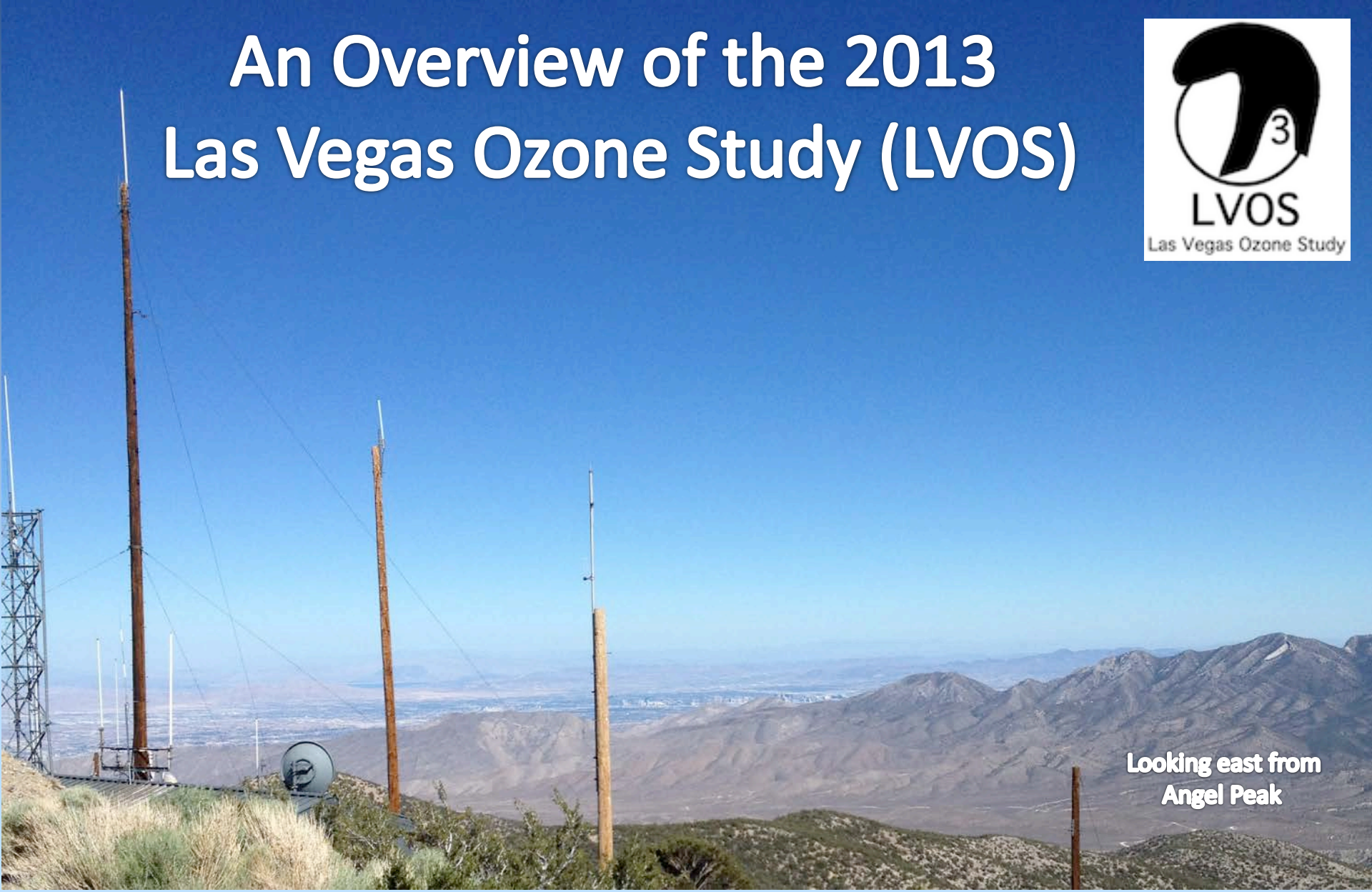
An Overview of the 2013 Las Vegas Ozone Study (LVOS)

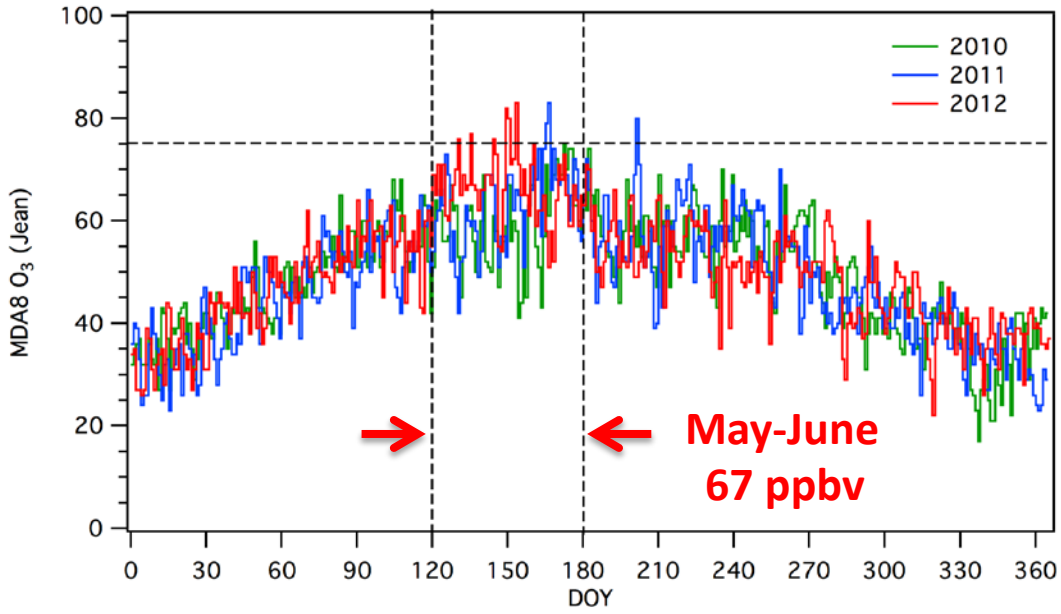


Andrew O. Langford NOAA ESRL Chemical Sciences Division, Boulder, CO

Global Monitoring Annual Conference, May 21, 2014

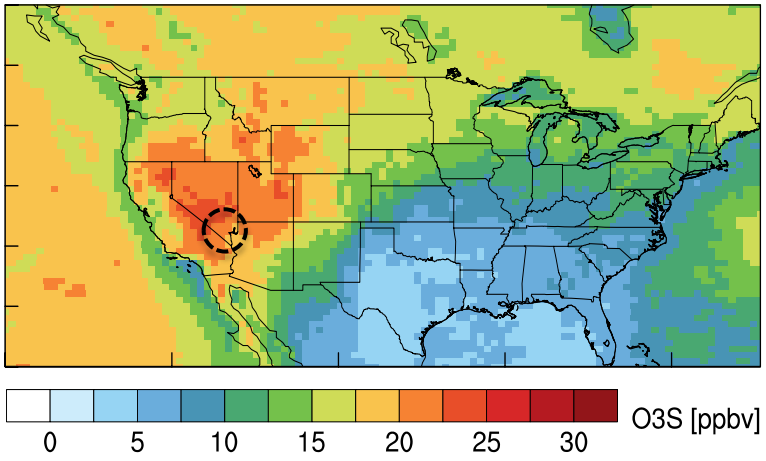
Motivation

Do stratosphere-to-troposphere (STT) and transport from Asia contribute to high springtime O_3 in Clark County, NV?

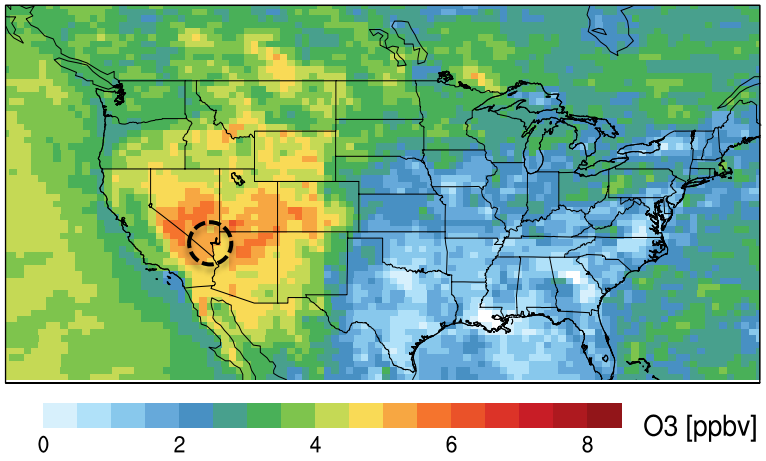


How do these contributions compare to local production and regional transport from Los Angeles or wildfires?

