Preliminary TOPAZ Results from the first CABOTS IOP

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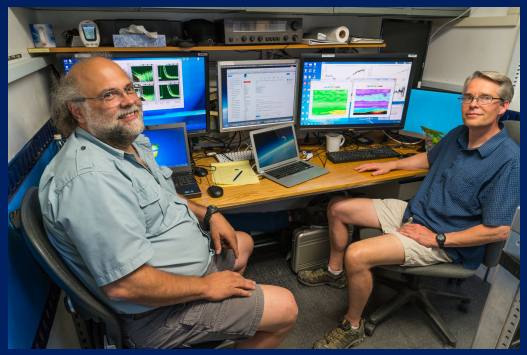
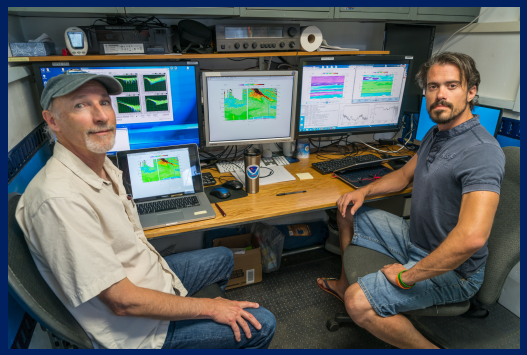
NASA Ames Alpha Jet

TOPAZ Truck

UC Davis / Sci. Aviation Mooney





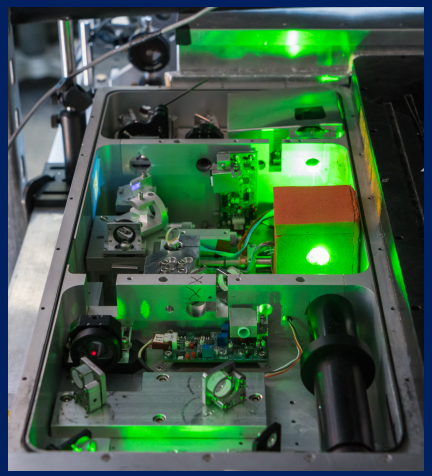
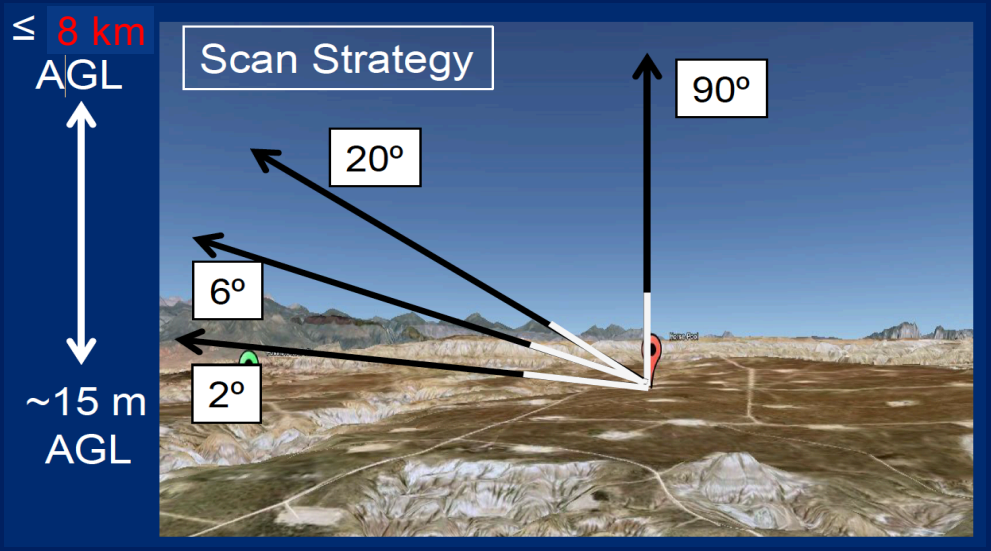
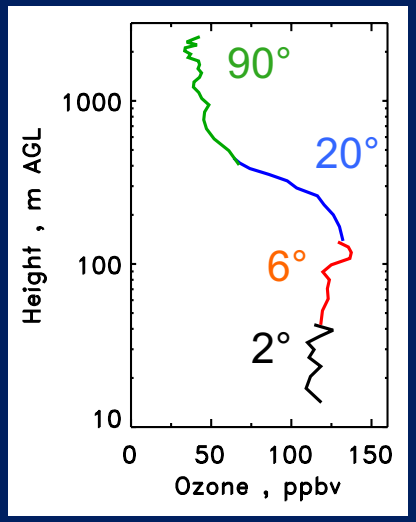


