SLC ‘24 Summer Campaigns

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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?

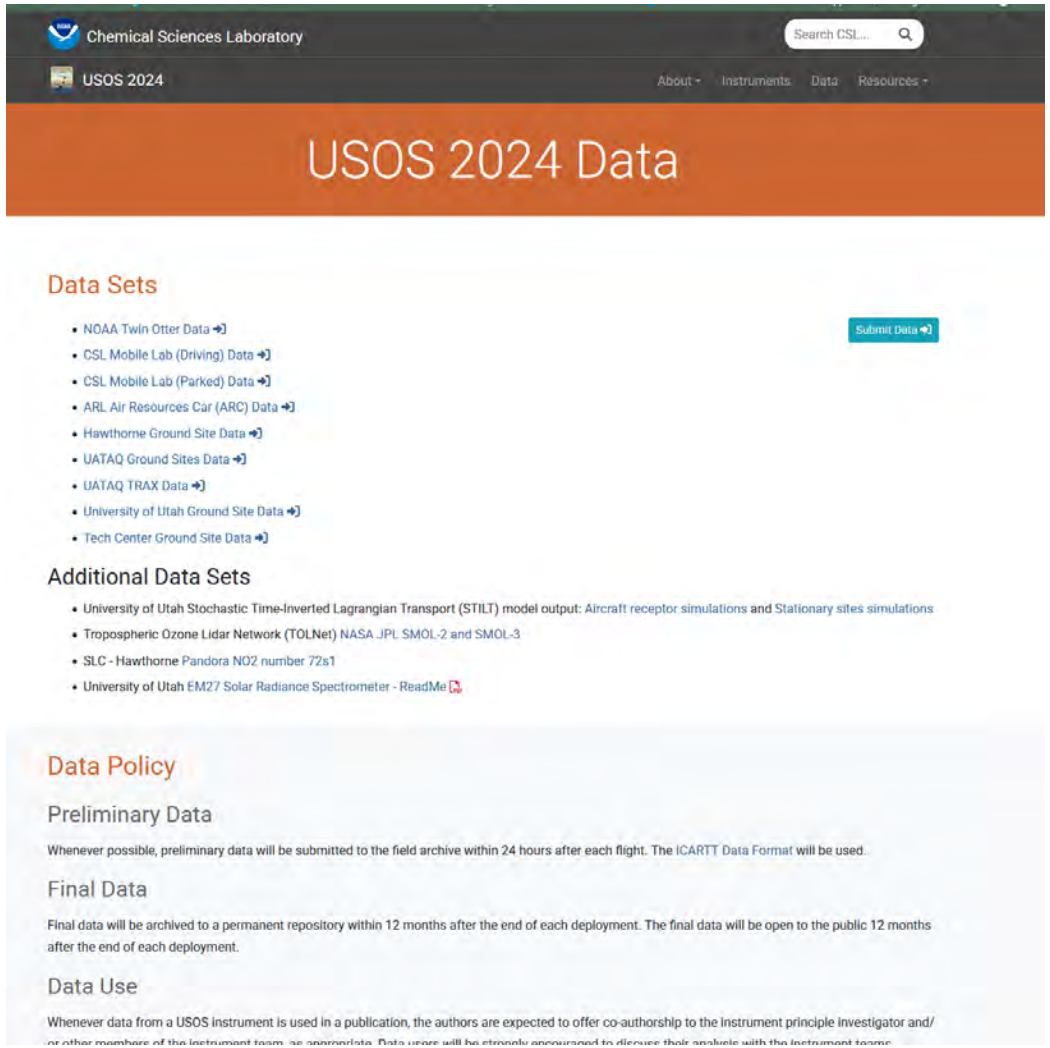
	A	B	C	D	E
1	**Date**	**Speaker 1**	**Affiliation**	**Topic**	
2	10-Jun	Carrie Womack	NOAA CSL	Meeting logistics, USOS data update	
3		Kelvin Bates + students	University of Colorado Boulder	VOC source attribution	
4	July ??	*TBD*			
5		*TBD*			
6	August ??	Thierry LeBlanc / Fernando Chouza Keil	NASA JPL	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_3 lidars** – Finalized
- **SUNY Nitrogen isotopes at UU and Tech Center** – Finalized
- **USU Drone O_3** – Coming soon

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

or google “NOAA USOS data”



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!

```
68, 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
0
iWAS_Start_UTC, SecondsFromMidnightUTC, WAS_Open
35
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1
-9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -9999, -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
C2Cl4_ppbv, ppbv, Gas_C2Cl4_Insitu_S_DVMR
C2HCl3_ppbv, ppbv, Gas_C2HCl3_Insitu_S_DVMR
CCl4_ppbv, ppbv, Gas_CCl4_Insitu_S_DVMR
CF2Cl2_ppbv, ppbv, Gas_CF2Cl2_Insitu_S_DVMR
CH2Cl2_ppbv, ppbv, Gas_CH2Cl2_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
1
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 PI.
OTHER_COMMENTS: N/A.
REVISION: RB
RA is preliminary data for a limited number of VOCs, R0 final data will contain expanded list of VOCs.
iWAS_Start_UTC, iWAS_Stop_UTC, iWAS_Mid_UTC, Acetone_ppbv, Benzene_ppbv, C2Cl4_ppbv, C2HCl3_ppbv, CCl4_ppbv, CF2Cl2_ppbv, CH2Cl2_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, 0
```

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

The Spreadsheet

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

SLC Summer 2024 Experimental Data Availability

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M223

Questions? caroline.womack@noaa.gov

Campaign (nominally)	Platform	Base Location	Base GPS coordinates	Stationary/Mobile	Data location	Format	Instrument Name	Version	Time resolution	Dates available	Data measured	Notes
USOS	NOAA Air Resources Car	Rose Park	40.78069, -111.94099	Mobile	https://csl.noaa.gov/groups/csl7/measurements/2024usos/ARC/DataDownload/	ICARTT	ARL-Suite	RA	1s	July 16 - Aug 4	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)
											CH4	Meaured by Picarro G2401m (same as CSL Mobile lab)
											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)	
											O3	
											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)	
USOS	Tech Center Ground Site	UDAQ Tech Center roof	40.77690, -111.94595	Stationary	https://csl.noaa.gov/groups/csl7/measurements/2024usos/GroundTechCenter/DataDownload/	ICARTT	NitIsotopes	R0	~6 - 24 hours	July 20 - Aug 2	Nitrous acid (HONO)	
											delta15-N HONO	
											delta18-O HONO	
											delta15-N NOx	
											delta15-N NO2	
											delta18-O NO2	
							NitFilters	R0	~24 hours	July 19 - Aug 2	Particulate nitrate (NO3-)	
											delta15-N NO3-	
											delta18-O NO3-	
											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	
USOS	UU Ground Site	University of Utah William Browning Building roof	40.76624, -111.84768	Stationary	https://csl.noaa.gov/groups/csl7/measurements/2024usos/GroundUU/DataDownload/	ICARTT	NO2	R0	1min	July 20 - Aug 5	Nitrogen dioxide (NO2)	
							NitIsotopes	R0	~6 - 24 hours	July 20 - Aug 2	Nitrous acid (HONO)	
											delta15-N HONO	
											delta18-O HONO	
											delta15-N NOx	
											delta15-N NO2	
											delta18-O NO2	
							NitFilters	R0	~24 hours	July 19 - Aug 2	Particulate nitrate (NO3-)	
											delta15-N NO3-	
											delta18-O NO3-	
											Nitric acid (HNO3)	
											delta15-N HNO3	
											delta18-O HNO3	
Ongoing	CU DOAS	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?

SLC Summer 2024 Experimental Data Availability

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Questions? caroline.womack@noaa.gov

Campaign (nominally)	Platform	Base Location	Base GPS coordinates	Stationary/Mobile	Data location	Format	Instrument Name	Version	Time resolution	Dates available	Data measured	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/2024usos/ARC/DataDownload/	ICARTT	ARL-Suite	RA	1s	July 16 - Aug 4	CH4	Meaured by Picarro G2401m (same as CSL Mobile lab)
											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)	
											O3	
											Nitrogen oxide (NO)	Measured by Darcy G60 (CRDS)
											Nitrogen dioxide (NO2)	Measured by Darcy G60 (CRDS)
											NOx (NO + NO2)	Measured by Darcy G60 (CRDS)
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											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	
							NitIsotopes	R0	~6 - 24 hours	July 20 - Aug 2	delta18-O HONO	
											delta15-N NOx	
											delta15-N NO2	
USOS	Tech Center Ground Site	UDAQ Tech Center roof	40.77690, -111.94595	Stationary	https://csl.noaa.gov/groups/csl7/measurements/2024usos/GroundTechCenter/DataDownload/	ICARTT					delta18-O NO2	
											Particulate nitrate (NO3-)	
											delta15-N NO3-	
							NitFilters	R0	~24 hours	July 19 - Aug 2	delta18-O NO3-	
											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	
							NitIsotopes	R0	~6 - 24 hours	July 20 - Aug 2	delta18-O HONO	
											delta15-N NOx	
											delta15-N NO2	
USOS	UU Ground Site	University of Utah William Browning Building roof	40.76624, -111.84768	Stationary	https://csl.noaa.gov/groups/csl7/measurements/2024usos/GroundUU/DataDownload/	ICARTT					delta18-O NO2	
											Particulate nitrate (NO3-)	
											delta15-N NO3-	
							NitFilters	R0	~24 hours	July 19 - Aug 2	delta18-O NO3-	
											Nitric acid (HNO3)	
											delta15-N HNO3	
											delta18-O HNO3	
Ongoing	CU-DOAS	UDAQ Prison Site	40.80742, -112.08850	Remote sensing	TBD	TBD	TBD	TBD	TBD	TBD	TBD	

Please check for errors!