Mean contribution to (May–June 2010) MDA8 surface O_3 from the GFDL AM3 model



CC:STT
>20 ppbv



CC:Asia
≈5 ppbv

Stratospheric influx is greatest in the Intermountain West

Meiyun Lin, Princeton and NOAA GFDL

Participants and support

NOAA/CIRES

Christoph Senff, Raul Alvarez, Scott Sandberg, Ann Weickmann, Richard Marchbanks, John Holloway, Eric Williams, Jerome Brioude, Owen Cooper

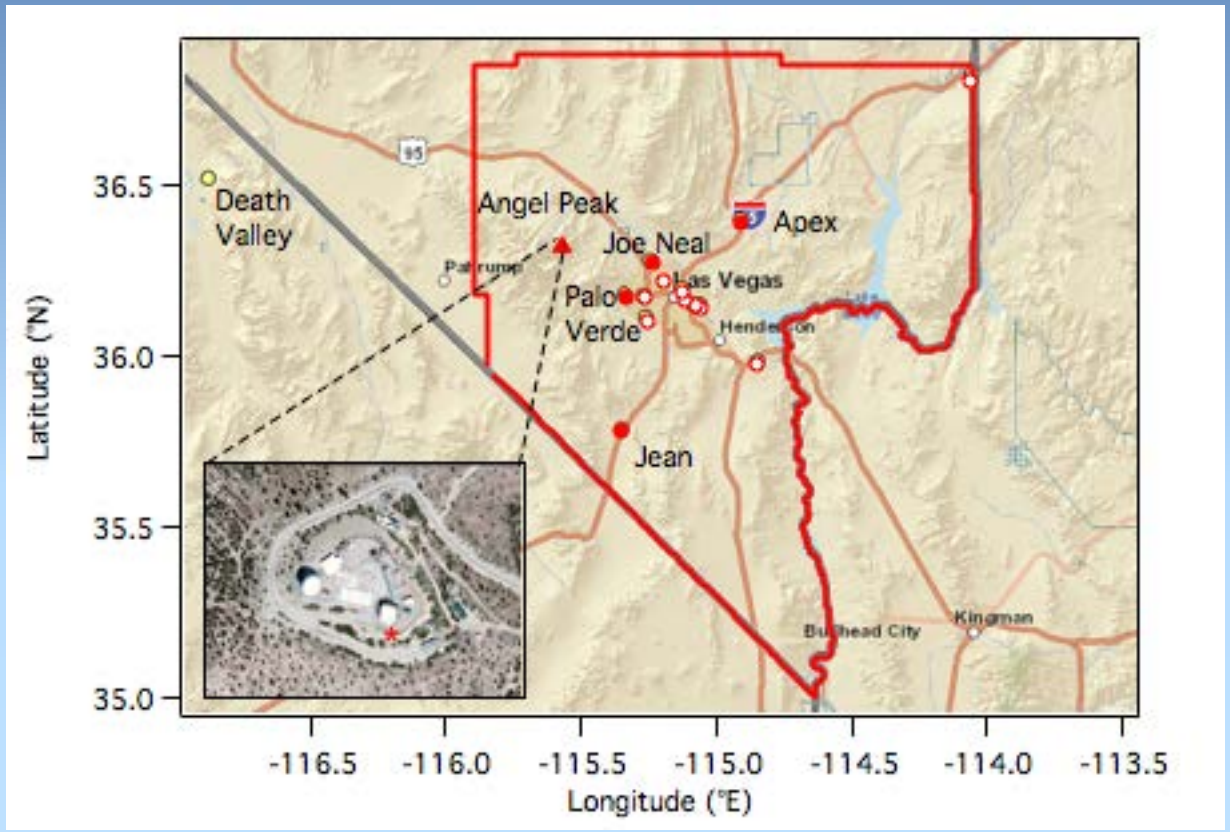
NOAA/NESDIS	Brad Pierce
CoDPHe	Pat Reddy
NOAA GFDL	Meiyun Lin

Clark County Department of Air Quality

Zheng Li, Dennis Ransel, Mickey Turner, Andy Gagliardo

LVOS supported by Clark County DAQ and NASA TOLNet

Angel Peak, NV
(36.32°N,-115.57°E, 2.68 km ASL)

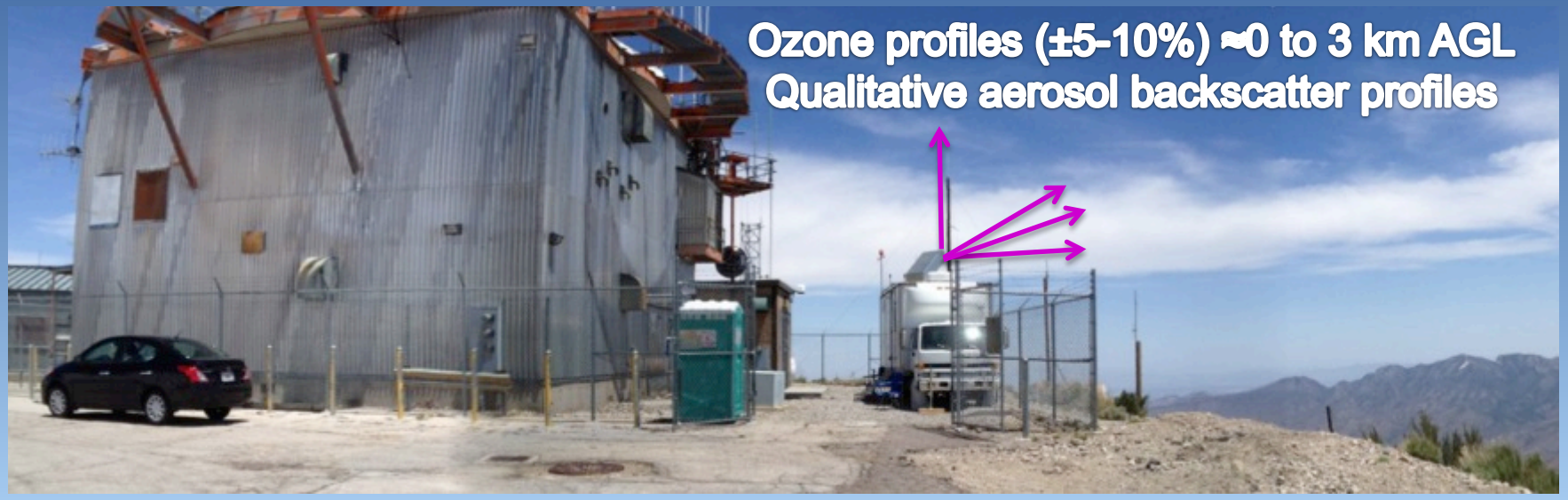


Las Vegas Ozone Study (LVOS)

Angel Peak, NV May 19 - June 29, 2013

- **TOPAZ scanning mobile ozone lidar**
  (ARS, NOAA/ESRL/CSD)
- **In situ O_3, CO, and meteorology**
  (Holloway, NOAA/ESRL/CSD/CIRES)
- **Satellite imagery**
  (Cooper, NOAA/ESRL/CSD/CIRES)
- **FLEXPART particle dispersion model**
  (Brioude, NOAA/ESRL/CSD/CIRES)
- **RAQMS forecasts and analyses**
  (Pierce, NOAA/NESDIS)
- **IPV analyses**
  (Reddy, CoDPHE)
- **AM3 Model Runs**
  (Lin, NOAA GFDL and Princeton)

TOPAZ DIAL at Angel Peak



In situ measurements at Angel Peak

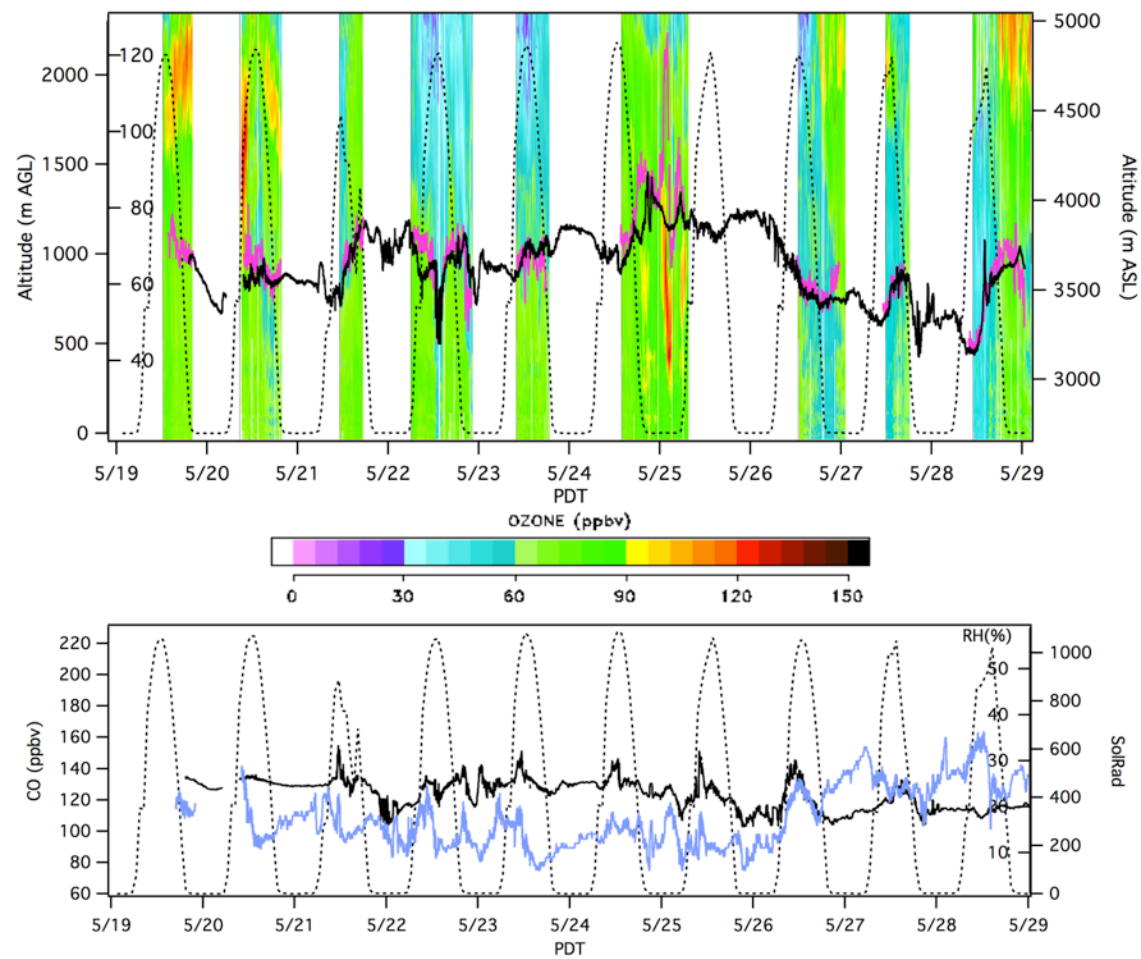
Continuous 1-min CO and O_3

CO: VUV resonance fluorescence (*Holloway et al.*)
±4%, ±1 ppbv for 1-min average

