



Reviewing Emissions Modeling Profiles and Using Google Earth to review NonEGUs.

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https://www.ladco.org/technical/modeling-results/2022_eic/#Reviews/Profile_Review

Thursday, April 18th 2024

SMOKE temporal, spatial, speciation profiles.

- Original Code written by Zac Adelman
- Most states ever see what profiles are used by the models.
- All the profiles you will see are defined by SCC code.
 - Some sectors/sources use facility/unit specific profiles.
 - Sometimes the profiles are embedded in the NEI(RWC, CEM, Nonroad)

Temporal Profiles.

- How to make an annual emissions inventory into monthly, day of week, and hourly emissions. Usually SCC specific profiles.
- Monthly: 12 values usually even across months. Since ozone is summer only, this can be most influential. See Motorboats vs Snowmobiles
- Day of week: Show weekend/weekday differences. LADCO work shows weekend chemistry different and sometimes more conducive to Ozone.
- Hour of Day: Moving Emissions to specific hours. Most ozone producing emissions happen in morning.

Spatial Attributes of emissions

- Spatial Surrogates are used to take national/state emissions to counties.
 - SCC specific and many categories use county specific activity.
- Spatial Surrogates are also used to take county level emissions down to individual modeling cells(12km, 4km, 1.3km)
 - This is the one that we are interested in here.
 - Most influential in large centrally located counties.

Chemical Speciation Profiles.

- Speciation profiles are used to create carbon bond group emissions from VOC and PM2.5.
- Carbon bond groups are collections of photochemically similar compounds.
- Maximum Incremental Reactivity(Bill Carter) are factors that estimate the amount of ozone that would be create from a mass weight of a chemical species.
- We have simplified MIR values for the carbon bond groups.
- Higher values result in higher ozone formation potential.

Descriptive Elements

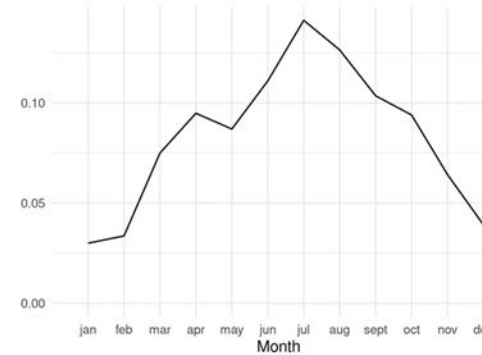
Descriptive Fields

- VOC – Nonpt,
- SCC: 2802004001, Silage
- Ranked 6 for this pollutant/sector
- NOX, VOC, PM2.5 Emissions

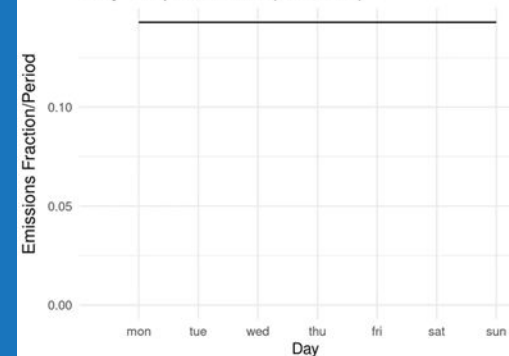
2022V1 NEI Top VOC Sources in Pennsylvania, Sector: nonpt, Source Rank: 6, SCC: 2802004001

Miscellaneous Area Sources: Agricultural Crop Usage: Agriculture Silage: Storage

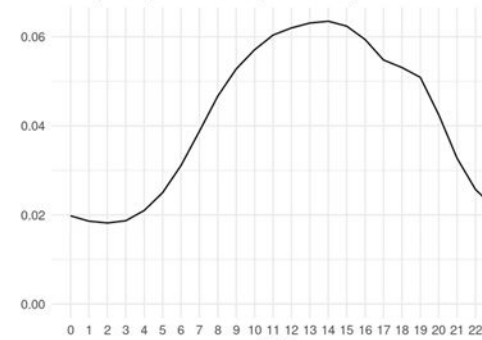
Monthly Temporal Profile (Profile #DA42071)