Summer 2024 platforms | Mobile Platform Start/Stop Times | Longterm EPA/UDAQ Monitoring Sites | STILT modeling

5 mobile platforms

Start/Stop times (in UTC)

Where?

SLC Summer 2024 Experimental Data Availability

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Platform	Drive/Flight Number	Date	Start Date	Start Time (UTC)	End Date	End Time (UTC)	Duration (hrs)	Route	Conditions	General wind conditions	Notes
CSL Mobile Lab	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	
	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	*Wednesday*	*8/7/2024*	*20:10:00*	*8/7/2024*	*21:32*	*1.4*	*Airport to meet with UDAQ*			*Not technically a science drive, we just had to go to UDAQ for a stakeholders meeting*
	20240815	Thursday	8/15/2024	11:48:00	8/15/2024	15:55:00	4.2	Emigration + Rose Park	Early morning	mostly S	
	20240817	Friday (technically saturday UTC)	8/17/2024	2:15:00	8/17/2024	6:10:00	3.9	Downtown, inland port, north industry	Evening	mostly S	
Twin Otter	20240719_L1	Friday	7/19/2024	14:53:00	7/19/2024	17:42:00	2.82	Transit to UT			
	20240719_L2	Friday	7/19/2024	20:17:00	7/19/2024	22:40:00	2.38	Transit to UT			
	20240720	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			
	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	SLC wind flow			
	20240806_L1	Tuesday	8/6/2024	16:14:00	8/6/2024	19:21:00	3.12	Uinta Basin			
	20240806_L2	Tuesday	8/6/2024	20:53:00	8/6/2024	23:47:00	2.90	Uinta Basin			
	20240808	Thursday	8/8/2024	15:37:00	8/8/2024	18:19:00	2.70	Transit to CO			
ARL Air Resources Car (ARC)	20240717	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			
	20240721	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			
	20240723	Tuesday	7/23/2024	15:11:34	7/23/2024	22:10:47	6.99	North Industry + Inland Port			
	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			
	3	Friday	8/2/2024	17:30:02	8/2/2024	18:43:53		Canyon Profile			
	4	Friday	8/2/2024	19:55:00	8/2/2024	23:20:18		Inland Port			

Summer 2024 platforms | Mobile Platform Start/Stop Times | Longterm EPA/UDAQ Monitoring Sites | STILT modeling

Where?

What was measured?

SLC Summer 2024 Experimental Data Availability

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A1:H1 All data is available at EPA AirData

All data is available at EPA AirData

All data is hourly, except speciated metals, GC, etc.

Site Name	CBSA	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 USOS
Brigham City	Ogden-Clearfield	Salt Lake City-Provo-Orem	UDAQ	BG	490030005	Box Elder	41.484886, -112.021625	1313	WS, WD, TEMP, SR, RH	O3, NO2, NO, NOx	PM2.5					Yes
Washakie	Ogden-Clearfield	Salt Lake City-Provo-Orem	Shoshone/Arapahoe Nations		490037001	Box Elder	41.945874, -112.233973	1369	WS, TEMP, SR, RH, Precip	O3, NO2, NO, NOx						Yes
Smithfield	Logan	N/A	UDAQ	SM	490050007	Cache	41.842641, -111.852196	1379	WS, WD, TEMP, SR, RH, Light absorption coefficient	O3, 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		GC, 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	O3, NO2, NO, NOx	PM2.5	CO			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	GC, 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	O3, NO2, NO, NOx	PM2.5	CO			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	O3, 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	O3, 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	O3, 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	O3, 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	O3, 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	US National Park Service		490471002	Uintah	40.4372, -109.3047	1463	WS, TEMP, SR, Precip	O3						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	O3, 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	O3, 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	O3, 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	O3, NO2, NO, NOx	PM2.5, PM10	CO				Yes

Summer 2024 platforms | Mobile Platform Start/Stop Times | Longterm EPA/UDAQ Monitoring Sites | STILT modeling

Where?

What was measured?

SLC Summer 2024 Experimental Data Availability

File Edit View Insert Format Data Tools Extensions Help

A1:H1 All data is available at EPA AirData

All data is available at EPA AirData

All data is hourly, except speciated metals, GC, etc.

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I have July/August hourly data scraped into spreadsheets. Would others be interested?
Some 1 minute data may be available from DAQ for intercomparison. Any interest?

Summer 2024 platforms | Mobile Platform Start/Stop Times | Longterm EPA/UDAQ Monitoring Sites | STILT modeling

SLC Summer 2024 Experimental Data Availability

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	A	B	C	D	E	F	G	H	I	J	K
1	**John Lin has conducted STILT back trajectories for the entire campaign, both at key points along the Twin Otter flight tracks, and at the following ground sites:**										
2	**Twin Otter data repository:**	https://home.chpc.utah.edu/~lin/USOS_Aircraft/HRRR_STILT_output/									
3	**Ground site data repository**	https://home.chpc.utah.edu/~lin/USOS_GroundSites/HRRR_STILT_output/									
4	**Location**	**Description**	**Lat**	**Long**	**Alt (m AGL)**						
5	University of Utah	Roof of WBB building	40.7634	-111.848	36						
6	Mountain Met	UDAQ site	40.7667	-111.8284	4						
7	Syracuse	UDAQ site	41.089	-112.119	4						
8	Hawthorne	UDAQ site	40.734477	-111.872172	4						
9	Copperview	UDAQ site	40.59794	-111.894	4						
10	Herriman	UDAQ site	40.49639	-112.036	4						
11	Rose Park	UDAQ site	40.79553	-111.931	4						
12	Prison Site	UDAQ site	40.80791	-112.088	4						
13	Lake Park	UDAQ site	40.7099	-112.009	4						
14	Tech Center	UDAQ site	40.77715	-111.946	4						
15	Bryant Middle School	NIST LP retroreflector site	40.76815	-111.86923	15						
16	The Shop	NIST LP retroreflector site	40.7605	-111.88098	15						
17	East High School	NIST LP retroreflector site	40.75042	-111.85516	10						
18	Westminster College	NIST LP retroreflector site	40.73258	-111.85488	15						
19	Mt Wire	NIST LP retroreflector site	40.7706	-111.79834	5						
20	Uintah Elementary School	NIST LP retroreflector site	40.74201	-111.846	10						
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Summer 2024 platforms | Mobile Platform Start/Stop Times | Longterm EPA/UDAQ Monitoring Sites | STILT modeling

Preliminary analysis of **VOC** data from **USOS** 2024

Nima Amiri, Maria Carter, & Kelvin Bates

CU Boulder Mechanical Engineering

10 June 2025

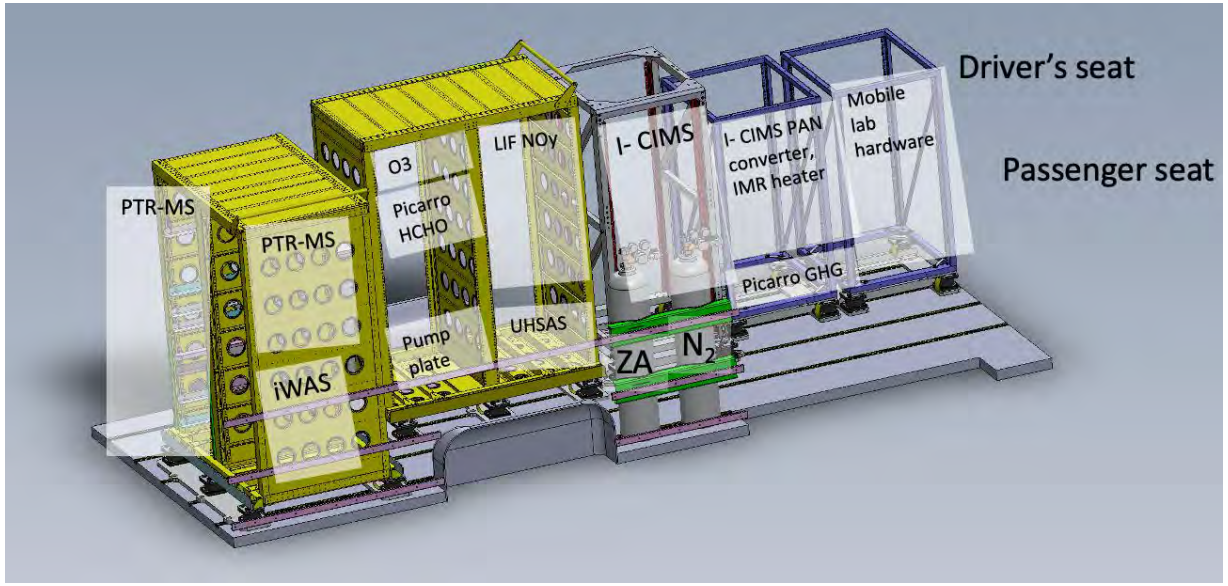
3 main questions:

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?

