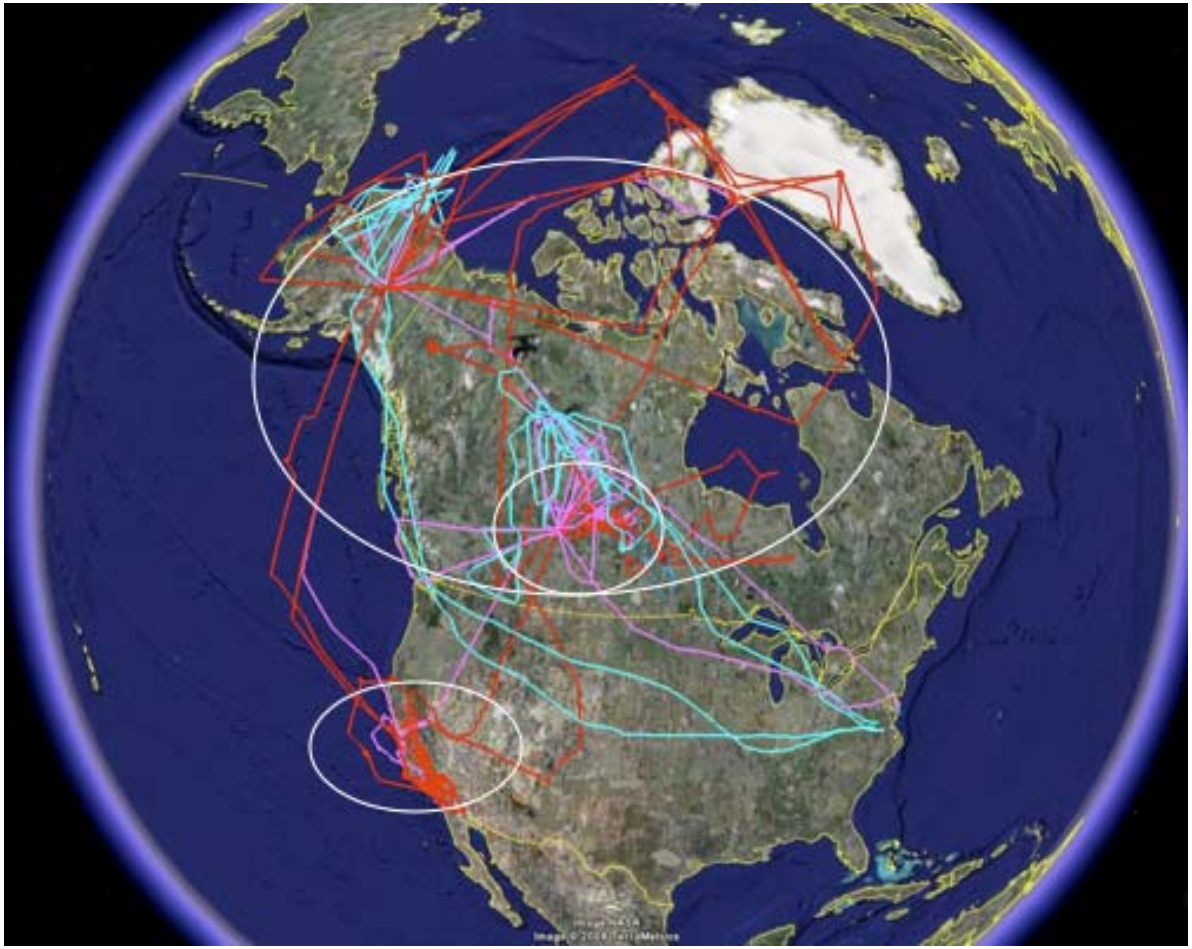
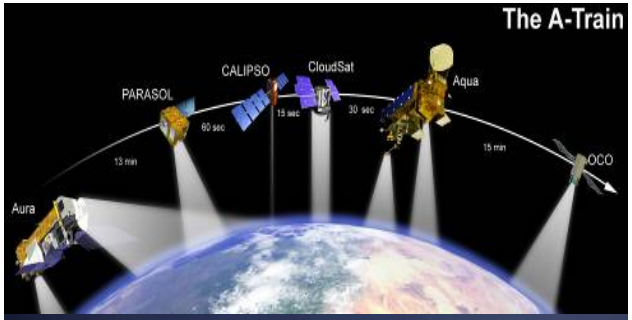
ARCTAS/CARB 2008

