# SLC '24 Summer Campaigns

**Carrie Womack** 

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# Purpose of these meetings

- To foster cross-communication between the summer '24 SLC campaigns
- To share ideas, get feedback, see preliminary results, start collaborations
- To not duplicate efforts unnecessarily
- To prepare for future SLC studies



# Suggest meeting format

- Monthly meeting, 1 hour, fully virtual
- Every 4 weeks? Or second Tuesday of the month?
- 1 2 speakers, on a volunteer basis, with lots of discussion time
- Ending when no longer seems useful/necessary?

	А	В	с	D	E
1	Date	Speaker 1	Affiliation	Торіс	
2	10-Jun	Carrie Womack	NOAA CSL	Meeting logistics, USOS data update	
3		Kelvin Bates + students	University of Colorado Boulder	VOC source attribution	
4	July ??	TBD			
5		TBD			
6	August ??	Thierry LeBlanc / Fernando Chouza Keil	NASA JPL	How to utilize the SMOL O3 lidars	
7		TBD			
8	September ??	TBD			
9		TBD			
10	October ??	TBD			
11					
12					

## USOS data update

- Some delays due to [recent events] at NOAA. Please bear with us as we finish this up!
- NOAA CSL Mobile Lab nearly all instruments finalized
- NOAA ARL Air Resources Car Data delayed due to staffing issues
- NOAA Twin Otter Aircraft and Doppler Lidar are final, in situ chemistry delayed due to staffing issues
- USU/Weber State ACSM Finalized
- JPL SMOL O<sub>3</sub> lidars Finalized
- SUNY Nitrogen isotopes at UU and Tech Center Finalized
- USU Drone O<sub>3</sub> Coming soon

### https://csl.noaa.gov/groups/csl7/measurements/2024usos/data.html

### or google "NOAA USOS data"

Sciences Laboratory	Search CSL Q
📑 USOS 2024	About - Instruments Data Resources -
USOS 202	24 Data
Data Sets	
NOAA Twin Otter Data →3     CSL Mobile Lab (Driving) Data →3     CSL Mobile Lab (Parked) Data →3     ARL Air Resources Car (ARC) Data →3     Hawthome Ground Site Data →3	Suftmit Déis +3
Hawthome Ground Site Data →]     UATAQ Ground Sites Data →]     UATAQ TRAX Data →]     University of Utah Ground Site Data →]     Tech Center Ground Site Data →]	
Additional Data Sets • University of Utah Stochastic Time-Inverted Lagrangian Transport (STILT) mo • Tropospheric Ozone Lidar Network (TOLNet) NASA JPL SMOL-2 and SMOL-3 • SLC - Hawthorne Pandora NO2 number 72s1 • University of Utah EM27 Solar Radiance Spectrometer - ReadMe []	
Data Policy	
Preliminary Data	
Whenever possible, preliminary data will be submitted to the field archive within 24	hours after each flight. The ICARTT Data Format will be used.
Final Data	
Final data will be archived to a permanent repository within 12 months after the end after the end of each deployment.	of each deployment. The final data will be open to the public 12 months

#### Data Use

Whenever data from a USOS instrument is used in a publication, the authors are expected to offer co-authorship to the instrument principle investigator and

Password protected until September 1 UN: usos PW: GHg@ses24

Most data is in ICARTT format. Parsing scripts are available in Igor Pro, Python, Matlab, R, and others.

-Stationary data (CSL ML Parked, Hawthorne GS) is organized by day.
-Mobile data (Twin Otter, CSL ML Driving, ARC) is organized by drive/flight
-UTAQ July/August data was helpfully added as ICARTTs by John Lin's group
- A few instruments have all data in a single ICARTT (nitrogen isotopes, CSL ML iWAS)

Links to STILT, SMOLs, Pandora NO2, EM27 info. We can add more!

8, 1001 Jessica Gilman and Victoria Treadaway NOAA Chemical Sciences Laboratory and CIRES at University of Colorado NOAA iWAS Instrument: VOC measurement USOS 1, 1 2024, 07, 18, 2024, 08, 26 iWAS\_Start\_UTC, SecondsFromMidnightUTC, WAS\_Open 35 -9999, iWAS Stop UTC, SecondsFromMidnightUTC, WAS Closed iWAS Mid UTC, SecondsFromMidnightUTC, WAS Mid Acetone ppbv, ppbv, Gas Acetone Insitu S DVMR Benzene ppbv, ppbv, Gas Benzene Insitu S DVMR C2C14 ppbv, ppbv, Gas C2C14 Insitu S DVMR C2HC13 ppbv, ppbv, Gas C2HC13 Insitu S DVMR CC14 ppbv, ppbv, Gas CC14 Insitu S DVMR CF2C12\_ppbv, ppbv, Gas\_CF2C12\_Insitu\_S\_DVMR CH2C12 ppbv, ppbv, Gas CH2C12 Insitu S DVMR EthBenzene ppbv, ppbv, Gas EthBenzene Insitu S DVMR Ethane ppbv, ppbv, Gas Ethane Insitu S DVMR Ethene ppbv, ppbv, Gas Ethene Insitu S DVMR Ethyne ppbv, ppbv, Gas Ethyne Insitu S DVMR Isoprene ppbv, ppbv, Gas Isoprene Insitu S DVMR Limonene ppbv, ppbv, Gas Limonene Insitu S DVMR MACR ppbv, ppbv, Gas MACR Insitu S DVMR Propane ppbv, ppbv, Gas Propane Insitu S DVMR Propene ppbv, ppbv, Gas Propene Insitu S DVMR Toluene ppbv, ppbv, Gas Toluene Insitu S DVMR aPinene ppbv, ppbv, Gas aPinene Insitu S DVMR bPinene ppbv, ppbv, Gas bPinene Insitu S DVMR iButane ppbv, ppbv, Gas iButane Insitu S DVMR iPentane\_ppbv, ppbv, Gas\_iPentane\_Insitu\_S\_DVMR iPropONO2 ppbv, ppbv, Gas iPropONO2 Insitu S DVMR mpXylene ppbv, ppbv, Gas mpXylene Insitu M DVMR nButane ppbv, ppbv, Gas nButane Insitu S DVMR nHeptane ppbv, ppbv, Gas nHeptane Insitu S DVMR nHexane ppbv, ppbv, Gas nHexane Insitu S DVMR nNonane ppbv, ppbv, Gas nNonane Insitu S DVMR nOctane ppbv, ppbv, Gas nOctane Insitu S DVMR nPentane ppbv, ppbv, Gas nPentane Insitu S DVMR nPropONO2 ppbv, ppbv, Gas nPropONO2 Insitu S DVMR oXylene\_ppbv, ppbv, Gas\_oXylene\_Insitu\_S\_DVMR x135tmBenzene ppbv, ppbv, Gas x135tmBenzene Insitu S DVMR x224TriMePentane\_ppbv, ppbv, Gas\_x224TriMePentane\_Insitu\_S\_DVMR SPECIAL COMMENTS: N/A 18 PI CONTACT INFO: 325 Broadway R/CSL7, Boulder, CO 80305, jessica.gilman@noaa.gov PLATFORM: NOAA Mobile Lab LOCATION: Salt Lake City, UT ASSOCIATED DATA: N/A INSTRUMENT INFO: Whole air samplers with offline analysis via GC-MS DATA INFO: Units: ppbv UNCERTAINTY: TBD ULOD FLAG: -7777 ULOD VALUE: N/A LLOD FLAG: -8888 LLOD VALUE: N/A DM CONTACT INFO: jessica.gilman@noaa.gov PROJECT INFO: Salt Lake City Utah July 17 to August 18, 2024; https://csl.noaa.gov/projects/aeromma/ STIPULATIONS ON USE: Use of these data require prior ok from PF OTHER COMMENTS: N/A REVISION: RB RA is preliminary data for a limited number of VOCs, RO final data will contain expanded list of VOCs. iWAS Start UTC, iWAS Stop UTC, iWAS Mid UTC, Acetone ppbv, Benzene ppbv, C2C14 ppbv, C2HC13 ppbv, CC14 ppbv, CF2C12 ppbv, CH2C12 ppbv 68970.4, 68970.4, 68970.4, 4.122, 0.183, 0.016, 0.006, 0.072, 0.421, 0.117, 0.052, 1.418, 0.217, 0.217, 0.397, -9999.000, 0.065, 0.59 69119.4, 69119.4, 69119.4, 5.645, 0.430, 0.024, 0.004, 0.072, 0.432, 0.134, 0.088, 2.283, 0.319, 0.402, 0.143, 0.002, 0.053, 2.112, C

A reminder to reach out to the PI listed in the ICARTT file if you intend to use the data in any way.