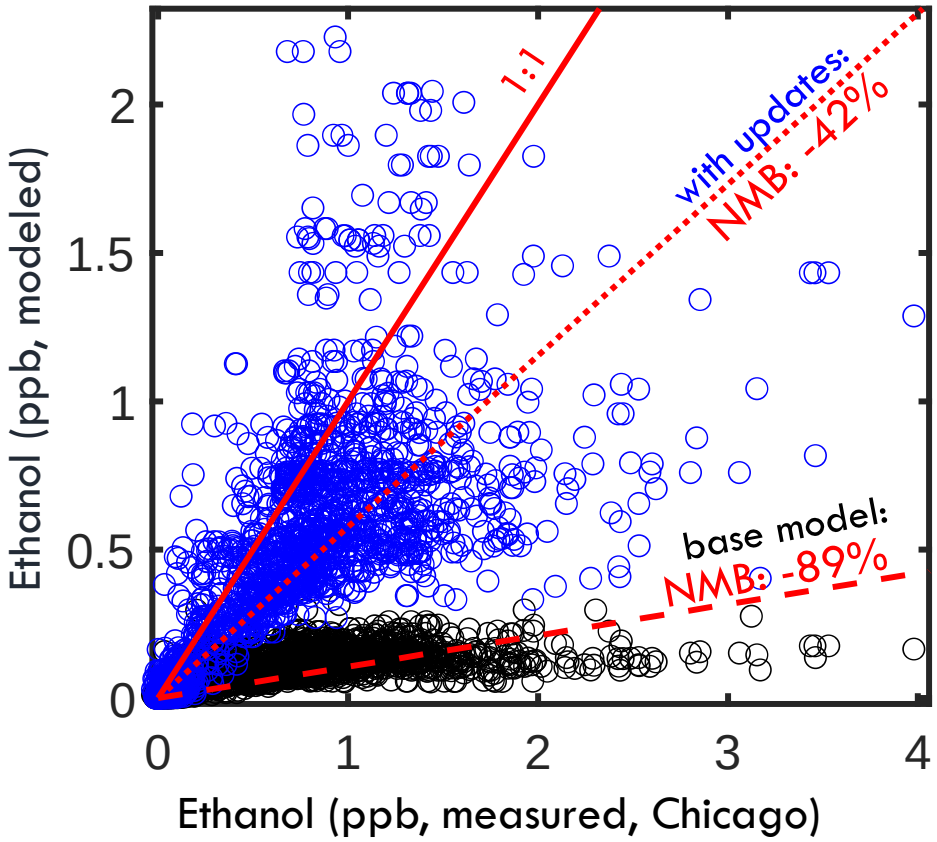
USOS

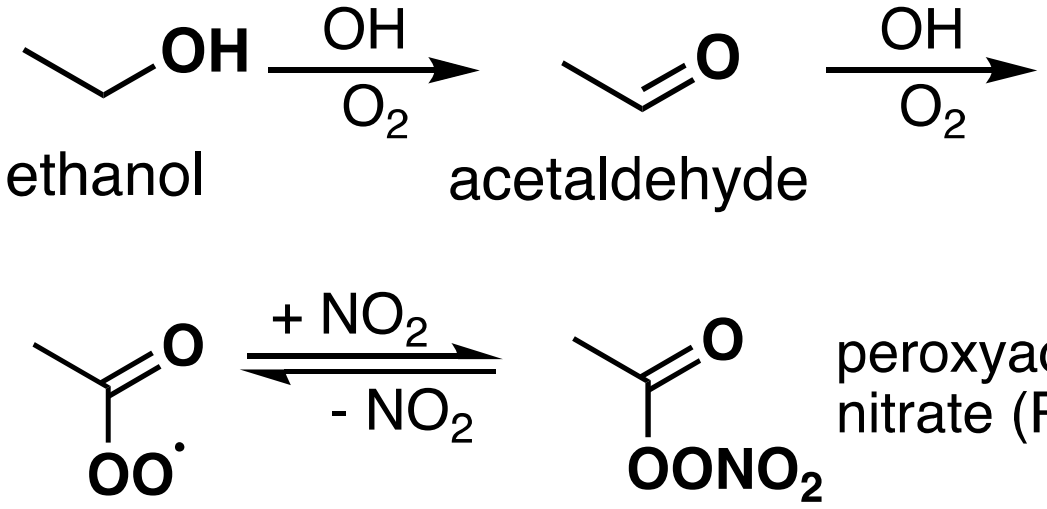

PTR-MS
PTR-MS
iWAS
O3
Picarro HCHO
Pump plate
LIF NOy
UHSAS
I- CIMS
ZA
N_2
I- CIMS PAN converter, IMR heater
Picarro GHG
Mobile lab hardware
Driver's seat
Passenger seat

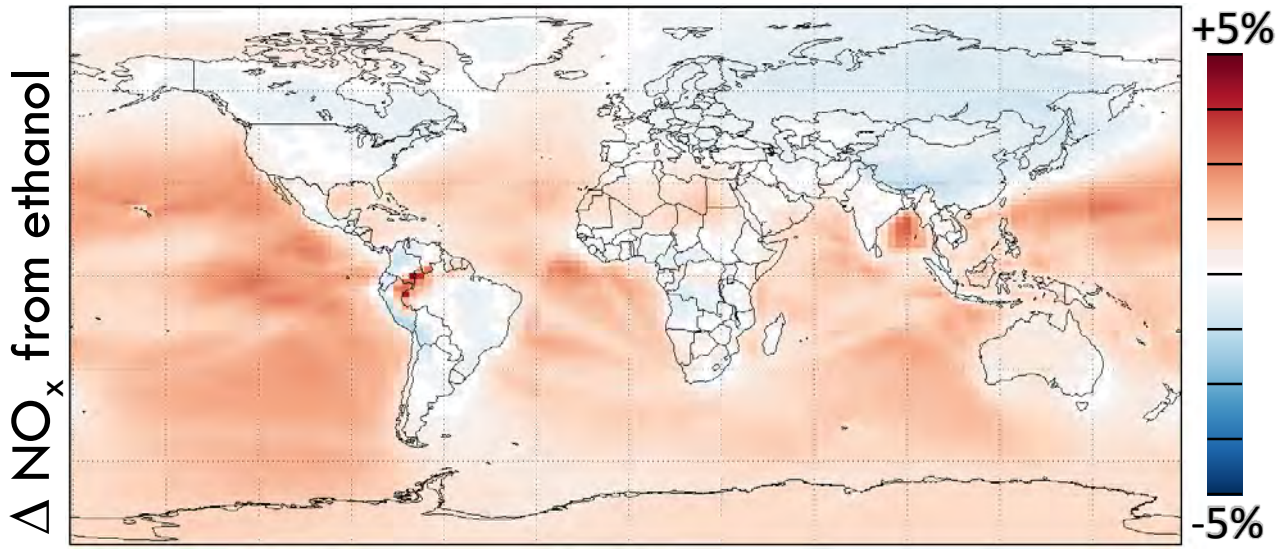

Stationary monitoring site
Farmington Bay Waterfowl Management Area
Centerville
North Salt Lake
Salt Lake City
Magna
West Valley City
Millcreek
Taylorsville
Holladay
Mount Olympus Wilderness
Cottonwood Heights
West Jordan
Twin Peaks Wilderness
Sandy
Bingham Canyon Mine
Herriman
Riverton
Draper
Lone Peak Wilderness
Bluffdale

ethanol sources

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)