O_3: UV absorption, TECO 49C (*Williams et al.*)
±2% for a 1-min average

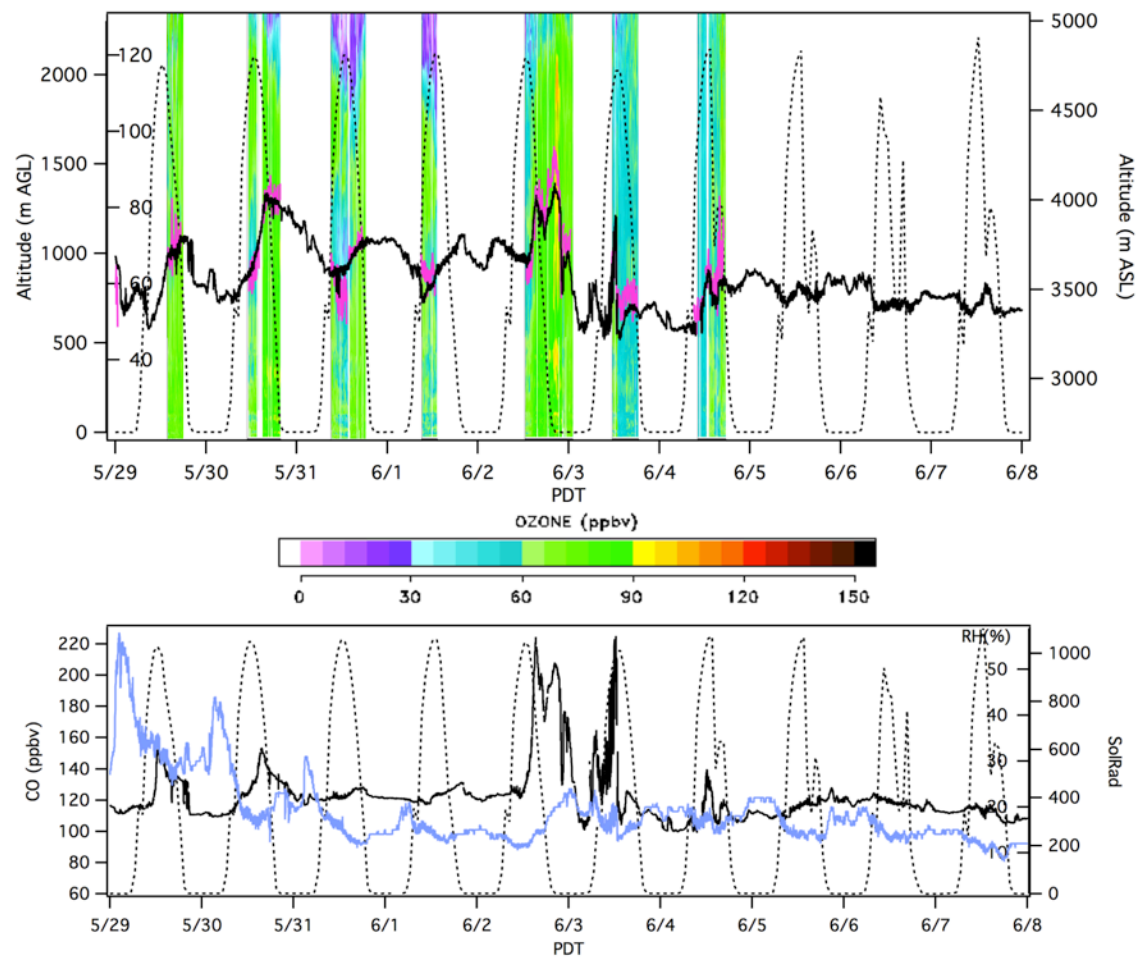
Continuous 5-min winds, T, and RH

I. May 19 – May 29



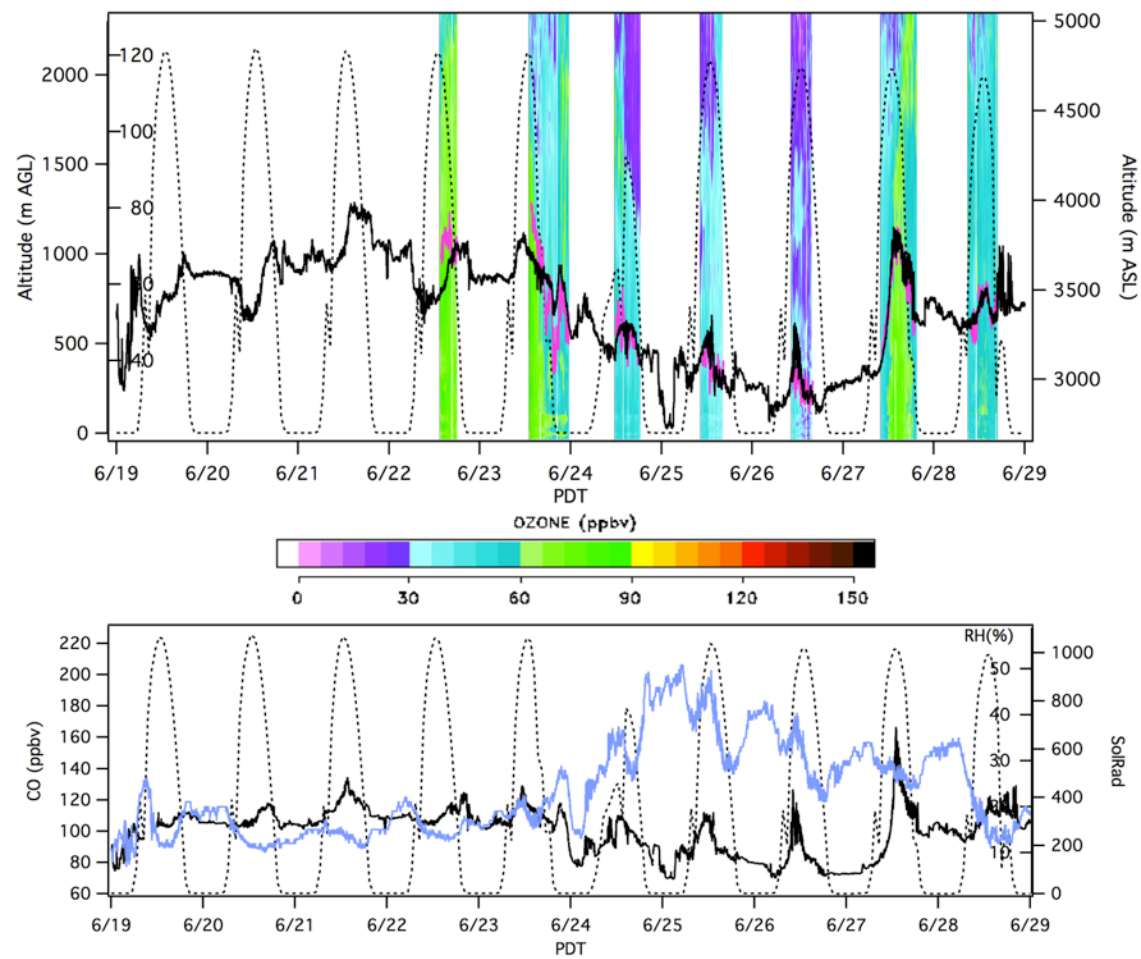
Stratospheric intrusions

II. May 29 - June 8



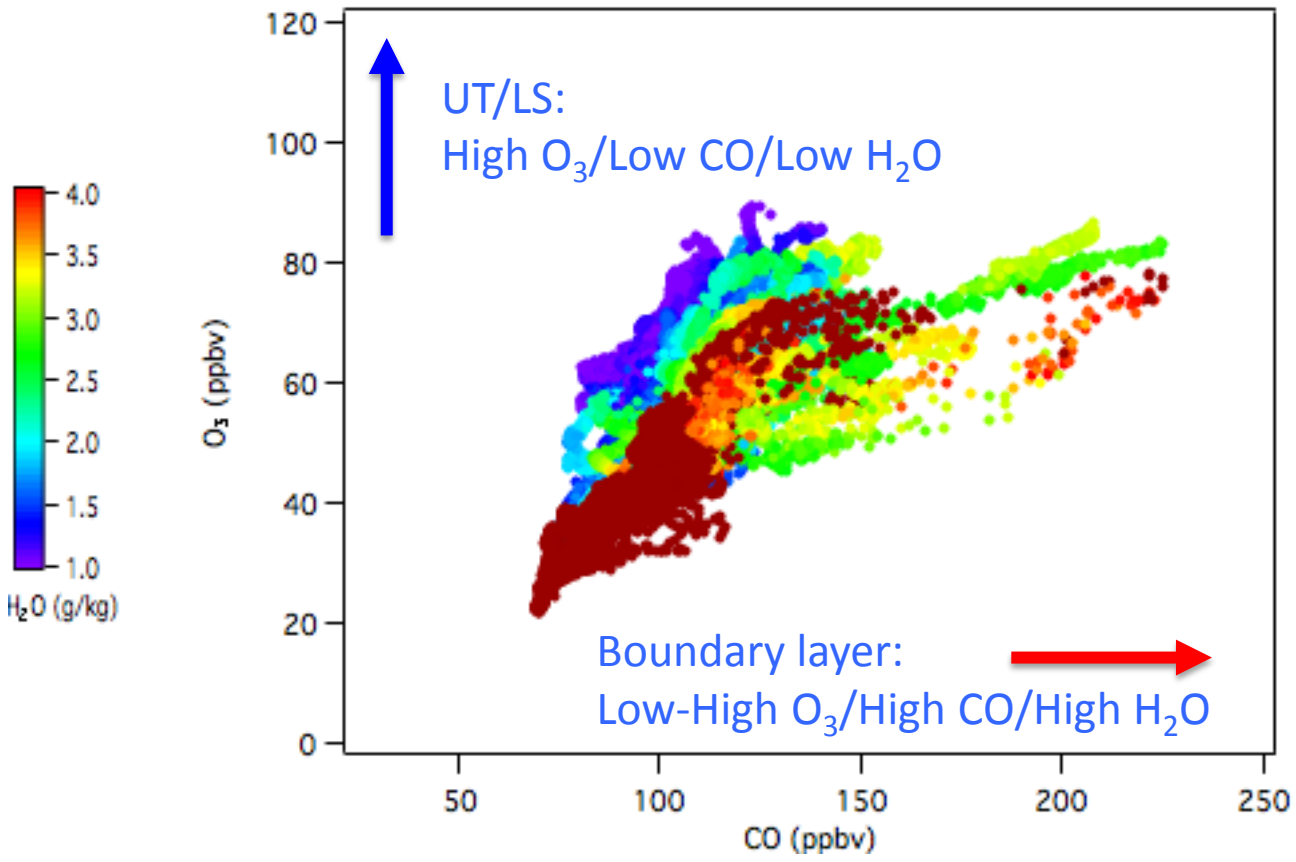
Biomass Burning and LA Basin

III. June 19 – June 29