They can help you know how to use the data, and if there are any issues

# An important side note about Pandoras!

- On the Pandonia Global Network, there are 3 Pandora in Utah
- However, Jeff Geddes (PI) says the data quality on SaltLakeCityUT (154) and SouthJordanUT(139) is not good enough.
- ONLY Hawthorne (72) is usable in summer 2024

A NAME Q bearch	SIZE	MODIFIED
OuezonCity/	-	12/27/2024. 3:14:21 A
RichmondCA/	-	12/27/2024. 3:11:34 A
Rome-IIA/	-	3/24/2025, 7:10:40 AN
Rome-ISAC/	÷.	3/24/2025, 8:43:36 AN
Rome-SAP/	-	3/24/2025, 6:23:58 AN
Rotterdam-Haven/	-	12/27/2024. 3:12:06 A
SaltLakeCityUT-Hawthorne/		12/27/2024, 3:12:03 A
SaltLakeCityUT/		12/27/2024, 3:13:18 A
SanAntonioTX/	-	5/4/2025, 3:39:40 AM
SanJoseCA/	-	12/27/2024, 3:13:43 A
SantaCruz/	-	4/3/2025. 6:14:30 AM
Sapporo/		12/27/2024. 3:14:10 A
Seosan/	-	12/27/2024. 3:13:28 A
Seoul-KU/	-	12/27/2024, 3:14:22 A
Seoul-SNU/	~	12/27/2024, 3:13:27 A
Seoul/		12/27/2024, 3:11:36 A
Singapore-NUS/	÷	12/27/2024, 3:12:04 A
Songkhla/	-	12/27/2024, 3:14:19 A
SouthJordanUT/	÷-	12/27/2024, 3:12:52 A
StGeorge/	~	12/27/2024, 3:13:33 A
StocktoniL/	-	3/27/2025, 7:29:30 AN
StonyPlain/		12/27/2024, 3:12:42 A

# The Spreadsheet

- Useful to others?
- Should we find a better way to host it?
- Are there errors? Missing information?

### El SLC Summer 2024 Experimental Data Availability 🛧 🗈 🗠 File Edit View Insert Format Data Tools Extensions Help

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npaign (nominally)	Platform	Base Location	Base GPS coordinates	Stationary/Mobile	Data location	Format	Instrument Name	Version	Time resolution	Dates available		Notes
											C2H6-to-CH4 ratio	Measured by Aeris
											CO	Meaured by Picarro G2401m (same as CSL Mobile lab)
											CO2	Meaured by Picarro G2401m (same as CSL Mobile lab)
USOS	NOAA Air Resources Car	Rose Park	40.78069, -111.94099	Mobile	https://csl.noaa.gov/groups/csl7/measurements/20 24usos/ARC/DataDownload/	ICADTT	ARL-Suite	RA	1s	July 16 - Aug 4	CH4	Meaured by Picarro G2401m (same as CSL Mobile lab)
0303	NOAA Air Resources Car	Rose Park	40.70009, -111.94099	Wobile		ICARTI	ARL-Suite	RA	15	July 16 - Aug 4	H2O	Meaured by Picarro G2401m (same as CSL Mobile lab)
											delta-13C CH4	Isotopes + concentration measured by Picarro G2201m
											delta-13C CO2	Isotopes + concentration measured by Picarro G2201m
											CH4	Isotopes + concentration measured by Picarro G2201m
											CO2	Isotopes + concentration measured by Picarro G2201m
											Ammonia (NH3)	
											03	
											Nitrogen oxide (NO)	Measured by Darcy G60 (CRDS)
											Nitrogen dioxide (NO2)	Measured by Darcy G60 (CRDS)
											NOx (NO + NO2)	Measured by Darcy G60 (CRDS)
											Nitrogen oxide (NO)	Measured by Teledyne N500 (CAPS)
											Nitrogen dioxide (NO2)	Measured by Teledyne N500 (CAPS)
											NOx (NO + NO2)	Measured by Teledyne N500 (CAPS)
											Black carbon (measured at 7 wavelengths)	
											PM2.5	
											PM10	
USOS	USU Drone	Multiple launch sites	Multiple launch sites	Mobile	TBD	TBD	TBD	TBD	TBD	TBD	Ozone (O3)	
											Nitrous acid (HONO)	
											delta15-N HONO	
								R0		July 20 - Aug 2	delta18-O HONO	
							Nitlsotopes		~6 - 24 hours		delta15-N NOx	
											delta15-N NO2	
		UDAQ Tech Center			https://csl.noaa.gov/groups/csl7/measurements/20						delta18-0 NO2	
USOS	Tech Center Ground Site	roof	40.77690, -111.94595	Stationary	24usos/GroundTechCenter/DataDownload/						Particulate nitrate (NO3-)	
											delta15-N NO3-	
											delta18-O NO3-	
							NitFilters	R0	~24 hours	July 19 - Aug 2	Nitric acid (HNO3)	
											delta15-N HNO3	
											delta18-O HNO3	
		UDAQ Tech Center										
MEEPC	NIST LP-DOAS	roof	40.77690, -111.94595	Remote sensing	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
						T	NO2	R0	1min	July 20 - Aug 5	Nitrogen dioxide (NO2)	
											Nitrous acid (HONO)	
											delta15-N HONO	
							Nitlsotopes	R0	~6 - 24 hours	July 20 - Aug 2	delta18-O HONO	
							чизоторез		0 - 24 10013	July 20 - Aug 2	delta15-N NOx	
		University of Utah									delta15-N NO2	
USOS	S UU Ground Site William Browning 40.76624, -111.8476		Stationary	https://csl.noaa.gov/groups/csl7/measurements/20 24usos/GroundUU/DataDownload/	ICARTT					delta18-O NO2		
		Building roof			2-1303/OrbandOo/DataDownload/						Particulate nitrate (NO3-)	
											delta15-N NO3-	
							N Dall Da	DO	24 hours	hub. 10 A 2	delta18-O NO3-	
							NitFilters	R0	~24 hours	July 19 - Aug 2	Nitric acid (HNO3)	
											delta15-N HNO3	
											delta18-O HNO3	
Ongoing	CUROAS	UDAQ Prison Site	40.80742, -112.08850	Remote sensing	TBD	TBD	TBD	TBD	TBD	TBD	TBD	

🕂 🚍 Summer 2024 platforms 🝷 Mobile Platform Start/Stop Times 👻 Longterm EPA/UDAQ Monitoring Sites 👻 STILT modeling 👻