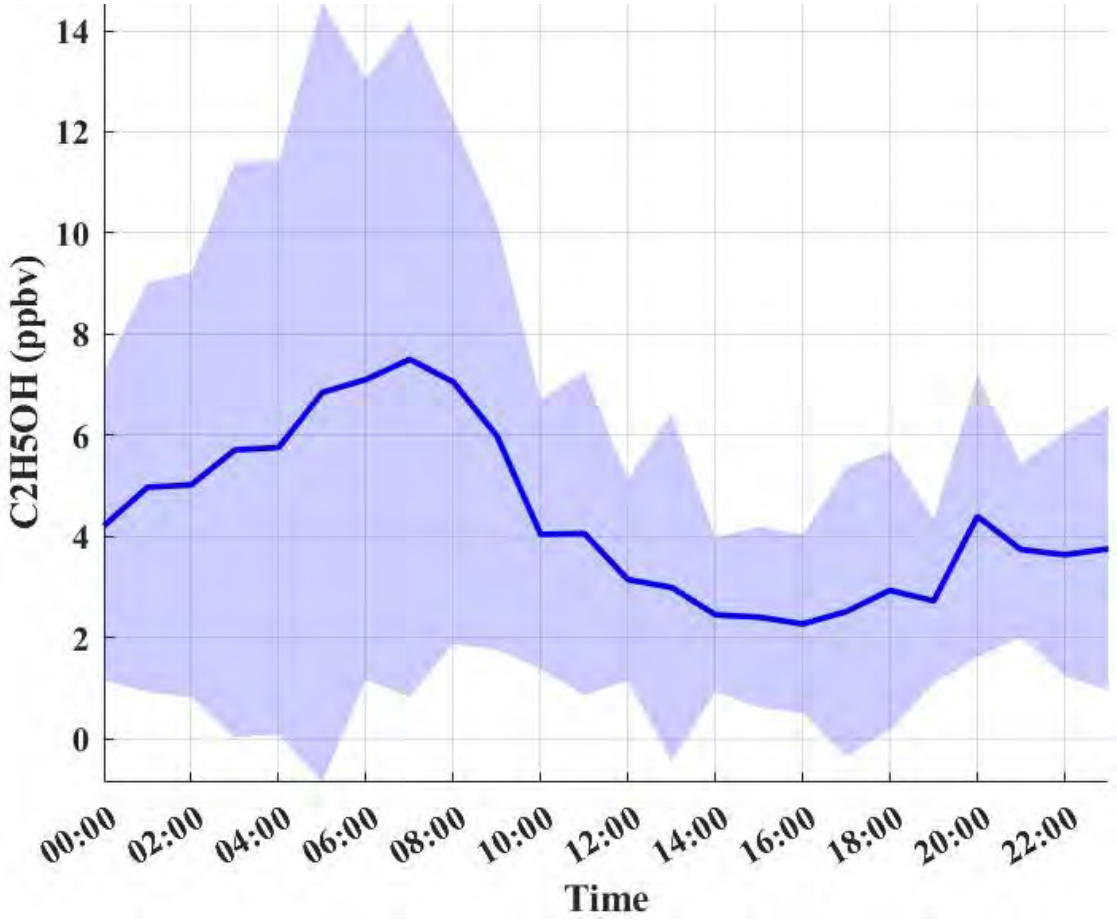


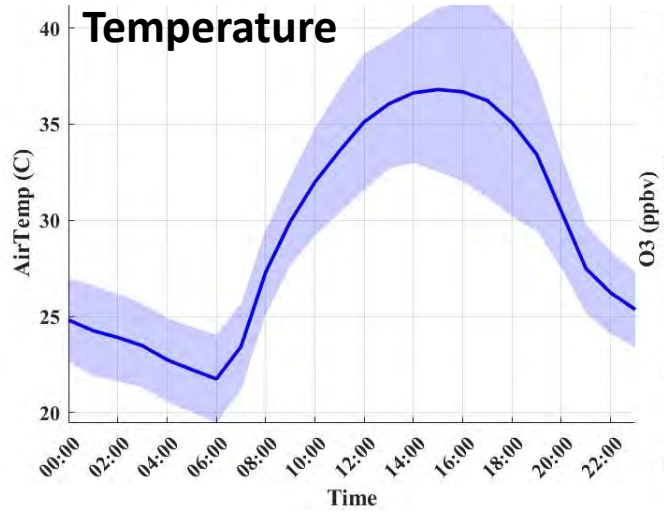


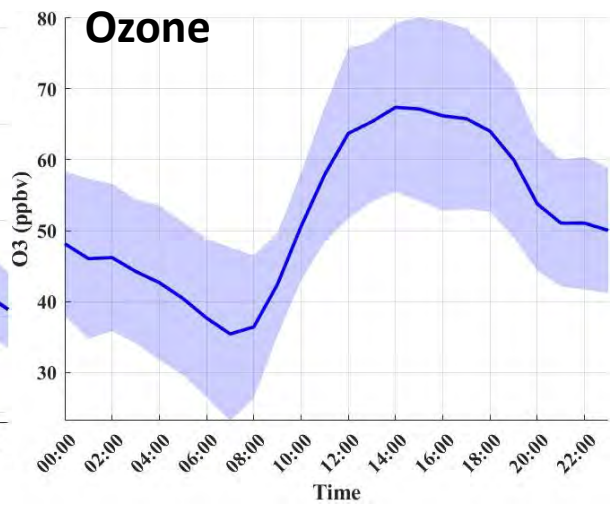
ethanol sources

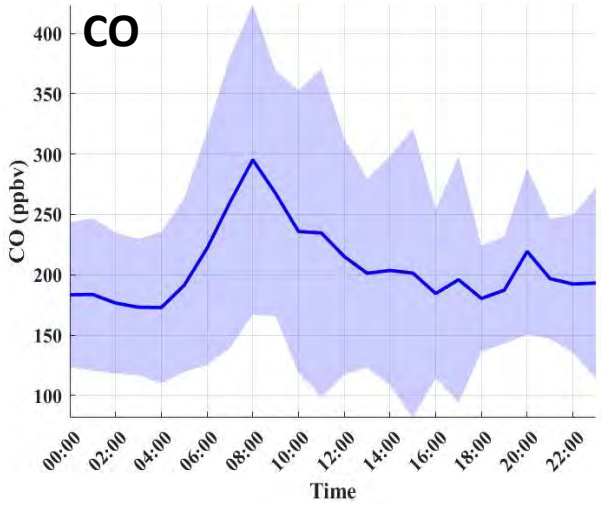
Ethanol is an important PAN precursor, with strong effects on NO_x and ozone, but is notoriously poorly represented in models

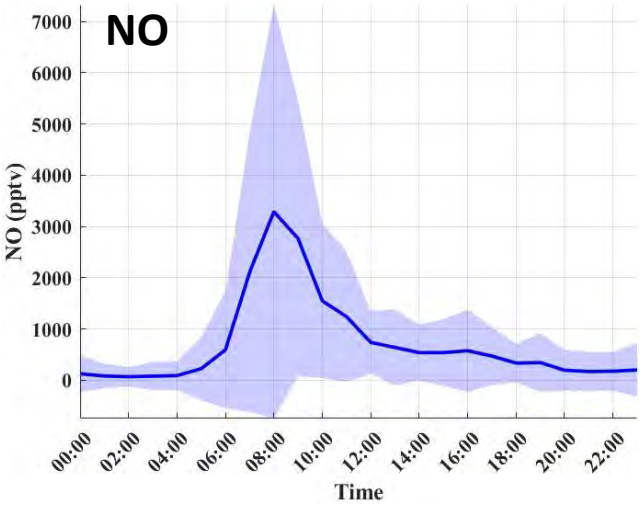
There's a lot of it in SLC – where is it coming from?









