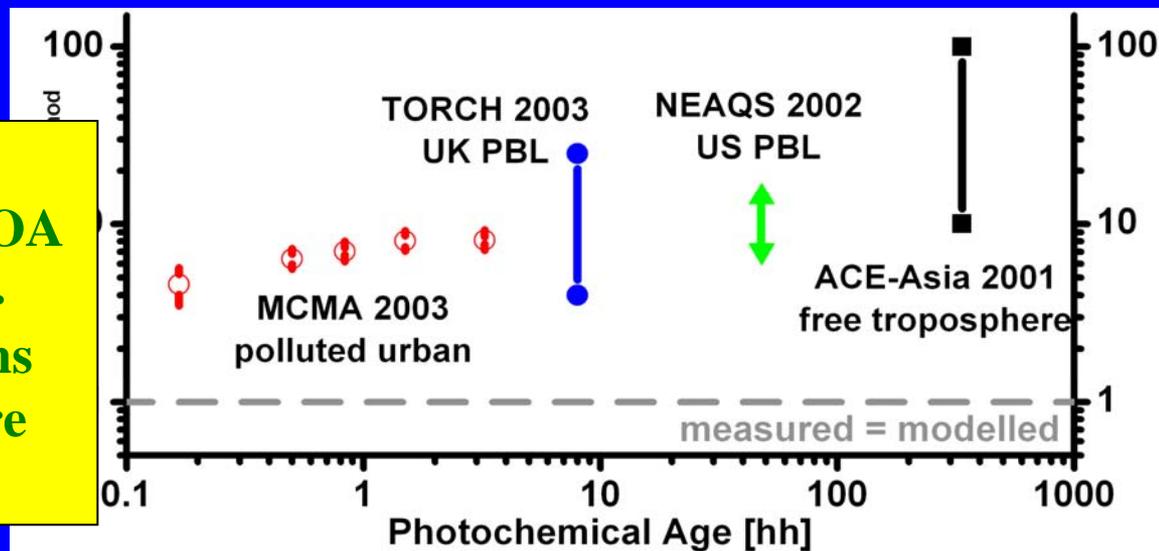
In 2 days:

- Composition changes
- Pie shrinks: species not measured? Deposition? [*de Gouw, JGR 2005*]
- SOA formation >> calculated from known precursors

SOA growth >> expected:

2010:

- Investigate early stages of SOA formation at central LA site.
- Coordinate with all platforms to build as complete a picture as possible





Transport and Meteorology

Understanding is critical for characterizing O₃ and PM levels

Investigate:

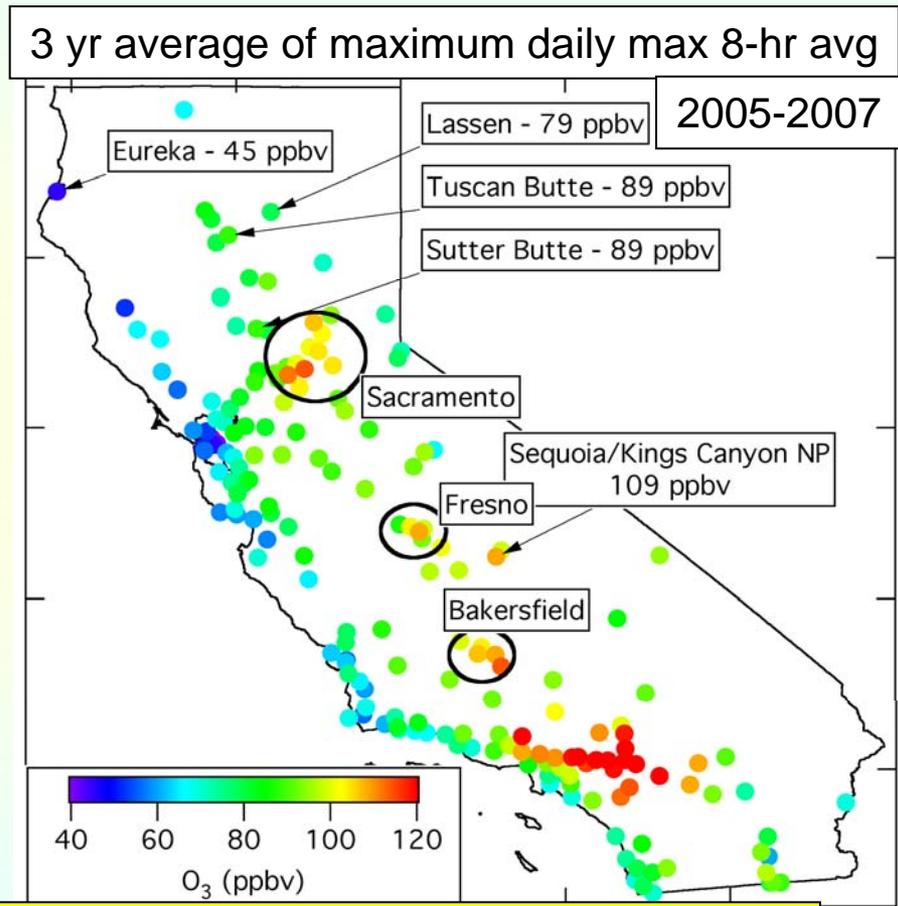
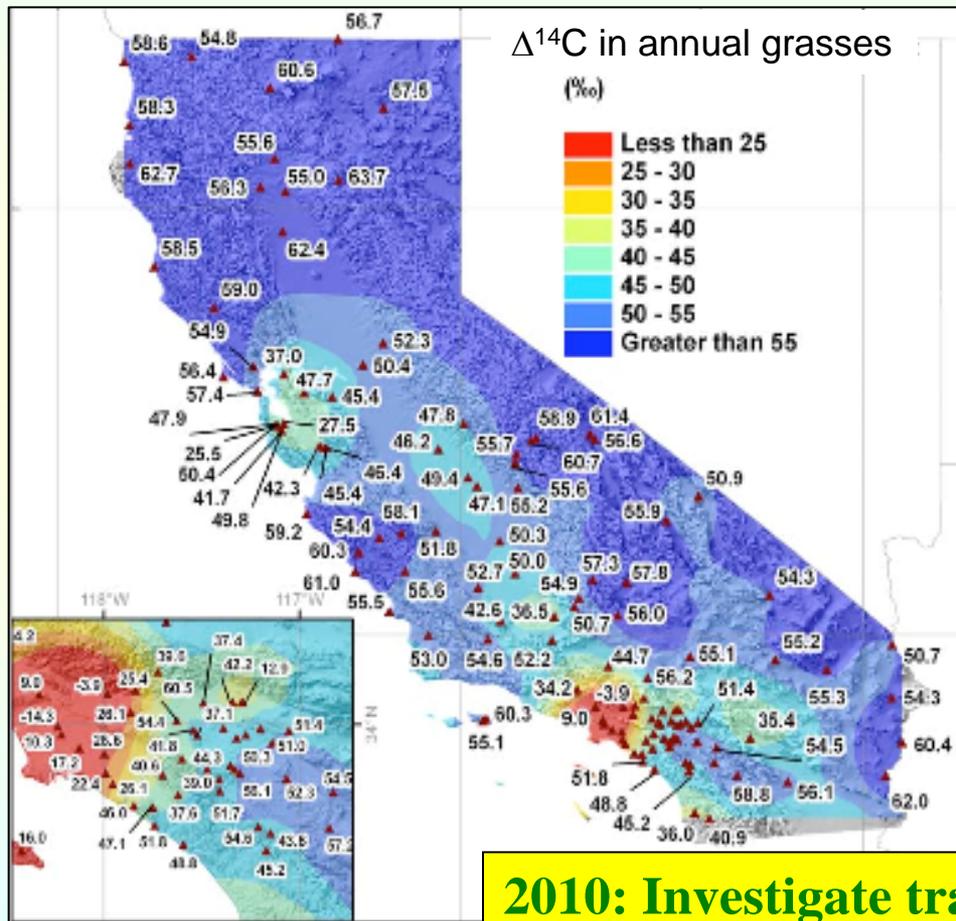
- Orographic ventilation and recirculation of pollution in the atmospheric boundary layer
- Inter-regional transport
- Offshore recirculation and marine boundary layer phenomena
- Longer-range transport



Transport and Meteorology

Understanding is critical for characterizing O₃ and PM levels

Transport of emissions into, within, and out of California



2010: Investigate transport mechanisms so that we can understand differences in observed patterns of anthropogenic emissions and ozone distributions

Riley et al., JGR, 113, 10.