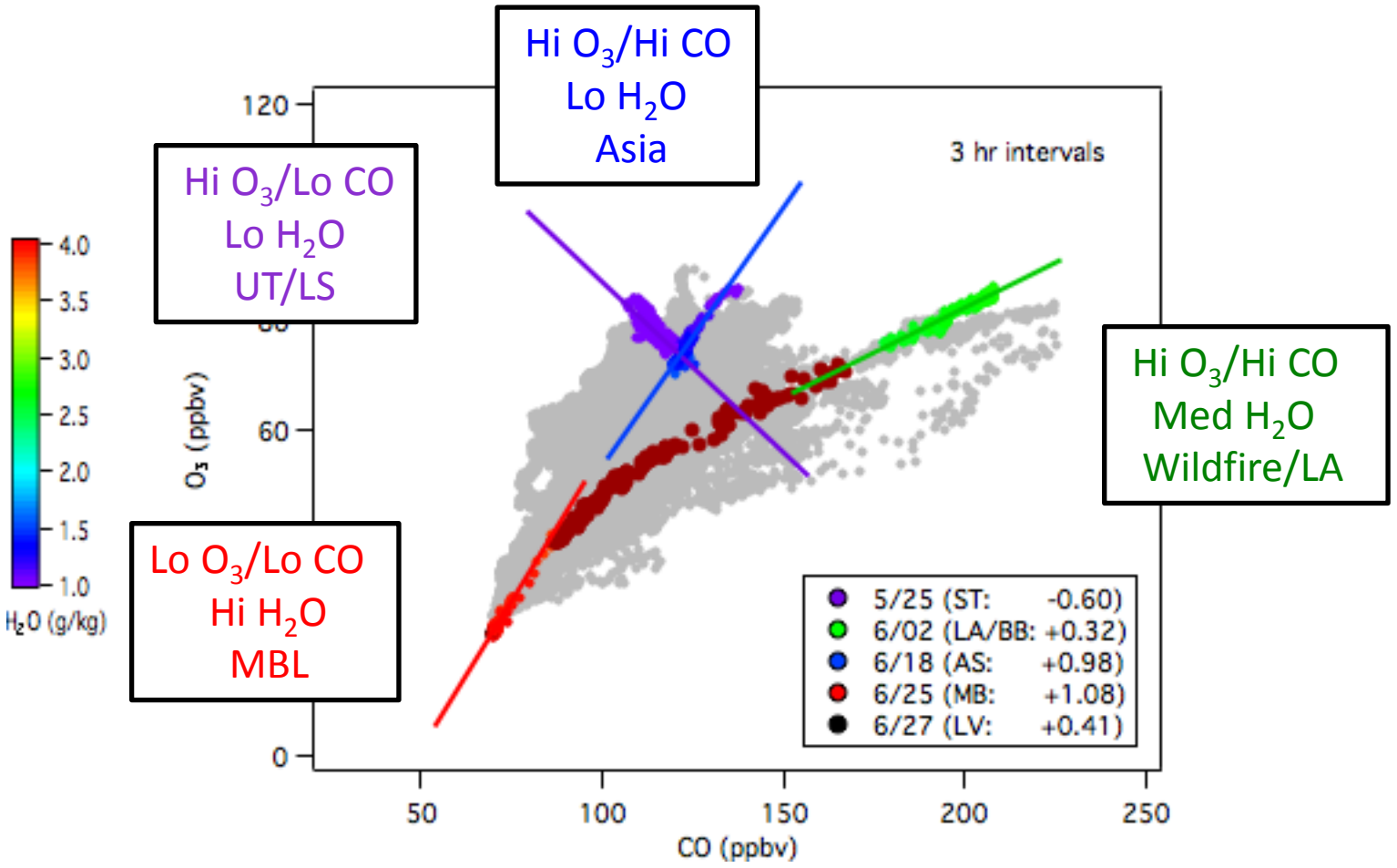


Marine air and locally produced ozone

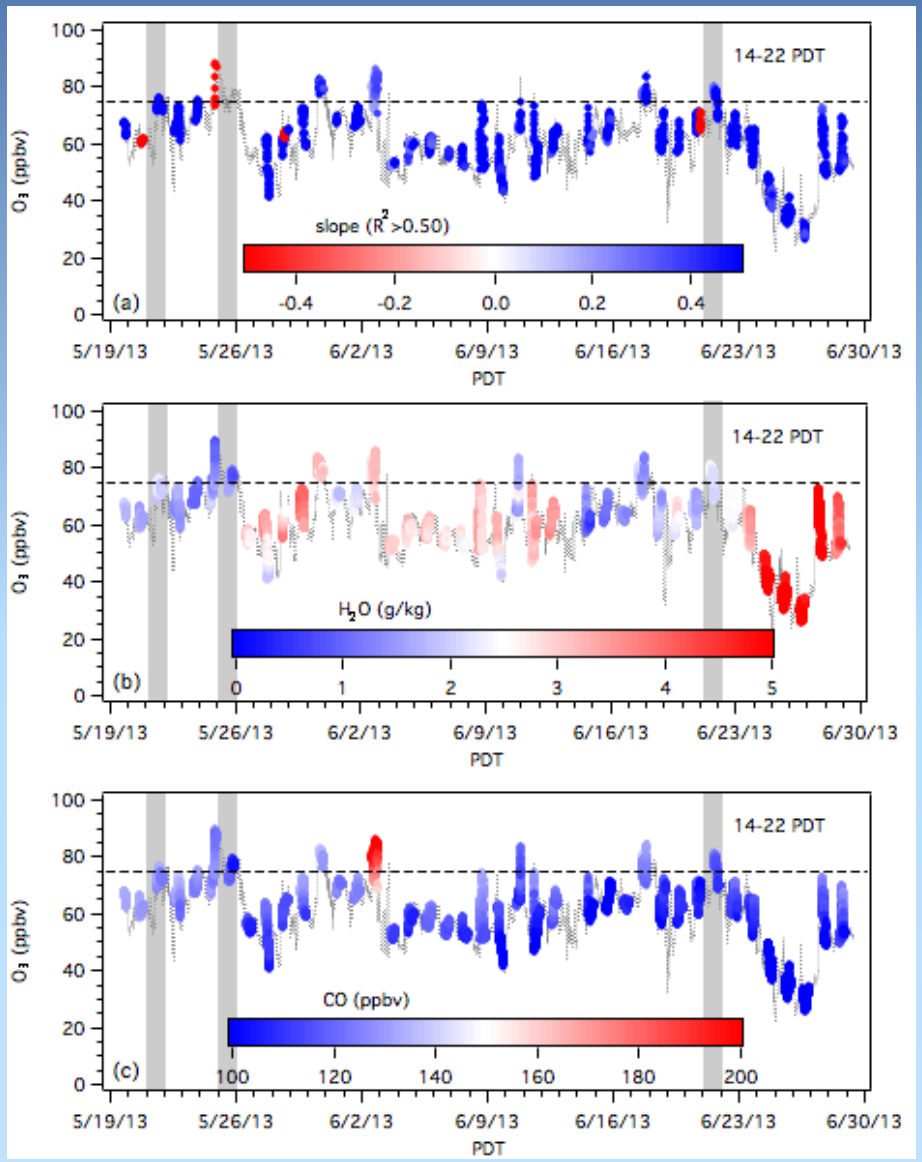
CO-O_3-H_2O correlations at Angel Peak



CO-O_3-H_2O correlations at Angel Peak



Angel Peak O_3 by source

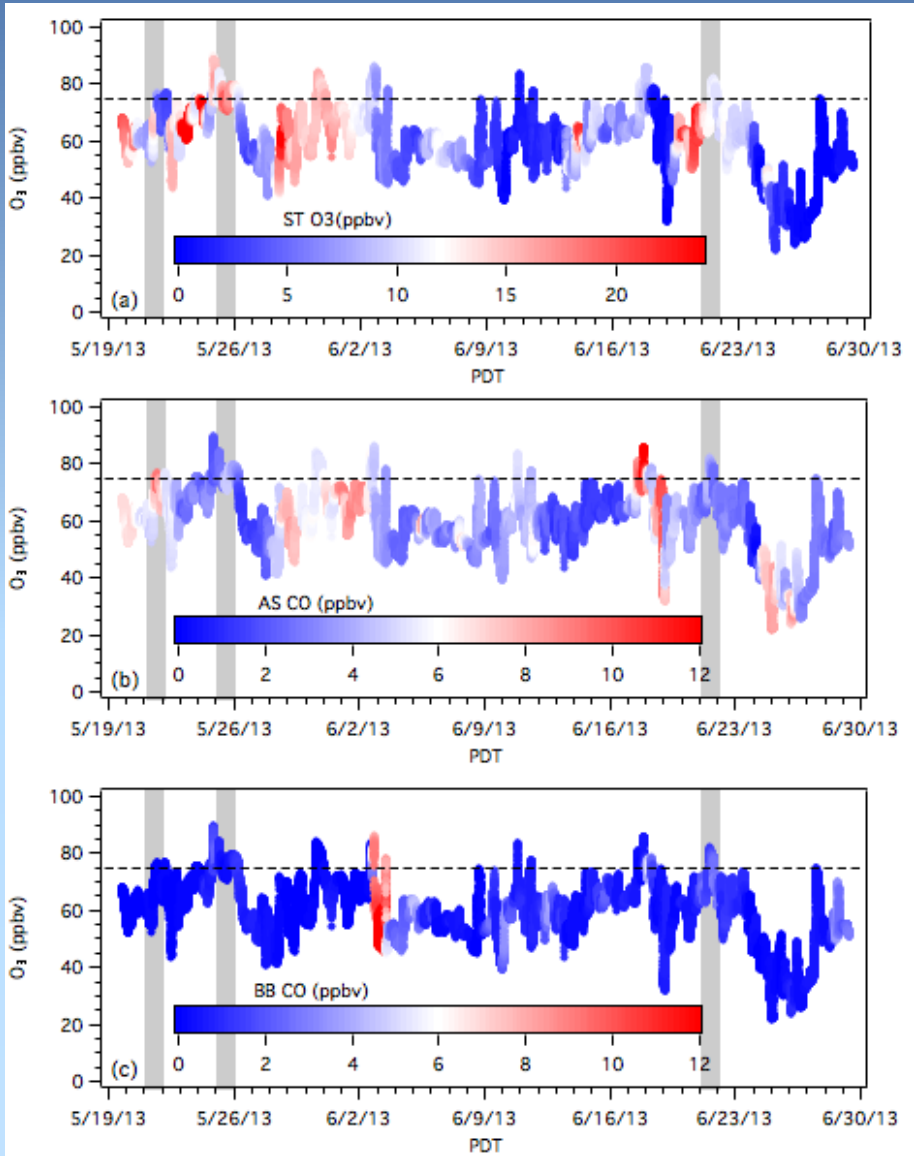


Negative correlations before each LVOS exceedance day.