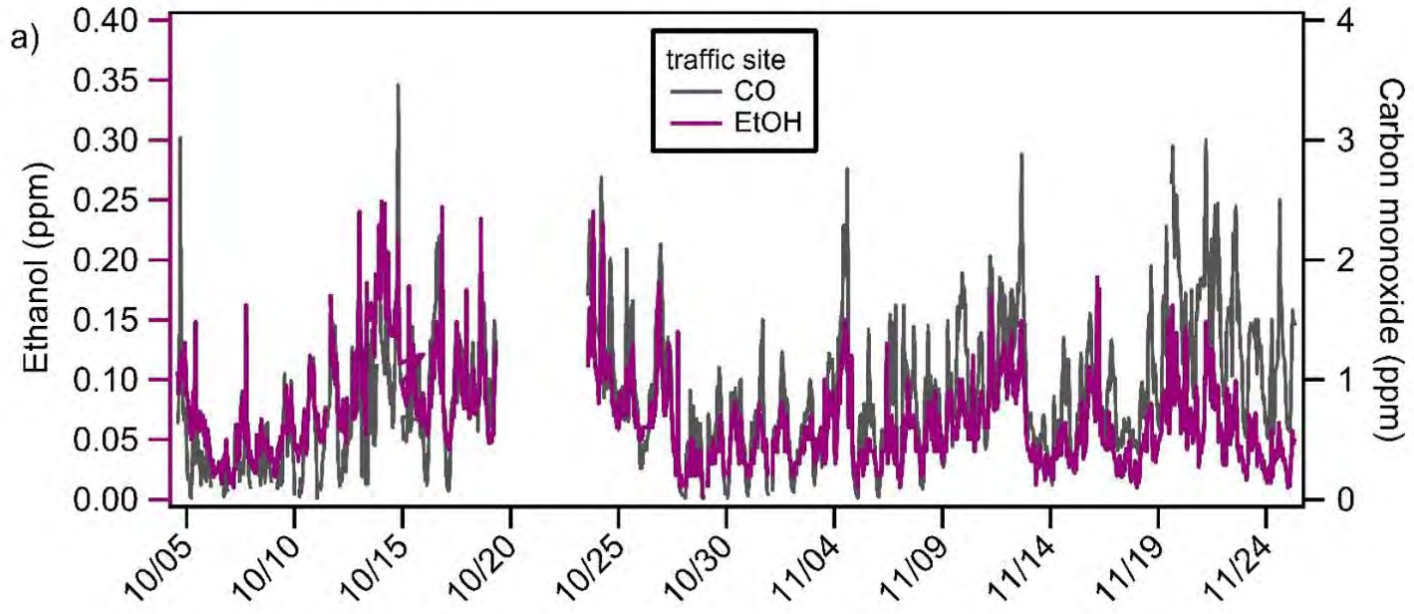


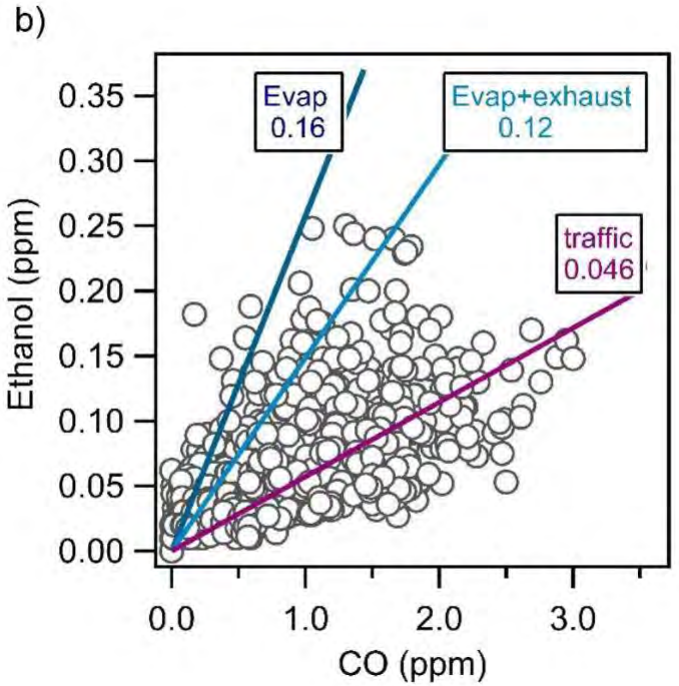
ethanol sources

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 → correlation with CO on drives





Dominutti et al., 2019

ethanol sources

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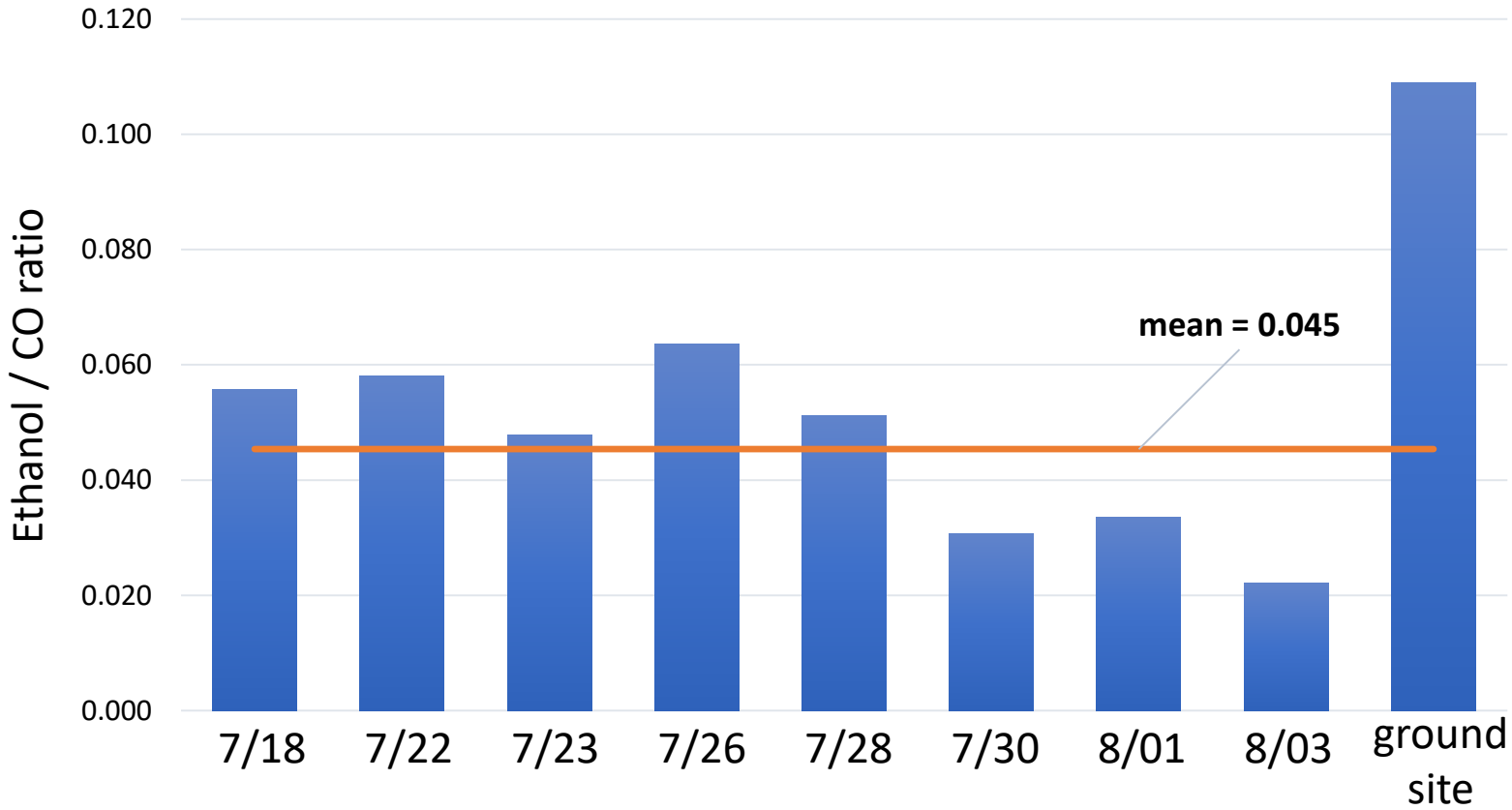