H. B. Singh, NASA Ames Research Center

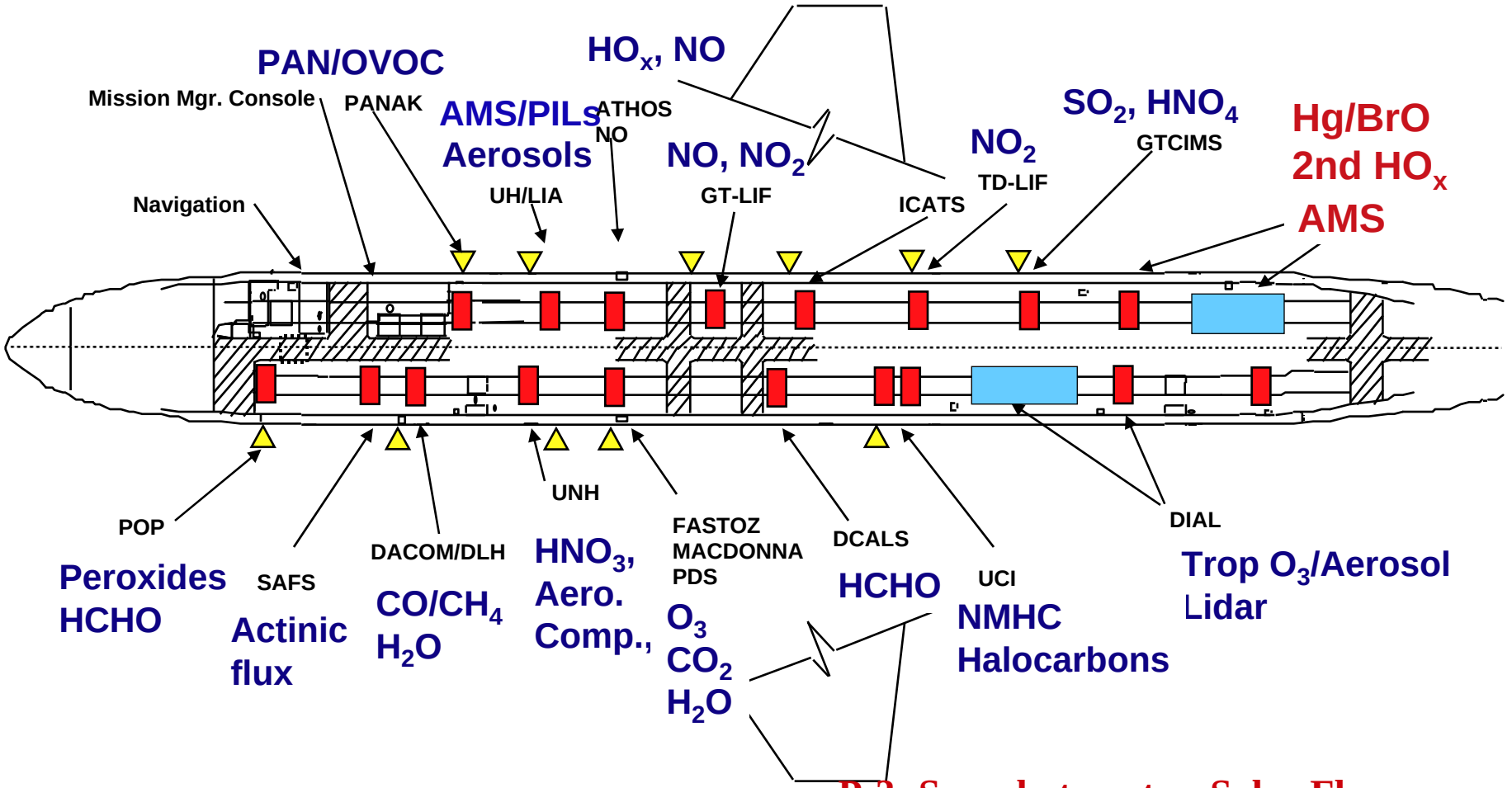
A collaboration between NASA and the California Air Resources Board focused on CA Air Quality and Climate