Dry air before each LVOS exceedance day.

No significant wildfire contributions to LVOS exceedance days.

Angel Peak O_3 by source (FLEXPART)

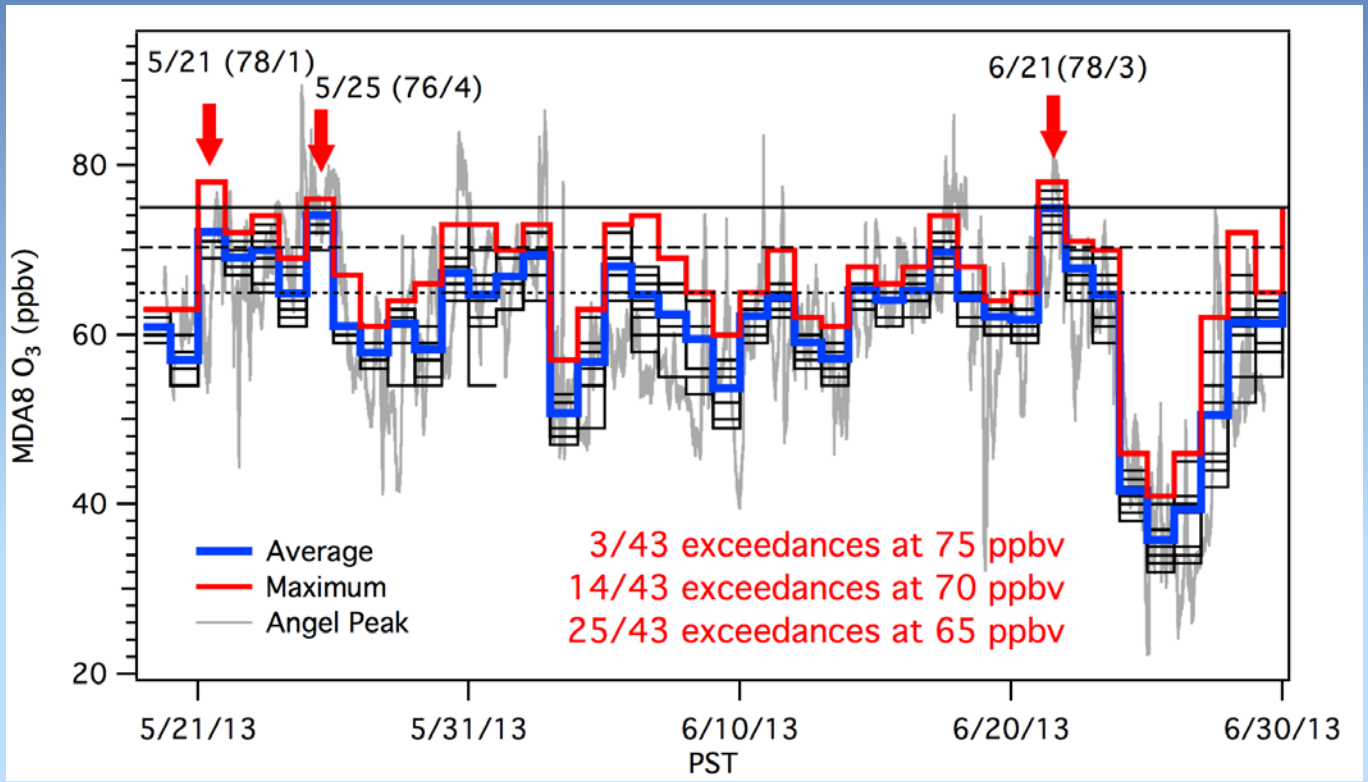


Stratospheric air before each LVOS exceedance.

Asian pollution contributes to first and last exceedances.

No significant wildfire contributions to LVOS exceedance days.