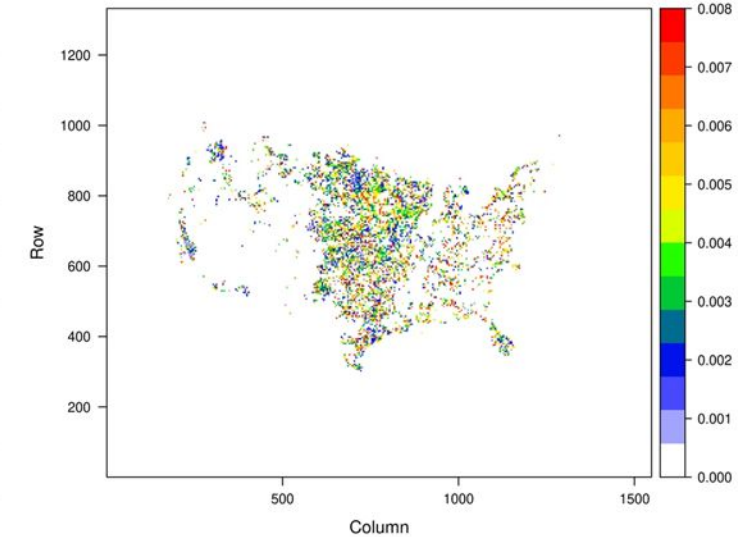
Daily Temporal Profile (Profile #7)



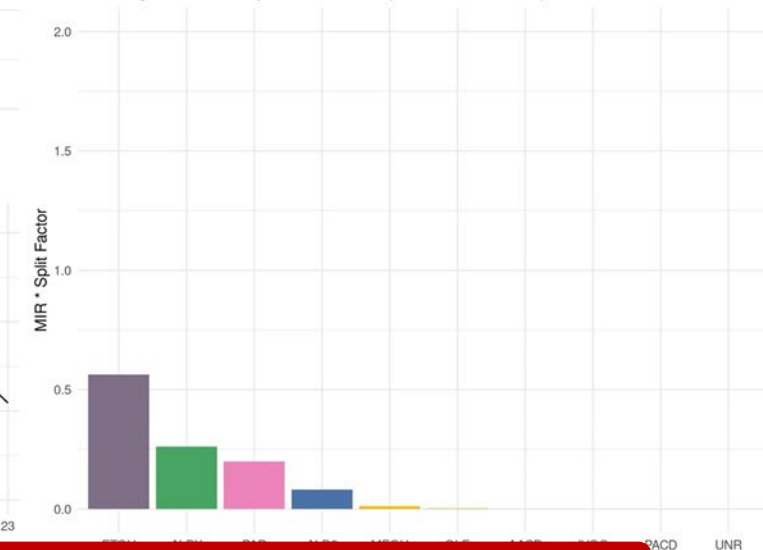
Hourly Temporal Profile (Profile #26)



Surrogate Fraction for surrogate 4011: FAO 2010 Large Cattle Operations



MIR Adjusted VOC Speciation, CB6 (95838:MIR=1.12:)