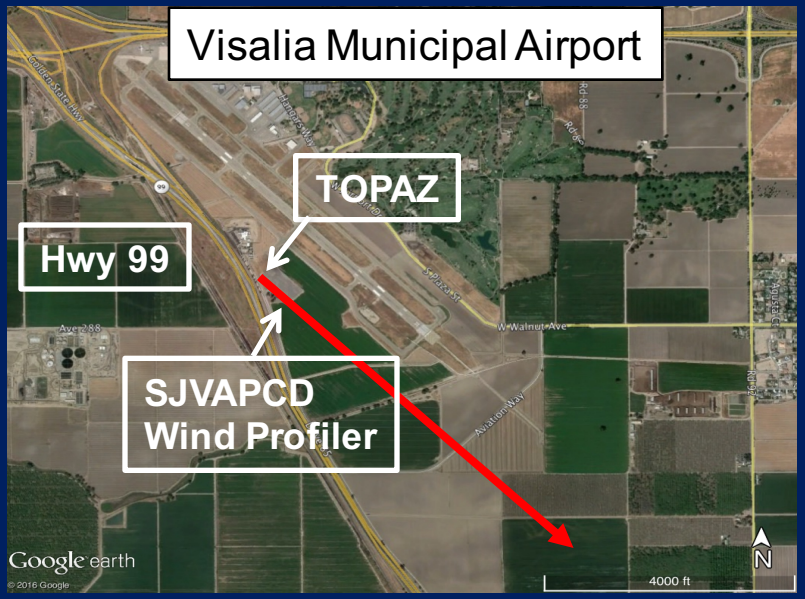
Photo Credit: Will von Dauster

TOPAZ lidar @ CABOTS



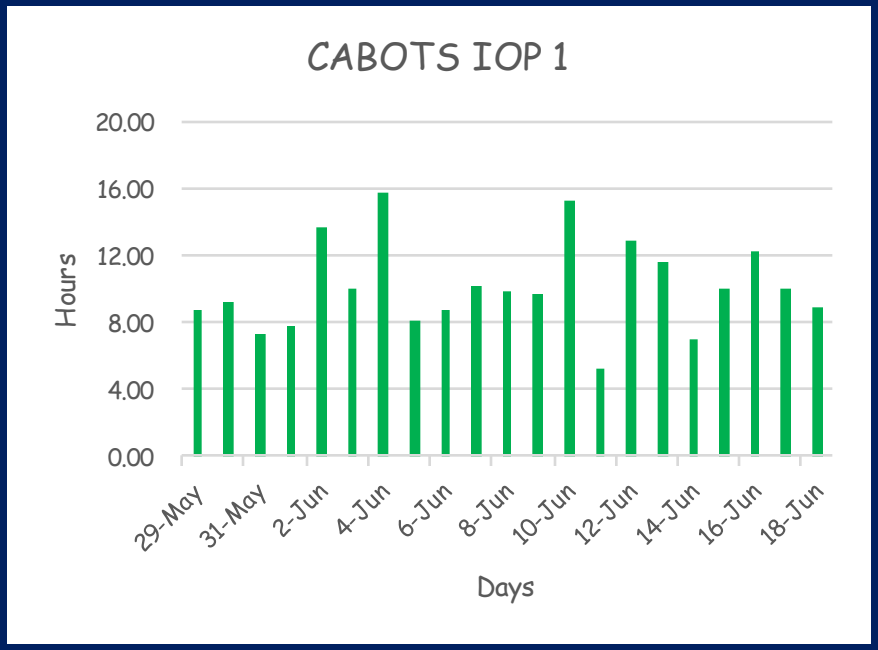


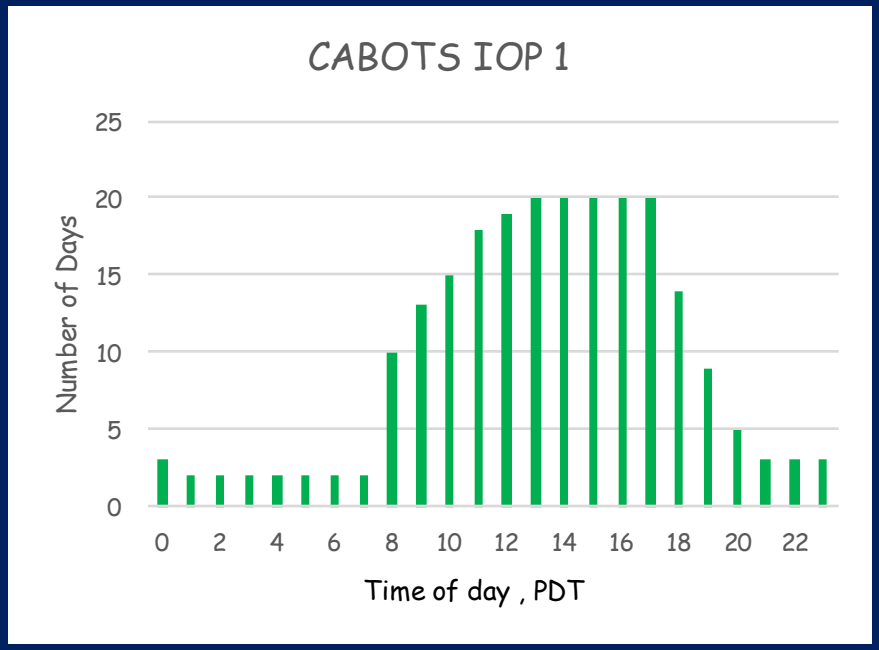
Composite vertical O_3 and aerosol profiles every 8 min