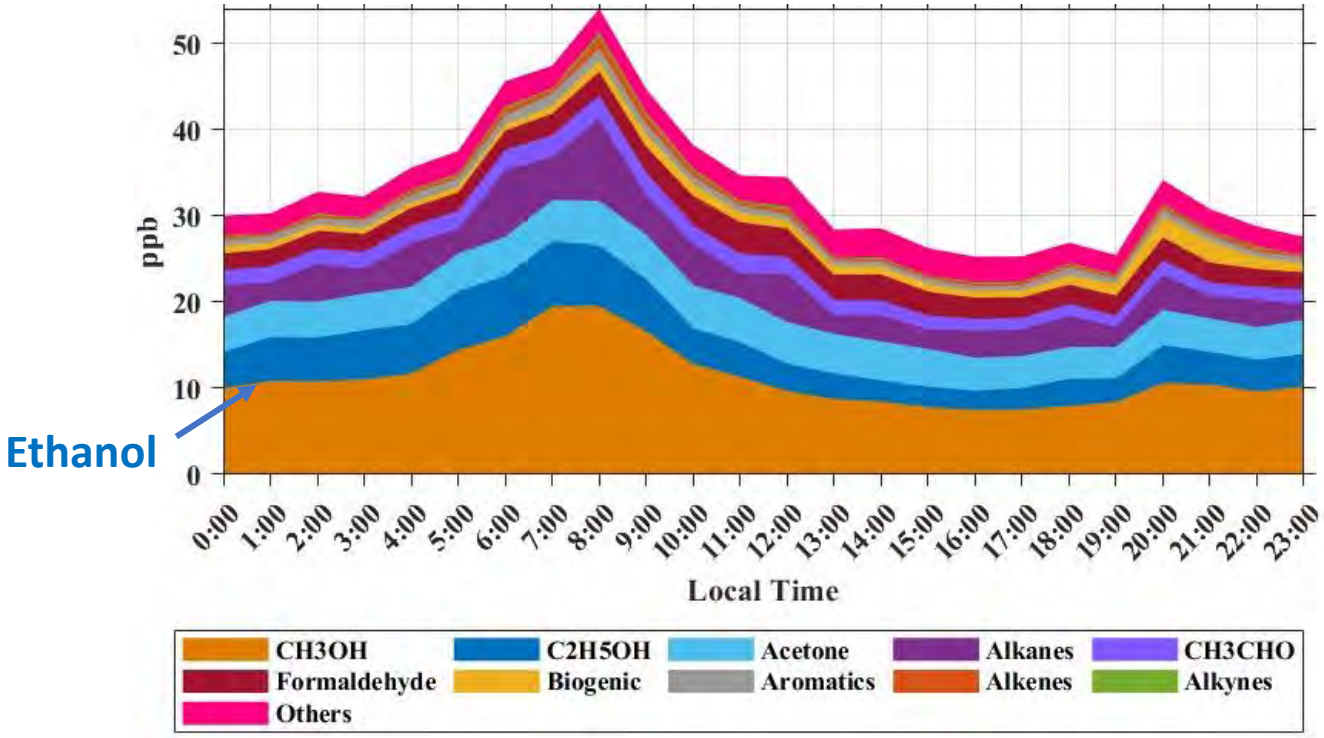
ethanol sources

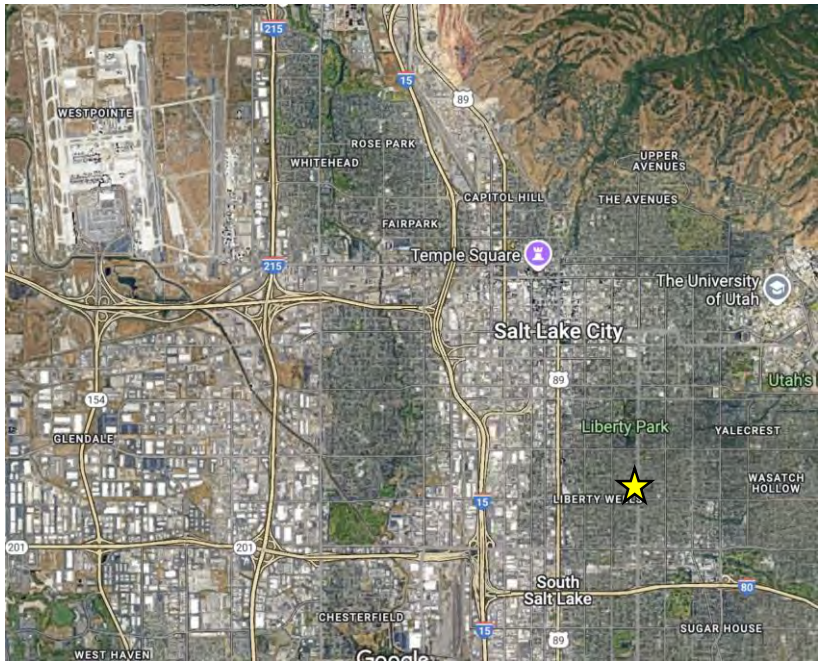
Ethanol is an important PAN precursor, with strong effects on NO_x and ozone, but is notoriously poorly represented in models

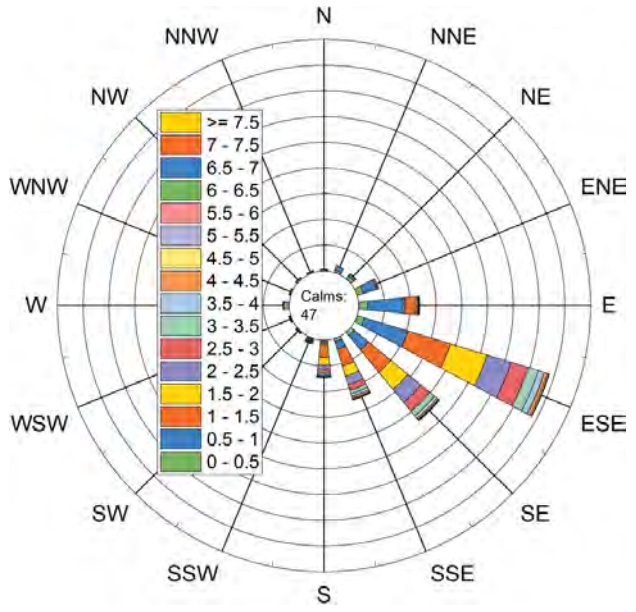
There's a lot of it in SLC – where is it coming from?

1. combustion → correlation with CO on drives

2. distributed sources → PMF on stationary data







ethanol sources

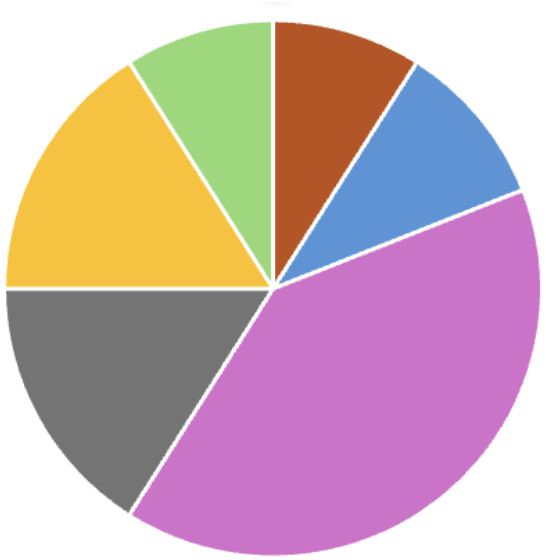
PMF on diurnally averaged signals shows 6 major factors …

tracers:	peak time:
PCBTF	11 am
limonene	9 am
aldehydes	4 am
DMS ??	12 am
alkanes, aromatics	8 am
isoprene, terpenes	10 pm

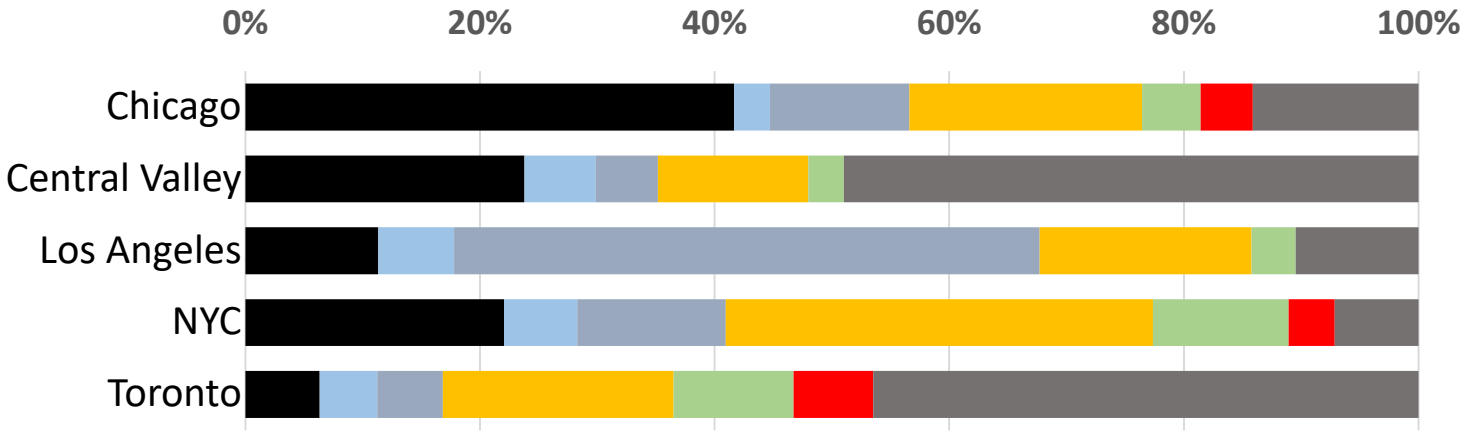
ethanol sources

PMF on diurnally averaged signals shows 6 major factors …

… from which we can estimate contributions to ethanol:



9%	solvents & coatings
10%	personal care products
40%	cooking
16%	unknown?
16%	combustion & industry
9%	biogenic

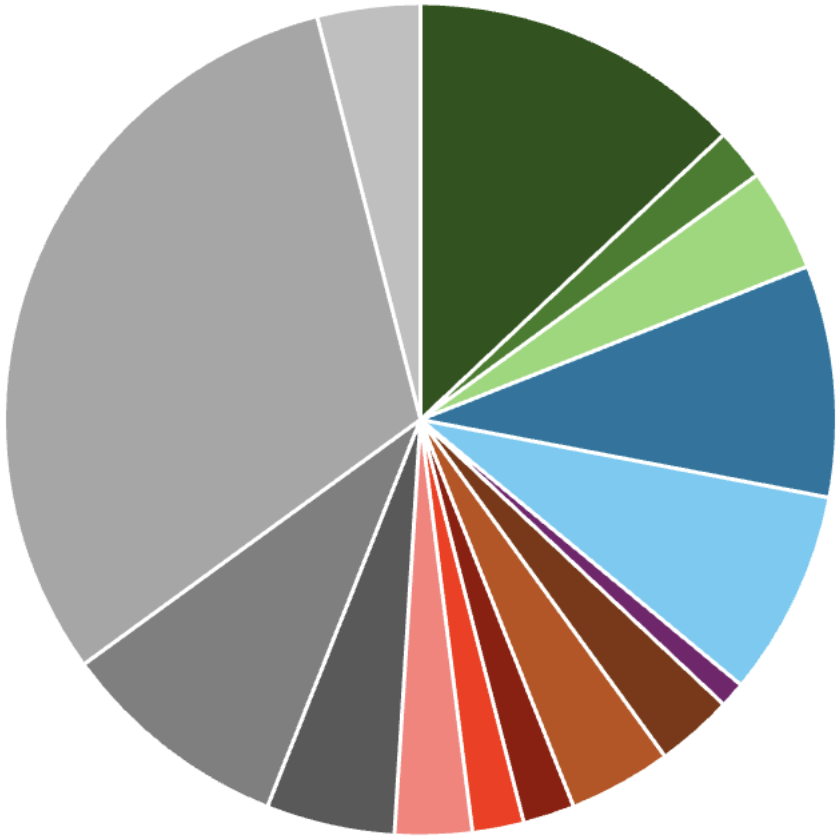


In AEROMMA we saw more agriculture (black) & less cooking

VOC sources

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

OH reactivity



isoprene
terpenes
MVK / MACR
formaldehyde
acetaldehyde
acetone
acrolein
methanol
ethanol
alkanes
alkenes
aromatics
methane
CO
NO_x
others