DC-8: 4 flights (33 hrs); P-3B: 1 flight (8 hrs)- June 2008, Palmdale, CA



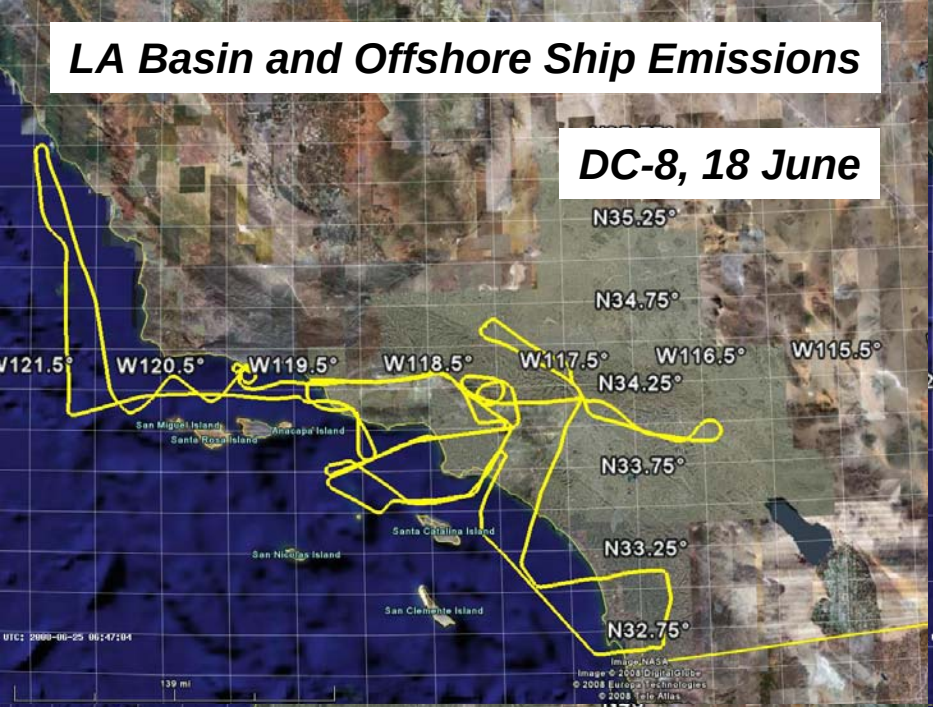


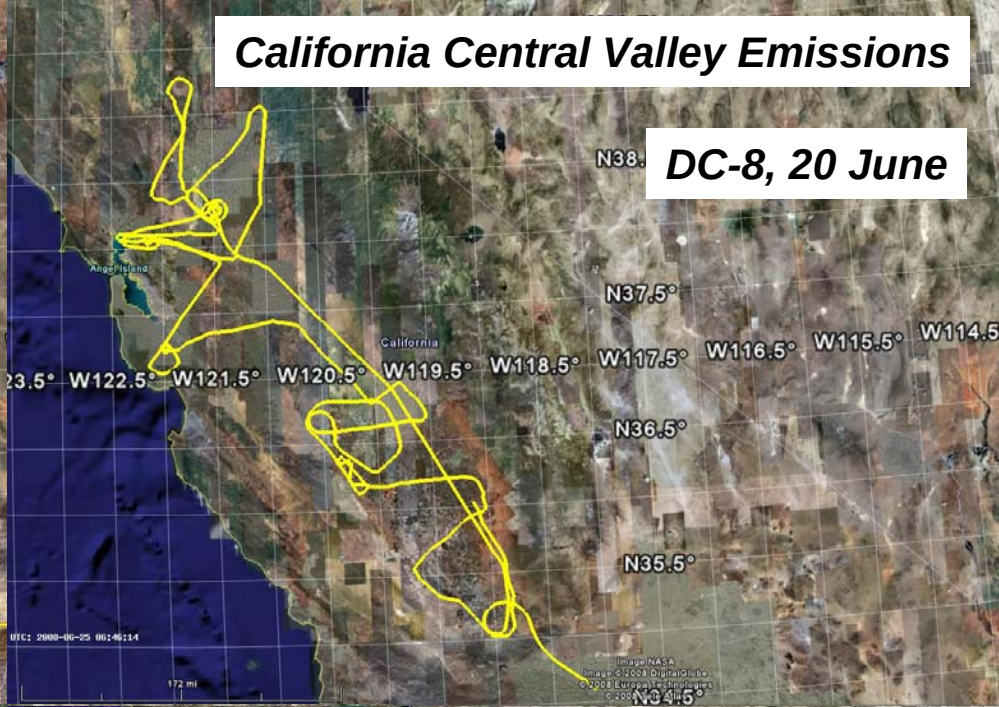
ARCTAS Payload for NASA DC-8 & P-3

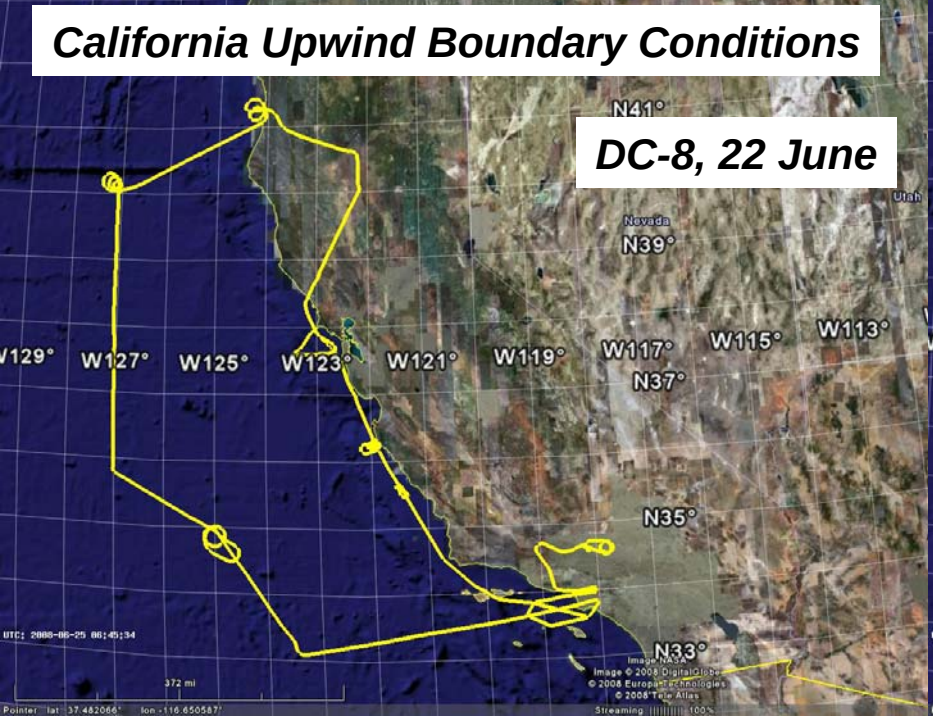


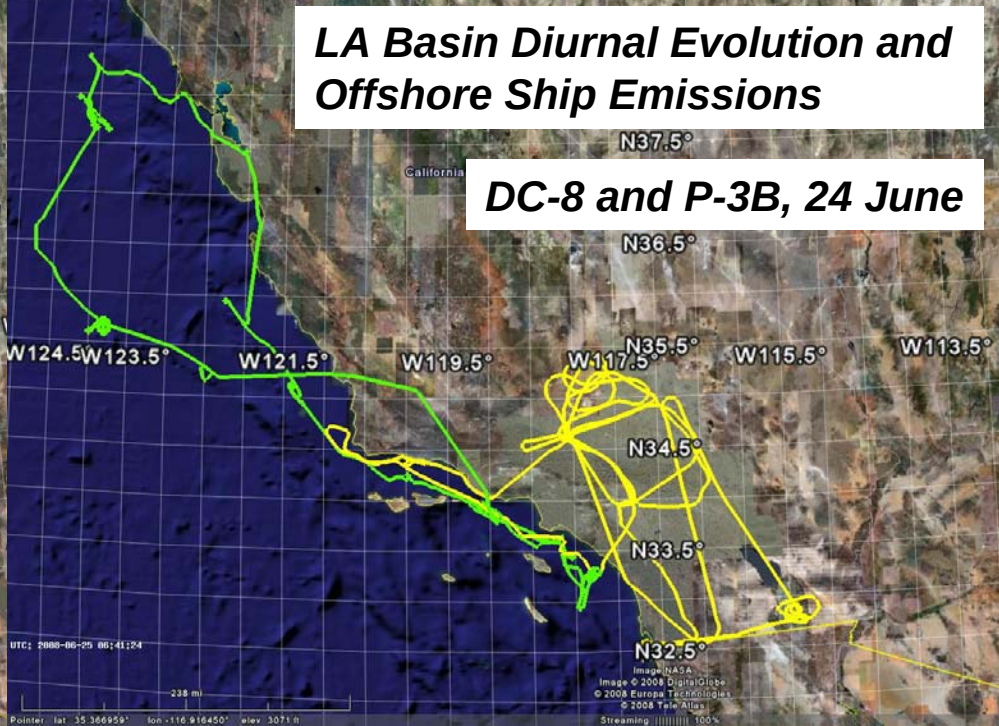
P-3: Sun photometer, Solar Flux Radiometer, Cloud Absorption Radiometer, Scanning Polarimeter, Aerosol, CO, O3

△ PROBE


LA Basin and Offshore Ship Emissions
DC-8, 18 June
N35.25°
N34.75°
W121.5°
W120.5°
W119.5°
W118.5°
W117.5°
W116.5°
W115.5°
N34.25°
San Miguel Island
Santa Rosa Island
Anacapa Island
N33.75°
Santa Catalina Island
San Nicolas Island
N33.25°
San Clemente Island
N32.75°