TOPAZ @ CABOTS IOP 1 (29 May – 18 Jun)

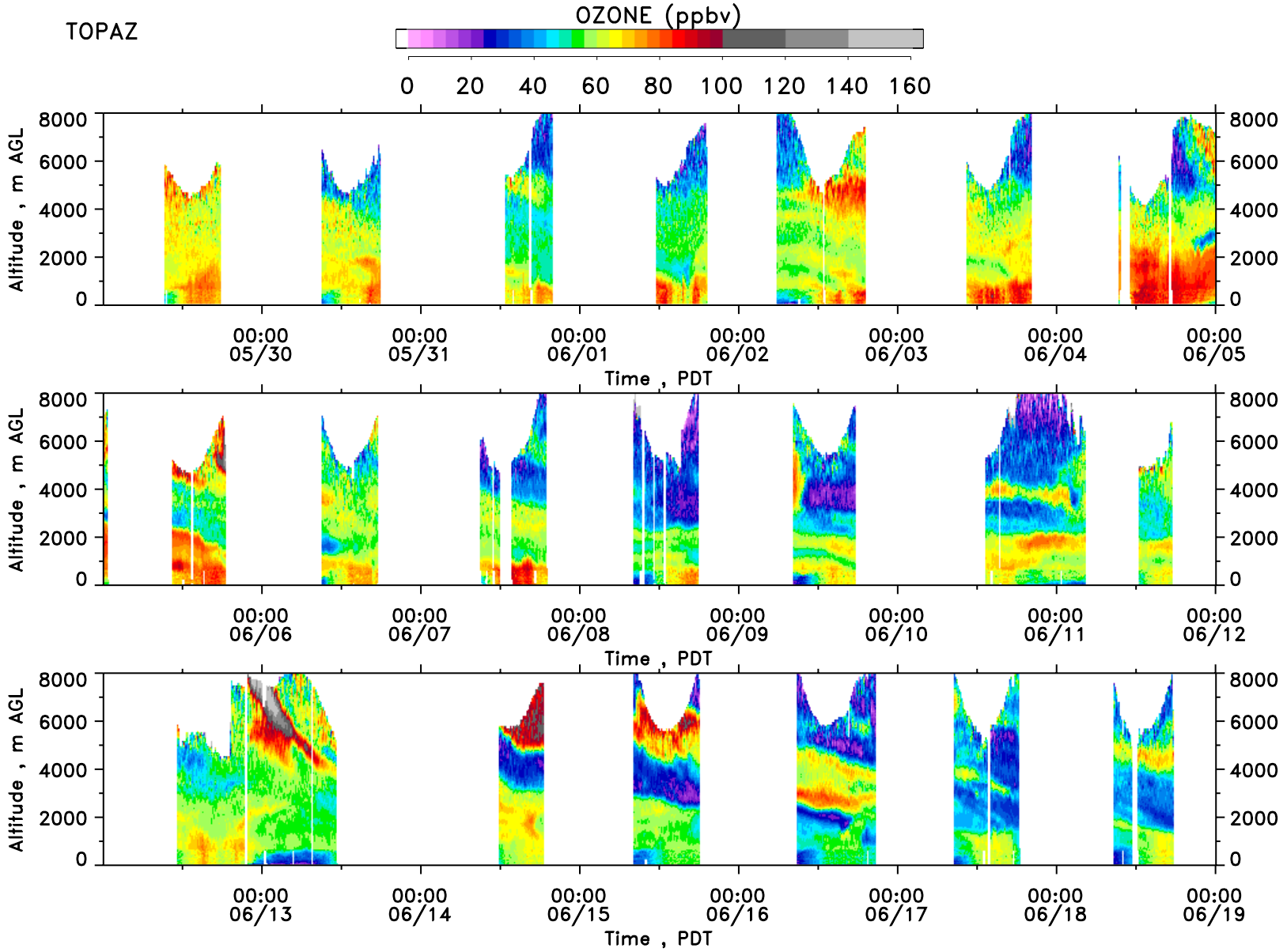
211 hours on 21 days



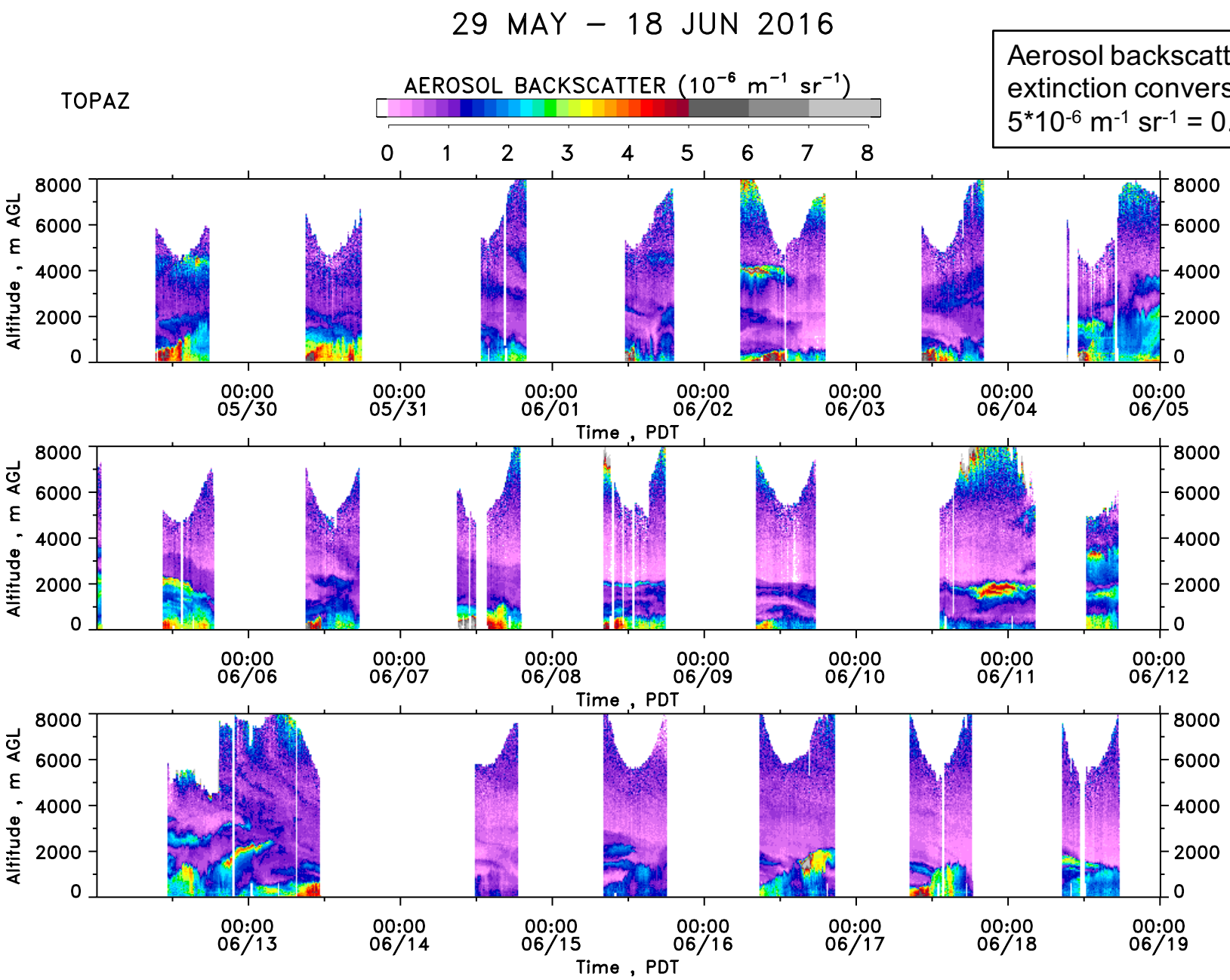


TOPAZ Ozone Mixing Ratio

29 MAY – 18 JUN 2016



TOPAZ Aerosol Backscatter @ 294 nm



Complex wind flow pattern and low summertime BL heights play an important role in the transport and distribution of pollutants in the San Joaquin Valley