### Campaign (ish)

### Where was it?

### How to I get the data? Is the data final? What was measured? Frequency? When?

	D24 Experimental Data Insert Format Data T											
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mpaign (nominally	y Platform	Base Location	Base GPS coordinates	Stationary/Mobile	Data location	Format	Instrument Name	Version	Time resolution	Dates available	Datameasured	Notes
	T										C2H6-to-CH4 ratio	Measured by Aeris
		,			🔶						► CO	Meaured by Picarro G2401m (same as CSL Mobile lab)
					•						C02	Meaured by Picarro G2401m (same as CSL Mobile lab)
USOS	NOAA Air Resources Car	Rose Park	40.78069, -111.94099	Mobile	https://csl.noaa.gov/groups/csl7/measurements/20	ICARTT	ARL-Suite	RA	<b>1</b> s	July 16 - Aug 4	CH4 H2O	Meaured by Picarro G2401m (same as CSL Mobile lab)
					24usos/ARC/DataDownload/							Meaured by Picarro G2401m (same as CSL Mobile lab)
											delta-13C CH4	Isotopes + concentration measured by Picarro G2201m
											delta-13C CO2 CH4	Isotopes + concentration measured by Picarro G2201m
											CH4 CO2	Isotopes + concentration measured by Picarro G2201m
											Ammonia (NH3)	Isotopes + concentration measured by Picarro G2201m
											O3	
											Nitrogen oxide (NO)	Measured by Darcy G60 (CRDS)
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											Black carbon (measured at 7 wavelengths)	including by rendying hours (arm by
											PM2.5	
											PM10	
USOS	USU Drone	Multiple launch sites	Multiple launch sites	Mobile	TBD	TBD	TBD	TBD	TBD	TBD	Ozone (O3)	
											Nitrous acid (HONO)	
											delta15-N HONO	
							Nitlsotopes	R0	~6 - 24 hours	July 20 - Aug 2	delta18-O HONO	
							Milsolopes	RU	-0 - 24 10015	July 20 - Aug 2	delta15-N NOx	
											delta15-N NO2	
USOS	Tech Center Ground Site	UDAQ Tech Center	40.77690, -111.94595	Stationary	https://csl.noaa.gov/groups/csl7/measurements/20	ICARTT-					delta18-O NO2	
0000	Tech Center Ordana Site	roof	40.77050, -111.54555	Stationary	24usos/GroundTechCenter/DataDownload/	CART					Particulate nitrate (NO3-)	
											delta15-N NO3-	Please check for err
							NitFilters	R0	~24 hours	July 19 - Aug 2	delta18-O NO3-	
									21110010	ouly to rage	Nitric acid (HNO3)	
											delta15-N HNO3	
											delta18-O HNO3	
MEEPC	NIST LP-DOAS	UDAQ Tech Center roof	40.77690, -111.94595	Remote sensing	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
							NO2	R0	1min	July 20 - Aug 5	Nitrogen dioxide (NO2)	
						[					Nitrous acid (HONO)	
											delta15-N HONO	
							Nitlsotopes	R0	~6 - 24 hours	July 20 - Aug 2	delta18-O HONO	
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		University of Utah			https://csl.noaa.gov/groups/csl7/measurements/20 24usos/GroundUU/DataDownload/						delta15-N NO2	
USOS	UU Ground Site	William Browning	40.76624, -111.84768	Stationary							delta18-O NO2	
		Building roof									Particulate nitrate (NO3-)	
											delta15-N NO3-	
						NitFilters	R0	~24 hours	July 19 - Aug 2	delta18-O NO3-		
										,	Nitric acid (HNO3)	
				1							delta15-N HNO3	
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Ongoing	CU DOAS		40.80742, -112.08850		TBD	TBD	TBD	TBD	TBD	TBD	delta18-O HNO3 TBD	

### 5 mobile platforms Start/Stop times (in UTC) Where?

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A	В	С	D	E	F	G	н	1	J	к	L
Platform D	Drive/Flight Number	Date	Start Date	Start Time (UTC	) End Date	End Time (UTC)	) Duration (hrs)	Route	Conditions	General wind conditions	Notes
	20240718	Thursday	7/18/2024	18:48:00	7/19/2024	0:13:00	5.4	North Industry + Inland Port	Hot, ozone exceedance day	E and S, but variable	
	20240722	Monday	7/22/2024	17:21:00	7/23/2024	0:31:00	7.2	South Survey + Canyons	Hot, ozone exceedance day	variable	
	20240723	Tuesday	7/23/2024	17:08:00	7/23/2024	22:47:00	5.7	North Industry + Inland Port	Hot, ozone exceedance day	W and N but variable	
	20240726	Friday	7/26/2024	15:08:00	7/26/2024	21:36:00	6.5	South Survey	Not as hot, smoke plume above	mostly S	
	20240728	Sunday	7/28/2024	15:11:00	7/28/2024	21:01:00	5.8	South Survey	Not as hot, smoke plume above	variable	
CSL Mobile Lab	20240730	Tuesday	7/30/2024	19:15:00	7/31/2024	0:38:00	5.4	North Industry + Inland Port	Smoky	N, relatively strong	
	20240801	Thursday	8/1/2024	17:59:00	8/2/2024	0:16:00	6.3	South Survey	Smoky, stagnant	N, weak	
	20240803	Saturday	8/3/2024	14:12:00	8/3/2024	19:38:00	5.4	North Industry + Inland Port	Not as smoky	S, relatively strong	
	N/A 20240815	Wednesday Thursday	8/7/2024 8/15/2024	20:10:00 11:48:00	8/7/2024 8/15/2024	21:32 15:55:00	1.4 4.2	Airport to meet with UDAQ Emigration + Rose Park	Early morning	meeth. C	Not technically a science drive, we just had to go to UDAQ for a stakeholders m
		Friday (technically saturday UTC)		2:15:00	8/17/2024	6:10:00	4.2 3.9	Downtown, inland port, north industry	Evening	mostly S mostly S	
	20240817 20240719 L1	Friday (lechnically saturday 010) Friday	7/19/2024	14:53:00	7/19/2024	17:42:00	2.82	Transit to UT	Evening	mosuy 5	
	20240719_L1 20240719_L2	Friday	7/19/2024	20:17:00	7/19/2024	22:40:00	2.38	Transit to UT			
	20240715_12	Saturday	7/20/2024	16:34:00	7/20/2024	19:30:00	2.93	SLC GSL plan			
	20240721 L1	Sunday	7/21/2024	16:03:00	7/21/2024	19:19:00	3.27	Uinta Basin			
	20240721_L2	Sunday	7/21/2024	20:45:00	7/21/2024	23:51:00	3.10	Uinta Basin			
	20240722_L1	Monday	7/22/2024	17:26:00	7/22/2024	18:44:00	1.30	SLC Urban survey			
	20240722_L2	Monday	7/22/2024	20:18:00	7/22/2024	23:50:00	3.53	SLC wind flow			
	20240723_L1	Tuesday	7/23/2024	16:18:00	7/23/2024	19:09:00	2.85	SLC GSL plan			
	20240723_L2	Tuesday	7/23/2024	20:21:00	7/23/2024	23:14:00	2.88	SLC wind flow			
	20240726 L1	Friday	7/26/2024	15:01:00	7/26/2024	18:30:00	3.48	SLC GSL plan			
	20240726_L2	Friday	7/26/2024	19:56:00	7/26/2024	23:06:00	3.17	SLC GSL plan			
	20240728	Sunday	7/28/2024	14:57:00	7/28/2024	18:04:00	3.12	SLC GSL plan			
Twin Otter	20240729_L1	Monday	7/29/2024	16:03:00	7/29/2024	19:11:00	3.13	Uinta Basin			
	20240729_L2	Monday	7/29/2024	20:39:00	7/29/2024	23:34:00	2.92	Uinta Basin			
	20240730_L1	Tuesday	7/30/2024	18:38:00	7/30/2024	22:03:00	3.42	SLC wind flow			
	20240730_L2	Tuesday	7/30/2024	23:35:00	7/31/2024	2:55:00	3.33	SLC wind flow			
	20240801_L1	Thursday	8/1/2024	16:02:00	8/1/2024	19:12:00	3.17	SLC wind flow			
	20240801_L2	Thursday	8/1/2024	20:47:00	8/1/2024	23:55:00	3.13	SLC GSL plan			
	20240803_L1	Saturday	8/3/2024	13:54:00	8/3/2024	17:06:00	3.20	SLC wind flow			
	20240803_L2	Saturday	8/3/2024	18:37:00	8/3/2024	21:33:00	2.93	SLC wind flow			
	20240805_L1	Monday	8/5/2024	15:44:00	8/5/2024	19:03:00	3.32	SLC wind flow			
	20240805_L2	Monday	8/5/2024	20:55:00	8/5/2024	23:10:00	2.25 3.12	SLC wind flow Uinta Basin			
	20240806_L1	Tuesday	8/6/2024 8/6/2024	16:14:00 20:53:00	8/6/2024 8/6/2024	19:21:00 23:47:00	3.12	Uinta Basin Uinta Basin			
	20240806_L2 20240808	Tuesday Thursday	8/8/2024	15:37:00	8/6/2024	23:47:00	2.90	Transit to CO			
	20240808	Wednesday	7/17/2024	20:11:00	7/17/2024	21:24:59	1.23	SLC North-South			
	20240718	Thursday	7/18/2024	20:01:22	7/18/2024	23:40:51	3.66	North Industry + Inland Port			
	20240710	Sunday	7/21/2024	18:26:18	7/21/2024	21:18:05	2.86	North Industry + Inland Port			
	20240722	Monday	7/22/2024	15:42:06	7/22/2024	21:31:59	5.83	SLC East-West			
ARL Air Resources	20240723	Tuesday	7/23/2024	15:11:34	7/23/2024	22:10:47	6.99	North Industry + Inland Port			
Car (ARC)	20240726	Friday	7/26/2024	14:45:09	7/26/2024	20:04:36	5.32	SLC Grid pattern - mid valley			
	20240728	Sunday	7/28/2024	15:01:02	7/28/2024	20:05:11	5.07	SLC Grid pattern - south valley			
	20240730	Tuesday	7/30/2024	15:20:40	7/30/2024	23:56:02	8.59	East side of GSL, antelope valley			
	20240801	Thursday	8/1/2024	14:30:34	8/1/2024	20:57:05	6.44	South side of GSL, USM			
	20240803	Saturday	8/3/2024	15:29:59	8/3/2024	20:08:34	4.64	SLC grid pattern - west valley			
	1	Monday	7/29/2024	17:40:50	7/29/2024	18:36:42		Test Drive			
	2	Thursday	8/1/2024	19:23:01	8/1/2024	22:57:25		Inland Port			
	4	ritaroady	OT TIL OL 4								