California Central Valley Emissions
DC-8, 20 June
N38.
Angel Island
N37.5°
California
W122.5°
W121.5°
W120.5°
W119.5°
W118.5°
W117.5°
W116.5°
W115.5°
W114.5
N36.5°
N35.5°


California Upwind Boundary Conditions
DC-8, 22 June
N41°
Nevada
Utah
N39°
W129°
W127°
W125°
W123°
W121°
W119°
W117°
W115°
W113°
N37°
N35°
N33°


LA Basin Diurnal Evolution and Offshore Ship Emissions
DC-8 and P-3B, 24 June
N37.5°
California
N36.5°
W124.5
W123.5°
W121.5°
W119.5°
W117.5°
N35.5°
W115.5°
W113.5°
N34.5°
N33.5°
N32.5°

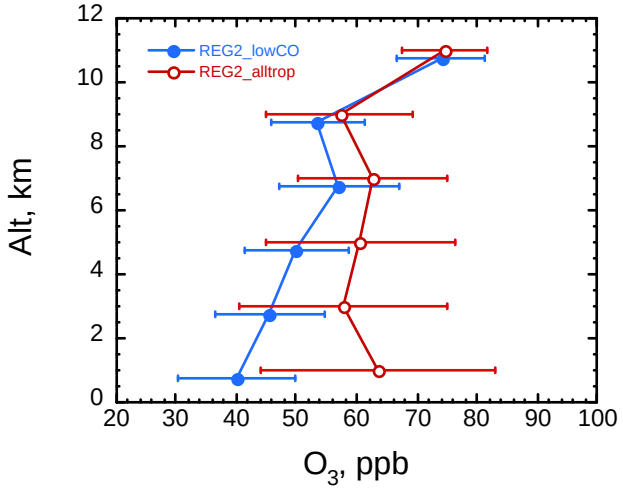
Flight 13 Central Valley Survey 06/20/2008: Mapping GHG emissions from urban & rural sources in California

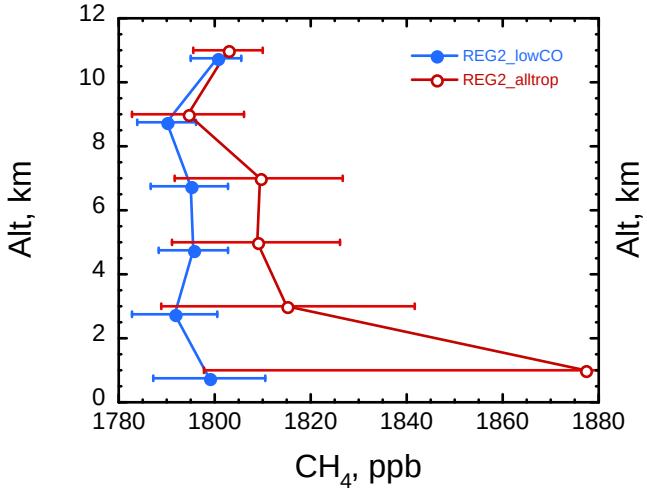
TARGETS:

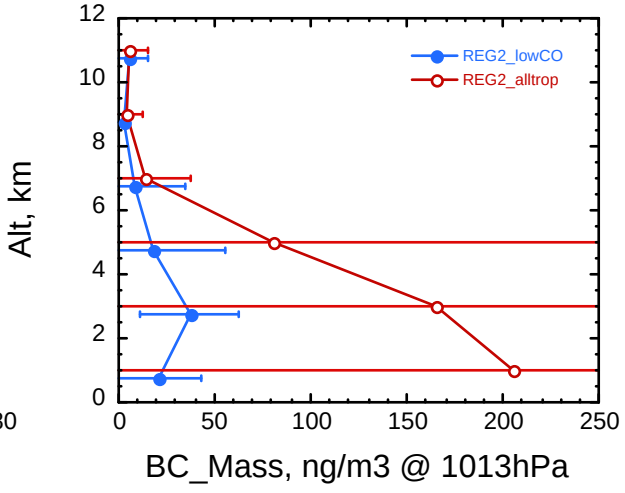
- **Sampling upwind/downwind of urban areas: Fresno, Stockton, Sacramento, SF-bay (covariance of GHG's & tracers)**
- **"Non-urban" emissions of GHG species – methane, from rice fields**
- **Walnut Grove Tower time series & profiling**
- **Emissions from dairy areas & feedlots**
- **Characterizing Central Valley gas/aerosol composition & variability**

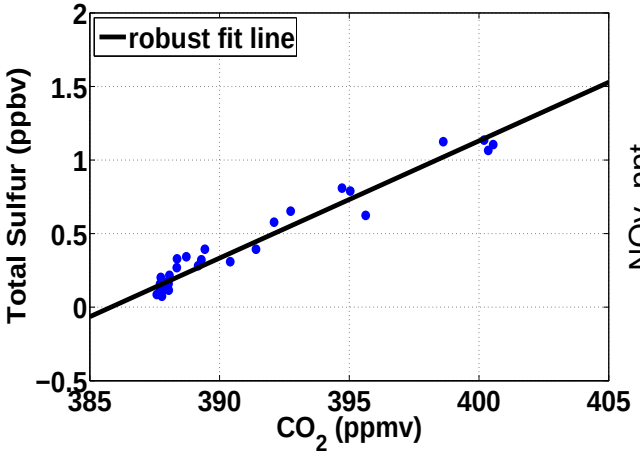
CARB representatives were deeply involved in the planning & execution of flights bringing extensive local knowledge of CA emissions & AQ

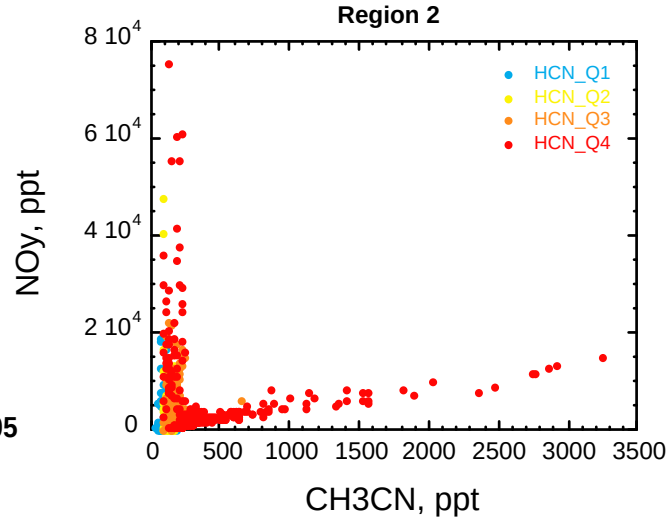
Pollutant distributions & relationships over CA