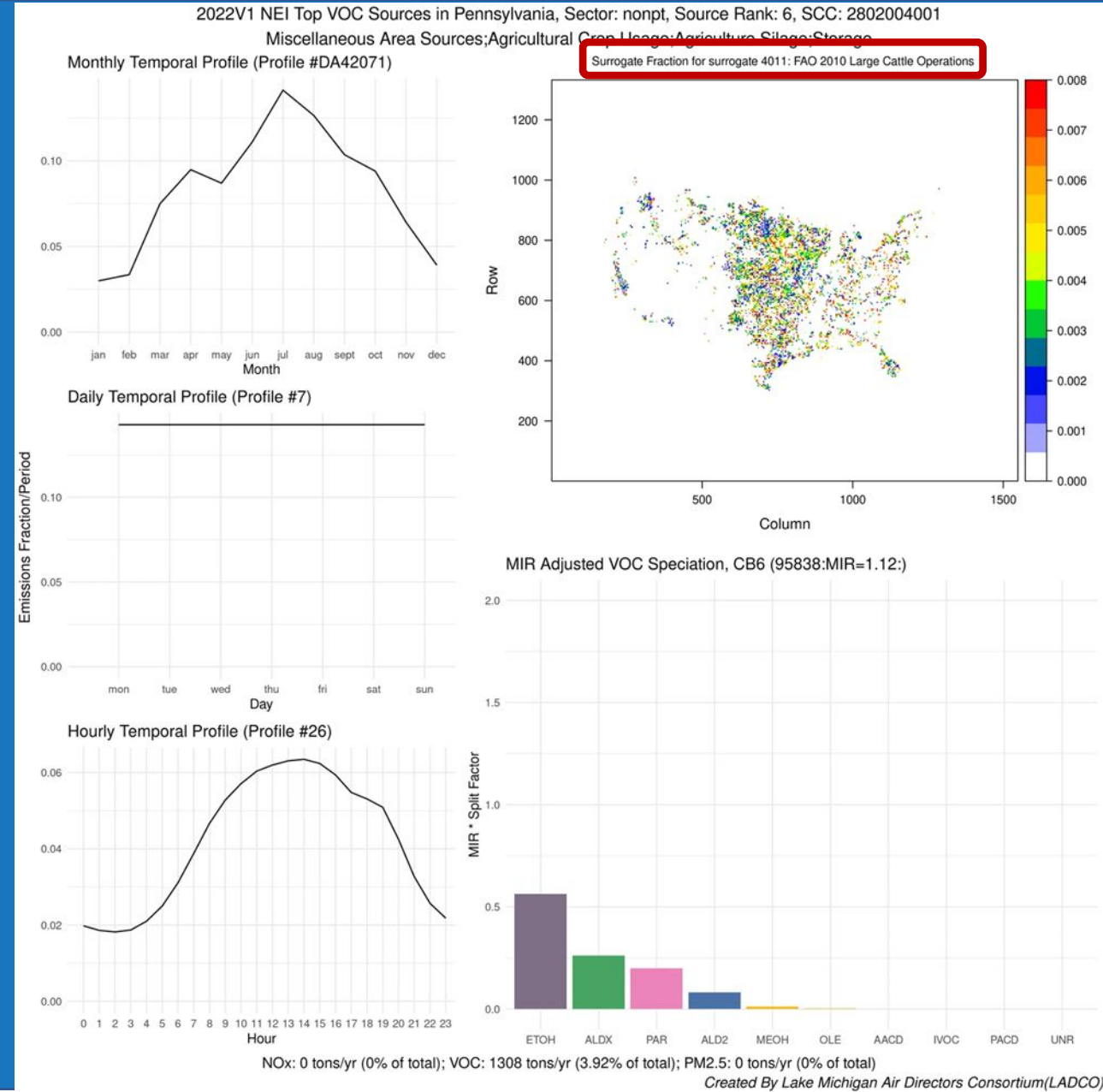


NOx: 0 tons/yr (0% of total); VOC: 1308 tons/yr (3.92% of total); PM2.5: 0 tons/yr (0% of total)