+ = Summer 2024 platform 🔹 Mobile Platform Start/Stop Times 🔹 Jongterm EPA/UDAQ Monitoring Sites 👻 STILT modeling

### Where?

### What was measured?

BLC Summer 2024 Experimental Data Availability 🖈 🗈 🗠 File Edit View Insert Format Data Tools Extensions Help

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#### A1:H1 - jx All data is available at EPA AirData

Site Name Brigham City Washakie Smithfield	CBSA Ogden-Clearfield	All data is hou	ata is available at EPA / urly, except speciated r													
Brigham City Washakie Smithfield			urly, except speciated r	metals. GC. etc.				•								
Brigham City Washakie Smithfield				,,												
Washakie Smithfield	Onden-Clearfield	CSA	Operator	UDAQ site abbreviation	EPA site number	County	GPS coordinates	Elevation (m ASL	Met	NOx and O3	PM	GHG	VOCs	Remote Sensing	Other	Availability during U
Smithfield		Salt Lake City-Provo-Orem	UDAQ	BG	490030005	Box Elder	41.484886, -112.021625	1313	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5					Yes
	Ogden-Clearfield	Salt Lake City-Provo-Orem Sho	oshone/Arapahoe Nation	ns	490037001	Box Elder	41.945874, -112.233973	1369	WS, TEMP, SR, RH, Precip	03, NO2, NO, NOx						Yes
Description	Logan	N/A	UDAQ	SM	490050007	Cache	41.842641, -111.852196	1379	WS, WD, TEMP, SR, RH, Light absorption coefficient	03, NO2, NO, NOx	PM2.5, Speciated PM2.5, Metals in PM2.5, BC					Yes
Bountiful	Ogden-Clearfield	Salt Lake City-Provo-Orem	UDAQ	BV	490110004	Davis	40.902943, -111.884473	1309	WS, WD, TEMP, SR, RH, Light absorption coefficient	O3, NO2, NO, NOx, NOy	PM2.5, PM10, Speciated PM2.5, Metals in PM10, BC	G	C, HCHO (24hr)			Yes
Antelope Island	Ogden-Clearfield	Salt Lake City-Provo-Orem	UDAQ	AI	490116001	Davis	41.034207, -112.235987	1349	WS, WD, TEMP, RH							Yes
Copperview	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	CV	490352005	Salt Lake	40.597926, -111.894186	1343	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5	со			SO2 (5min)	Yes
Hawthorne	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	HW	490353006	Salt Lake	40.734367, -111.872171	1306	WS, WD, TEMP, SR, RH, Light absorption coefficient	O3, NO2, NO, NOx, NOy	PM2.5, PM10, Speciated PM2.5, Metals in PM2.5	CO G	C, HCHO (8hr)	Ceilometer	SO2	Yes
Rose Park	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	RP	490353010	Salt Lake	40.795536, -111.930997	1295	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5	со			SO2	Yes
Herriman	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	H3	490353013	Salt Lake	40.496393, -112.036356	1530	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, PM10					Yes
Lake Park	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	LP	490353014	Salt Lake	40.709791, -112.008576	1297	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, BC					Yes
Tech Center	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	EQ	490353015	Salt Lake	40.776862, -111.945962	1283	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, PM10	CO	GC	Ceilometer	SO2	Yes
Prison / Inland	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	ZZ	490353016	Salt Lake	40.807897, -112.087717	1286	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, BC			Ceilometer		Yes
Red Butte	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	RB	490353018	Salt Lake	40.766528, -111.828361	1517	WS, WD, TEMP, SR, RH	O3, NO2, NO, NOx, NOy	PM2.5		GC	Ceilometer		Yes
Near Road	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	NR	490354002	Salt Lake	40.662961, -111.901851	1298	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5	CO				Yes
Erda	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	ED	490450004	Tooele	40.600562, -112.355776	1511	WS, WD, TEMP, SR, RH	O3, NO2, NO, NOx, NOy	PM2.5		GC			Yes
Badger Island	Salt Lake City	Salt Lake City-Provo-Orem	UDAQ	BI	490456001	Tooele	40.94212, -112.561943	1282	WS, WD, TEMP, SR, RH							Yes
Dinosaur NP	Vernal	N/A U	IS National Park Service	•	490471002	Uintah	40.4372, -109.3047	1463	WS, TEMP, SR, Precip	03						Yes
Vernal	Vernal	N/A	UDAQ	V4	490471004	Uintah	40.46471, -109.561472	1668	WS, WD, TEMP, SR, RH							Yes
Lindon	Provo-Orem	Salt Lake City-Provo-Orem	UDAQ	LN	490494001	Utah	40.339574, -111.713481	1442	WS, WD, TEMP, SR, RH, Light absorption coefficient	03, NO2, NO, NOx	PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC	CO				Yes
Spanish Fork	Provo-Orem	Salt Lake City-Provo-Orem	UDAQ	SF	490495010	Utah	40.136320, -111.657929	1380	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5					Yes
Heber	Heber	Salt Lake City-Provo-Orem	UDAQ	HB	490510001	Wasatch	40.497962, -111.39763	1306	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5					Only August
Harrisville	Ogden-Clearfield	Salt Lake City-Provo-Orem	UDAQ	HV	490571003	Weber	41.302678, -111.986448	1331	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, PM10	CO				Yes
			_													

### Where?

### What was measured?

SLC Summer 2024 Experimental Data Availability 👷 🗈 🗠 ⊞

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#### A1:H1 ✓ fit All data is available at EPA AirData

