California Baseline Ozone Transport Study (CABOTS)

ARB/RD
Introduction:
Challenges of Ozone Pollution Management in the Western US

Lin, M., Transboundary Ozone Pollution Conference, April 2015
California’s Unique Challenges

- Limited data to check the global models which provide our boundary conditions
- SJV and SoCAB are not high elevation which complicates modeling the impact of long range transported O$_3$
Objectives of CABOTS

• Data to better understand how well global models reproduce the content and daily variability of ozone vertical profiles as they enter the State from the Pacific.

• Understand to what extent does trans-Pacific long-range transported ozone mix down to surface sites in the SJV and what is the impact.
Key ARB Funded Projects

• Improved Understanding of the Magnitude of Trans-Pacific Long Range Transported Ozone Aloft at California’s Coast
  – PI: Dr. Sen Chiao of the San Jose State University (SJSU)
  – This project funds ozonesonde launches from the UCD Bodega Marine Laboratory once a day for about 3 months during the spring and summer of 2016.

• Lidar Profiling of Ozone in the San Joaquin Valley
  – PIs: Drs. Andrew O. Langford and Christoph J. Senff of NOAA
  – This project will use a surface based ozone lidar to provide quasi-continuous ozone profiles up to 2 – 3 km above ground level in the SJV (Visalia Airport) for 3 weeks each in the spring (“transport season”) and summer (ozone season) of 2016.
CABOTS Ozonesonde and Ozone Lidar Sites
SJSU Ozonesondes

- Near daily ozonesondes mid-May – mid Aug.
- Team trained at NOAA
- Data available within hours for planning lidar operations
- Products:
  - Data to validate ARB’s modeled boundary conditions
  - Link ozone aloft the next day at the lidar site
Ozone Lidar at Visalia Airport

- Collocated with SJVAPCD wind profiler
- Deployments: May 29 – June 18 and July 18 – Aug 7
- 8 hours per day continuous ozone vertical profile
- O$_3$ monitor, T, p, RH, wind speed/dir
- Products:
  - Dynamic aloft O$_3$ data to track inputs to surface
  - NCAR, EPA, AQAST modelers interested
Other Related Work

• Aircraft Measurements
  – ARB’s Aircraft Pilot Observation (APOB) program.
  – NASA Ames Alpha Jet
  – NASA DC-8

• Surface Measurements
  – Bodega Bay and Visalia Airport
  – Summit of the Mammoth Mountain
  – Routine surface sites in the SJV and the Northern California coastal area

• Measurements at Chews Ridge, an elevated site in the Coastal Range

• Global and Regional Transport Modeling
ARB’s APOB

- Supports smoke management program
- Flights daily between 4 – 6 am over Fresno and Bakersfield, June through September
- Continuous measurements of ozone up to ~3000 m above ground.
- Variables measured included O$_3$, temperature, pressure/altitude, latitude and longitude
- Data annually since 2008
ARB Contract 14-308: Residual Layer $O_3$ & Mixing in SJV
NASA Ames – AJAX Program

- Alpha Jet: range 1,200 miles, duration 2 hours
- Instruments: $O_3$, $CO_2$, $CH_4$
- Met: P, T, turbulence index and 3-D wind vector
- Availability: 3 flights each in spring and summer.

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NASA Student Airborne Research Program (SARP) flights on June 17 and 18 in California
Chews Ridge

- Ian Faloona, UCD
- Funded by SJVAPCD
- 20 km inland from Pt. Sur
- 1500 m agl
- Ozone relatively flat with no urban diurnal pattern