OFP

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

VOC sources

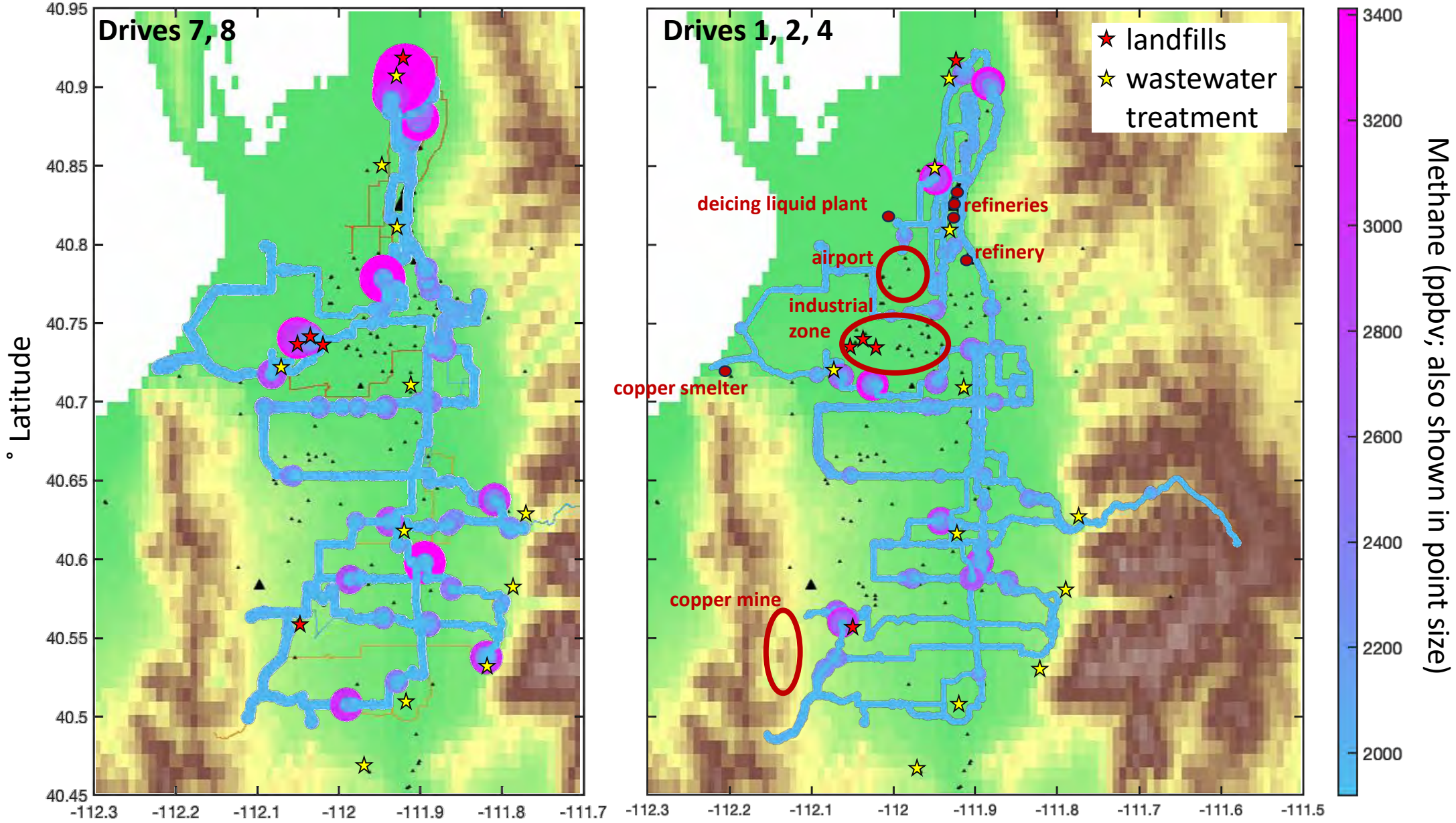
We can use the same diurnal VOC profile to estimate OH reactivity and ozone formation potential …

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

20%	solvents & coatings
15%	personal care products
11%	cooking
6%	unknown?
40%	combustion & industry
8%	biogenic