Summertime low-level wind flow patterns in California's Central Valley

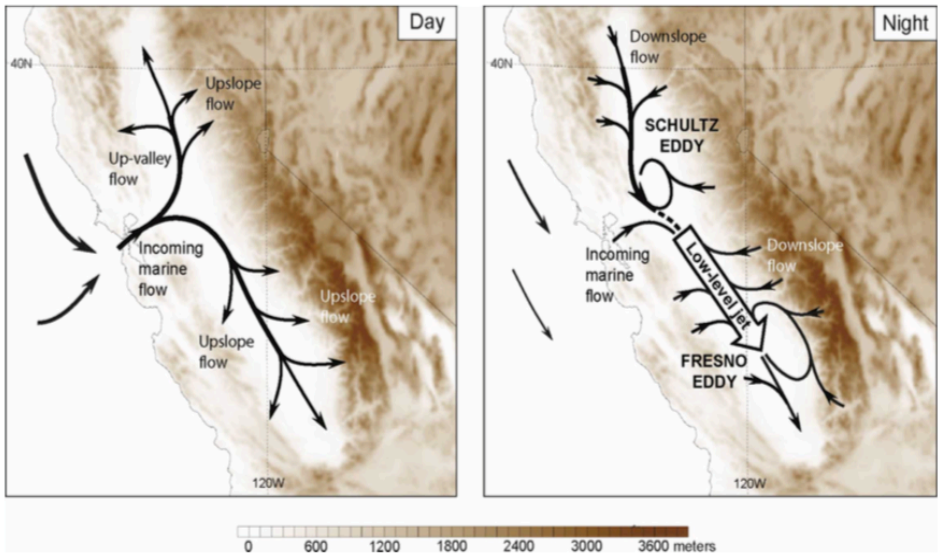
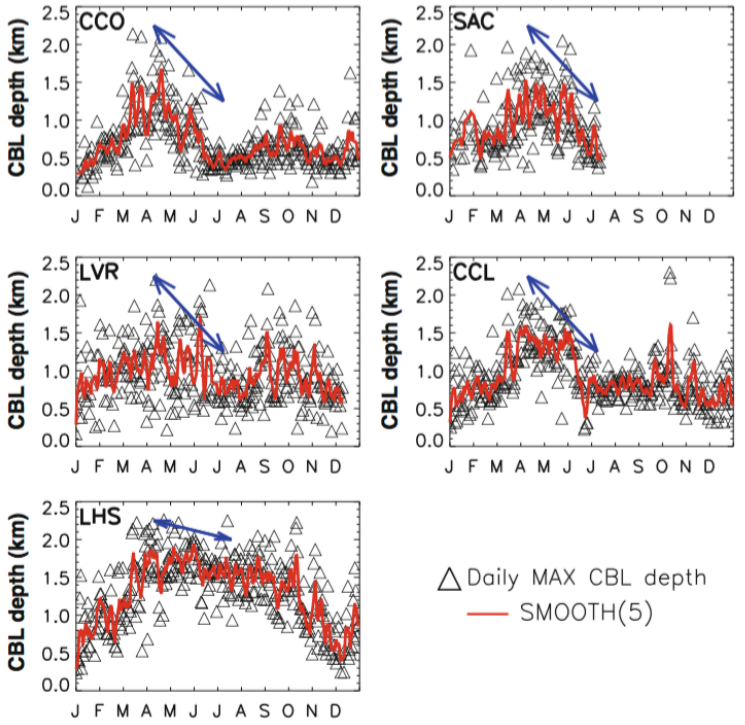


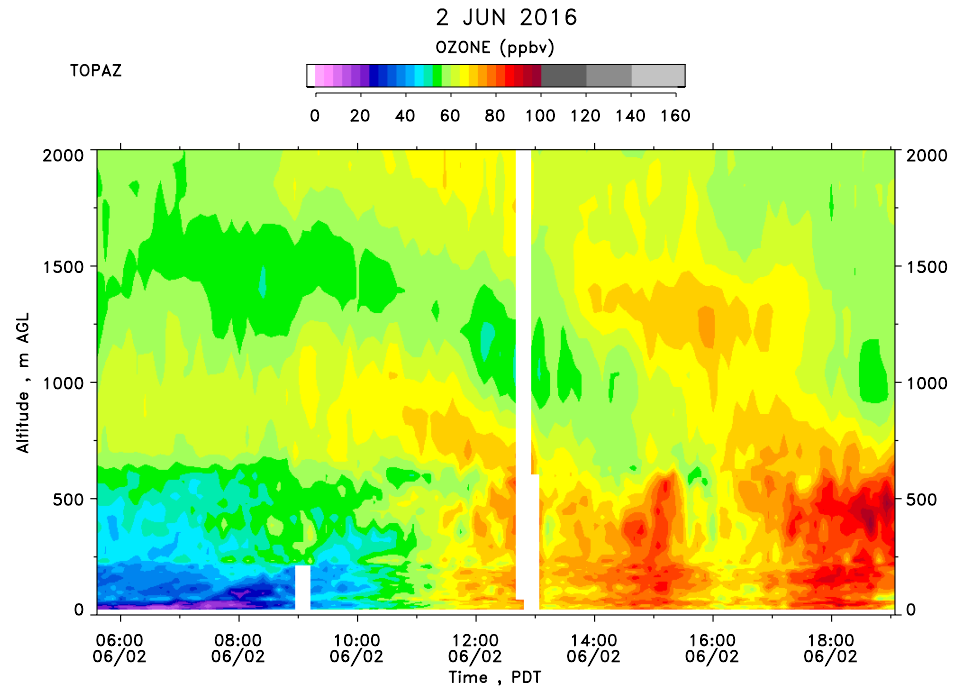
FIG. 11. Conceptualization of the daytime and nighttime low-level wind regimes during the 5-day episode.

