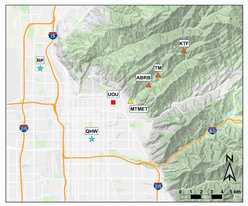
The Red Butte Canyon Ozone Project

Logan E. Mitchell, Ryan Bares, Logan Jamison, Dave Eiriksson

Department of Atmospheric Sciences, University of Utah, Salt Lake City, UT. logan.mitchell@utah.edu

Introduction

We deployed a transect of Ozone (O_3) monitoring stations throughout Red Butte Canyon, a tributary canyon adjacent to the University of Utah. Red Butte Canyon is a United States Forest Service designated Research Natural Area and already has significant monitoring resources deployed in it. This network will produce a dataset with several applications ranging from: (a) probing the role of canyon flows in the transport of O_3 during stratospheric injections in the summer (b) examining the exchange of O_3 from the free troposphere with stagnant air in persistent cold air pools in the winter (c) the potential for using the site to assist in understanding and monitoring background O_3 concentrations, and (d) examining the impact of anthropogenic activities on O_3 formation. A better understanding of these outstanding questions is central in the implementation of successful O_3 mitigation policies in Utah.



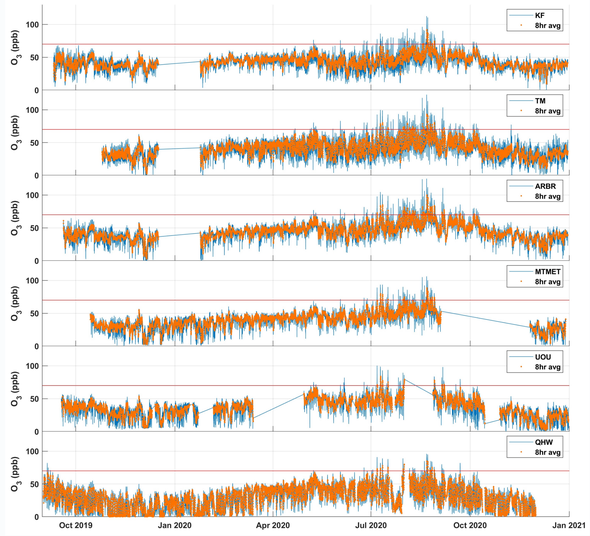
Ryan Bares & Dave Eiriksson at the Knolton Fork (KF) site

- The Red Butte Ozone data set continues to grow →
- Highest O_3 was seen in the middle of the RBO transect, demonstrating photochemical O_3 production downwind of SLC

Table 1. Number of days and 8-hour averages > 70 ppb

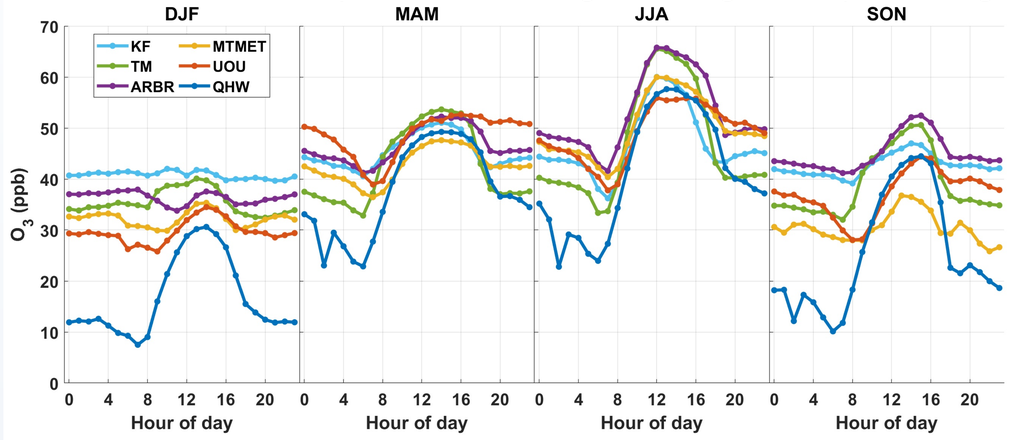
Site	# of days with 8hr O_3 > 70 ppb	# of hours with 8hr O_3 > 70 ppb	Max 8hr O_3 (ppb)
KF	8	45	92
TM	20	98	93
ARBR	38	215	100
MTMET	13*	72*	89*
UOU	12*	52*	84*
QHW	12	48	85

* MTMET and UOU have data gaps during the highest ozone episodes, so the counts and max represent minimum values.