source tracers

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



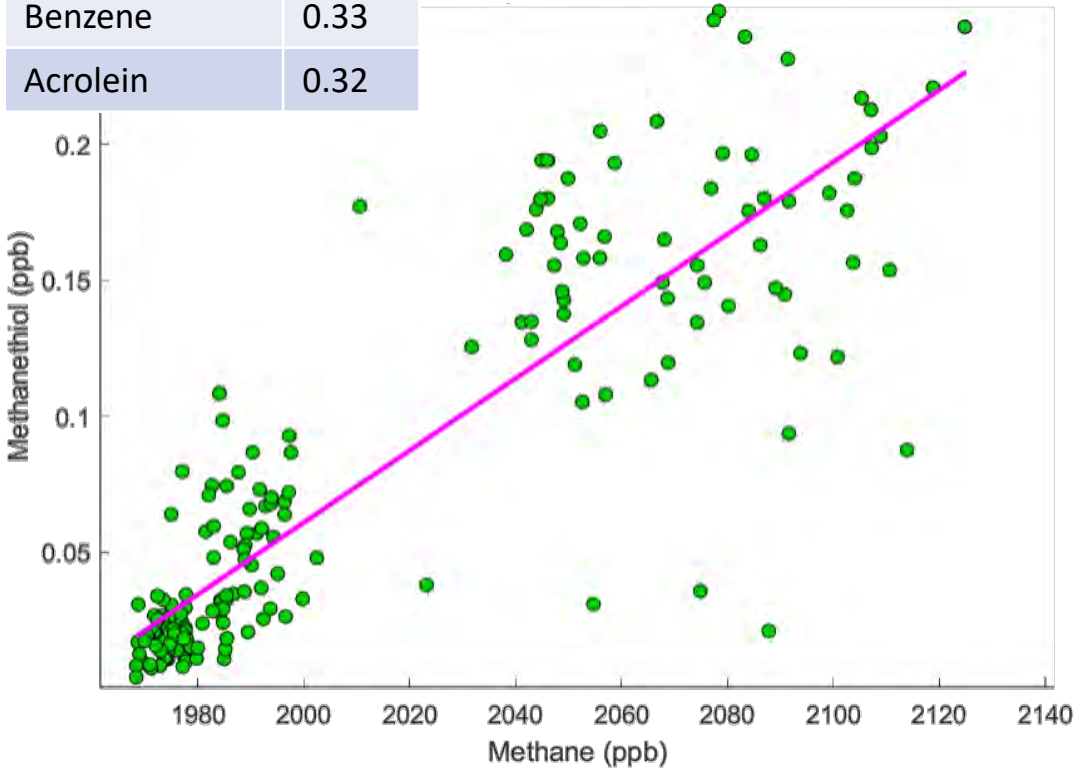
source tracers

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

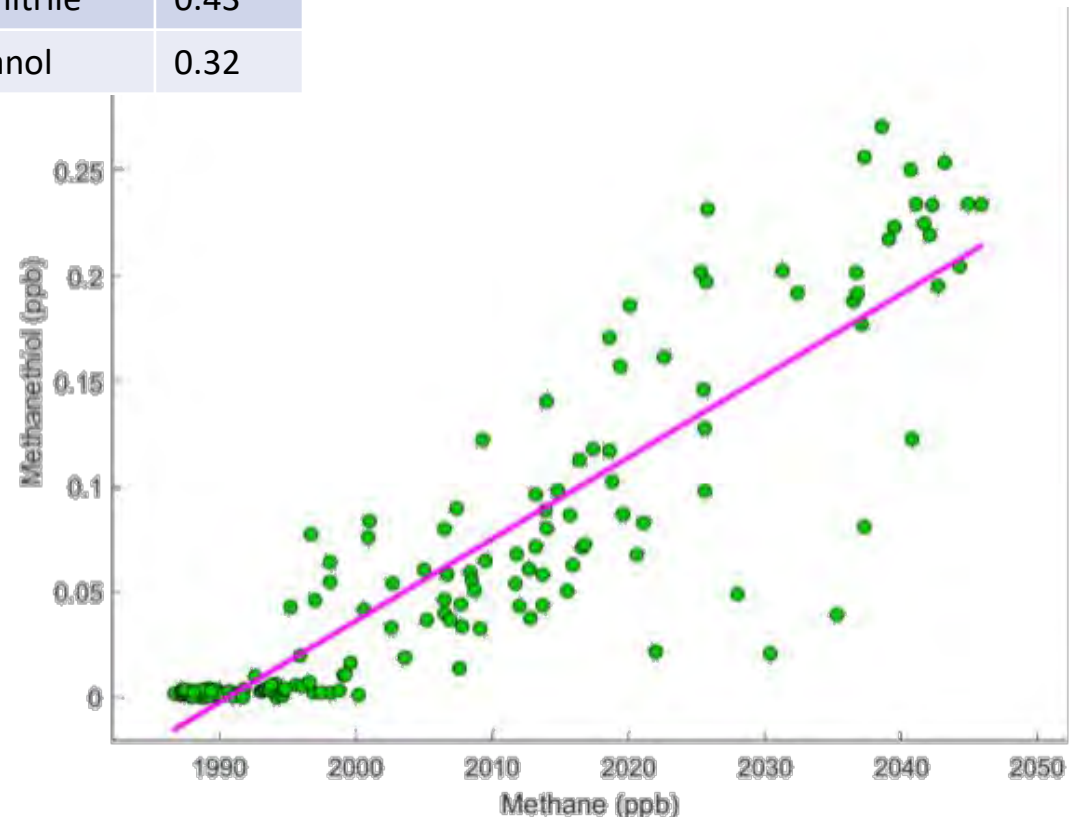
Species	R^2
Methanethiol	0.76
Acetaldehyde	0.64
MVK/MACR	0.33
Benzene	0.33
Acrolein	0.32

7/18, 2:02 PM MDT,
SLC Water Reclamation Facility, 36˚C,
west wind



Species	R^2
Methanethiol	0.80
DMS	0.69
Acetonitrile	0.43
Methanol	0.32

7/22, 6:08 PM MDT,
Central Valley Water Recl. Facility, 34.5˚C,
NW wind



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

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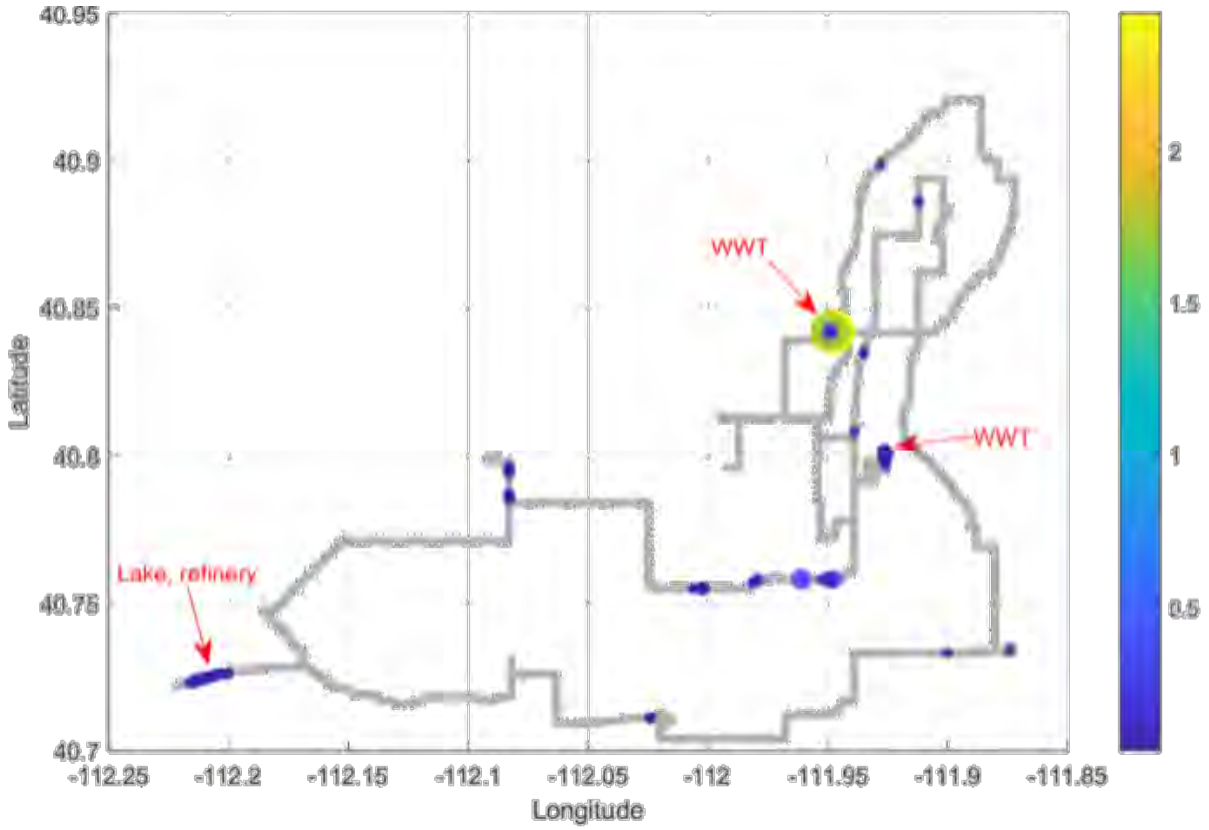
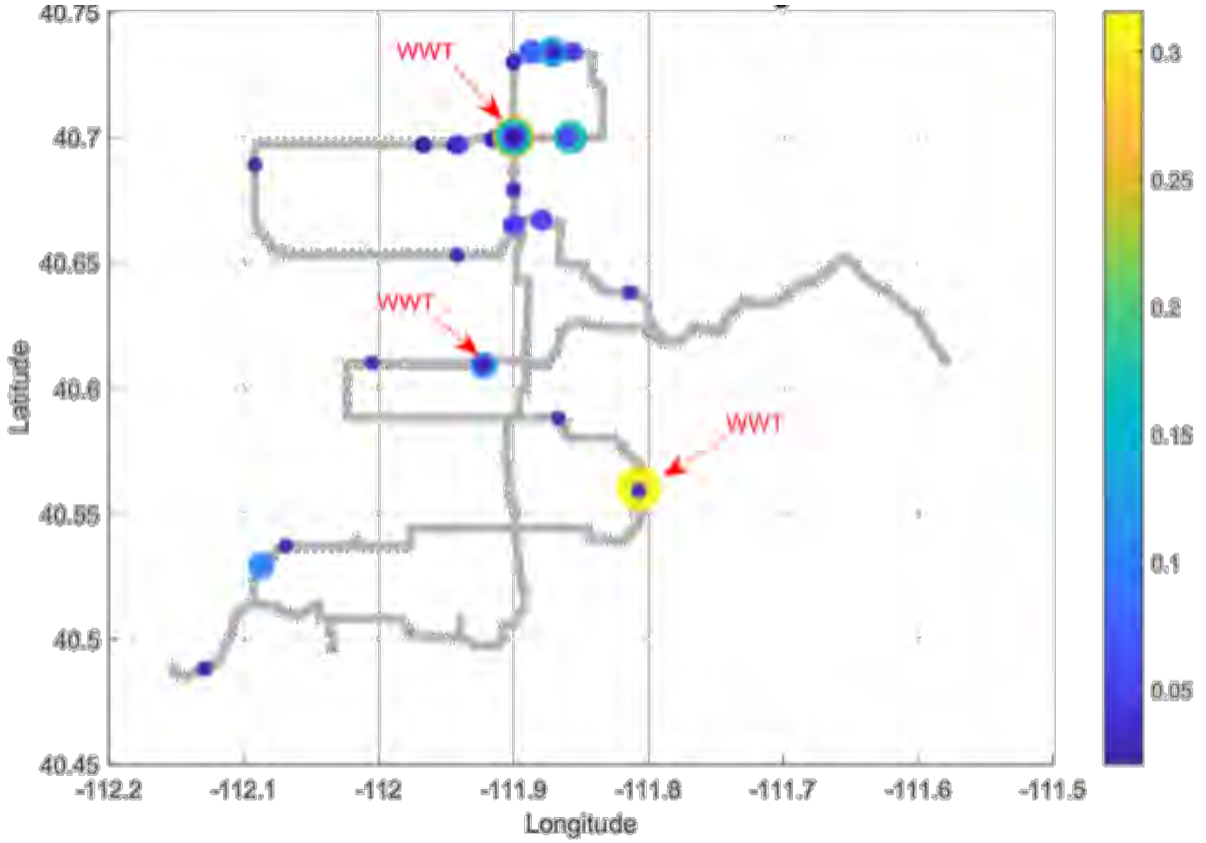
So far, the most consistent is methanethiol (CH_3SH) – more for WWT than landfills

7/18 CH_3SH enhancement above background (ppb)



7/22 CH_3SH enhancement above background (ppb)



source tracers

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

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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_3SH/CH_4 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?