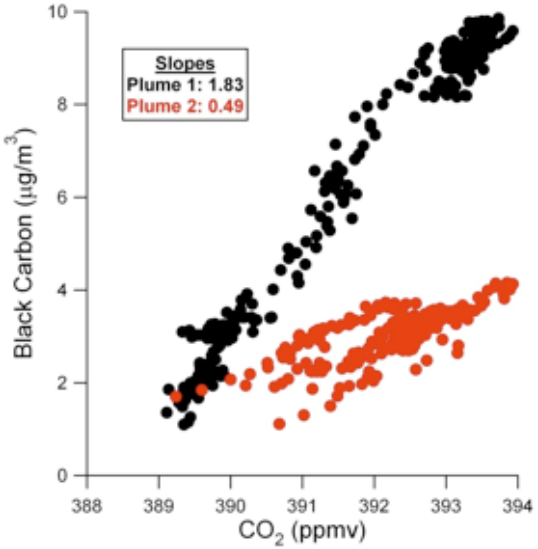






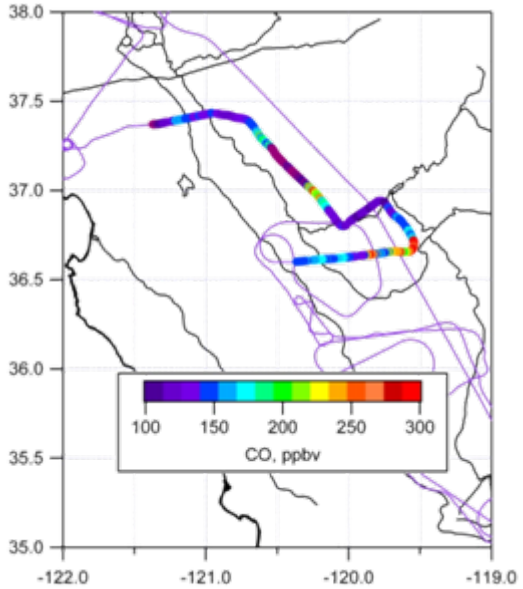


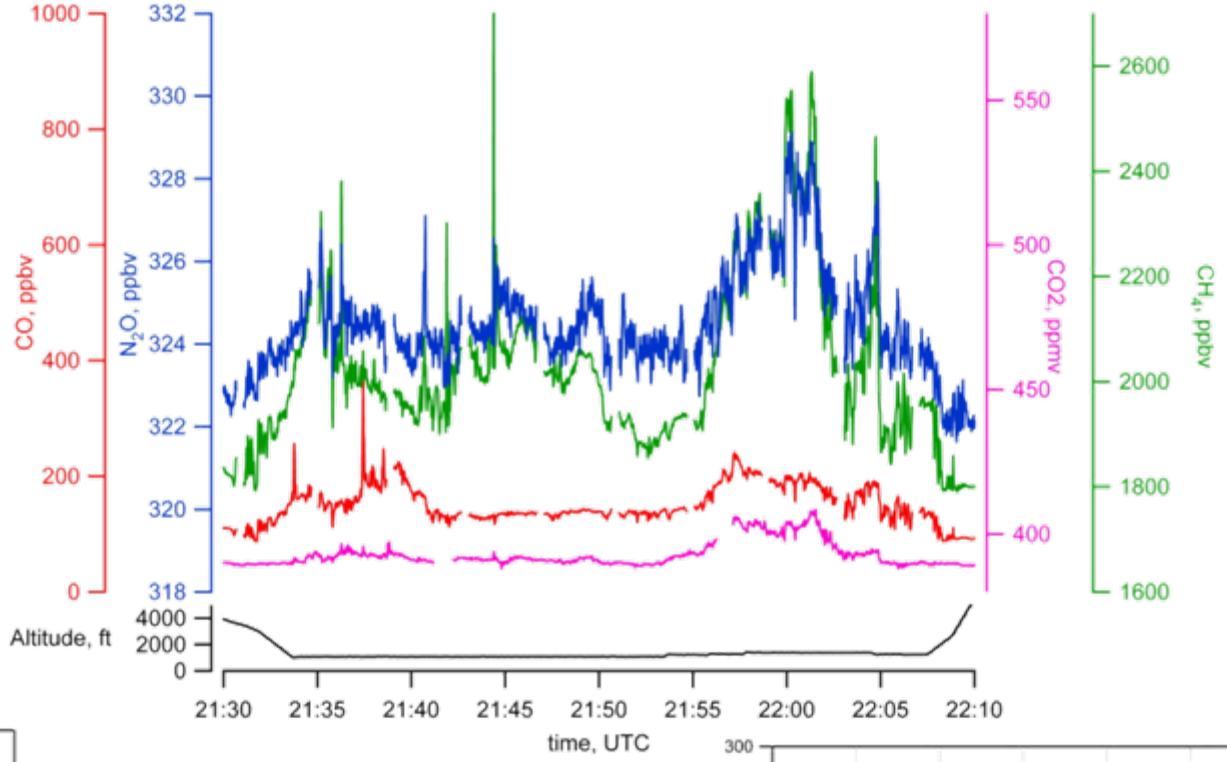


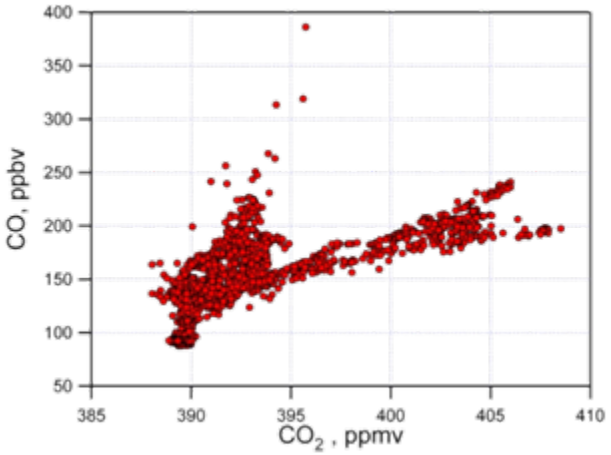


ARCTAS Flight #13 / CARB Flight #2

low-level flight over agriculture, biomass burning, urban, other

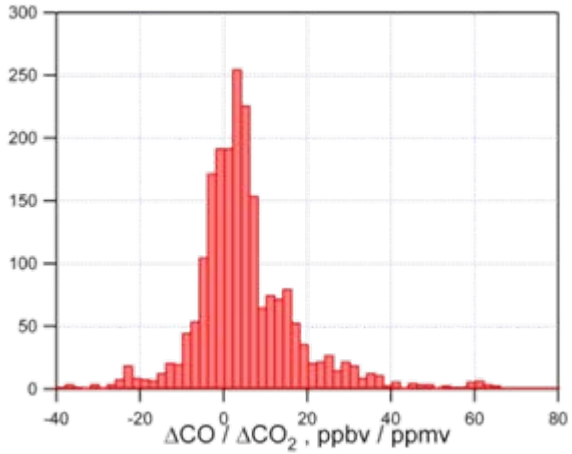