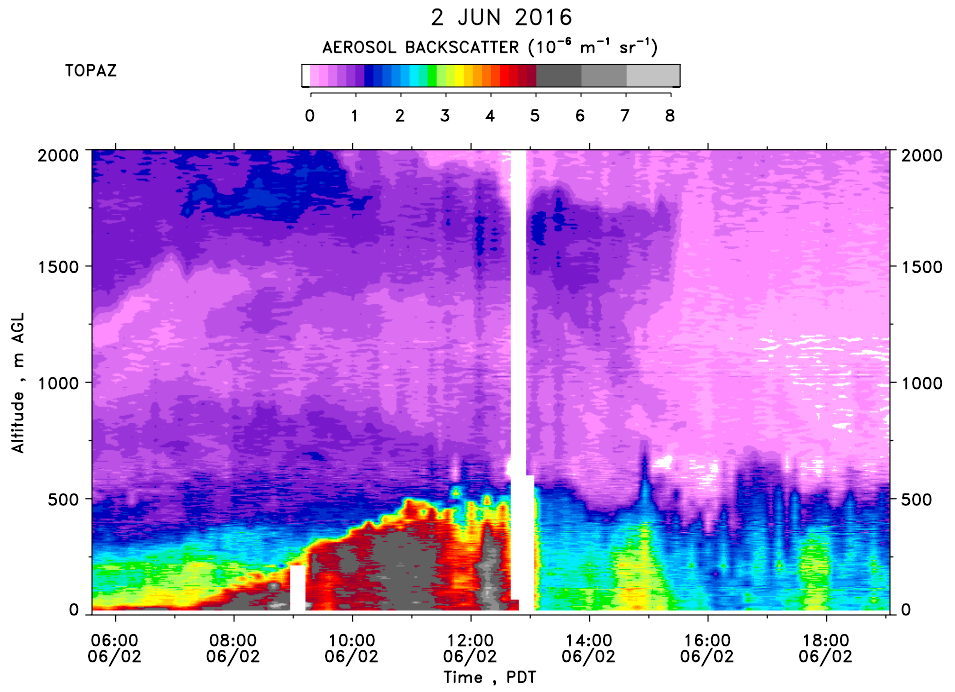
Bao, J.-W. et al., 2008: Observed and WRF-Simulated Low-Level Winds in a High-Ozone Episode during the Central California Ozone Study, *J. Appl. Meteor. Climatol.*, **47**, 2372-2394.

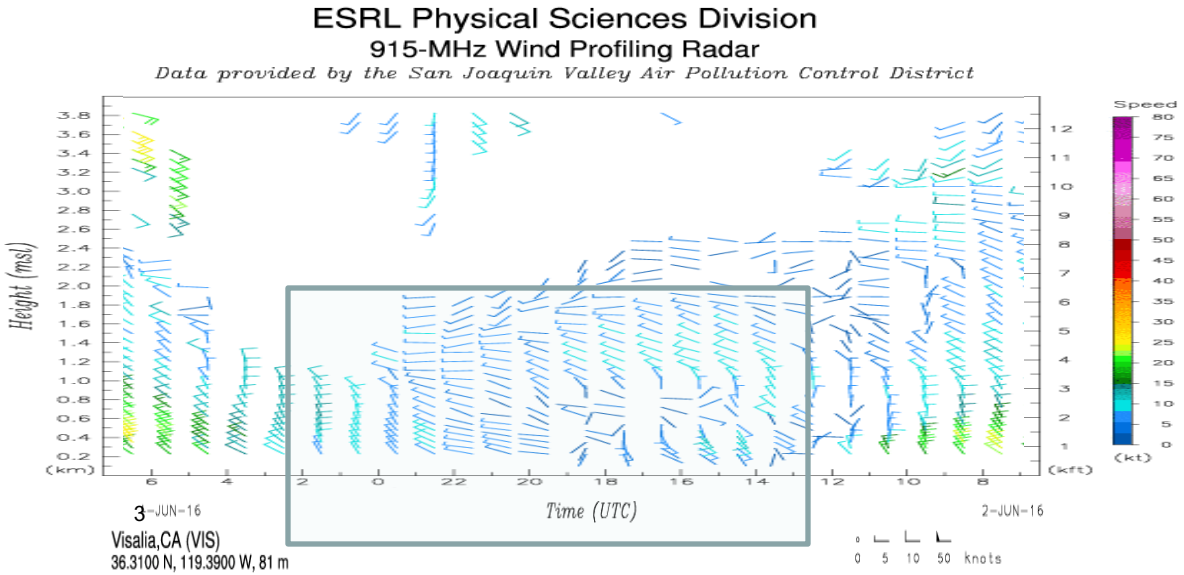
Annual variability of BL height in California's Central Valley