Alter         Autory operations (6.4)	A	D	L	D All data is available at EPA A	C.	r	G	Н	'	L	r.	L	м	N	0	P	Q
Instruction         Oppose Classified         Solt Lake Cly-Provo Cm         UDA         DB         BB         BB <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>•</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>									•								
Instruction         Oppose Classified         Solt Lake Cly-Provo Cm         UDA         DB         BB         BB <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>																	
Whates         Open-Charantee         Balt Label Cap-Prov-Creen         Monton-Magata Nations         Weight 1996         With TMM 98, RH / Proping         OUX 200 / No.         PLX 5. Specialed PM2 5. Music In PLX 5													GHG	VOCs	Remote Sensin	g Other	, ,
Smathal         Vin         Vin<         Vin< <td></td> <td>, ,</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>PM2.5</td> <td></td> <td></td> <td></td> <td></td> <td></td>		, ,										PM2.5					
Bandiff         Open-Gasefield         Sai Lake City-Prov-Orm         UDA         PV         PV         PVID         PVID        PVID        PVID         <			Salt Lake City-Provo-Orem							and the second							
Anthoge Statusd         Ogene Chandral         Sat Lake Chy-Provo Chem         UAAO         All         40911901         Darks         4108207-112.23971         1.049         WS: WD: TEMP RH         Disc.         Conc.         Conc.         Conc.         Soc.			N/A														
Corporation         Statitate City         Statitate City         Statitate City         Statitate City         OutAct         HW         49933298         Statitate 4         49932598         Statitate 4         49939598         Statitate 4         49939598         Statitate 4         49939598         Statitate 4         499399997997999         4993999979         4		•									O3, NO2, NO, NOx, NOy	PM2.5, PM10, Speciated PM2.5, Metals in PM10, BC		GC, HCHO (24hr)			
Humemene         Salt Lake Clav         Salt Lake Clav         Salt Lake Clav         Horizant         Horizant         Salt Lake Clav         Horizant			,,														
Base Park         Salt Lake City         Salt Lake Ci																	
Merinan       Sali Lake Org														GC, HCHO (8hr)	Ceilometer		
Lake Park         Sal Lake City         Sal Lake Cit													co			SO2	
Tech Center         Sal Lake Clip,																	
Phono Inland       Salt Lake City       Salt La		,															
Rear Road         Salt Lake City         Salt Lake City-Prov-Orem         UDAQ         RB         49935319         Salt Lake City-Prov-Orem         ODA NO.													co	GC		SO2	
Near Boad         Salt Lake Chy         Salt Chy																	
Erda         Salt Lake Clip         Salt Lake Clip         Salt Lake Clip         Salt Lake Clip         DAG         ED         49945001         Toele         40 600552, 112,355776         1511         WS, WD, TEMP, SR, RH         O3, NO2, NO, NOx, NO         PM2.5         GC         M         M           Badger Island         Salt Lake Clip, Provo-Orem         UDAQ         B1         49945001         Toele         40 60052, 112,355716         1511         WS, WD, TEMP, SR, RH         O3         C         C         M         Yes           Dinosaur NP         Vernal         NA         UDAQ         V4         499471002         Uintah         40,472, 119351417         1162         WS, WD, TEMP, SR, RH         O3         C         C         Vers           Vernal         Vernal         NA         UDAQ         Link         490494001         Uintah         40,472,119351412         1162         WS, WD, TEMP, SR, RH         O3         C         C         Vers         Vers           Linkon         Provo-Orem         Stal Lake Clip,Provo-Orem         UDAQ         Linko         Vers         M399574.11171377131         1342         WS, WD, TEMP, SR, RH         O3, NO2, NO, NOx         PM2.5, PM10, SO, NOx         PM2.5, PM10         CO         Vers         OP         OP <td></td> <td>,</td> <td></td> <td>GC</td> <td>Ceilometer</td> <td></td> <td></td>		,												GC	Ceilometer		
Badger Island       Salt Lake Chy       Salt Lake Chy<		,											CO				
Dinosaur NP       Vernal       N/A       US National Park Service       4904/1002       Uintah       40.4372,-109.3047       1463       WS, TEMP, SR, Precip       03       03       14000       14000       14000       14000       14000       14000       14000       14000       14000       14000       14000       14000       14000       14400       141000       14400       14000       WS, WD, TEMP, SR, RH       03.       03.       PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC       CO       CO       14000       Yes         Spanish Fork       Provo-Orem       Salt Lake City-Provo-Orem       UDAQ       SF       4904950100       Utah       40.33520, 111.65729       1330       WS, WD, TEMP, SR, RH       03. NO2, NO, NOx       PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC       CO       CO       WS       WS         Heber       Heber       Salt Lake City-Provo-Orem       UDAQ       HB       490510001       Waasch       40.497962, -111.3763       1306       WS, WD, TEMP, SR, RH       03. NO2, NO, NOx       PM2.5       PM2.5       MI0       CO		· · · · · · · · · · · · · · · · · · ·									O3, NO2, NO, NOx, NOy	PM2.5		GC			
Veraal         Veraal         N/A         UDAQ         V4         490471004         Ulintah         40 46471, 109 561472         1668         WS, WD, TEMP, SR, RH         O3, NO2, NO, NOx         PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC         Co         Co         Metal         Yes           Spanish Fork         Provo-Orem         Salt Lake Chy-Provo-Orem         UDAQ         LN         490494001         Utah         40339574, 111, 131461         1442         WS, WD, TEMP, SR, RH         03, NO2, NO, NOx         PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC         Co         Co         Metal         Yes           Heber         Salt Lake Chy-Provo-Orem         UDAQ         HB         49051001         Wasatch         40.497962, 111.39763         1306         WS, WD, TEMP, SR, RH         03, NO2, NO, NOx         PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, PM 10         Co         Metal         Yes           Heber         Salt Lake Chy-Provo-Orem         UDAQ         HB         490517003         Weber         1306         WS, WD, TEMP, SR, RH         03, NO2, NO, NOx         PM2.5, PM10         Co         Metal         Yes           Harrisville         Ogden-Clearfield         Salt Lake Chy-Provo-Orem         UDAQ         HV         490571003         Weber         1302         Metal         Metal		· · · · · · · · · · · · · · · · · · ·															
Lindon       Prove-Orem       Salt Lake (Diy-Provo-Orem       UDAQ       LN       490494001       Utah       40.339574, 111.713481       1442       WS, WD, TEMP, SR, RH, Ught absorption coefficient       03, NO2, NO, NOx       PM2.5, PM10, Speciated PM2.5, Metals in PM2.5, BC       Co       Co </td <td></td> <td>03</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>											03						
Spanish Fork       Provo-Orem       Salt Lake City-Provo-Orem       UDAQ       SF       490495010       Utah       40.136320, -111.657329       1380       WS, WD, TEMP, SR, RH       03, NO2, NO, NOx       PM2.5       Media																	
Heber       Balt Lake City-Provo-Orem       UDAQ       HB       490510001       Wasatch       40.497962, -111.39763       1306       WS, WD, TEMP, SR, RH       03, N02, NO, NOx       PM2.5       CO       Only August         Harrisville       Ogden-Clearlield       Salt Lake City-Provo-Orem       UDAQ       HV       490571003       Weber       41.302678, -111.986448       1331       WS, WD, TEMP, SR, RH       03, N02, NO, NOx       PM2.5, PM10       CO       Only August         Harrisville       Ogden-Clearlield       Salt Lake City-Provo-Orem       UDAQ       HV       490571003       Weber       41.302678, -111.986448       1331       WS, WD, TEMP, SR, RH       03, N02, NO, NOx       PM2.5, PM10       CO       Only August         Heber       Harrisville       Hu       Hu       490571003       Weber       41.302678, -111.986448       1331       WS, WD, TEMP, SR, RH       03, N02, NO, NOx       PM2.5, PM10       CO       Only August         Heber       Hu       H	Lindor	Provo-Orem	Salt Lake City-Provo-Orem			490494001	Utah	40.339574, -111.713481		WS, WD, TEMP, SR, RH, Light absorption coefficient			co				
Harrisville       Ogden-Clearfield       Salt Lake Chy-Provo-Orem       UDAQ       HV       490571003       Weber       41.302678, -111.986448       1331       WS, WD, TEMP, SR, RH       03, NO2, NO, NOx       PM2.5, PM10       CO       Yes         Harrisville       Ogden-Clearfield       Salt Lake Chy-Provo-Orem       UDAQ       HV       490571003       Weber       41.302678, -111.986448       1331       WS, WD, TEMP, SR, RH       03, NO2, NO, NOx       PM2.5, PM10       CO       Yes         Image: Comparison of the	Spanish F																
I have July/August hourly data scraped into spreadsheets. Would others be interested	Heber						Wasatch										
	Harrisvi	e Ogden-Clearfield	Salt Lake City-Provo-Orem	n UDAQ	HV	490571003	Weber	41.302678, -111.986448	1331	WS, WD, TEMP, SR, RH	03, NO2, NO, NOx	PM2.5, PM10	CO				Yes
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Some 1 minute data may be available from DAQ for intercomparison. Any interest?					- C.	1						O fau internet			A		
					<u> </u>	ome L	mini	ute data	a mav	' be available t	rom Da	U for intercomp	arı	son.	ANV I	nte	estr
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+ 😑 Summer 2024 platforms 👻 Mobile Platform Start/Stop Times 👻 Longterm EPA/UDAQ Monitoring Sites 👻 STILT modeling -

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1	A	B	C	D	E	F	G	H	1	J	
1	John Lin has conducted STILT back traject Twin Otter data repository:	ories for the entire campaig https://home.chpc.utah.				cks, and at the	e tollowing gro	ound sites:			
3	Ground site data repository	https://home.chpc.utah.									
4	Location	Description		Long	Alt (m AGL)						
5	University of Utah	Roof of WBB building	40.7634								
6	Mountain Met	UDAQ site	40.7667	-111.8284							
7	Syracuse	UDAQ site	41.089	-112.119	4						
8	Hawthorne	UDAQ site	40.734477	-111.872172							
9	Copperview	UDAQ site	40.59794	-111.894							
0	Herriman	UDAQ site	40.49639	-112.036							
1	Rose Park	UDAQ site	40.49039	-112.030	4						
2	Prison Site	UDAQ site	40.75355	-112.088							
3	Lake Park	UDAQ site	40.7099	-112.000	4						
4	Tech Center	UDAQ site	40.77715	-112.009	4						
15	Bryant Middle School	NIST LP retroreflector site		-111.86923	15						
16	The Shop	NIST LP retroreflector site		-111.88098	15						
17	East High School	NIST LP retroreflector site		-111.85516	10						
18	Westminster College	NIST LP retroreflector site		-111.85488							
19	Mt Wire	NIST LP retroreflector site		-111.79834							
20	Uintah Elementary School	NIST LP retroreflector site		-111.846	10						
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Preliminary analysis of VOC data from USOS 2024