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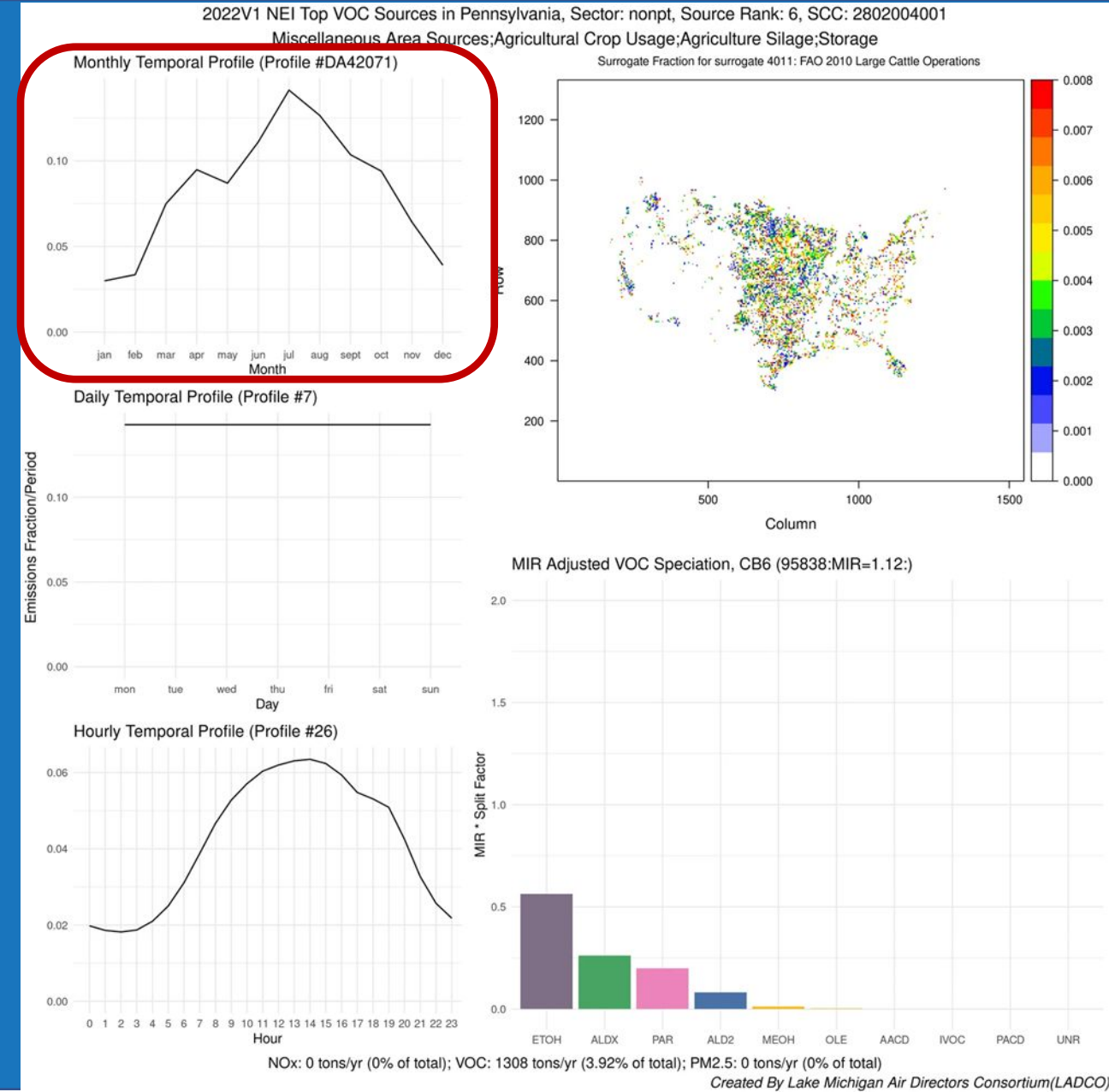
Spatial Surrogate

- The name and number of the spatial surrogate: 4011, large cattle operations.
- Don't trust or use the map. Everything to review is county to cell. Version 2 of this chart or some future EPA tool may have county specific plots which are needed.