Clark County MDA8 O_3 during LVOS



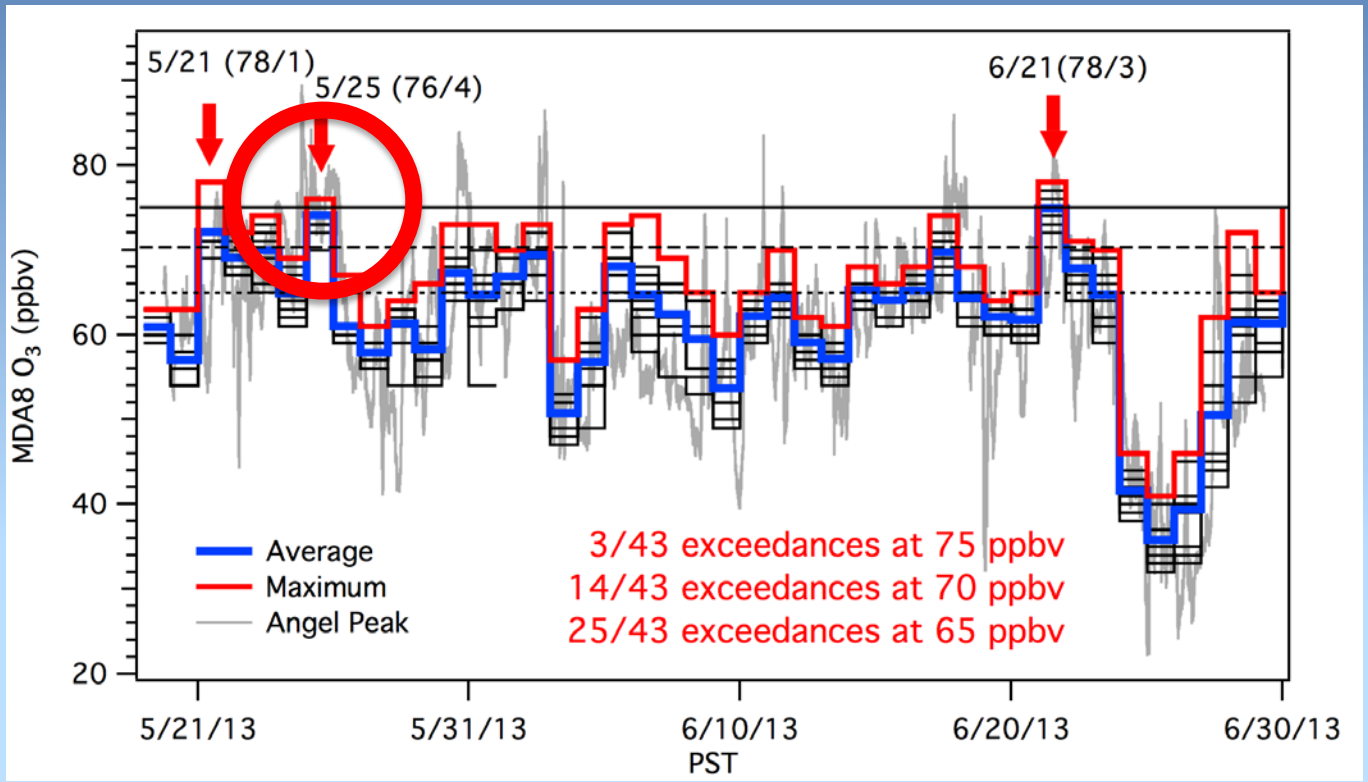
Exceedances of the current NAAQS on 3 days (May 21, May 25, and June 21)

Summary

- STT contributed to all three O_3 NAAQS exceedances during LVOS.
- Exceedances will become more frequent in Clark County if the NAAQS is lowered.
- Much of the Intermountain West will be unable to meet stricter O_3 standards.

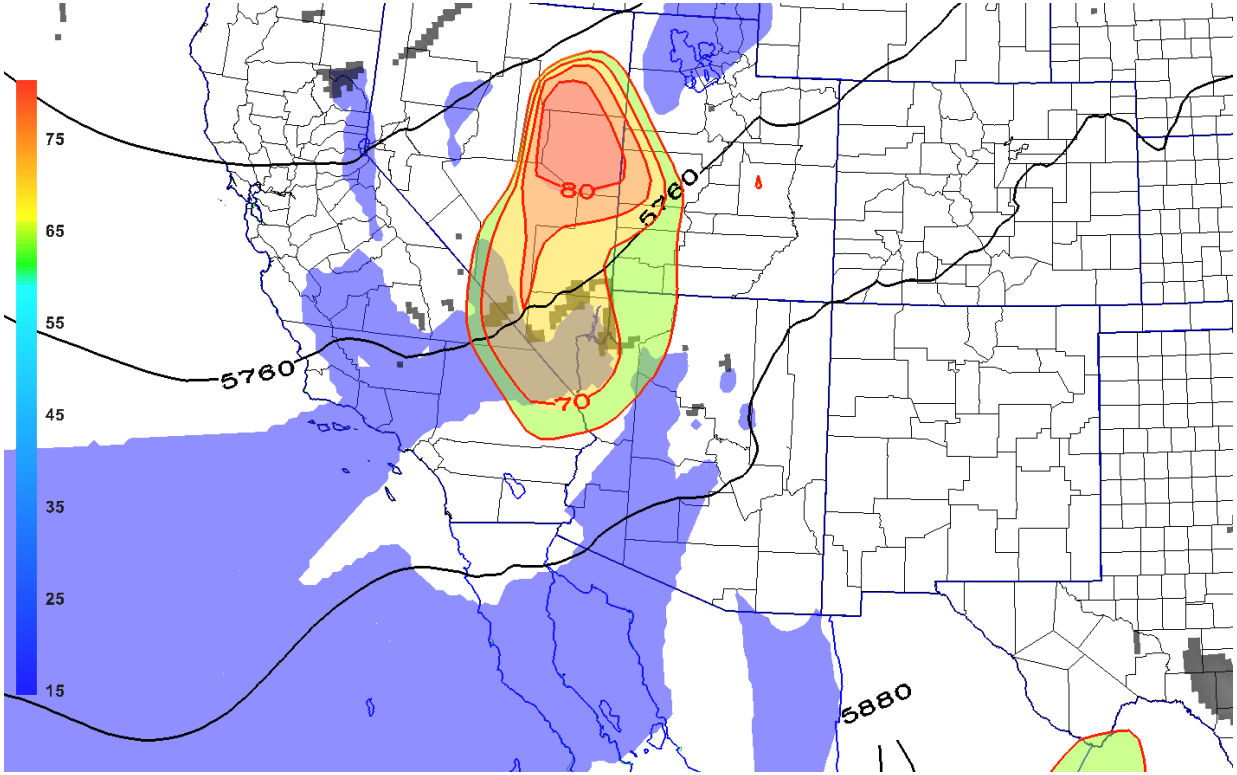
Thank you, thank you very much!

Clark County MDA8 O_3 during LVOS



4 stations in exceedance of the current NAAQS on May 25

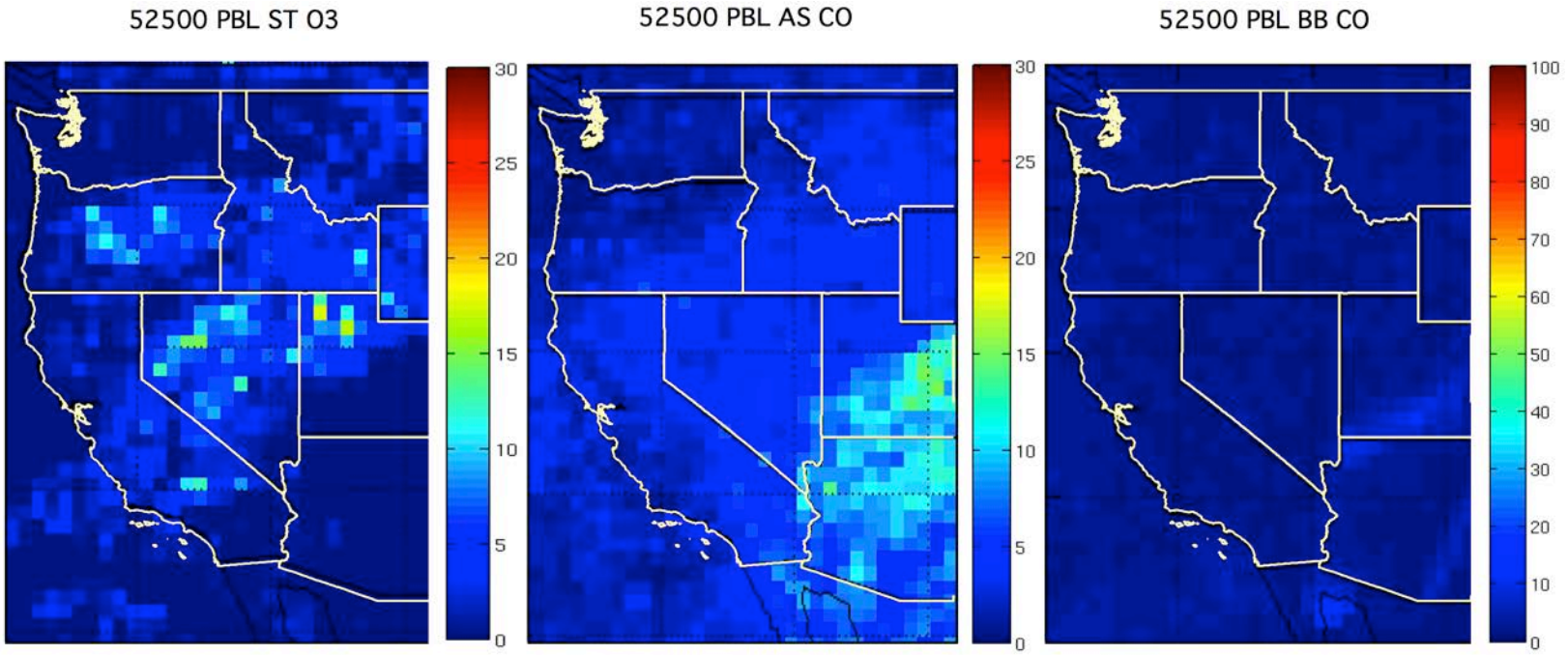
May 25 2013 0Z NAM12 analysis
625 RH IPV



Pat Reddy, CoDPHe

FLEXPART tracers in the PBL (<1.5 km asl)