### Nima Amiri, Maria Carter, & Kelvin Bates

CU Boulder Mechanical Engineering 10 June 2025

# 3 main questions:

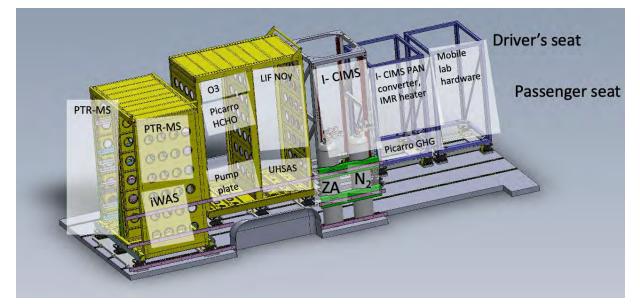
What are the sources of **ethanol** in SLC?

What are the overall **VOC sources** driving OH reactivity and ozone production?

Can we identify new **tracers** for specific sources like landfills & wastewater treatment?

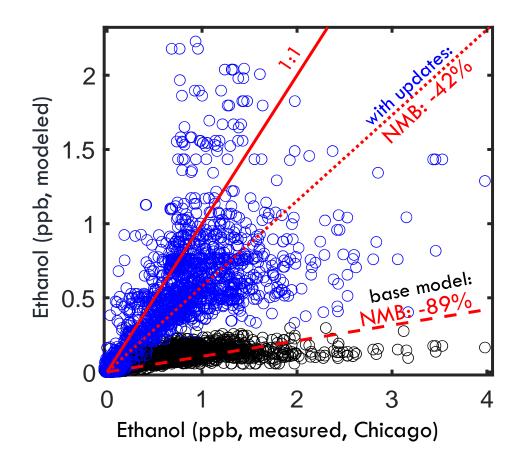
## USOS

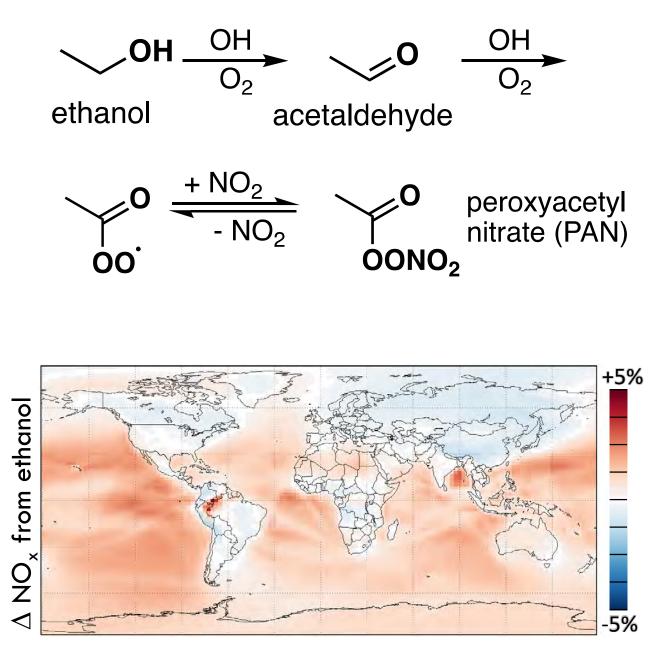






Ethanol is an important PAN precursor (right, top), with strong effects on  $NO_x$  and ozone (right, bottom), but is notoriously poorly represented in models (*e.g.*, GEOS-Chem vs. AEROMMA, below)

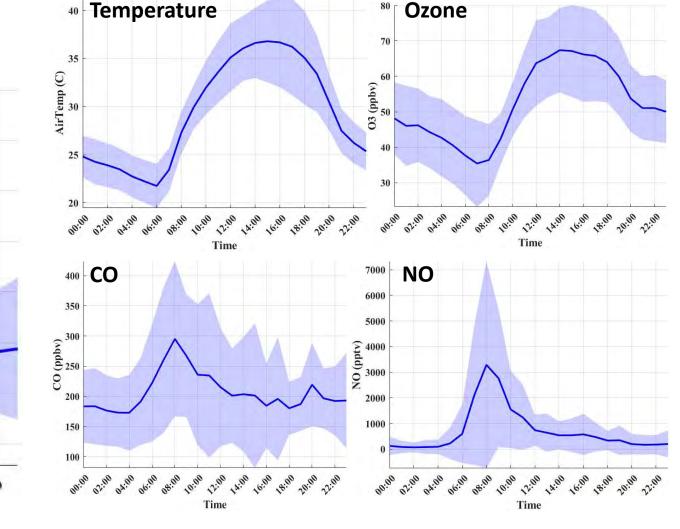




Ethanol is an important PAN precursor, with strong effects on  $NO_x$  and ozone, but is notoriously poorly represented in models

There's a lot of it in SLC – where is it coming from?

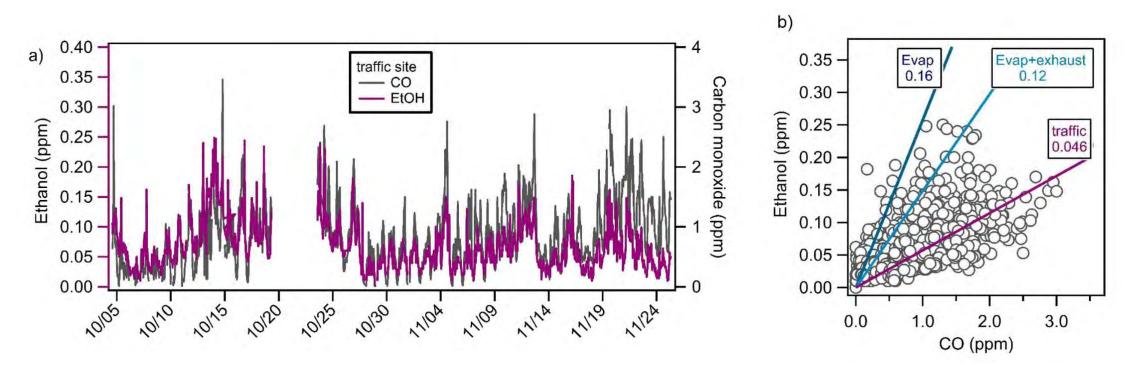
14 12 10 C2H5OH (ppbv) 8 4 2 0 06:00 08:00 04:00 02:00 00:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 Time



Ethanol is an important PAN precursor, with strong effects on  $NO_x$  and ozone, but is notoriously poorly represented in models

There's a lot of it in SLC – where is it coming from?

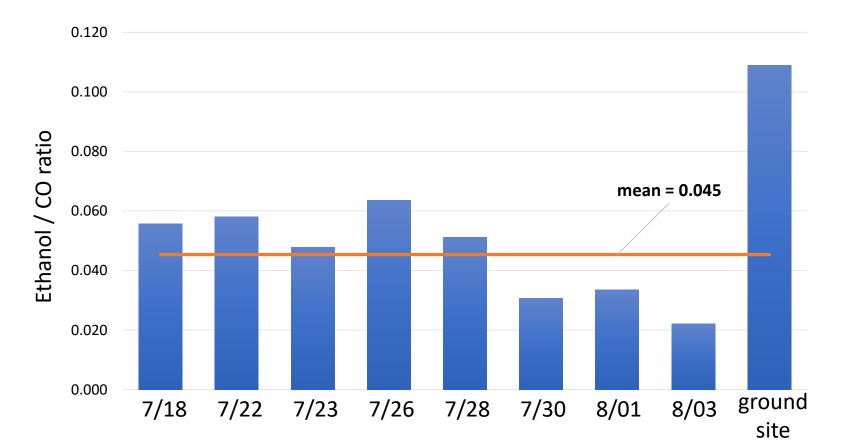
1. combustion  $\rightarrow$  correlation with CO on drives



Ethanol is an important PAN precursor, with strong effects on  $NO_x$  and ozone, but is notoriously poorly represented in models

There's a lot of it in SLC – where is it coming from?

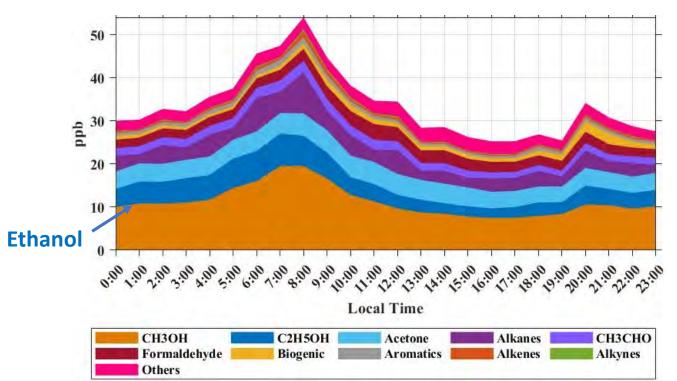
1. combustion  $\rightarrow$  correlation with CO on drives

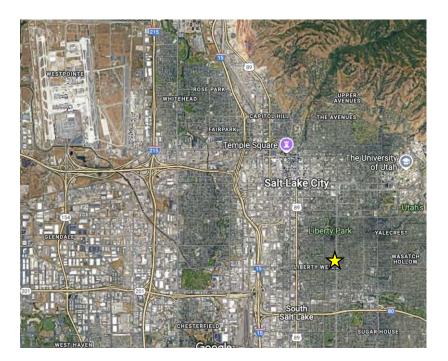


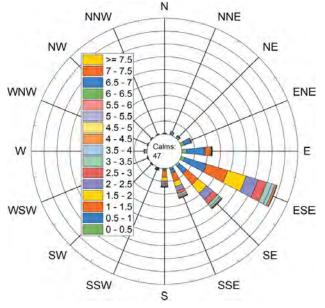
Ethanol is an important PAN precursor, with strong effects on  $NO_x$  and ozone, but is notoriously poorly represented in models

There's a lot of it in SLC – where is it coming from?

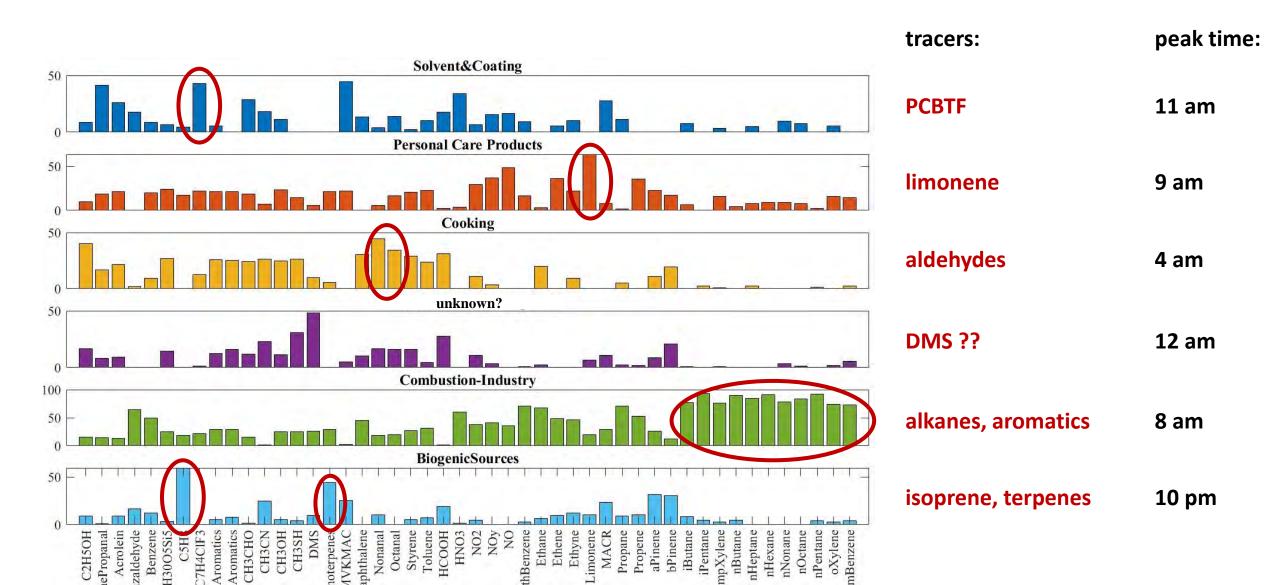
- 1. combustion  $\rightarrow$  correlation with CO on drives
- 2. distributed sources  $\rightarrow$  PMF on stationary data





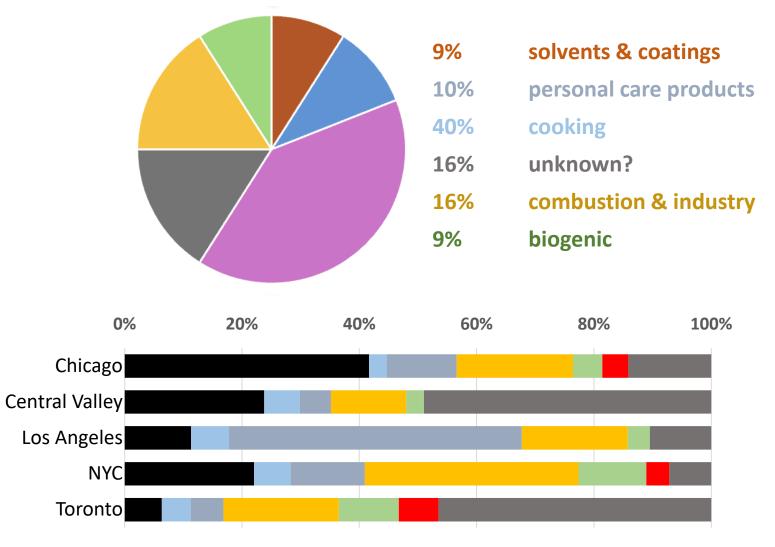


PMF on diurnally averaged signals shows 6 major factors ...



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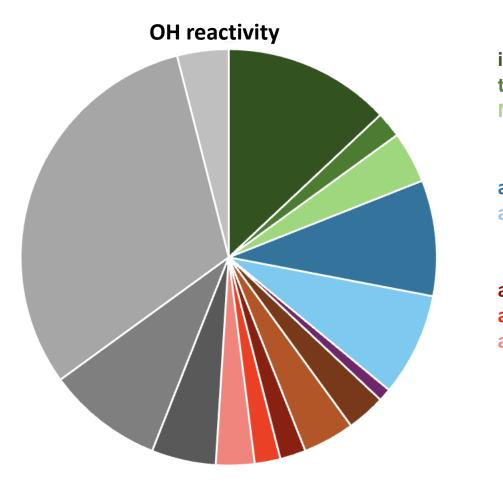
... from which we can estimate contributions to ethanol:



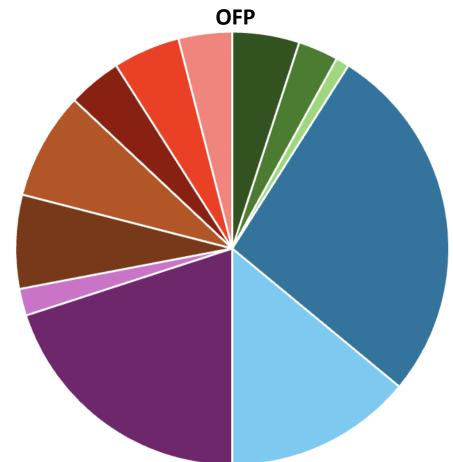
In AEROMMA we saw more agriculture (black) & less cooking

### **VOC sources**

We can use the same diurnal VOC profile to estimate OH reactivity and ozone formation potential ...



isoprene terpenes **MVK / MACR** formaldehyde acetaldehyde acetone acrolein methanol ethanol alkanes alkenes aromatics methane CO NO<sub>x</sub> others

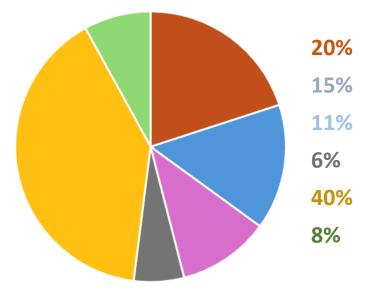


Oxygenates (aldehydes, ketones, alcohols) dominate ozone formation potential at the ground site!

## **VOC sources**

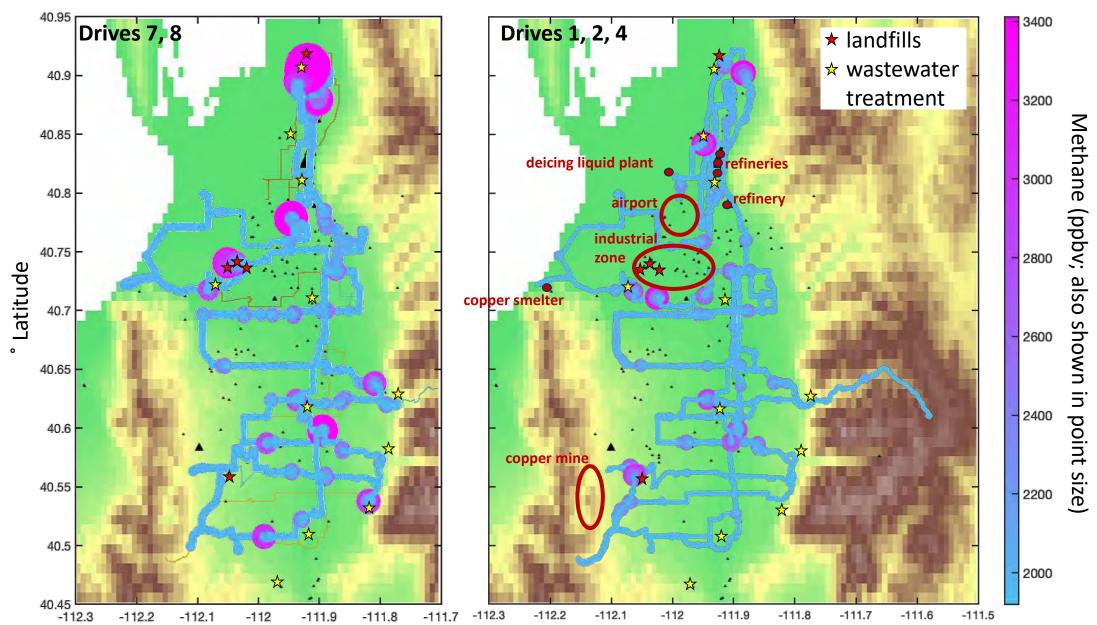
We can use the same diurnal VOC profile to estimate OH reactivity and ozone formation potential ...

... and then use the same PMF factors to apportion that ozone formation potential:



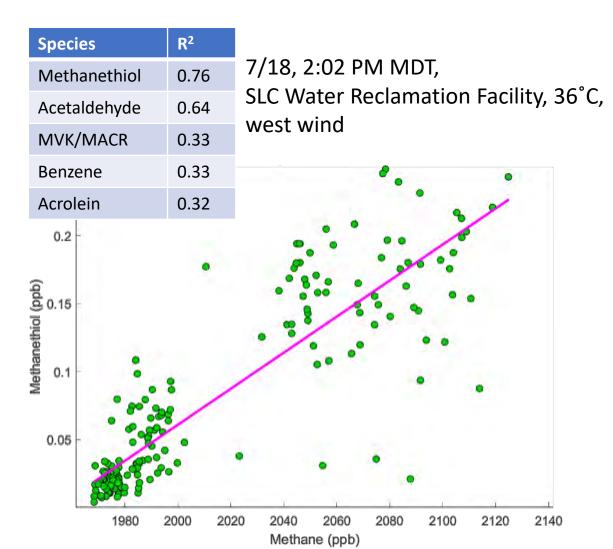
solvents & coatings
personal care products
cooking
unknown?
combustion & industry
biogenic

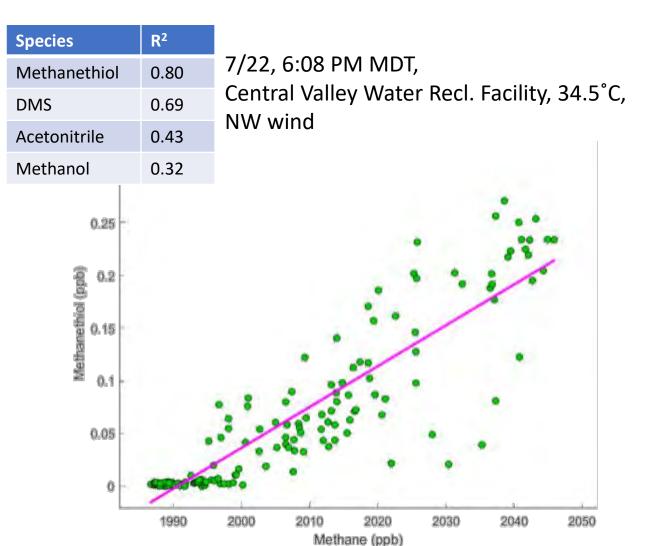
Landfills & wastewater treatment facilities are strong sources of methane on USOS drives



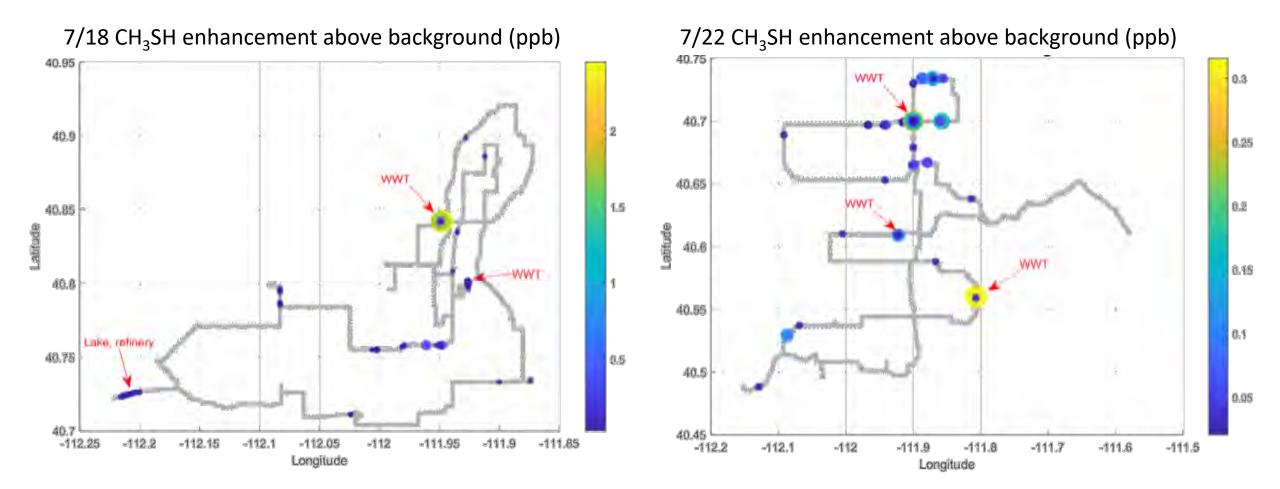
Landfills & wastewater treatment facilities are strong sources of methane on USOS drives

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Landfills & wastewater treatment facilities are strong sources of methane on USOS drives We've been digging for PTR-detected species that can serve as tracers for these sources So far, the most consistent is methanethiol ( $CH_3SH$ ) – more for WWT than landfills Observed  $CH_3SH/CH_4$  ratios are inconsistent

Date	Wastewater treatment plant	Temperature	CH <sub>3</sub> SH/CH <sub>4</sub> slope
7/18	SLC Water Reclamation Facility	36°C	0.001321
7/22	Central Valley Water Reclamation Facility	34.5°C	0.003881
7/26	South Valley Water Reclamation Facility	30°C	0.000570
7/28	Central Valley Water Reclamation Facility	21.8°C	0.000149
7/30	SLC Water Reclamation Facility	20.8°C	0.001791
8/03	SLC Water Reclamation Facility	30.2°C	0.001841

# Questions? Ideas? Feedback?

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