Monthly Profiles

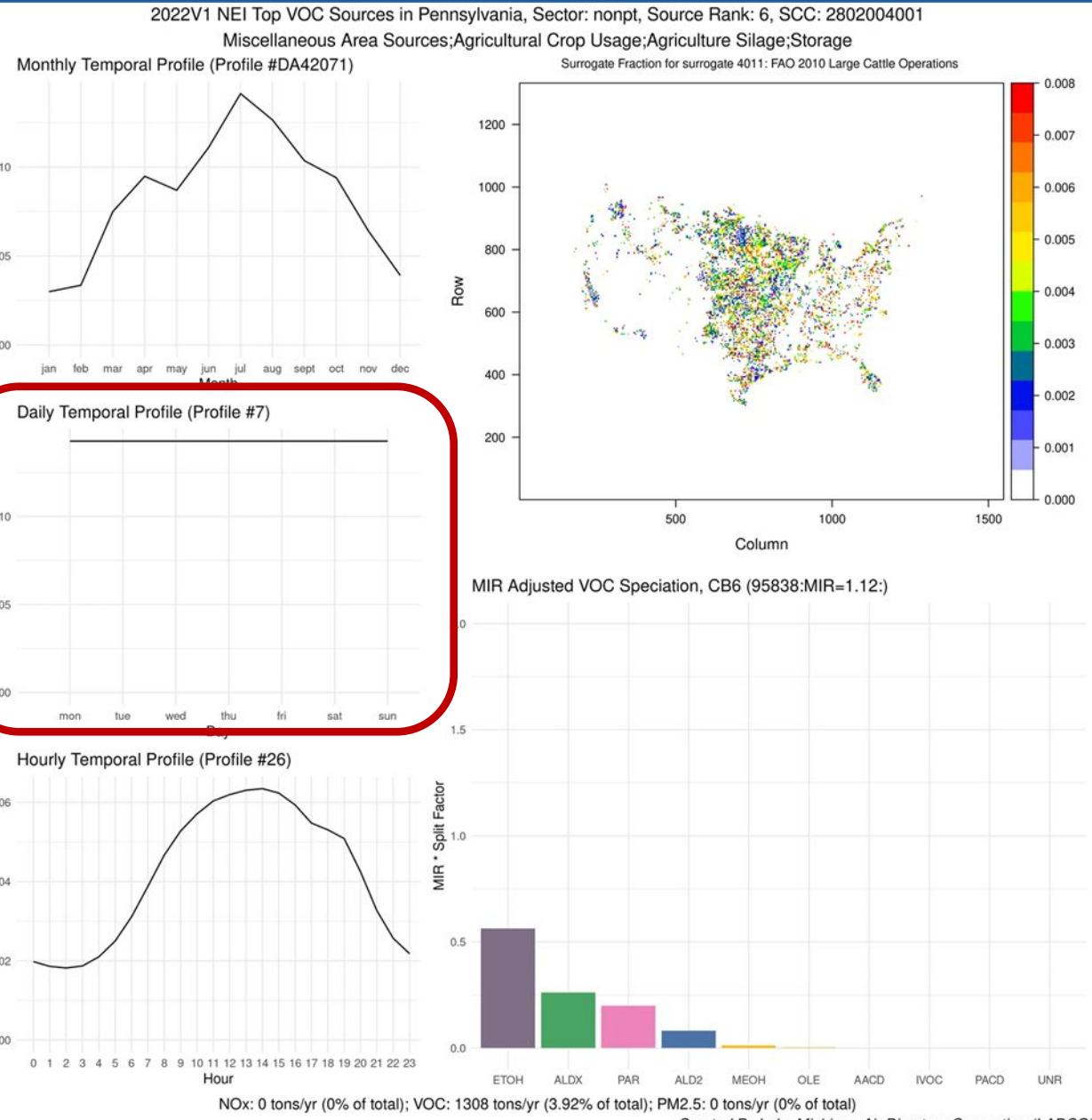
- Important because it defines winter/summer split
- Easiest to understand and find.
- Temporal often embedded in inventory file or created from information in inventory(eg. Hours/Year in point sources)