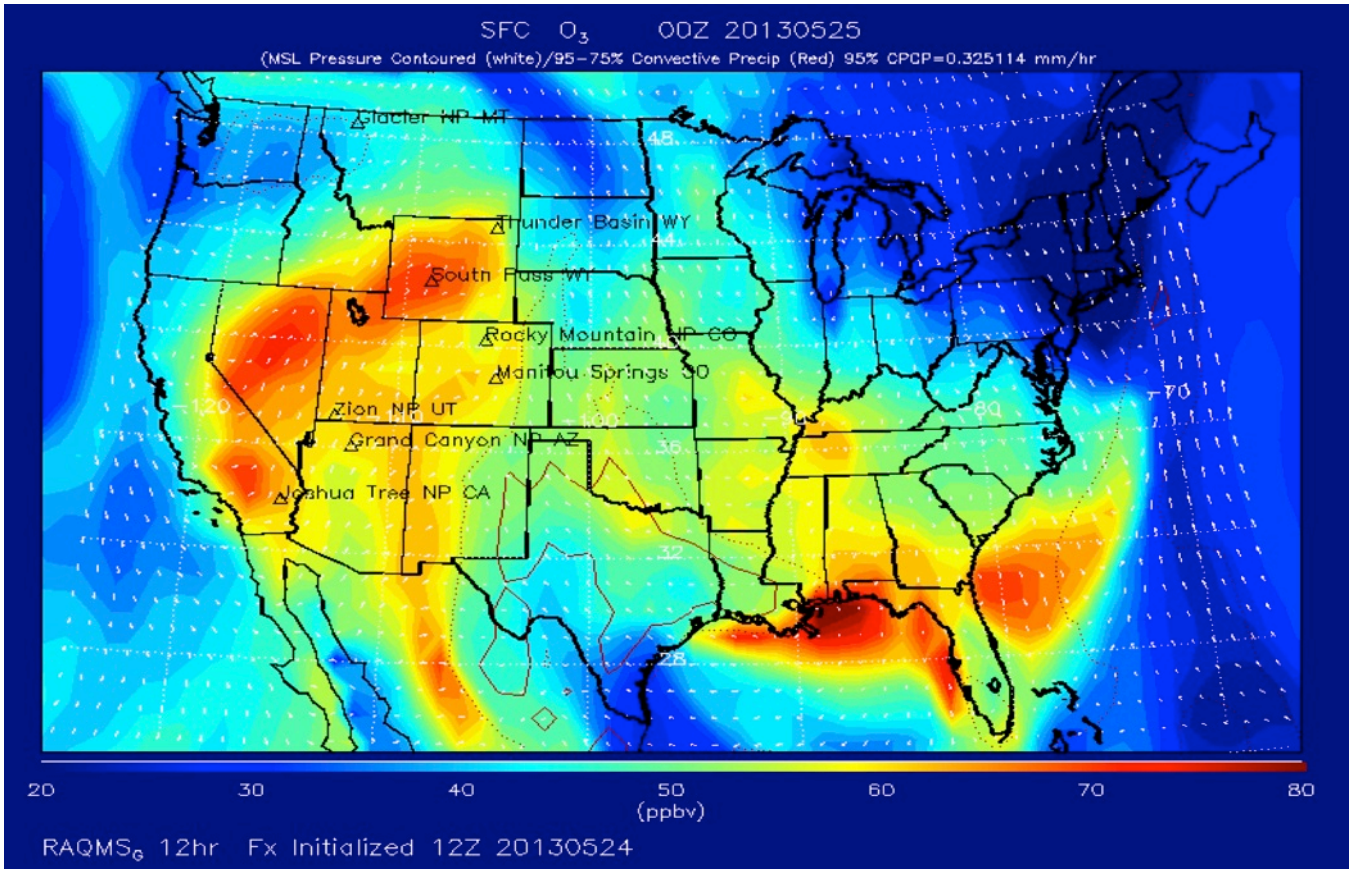
00 UT May 25, 2013



Stratospheric O_3 | Asian Transport CO | Biomass Burning CO

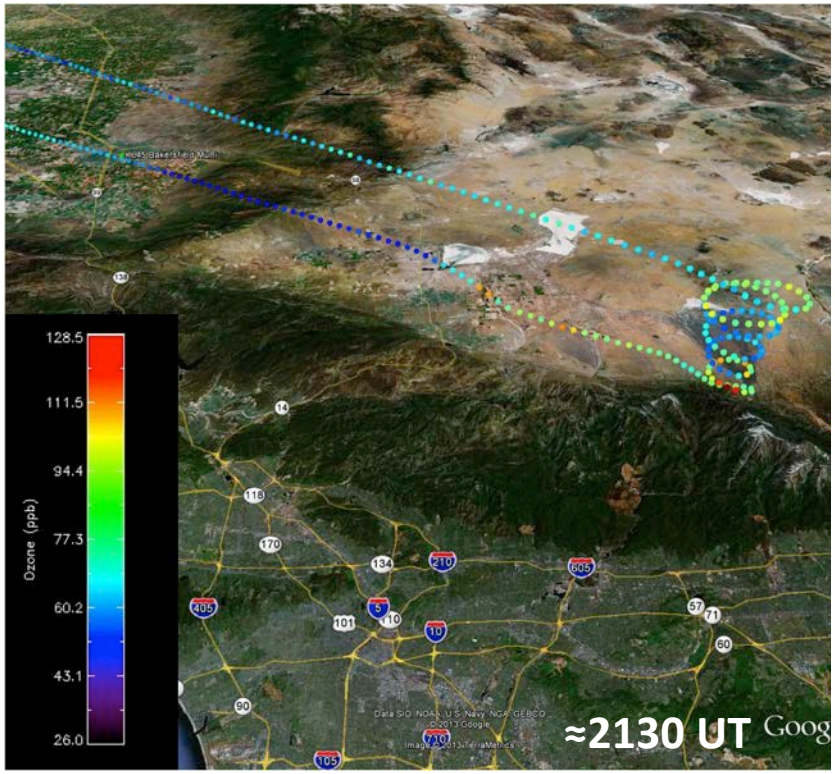
Jerome Brioude, NOAA/ESRL

Realtime Air Quality Modeling System (RAQMS)



Brad Pierce, NOAA/NESDIS

AJAX Flight 92 May 24, 2013



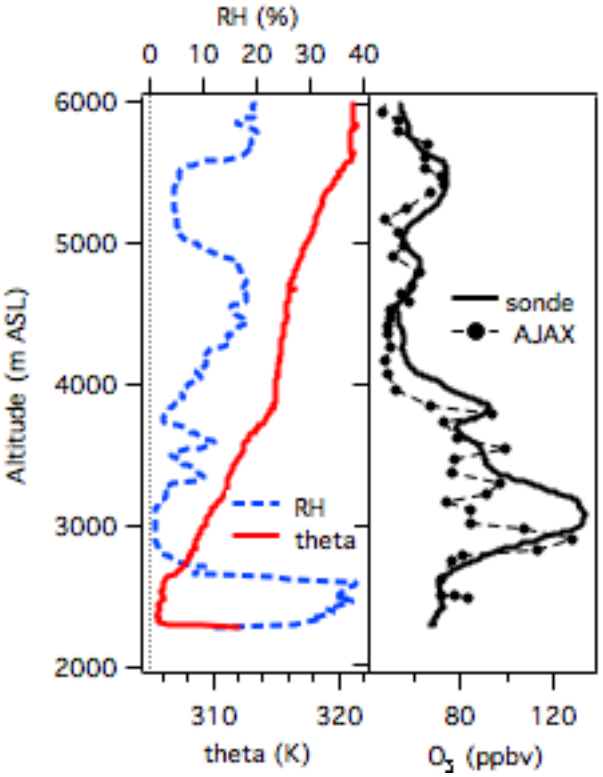
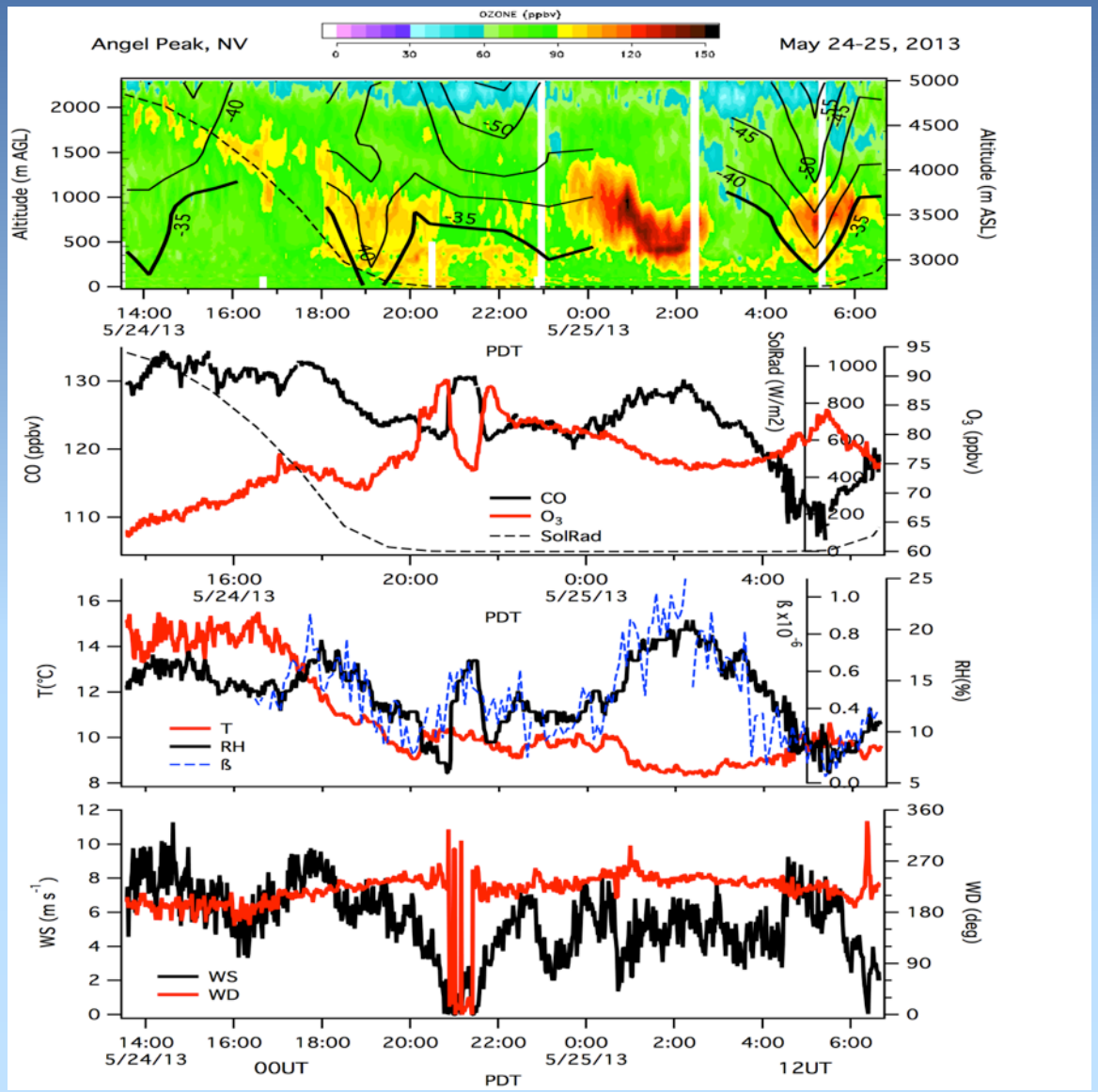