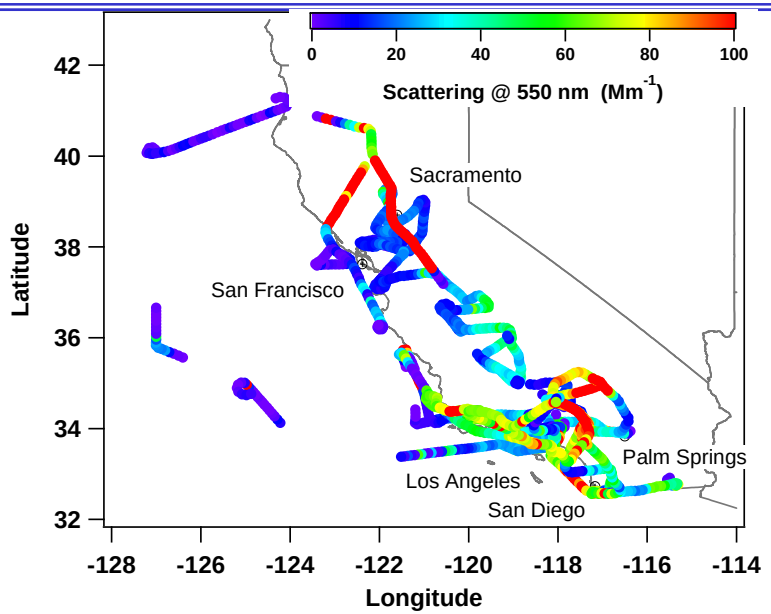


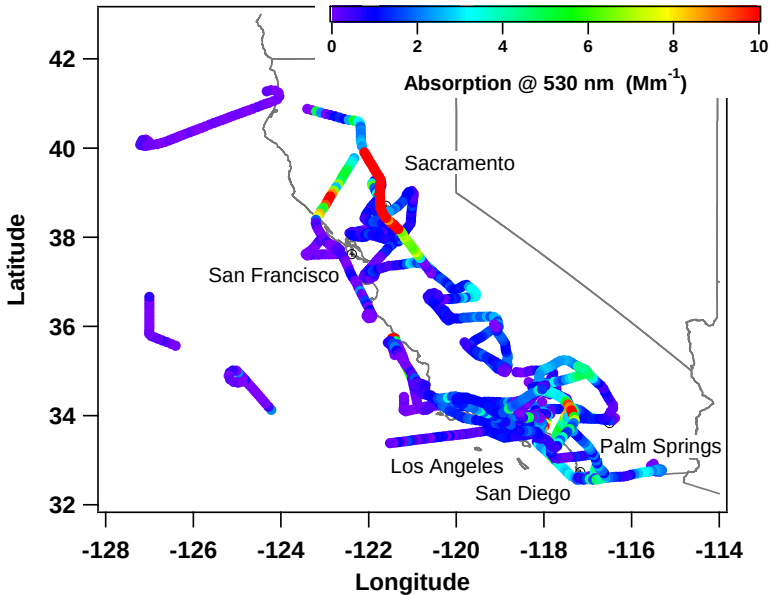
ΔCO / ΔCO_2 shows several modes in this 40 minute segment

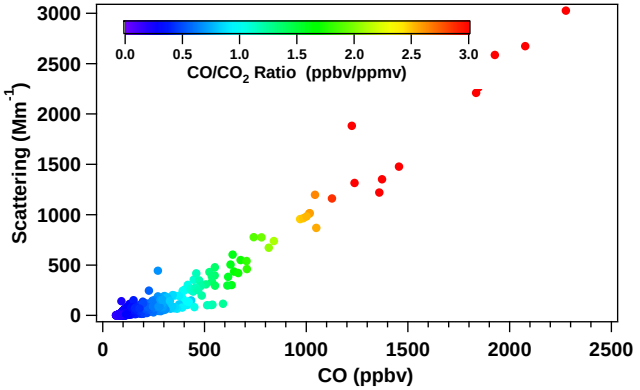
- 60 x 10^{-3} – biomass burning
- 5 x 10^{-3} – automotive
- 10-30 x 10^{-3} – uncertain
- negative slope – drawdown ?