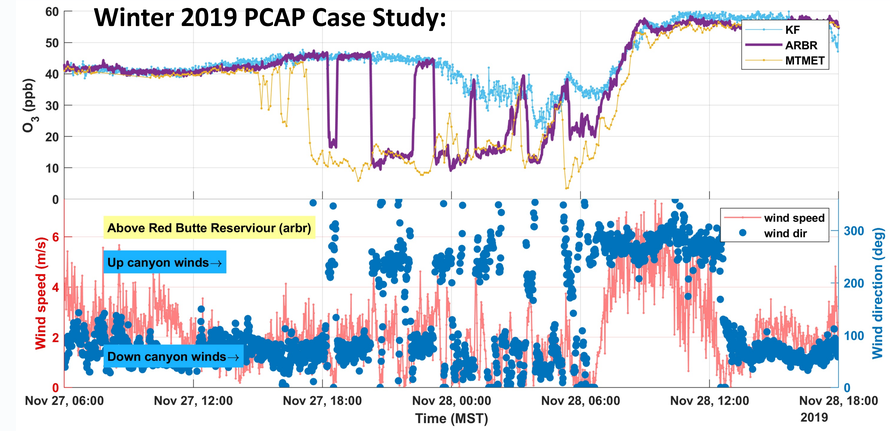


Seasonal diel profiles (below):

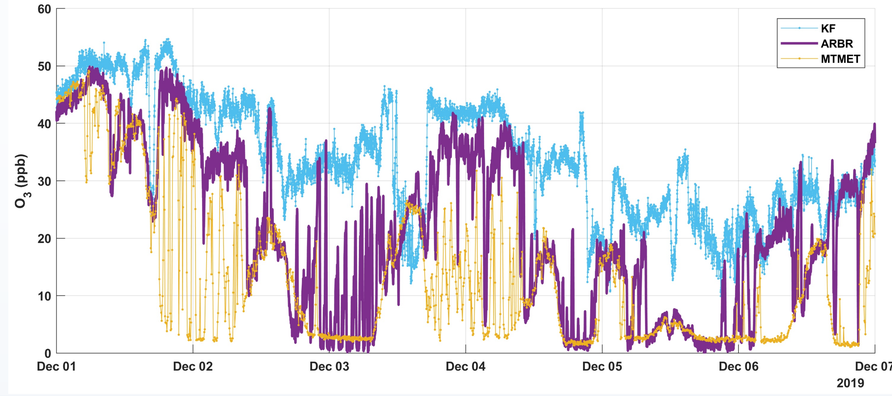
- Highest O_3 in JJA were observed at TM & ARBR sites
- QHW always had lower O_3 than Red Butte sites. Nighttime urban titration visible
- All sites except KF in DJF had diel profiles suggesting they're affected by urban emissions & therefore may not be ideal for regional background O_3 monitoring



Winter 2019 PCAP Case Study:



As O_3 becomes titrated in SLC, small changes in winds toggle the O_3 at ARBR between air masses causing mixing (above). This may be the dominant mechanism of oxidant exchange with PCAP air masses via tributary canyons that contributes to $PM_{2.5}$ formation during PCAPs. This is shown through an entire PCAP event below.



Data collection is ongoing

This work is supported by funding from the Utah Division of Air Quality

Salt Lake Measurement Programs

(a) TRAX light rail network (http://utahaq.chpc.utah.edu/)
(b) Urban CO_2 network (https://air.utah.edu/)
(c) MesoWest (http://mesowest.utah.edu/)
(d) Utah Div. of Environmental Quality (http://air.utah.gov/)

Real Time TRAX Data: