Credit: Chelsea Thompson, NOAA

USOS Monthly Meeting #4

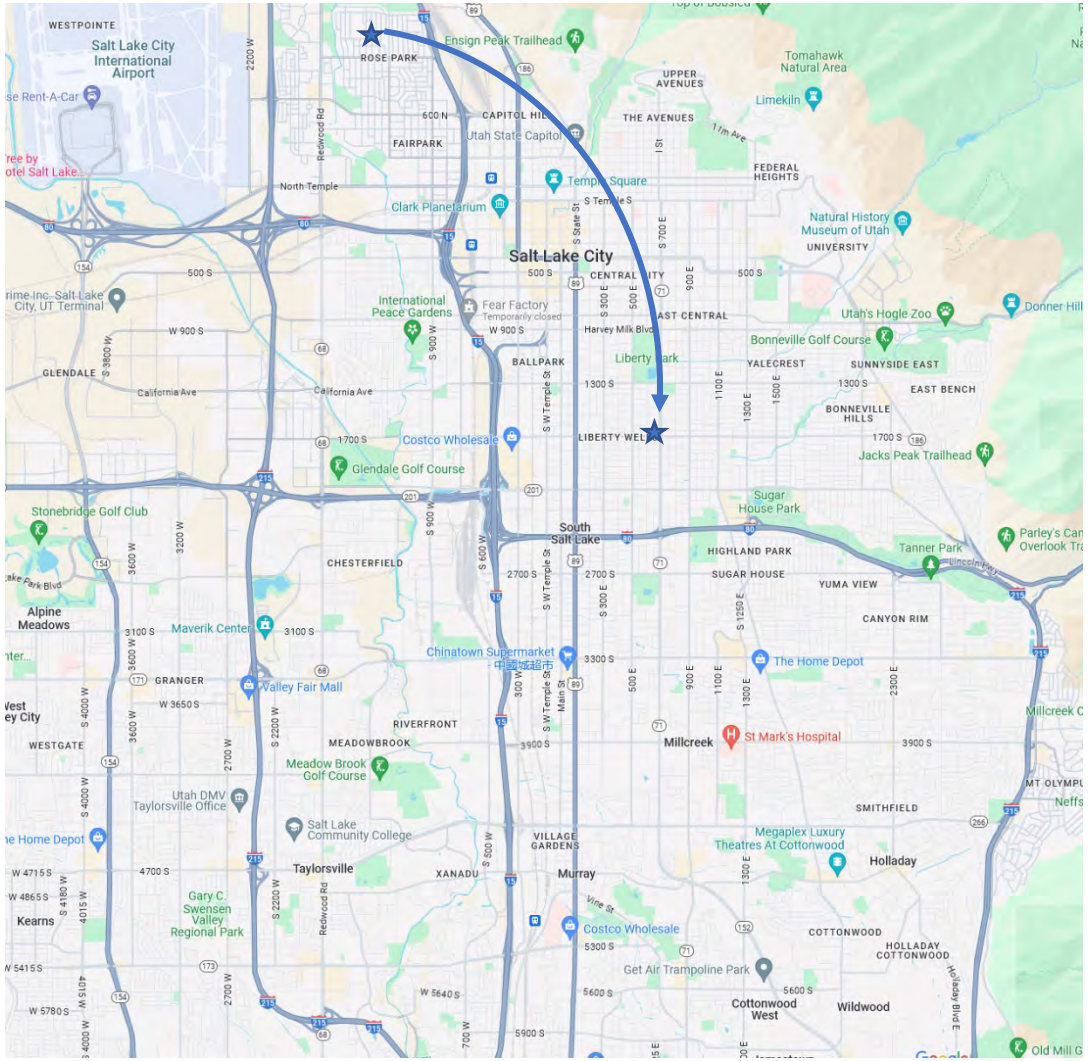
April 17, 2024

Next meetings:
May 22, 1pm Mountain Time
THURSDAY June 20, 1pm Mountain Time
To be added to email list: email caroline.womack@noaa.gov

Agenda

- Payload updates
- SLC-SOS drive tracks and updates (Emily Fischer, CSU)
- Modeling projects (Jessica Haskins, University of Utah)
- ACSM and GC-CIMS measurements (Demetrios Pagonis, Weber State University)
- Discussion

USOS CSL Mobile Lab update:



Salt Lake City School District is redistricting

- Rose Park will be expanded → parking lot repairs needed summer 2024
- Hawthorne is now available!

CSL Mobile Lab will *likely* move to Hawthorne

- Everything else will stay the same

USOS ARL Air Resources Car update:

- *(From Xinrong Ren)*
- Issue with car charger → will likely park at the Airbnb near Tech Center overnight
- A Picarro NH_3 analyzer (from Randy Martin) will likely be added to the payload

Instrument	Species Measured	Institution / PI
Picarro G2401	$CO_2/CH_4/CO/H_2O$	NOAA ARL
Aeris Ultra	CH_4/C_2H_6	NOAA ARL
Picarro G2201-i	$^{12}CH_3/^{13}CO_2$ isotopes	NOAA ARL
AE43 Aethalometer	Black carbon mass	NOAA ARL
Met package	T, P, RH, Winds, GPS position	NOAA ARL
2B Tech O3	O_3	NOAA ARL
Teledyne N500 CAPS	NO, NO_2, NOx	NOAA ARL
Picarro NH3	*NH_3*	*USU*

SLC-SOS Drive Updates

Department of
ATMOSPHERIC SCIENCES
MINES AND EARTH SCIENCES | THE UNIVERSITY OF UTAH

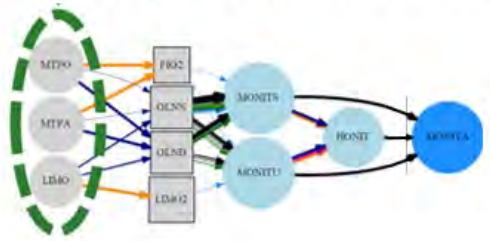
Model Mechanism Comparison of O_3 Formation:

(+assessing impact of halogens)

Prof. Jessica Haskins

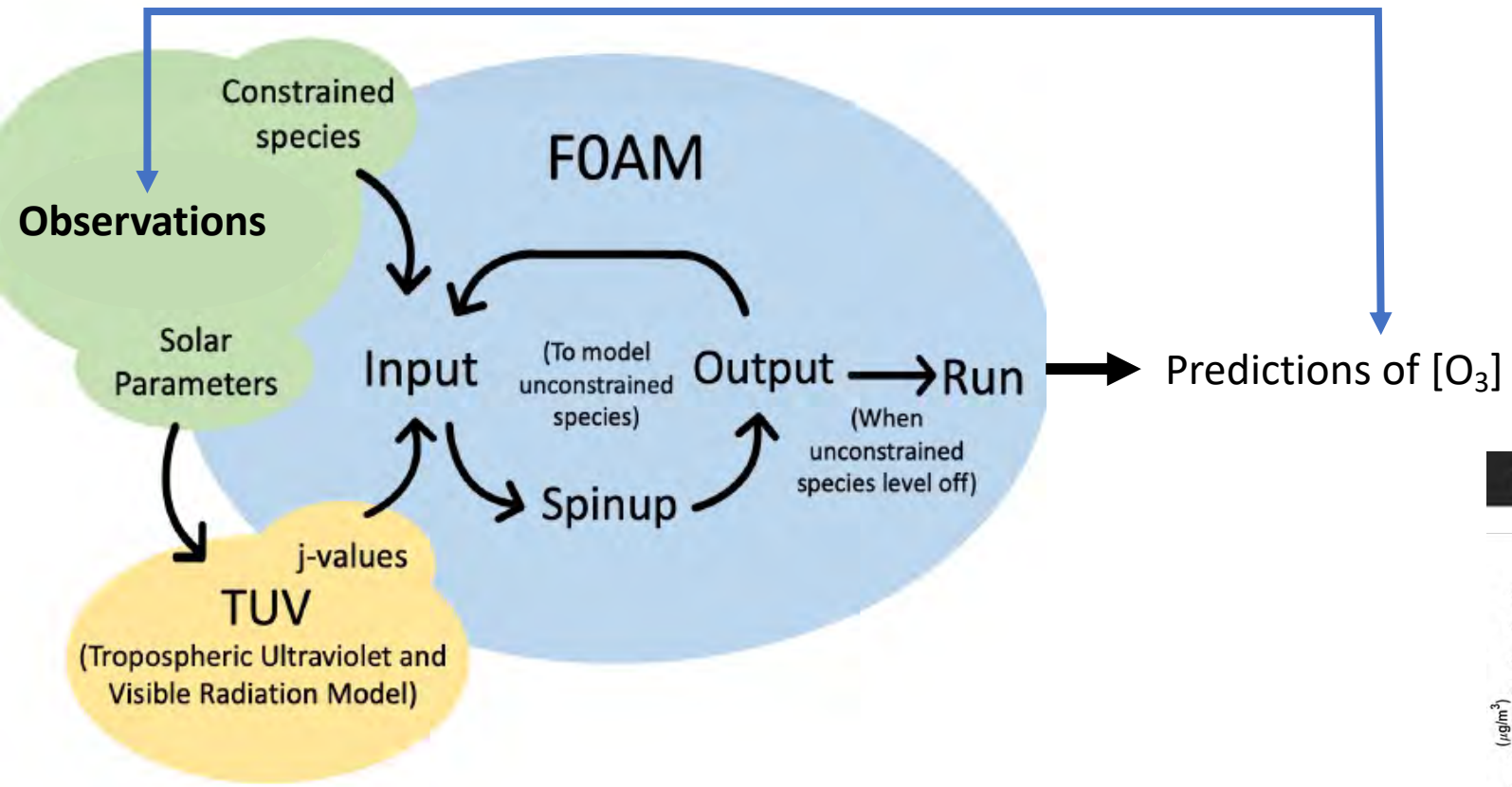
UUtah/ATMOS

Chemical mechanism complexity of VOC oxidation can vary a lot between different models…

MCM v3.3.1+RCIM Isoprene	GEOS-Chem v13.3.4
α-Pinene Oxidation Scheme	Monoterpene Oxidation Scheme
	
Total Mechanism: • 5880 species • 16705 reactions	**Total Mechanism:** • 272 species • 832 reactions

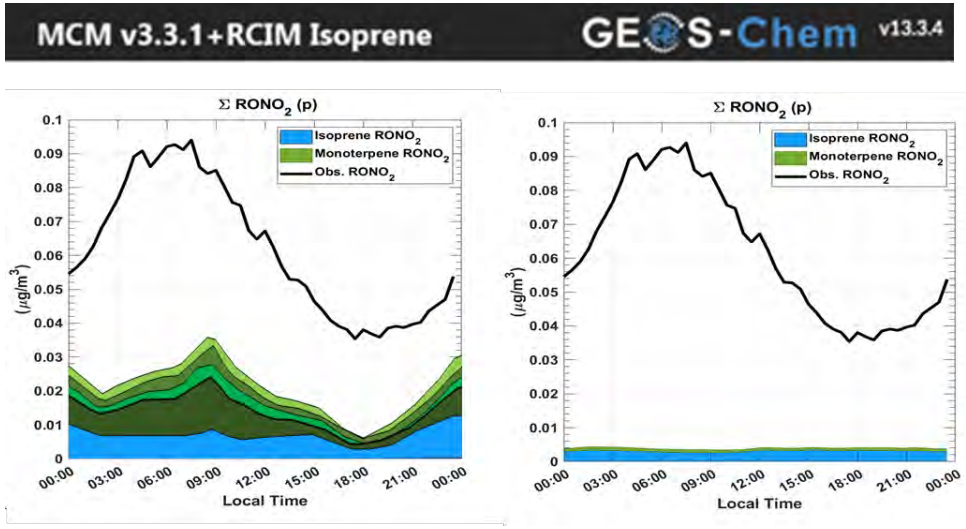
Comparing different mechanisms predictions against observations of O_3 will give us insights on which model mechanisms are doing the best & whether any disparities are arising due only to differences in chemical lumping.

Q1: How well do dif. mechanisms predict observed O_3 when VOCs, NOx, etc. are fully constrained to observations?



→ Predictions of [O_3]

Gas-Phase Mechanism
1. CRACMMv1.0
2. MCM Monoterpenes + RCIM Isoprene + Womack et al., 2023
3. GEOS-Chem (Wang et al., 2021)



Can we identify what VOCs contribute most to efficient NOx cycling/ $P(O_3)$?

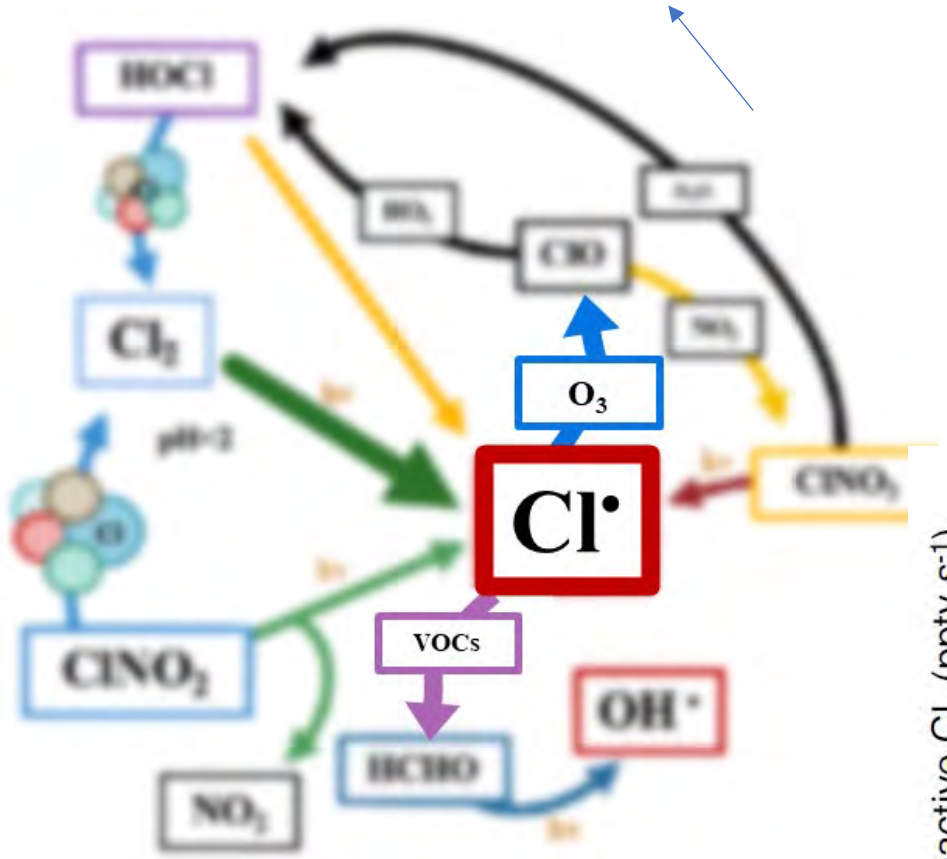
Would reducing Toluene, Xylene, & Benzene be an effective mitigation strategy in SLC?

Place et al., 2023 (https://doi.org/10.5194/egusphere-2023-288)
found over the Northeastern U.S. that …

- … CRACMMv1.0 benzene, toluene, and xylene chemistry led to efficient NOx cycling such that CRACMMv1.0 predicted **controlling aromatics reduces ozone without rural O_3 disbenefits**.

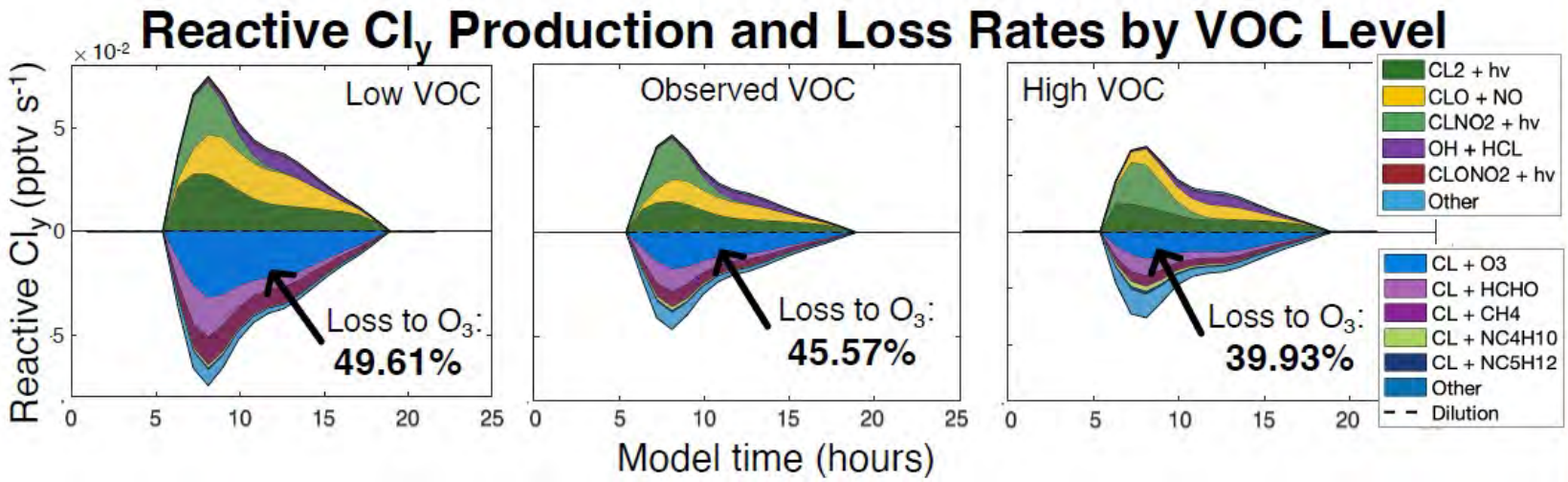
- In contrast, semivolatile to intermediate volatility alkanes introduced in CRACMMv1.0 acted to suppress O_3 formation across the regional background through the sequestration of nitrogen oxides (NO_x) in organic nitrates.

What is the impact of halogens on O_3 in SLC?



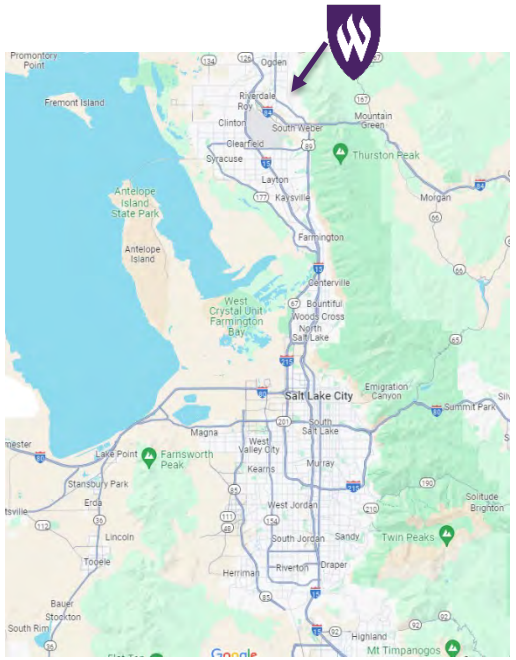
There are ALSO large differences in choices of key rxn rates give your choice of halogen mechanism… what's best?

Mechanism
UDAQ Custom Ramboll
MCM Monoterpenes + RCIM + Womack et al., 2023
GEOS-Chem (Wang et al., 2021)



EMpowering BRoader Academic Capacity and Education (EMBRACE)

Aerodyne Research



Aerosol Chemical Speciation Monitor (ACSM)

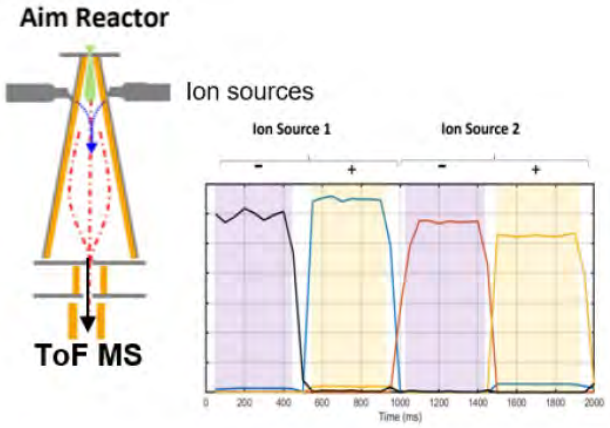
PM_1 composition

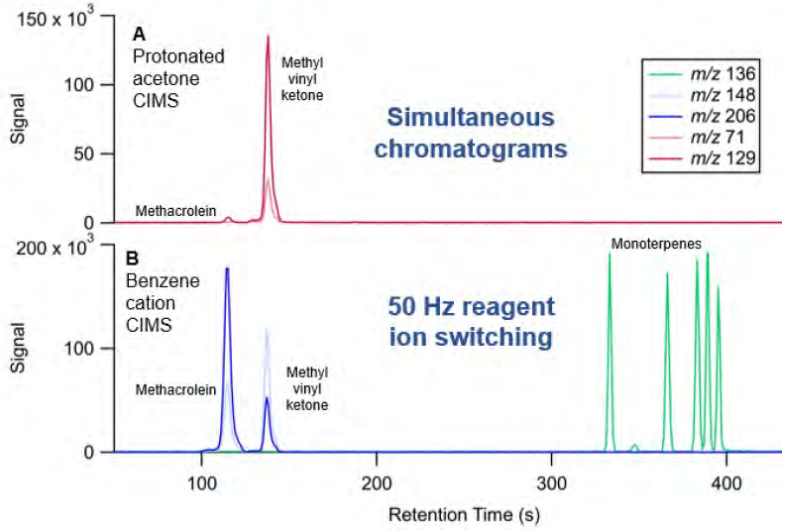
- Organic aerosol
- Nitrate
- Sulfate
- Ammonium
- Chloride

Fast-Switching Chemical Ionization GC-MS (b-ToF)

Online measurement, gas chromatography to separate isomers, and multiple reagent ions for a broad range of volatility

- Iodide anion (oxygenated VOCs, halogens)
- Ammonium cation (VOCs)
- Benzene cation (hydrocarbons, VOCs)
- Acetone anion

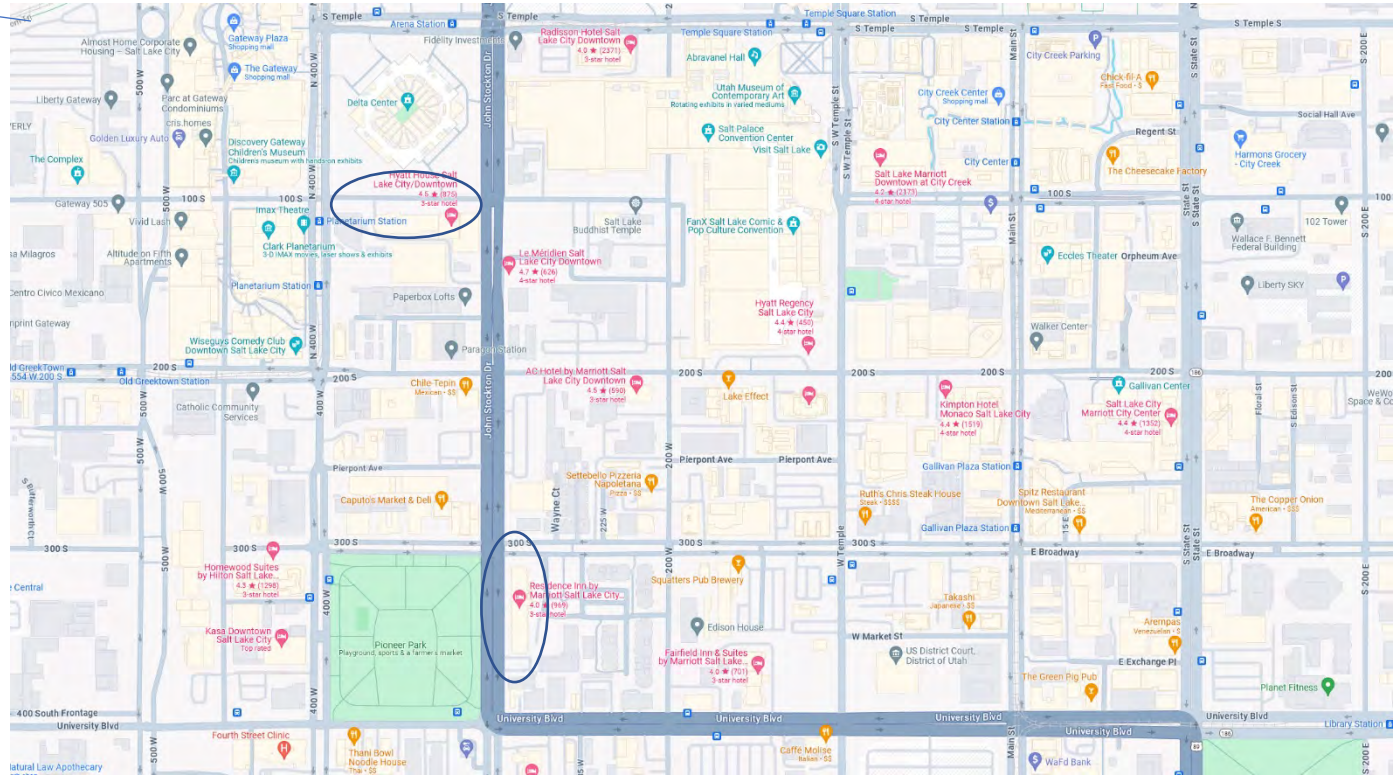




Travel and logistics

10 minute drive to hanger

20 TRAX ride to Salt Lake Int'l



10 minute drive to Hawthorne

- Booking a hotel block is HARD
- Daily briefings likely to happen at Residence Inn.
- Question for group: What time?