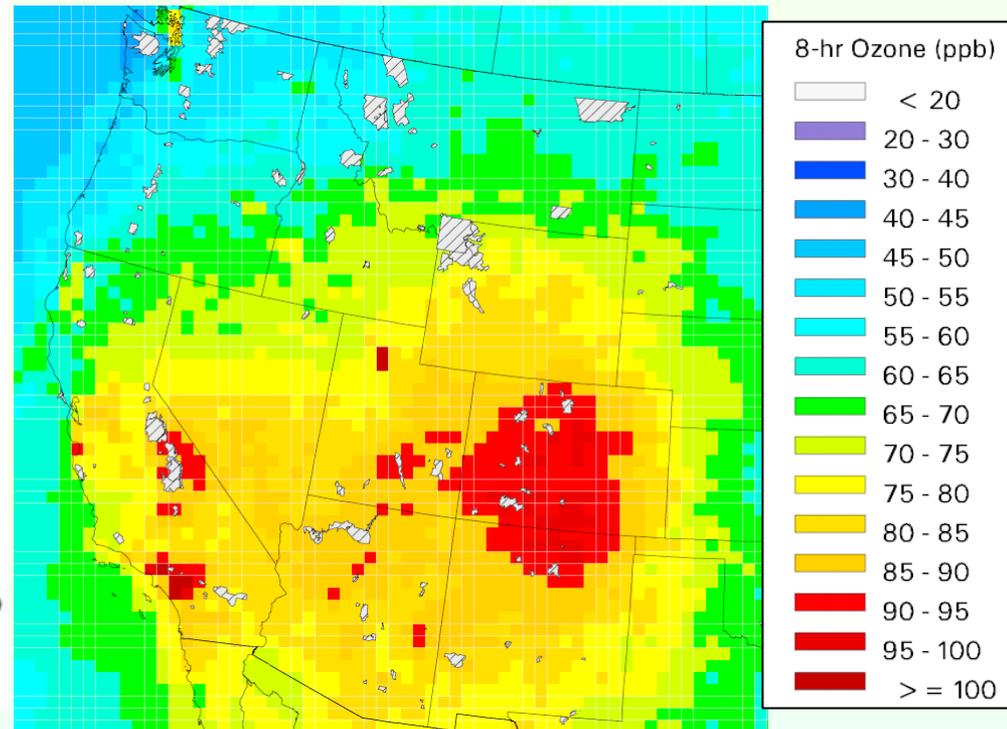
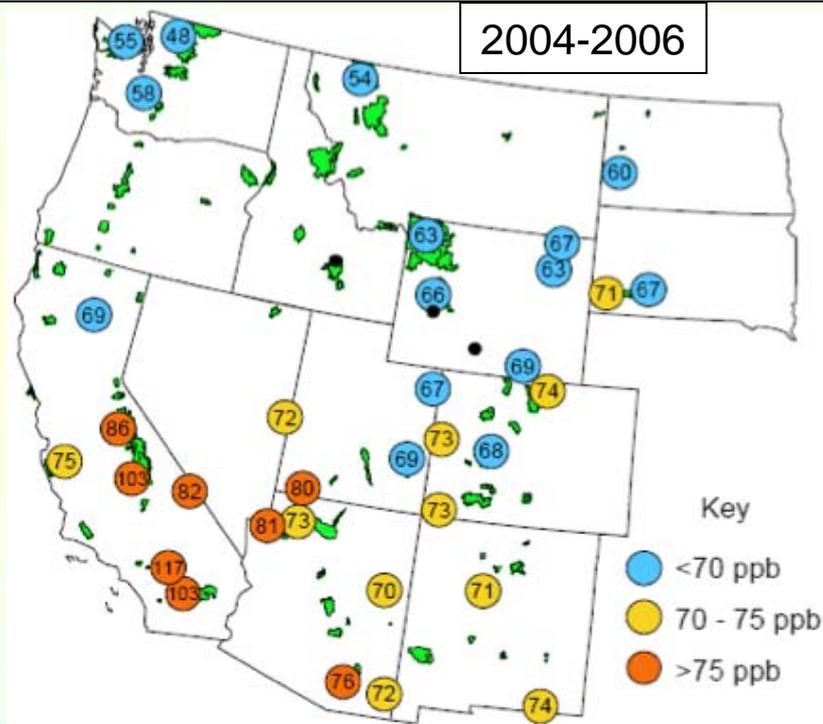
Transport and Meteorology

Understanding is critical for characterizing O₃ and PM levels

Transport of emissions into, within, and out of California

3 yr average of 4th highest daily max 8-hr avg

WRAP 2018 regional modeling



Tom Moore, WRAP, 2008

2010: Investigate export of California emissions to test reality of such modeling.