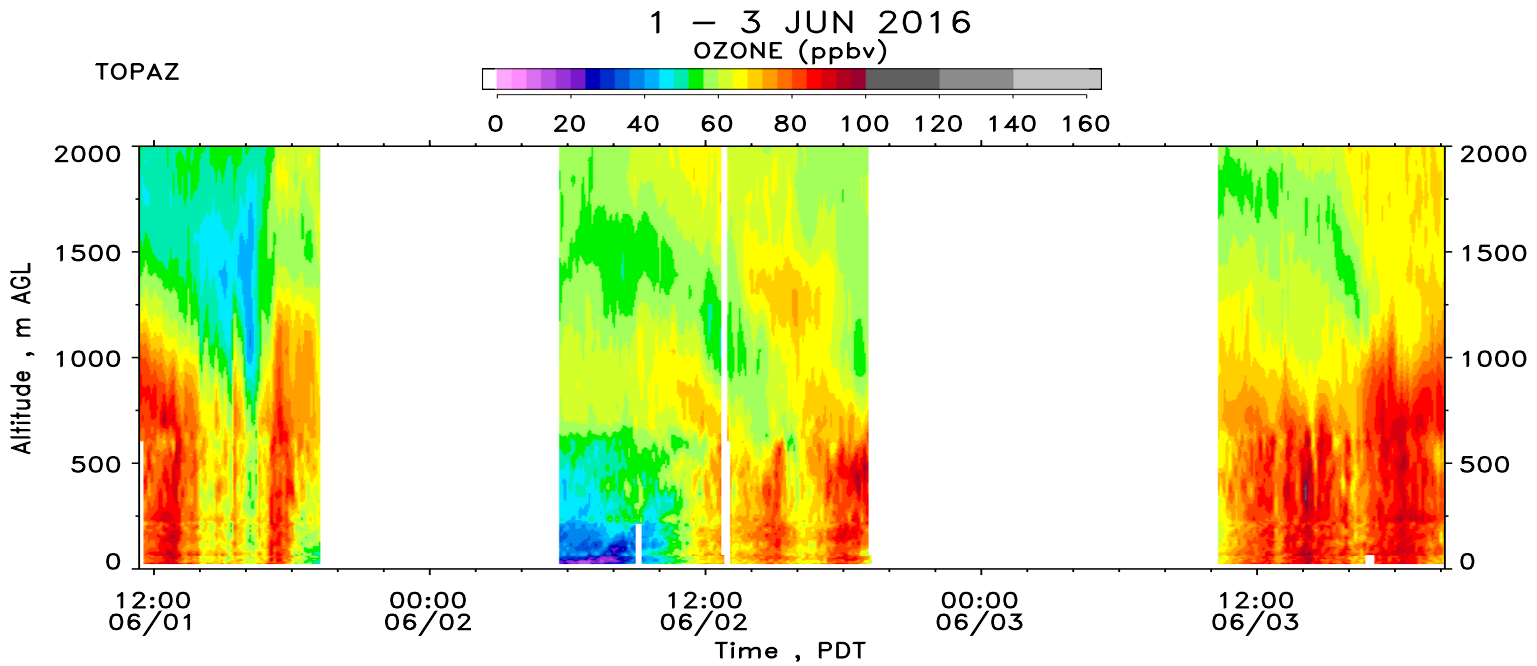


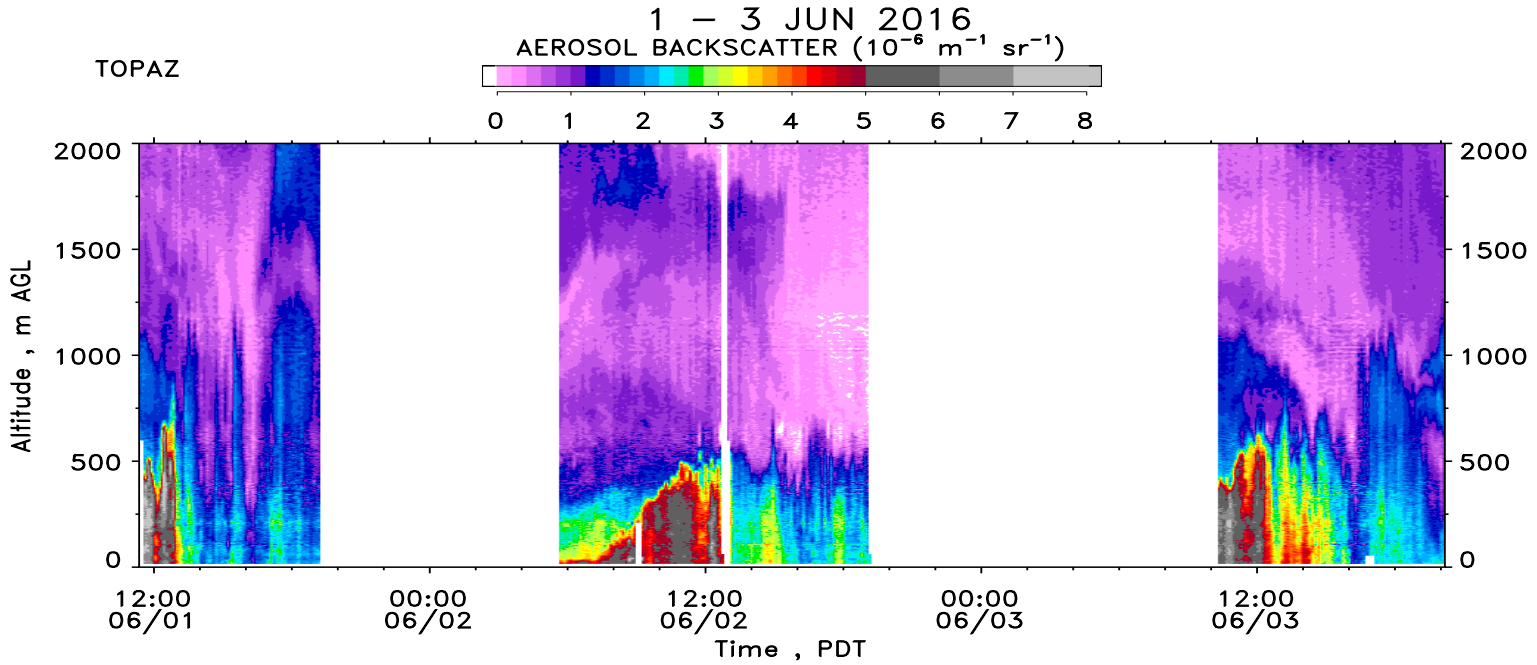
Bianco, L. et al., 2011: Diurnal Evolution and Annual Variability of Boundary-Layer Height and Its Correlation to Other Meteorological Variables in California's Central Valley, *Boundary-Layer Meteorol.*, **140**, 491-511.


2 JUN 2016
OZONE (ppbv)
TOPAZ
0 20 40 60 80 100 120 140 160
Altitude , m AGL
2000
1500
1000
500
0
06:00 06/02
08:00 06/02
10:00 06/02
12:00 06/02
14:00 06/02
16:00 06/02
18:00 06/02
Time , PDT


2 JUN 2016
AEROSOL BACKSCATTER (10^{-6} m^{-1} sr^{-1})
TOPAZ
0 1 2 3 4 5 6 7 8
Altitude , m AGL
2000
1500
1000
500
0
06:00 06/02
08:00 06/02
10:00 06/02
12:00 06/02
14:00 06/02
16:00 06/02
18:00 06/02
Time , PDT


ESRL Physical Sciences Division
915-MHz Wind Profiling Radar
Data provided by the San Joaquin Valley Air Pollution Control District
Height (msl)
(km)
(kft)
Speed
(kt)
Time (UTC)
3-JUN-16
2-JUN-16
Visalia,CA (VIS)
36.3100 N, 119.3900 W, 81 m
0 5 10 50 knots


1 – 3 JUN 2016
OZONE (ppbv)
TOPAZ
0 20 40 60 80 100 120 140 160
2000
1500
1000
500
0
Altitude , m AGL
12:00 06/01
00:00 06/02
12:00 06/02
00:00 06/03
12:00 06/03
Time , PDT


1 – 3 JUN 2016
AEROSOL BACKSCATTER (10^{-6} m^{-1} sr^{-1})
TOPAZ
0 1 2 3 4 5 6 7 8
2000
1500
1000
500
0
Altitude , m AGL
12:00 06/01
00:00 06/02
12:00 06/02
00:00 06/03
12:00 06/03
Time , PDT

Preliminary Thoughts/Findings

- Wind shift to NW around midday caused a significant drop in boundary layer (BL) aerosol concentrations, which sometimes was accompanied by a reduction in ozone as well.
- PM boundary layer heights (BLH) ranged from 500 – 1700 m AGL.
- BLHs were lowest (500 – 1200 m AGL) from 2 – 11 June with strong high pressure aloft.
- Only low-altitude ozone/aerosol layers aloft were entrained into the shallow BL.
- Strong subsidence in SJV caused layers aloft to lower during the day.