Day of Week Profiles

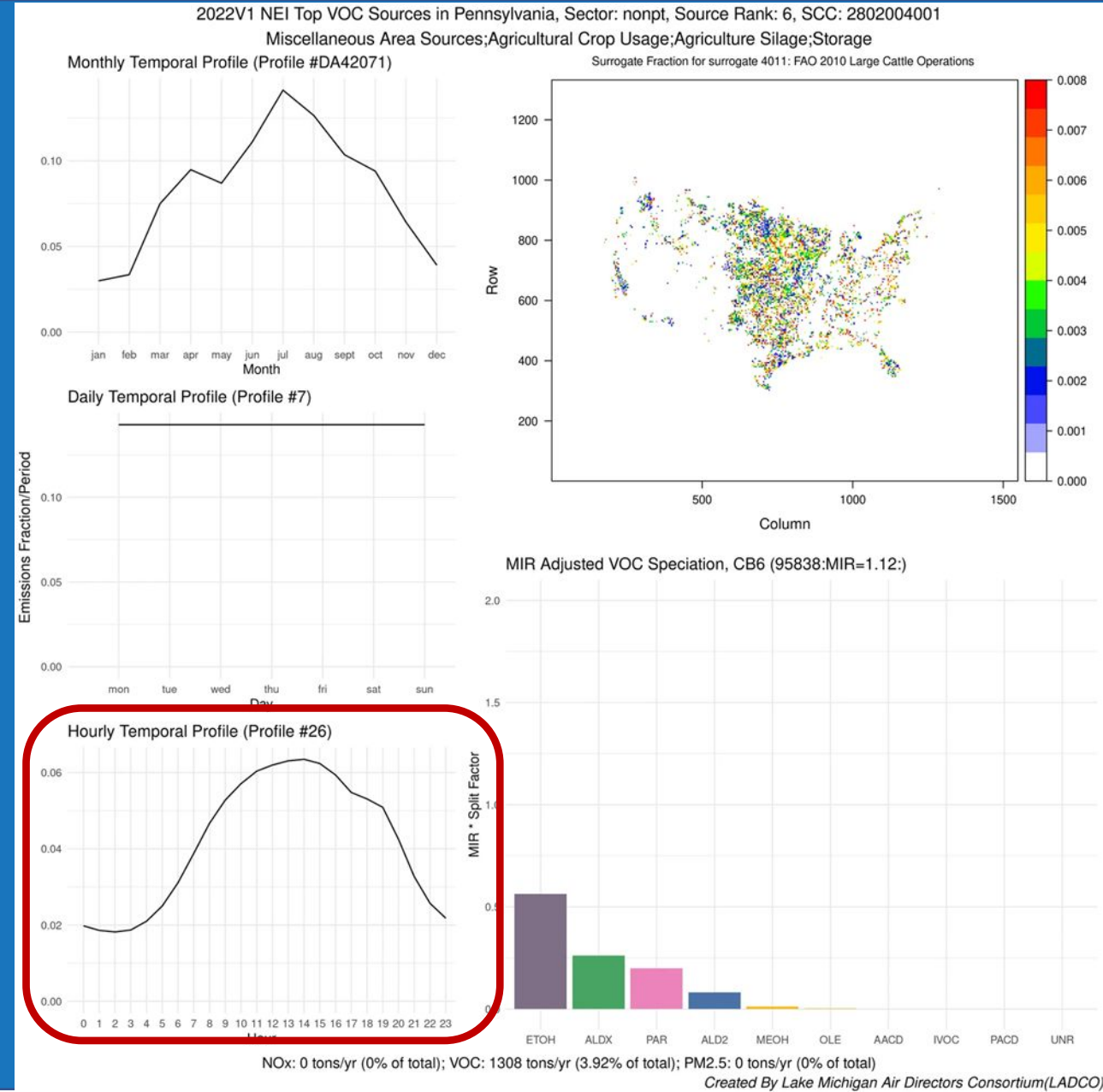
- Weekend vs Weekday

-



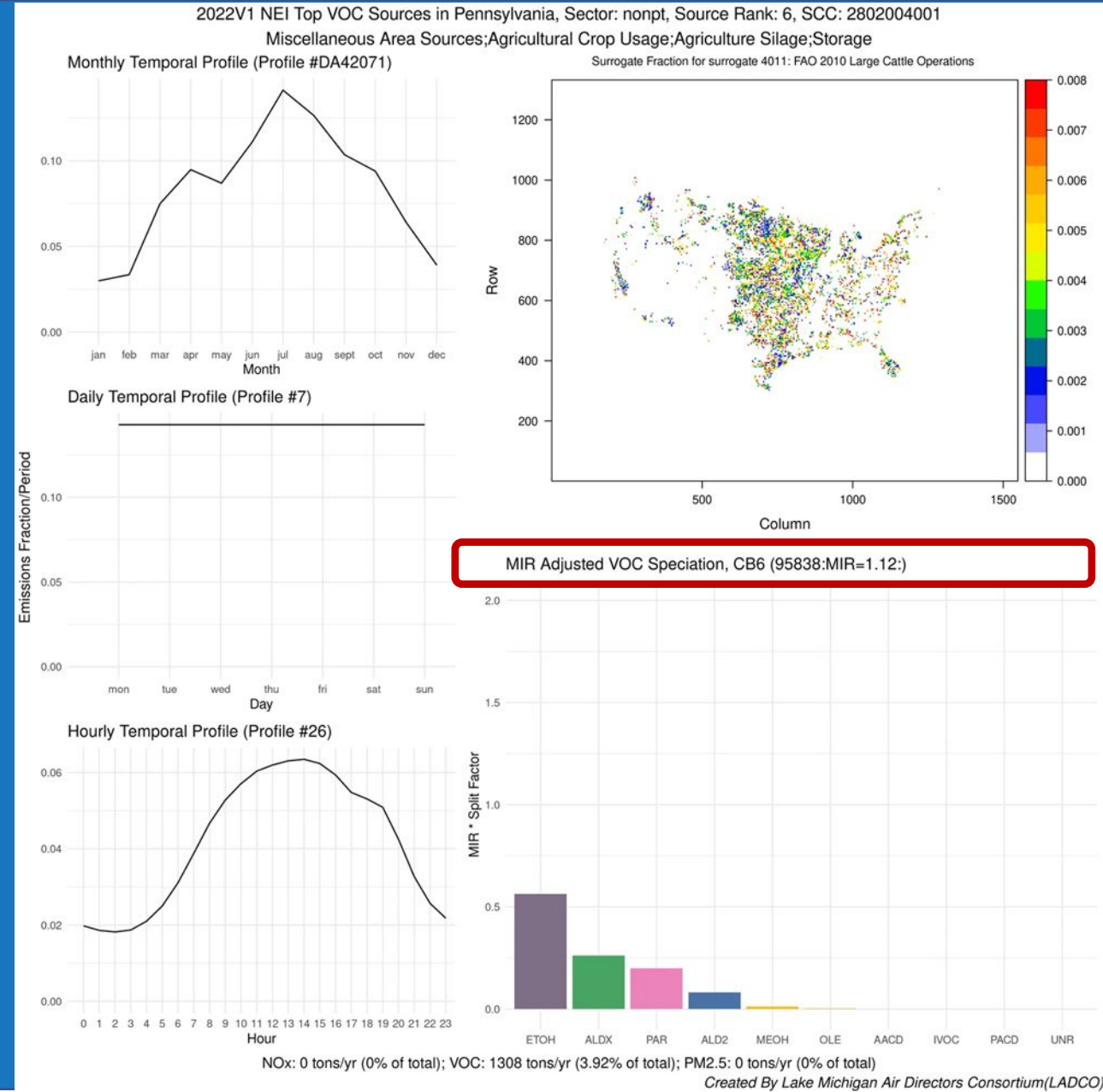
Hourly Profiles

- Based on local time zone and adjusted to central time zone in SMOKE.
- Temporal often embedded in inventory file or created from information in inventory(eg. Hours/Year in point sources)



Speciation Profile

- Profile name
- MIR – Maximum Incremental Reactivity.
 - $\Delta O_3 / \Delta VOC$
 - Applied by CB group, Best way is by chemical species
 - Higher MIR more reactive