Aerosol Properties and Radiative Effects

Aim to reduce uncertainty of aerosol radiative forcing

Investigate:

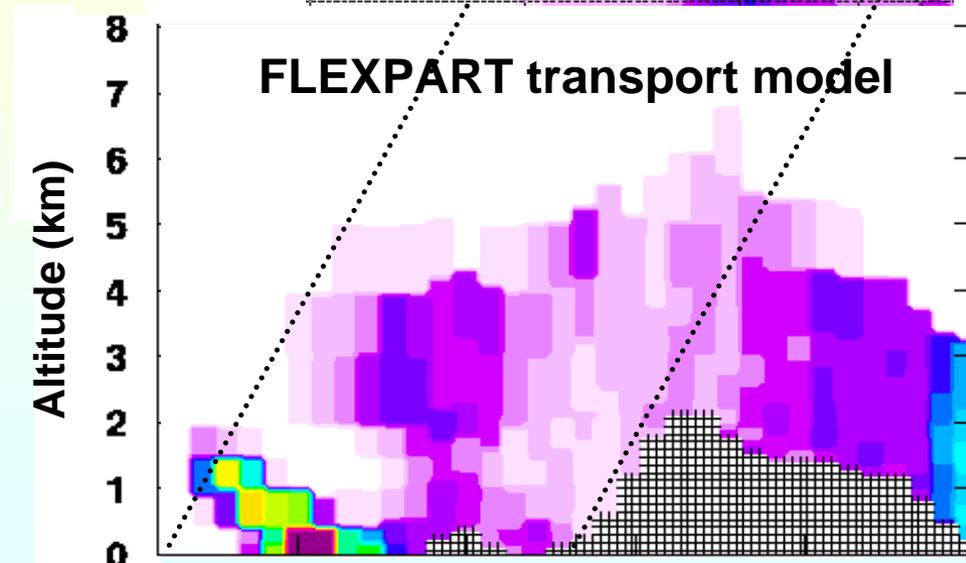
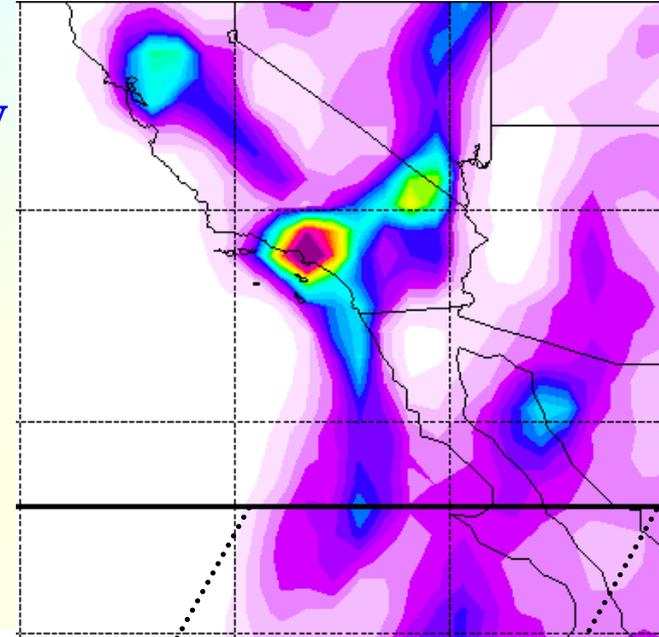
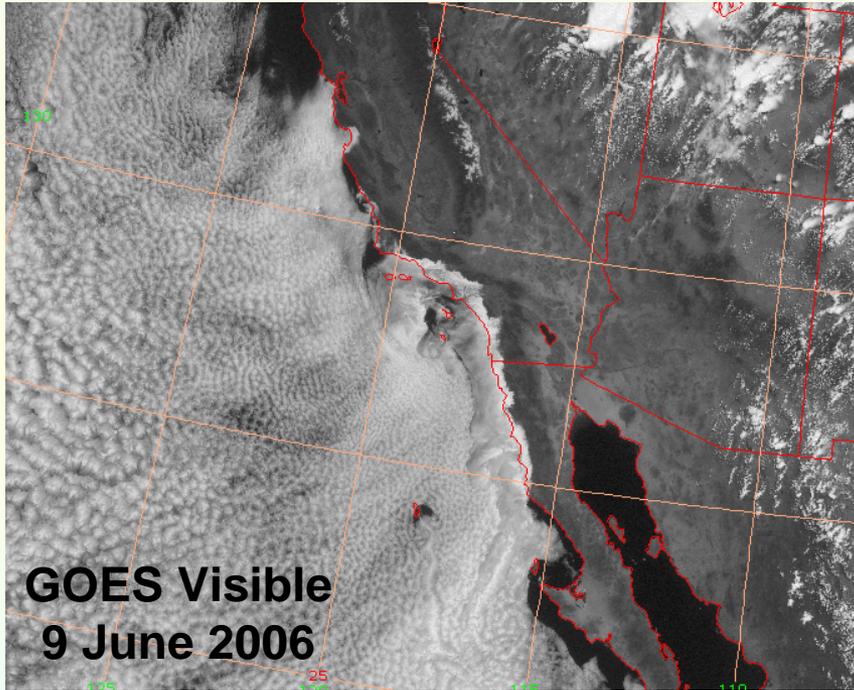
- **Direct radiative effects**
- **Aerosol-cloud interactions (Indirect effects)**