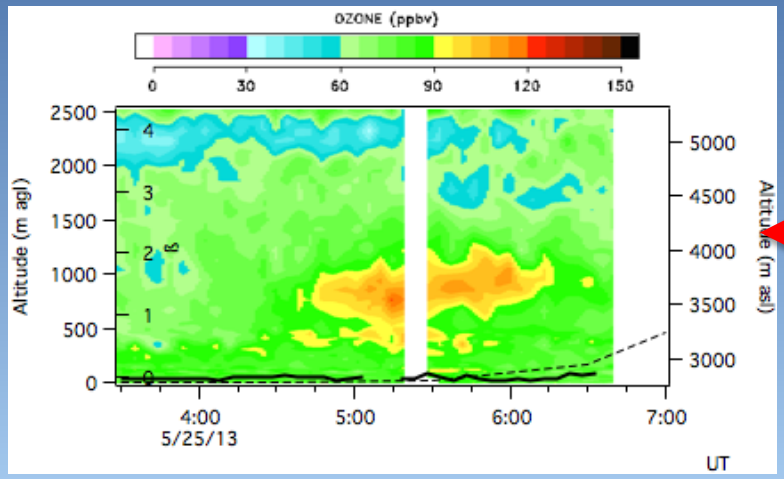
Table Mountain ozonesonde

Emma Yates, NASA Ames/Thierry LeBlanc TMF

Lidar and in situ measurements at Angel Peak

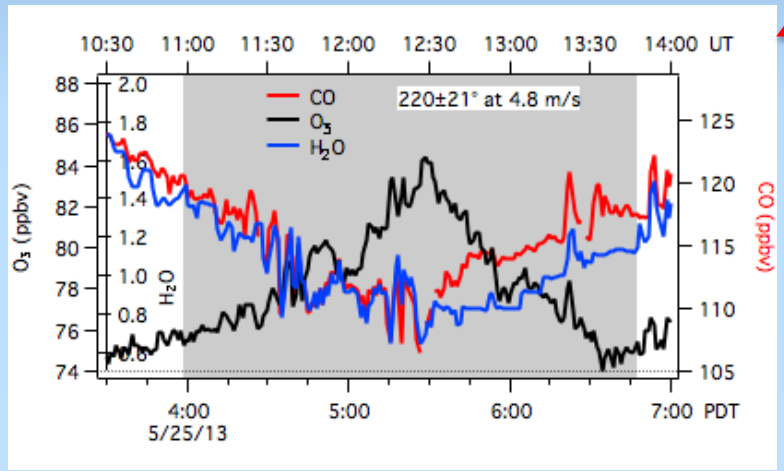


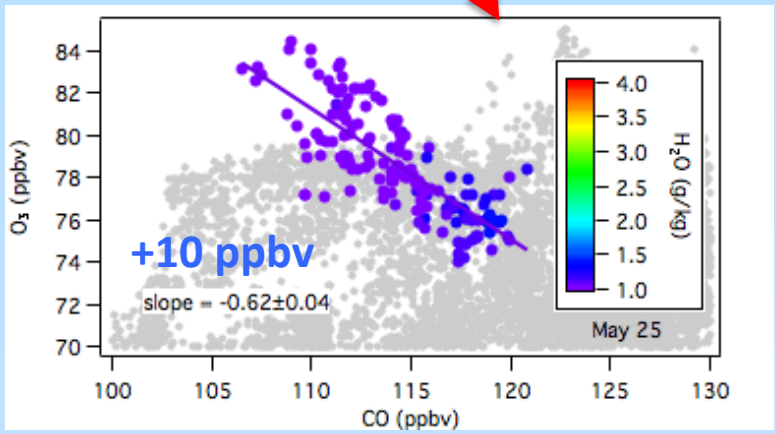
May 24-25, 2013 Stratospheric intrusion at Angel Peak



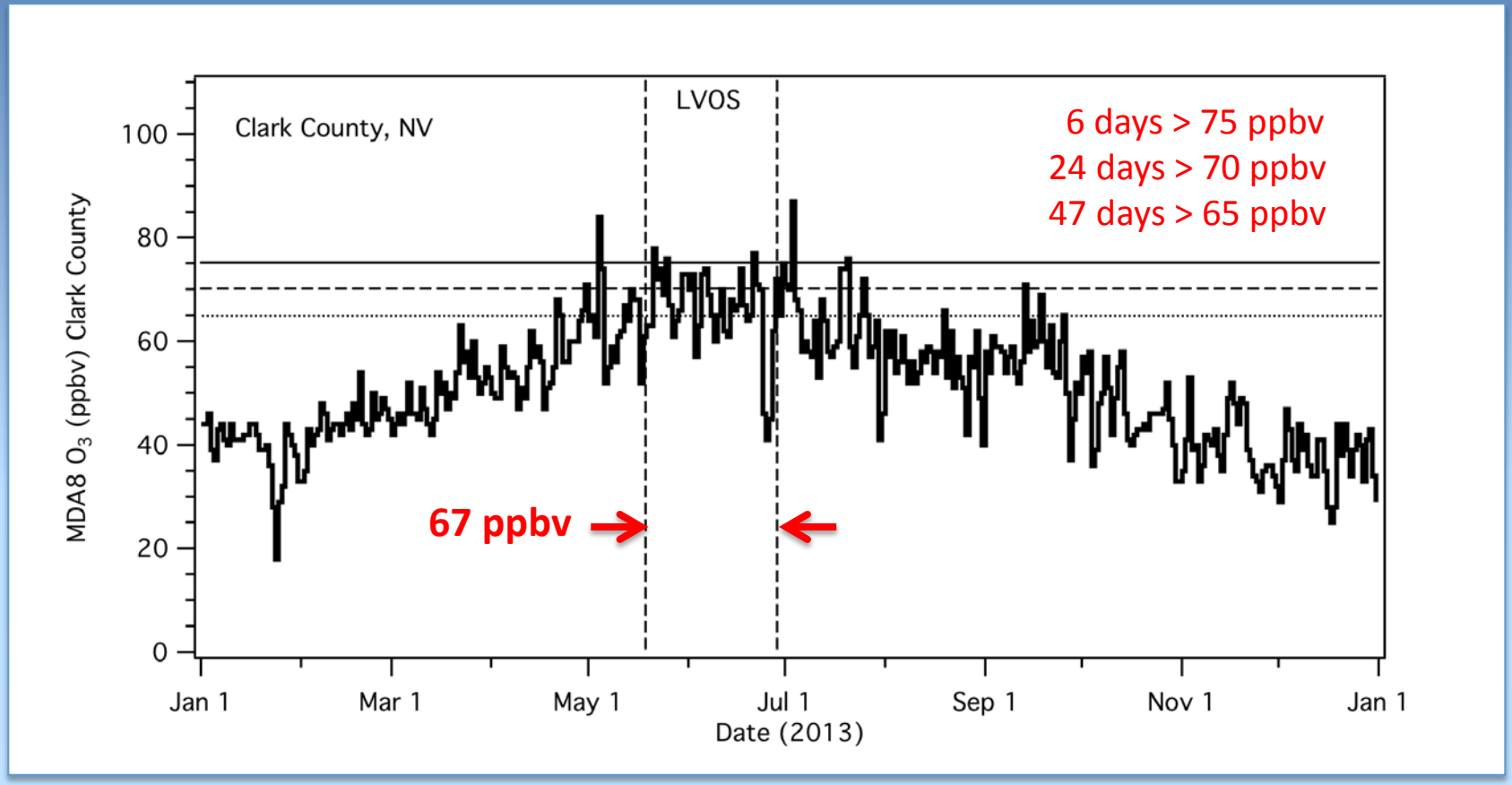
Elevated O_3 layer above Angel Peak at sunrise

Surface O_3 anticorrelated with CO and H_2O





Surface ozone in Clark County Nevada



Highest mean ozone in Clark County mid-May to mid-June