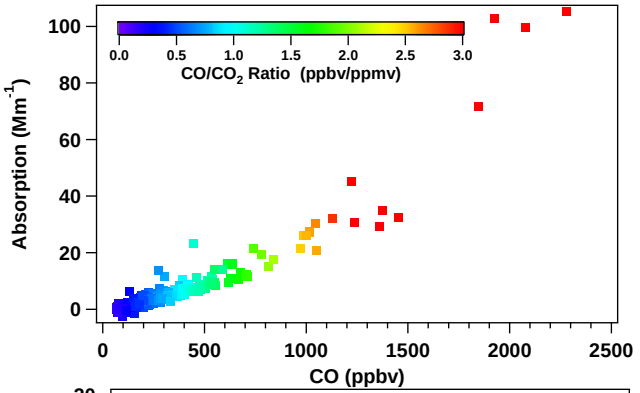


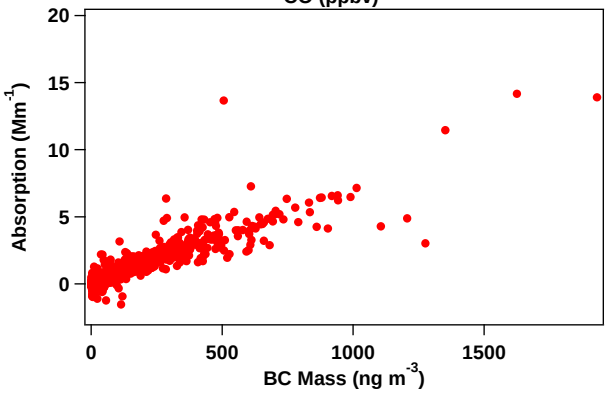
Anthropogenic Impact on Aerosol Direct Effect (ARCTAS/CARB)