Aerosol Properties and Radiative Effects

Aim to reduce uncertainty of aerosol radiative forcing

Los Angeles plume advected into offshore stratus deck provides a laboratory to study aerosol indirect effect on climate

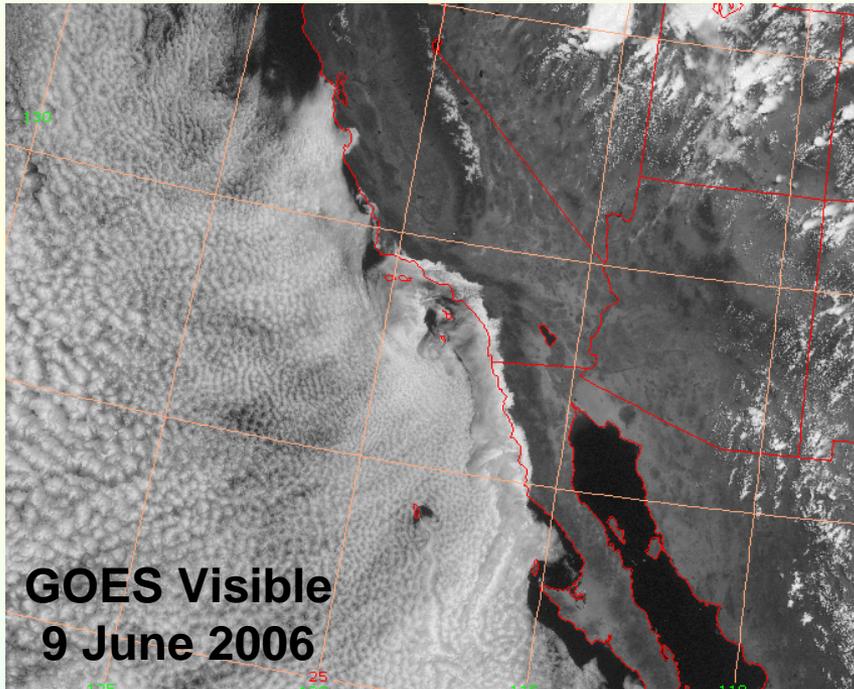




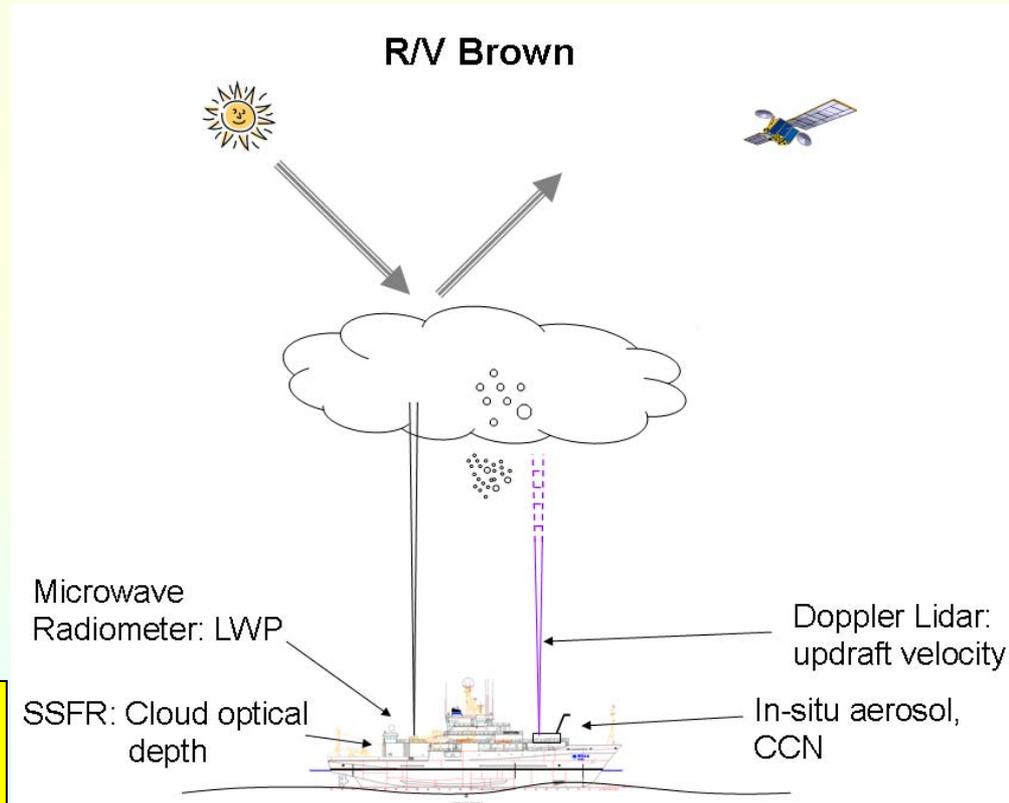
Aerosol Properties and Radiative Effects

Aim to reduce uncertainty of aerosol radiative forcing

Los Angeles plume advected into offshore stratus deck provides a laboratory to study aerosol indirect effect on climate