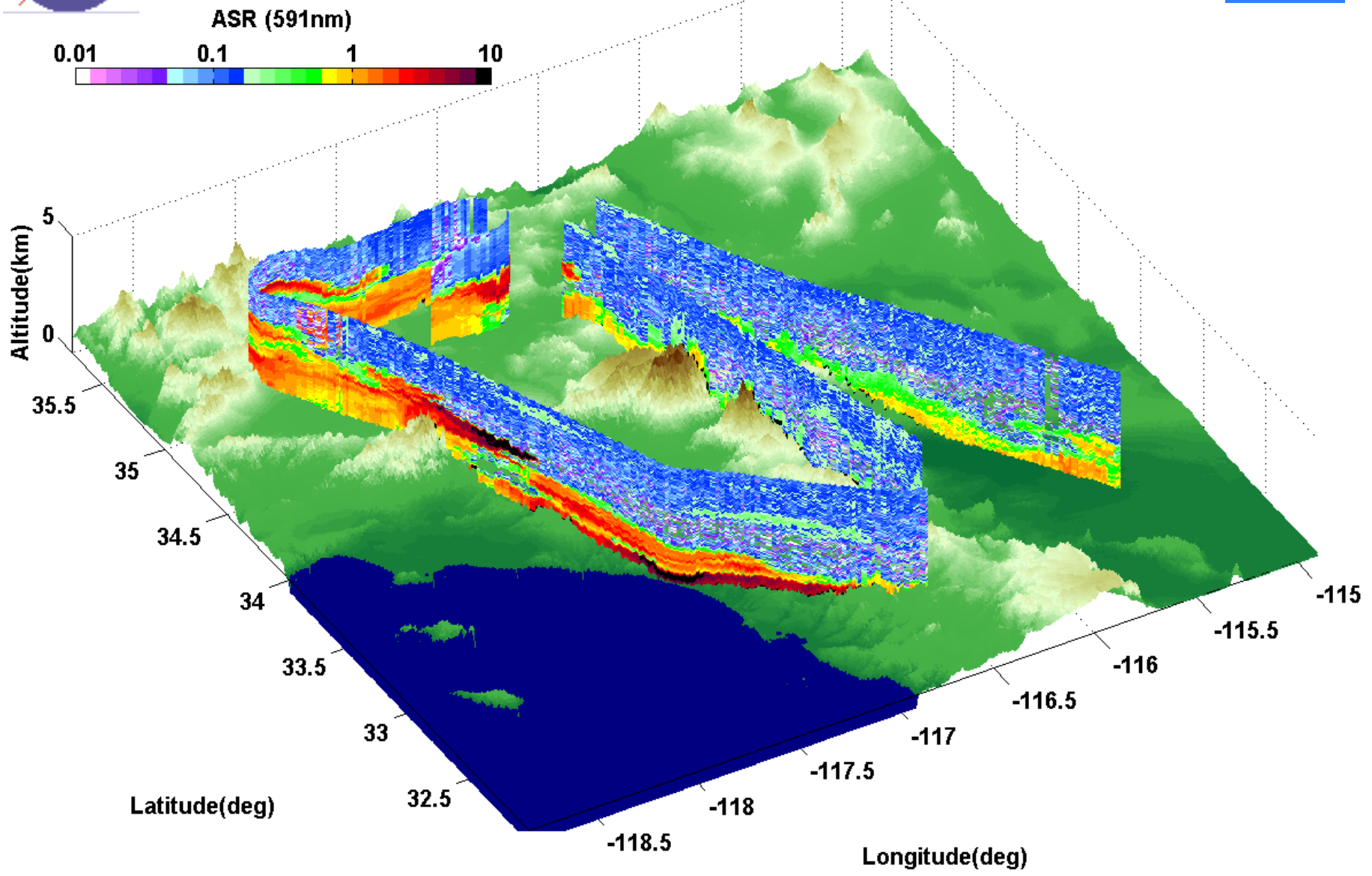




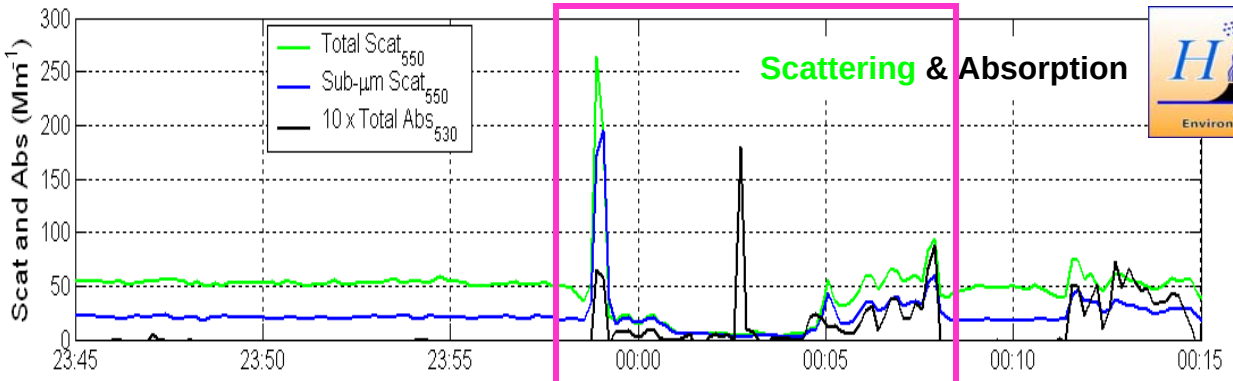


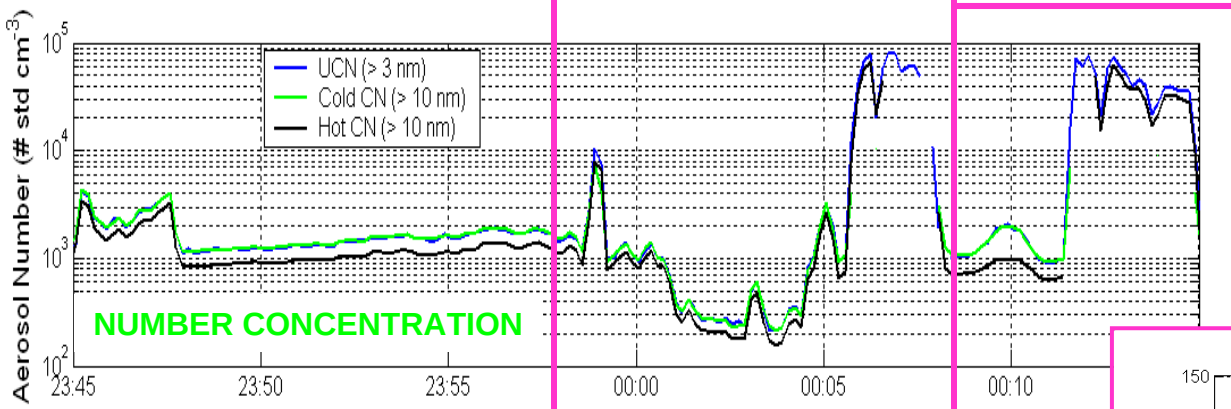


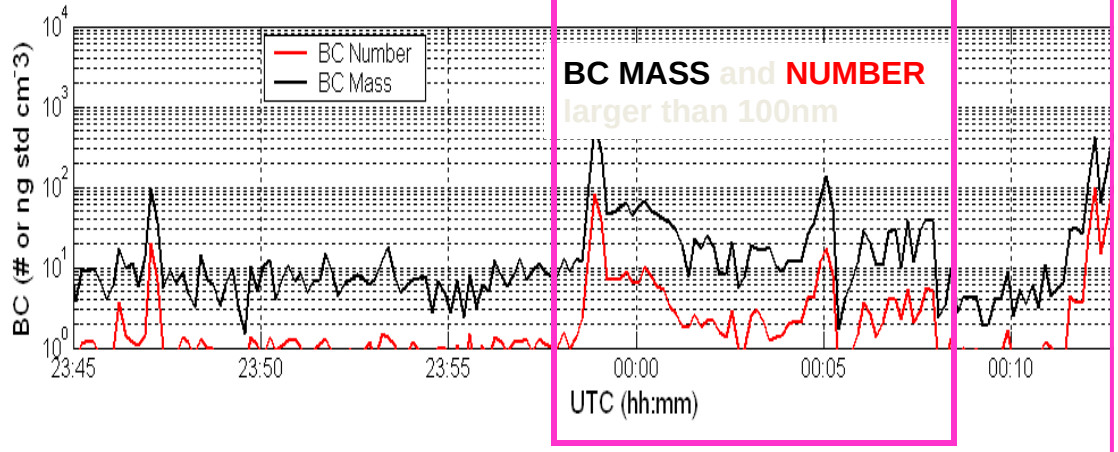
Aerosol Scattering Ratio Over SCAB- DC-8 Dial Lidar



NYK Argus; Cargo 300m, 35 49.2’ 122 05.6’, Plume run



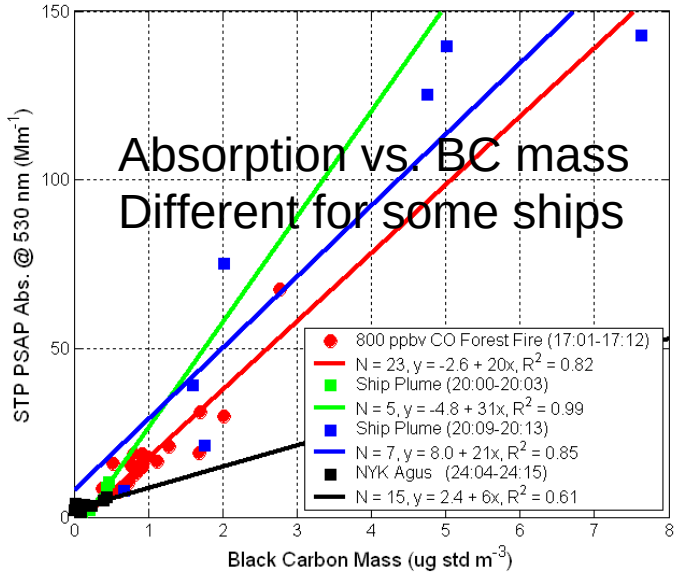




AS2_HanwatRF12_3panel_tseries4.fig, AS2_HanwatRF12_timeseries.m, Cam, 2008-12-31

HIGEAR
Hawaii Group for Environmental Aerosol Research

NYK Argus from P3b, courtesy photo Y. Shinozuka



ARCTAS-CARB data sets/accomplishments

Emissions of Greenhouse Gases and Aerosols:

- Extensive low level sampling of emissions across the Southern California Air shed, Central Valley, offshore shipping lanes, & wild fires

Air Quality Modeling and Prediction:

- Complete characterization of aerosols & ozone precursors useful for evaluating air quality models
- Establishing boundary conditions for use in CA regional air quality models and to test global models useful for providing BCs