2010: Contrast aerosol-cloud interactions with VOCALS results (Urban vs. smelter emissions)



CalNex 2010: NOAA perspective

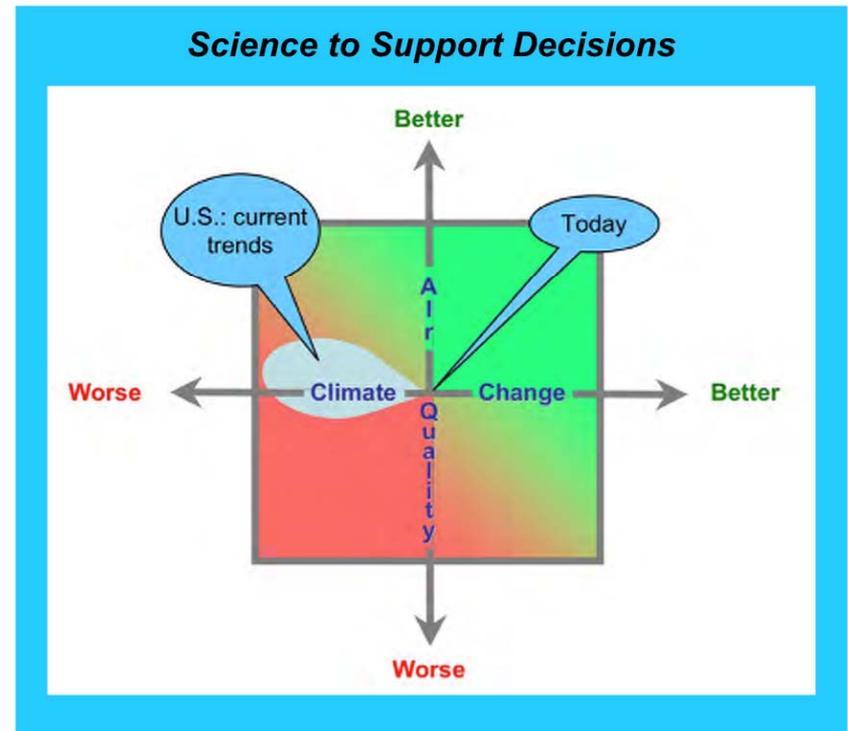
Why CalNex?

**Goal of this meeting:
Continue planning how to most
effectively investigate the
science issues collected in this
document.**

2010 CalNex public meeting
February 5, 2009, Sacramento, CA



2010 CalNex Science and Implementation Plan



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