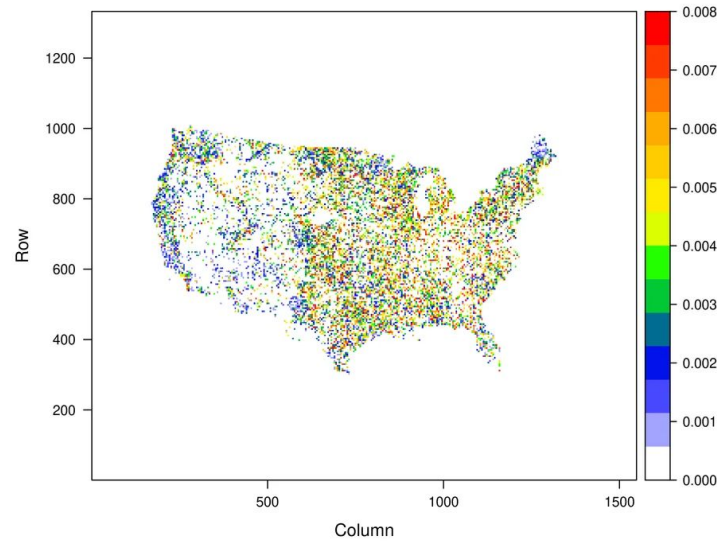
Reviewing Speciation Profile

- Take profile to EPA SPECIATE and review the component species
- Look at Mass fractions by chemical species and see if those concur with your concern
- Suggest an alternative or build/collect an alliterative.

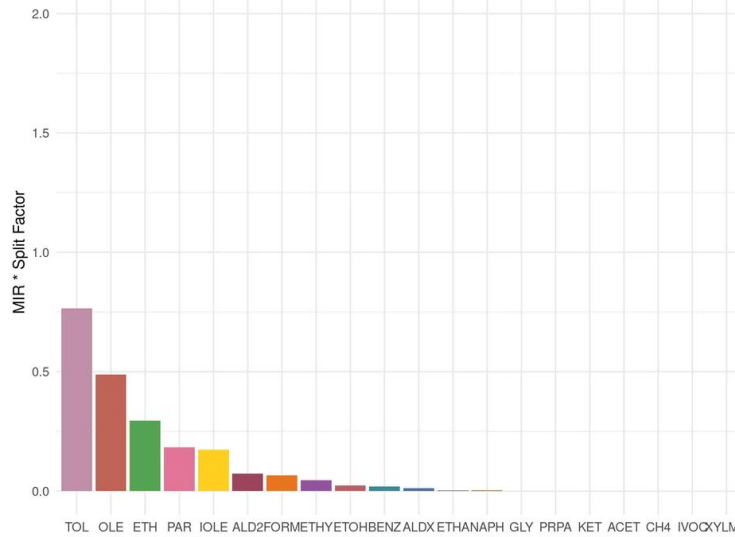
What if a chart is missing

To make these charts it must be SCC specific

- Spatial
 - Is it a point source. Those don't have surrogates
- Temporal
 - Is that part of temporal derived somewhere else
 - Month for Nonroad
 - Hourly for CEM or Fire sources
 - All for point sources where hours/year define profile
- Speciation
 - Does the pollutant have a profile(ie NOX)
 - Is speciation defined in inventory(nonroad, ptfire-rx, ptfire-wild)
- Question: So why no charts for EGU NOX?

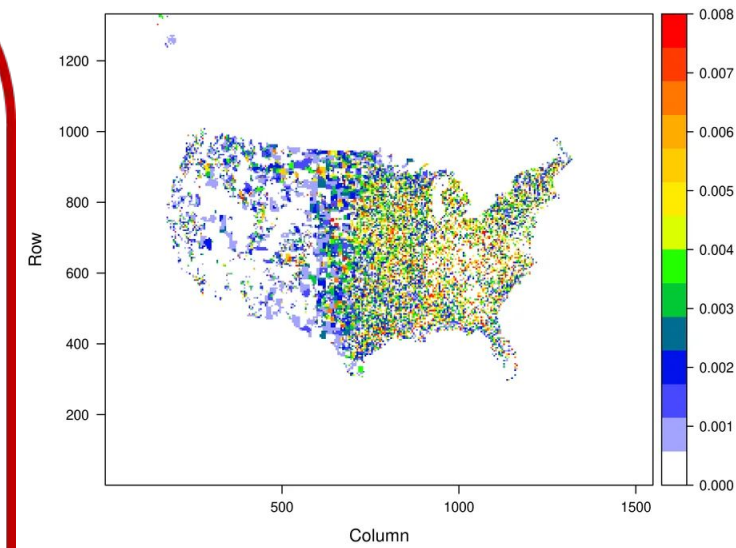


MIR Adjusted VOC Speciation, CB6 (8751a:MIR=2.16:)

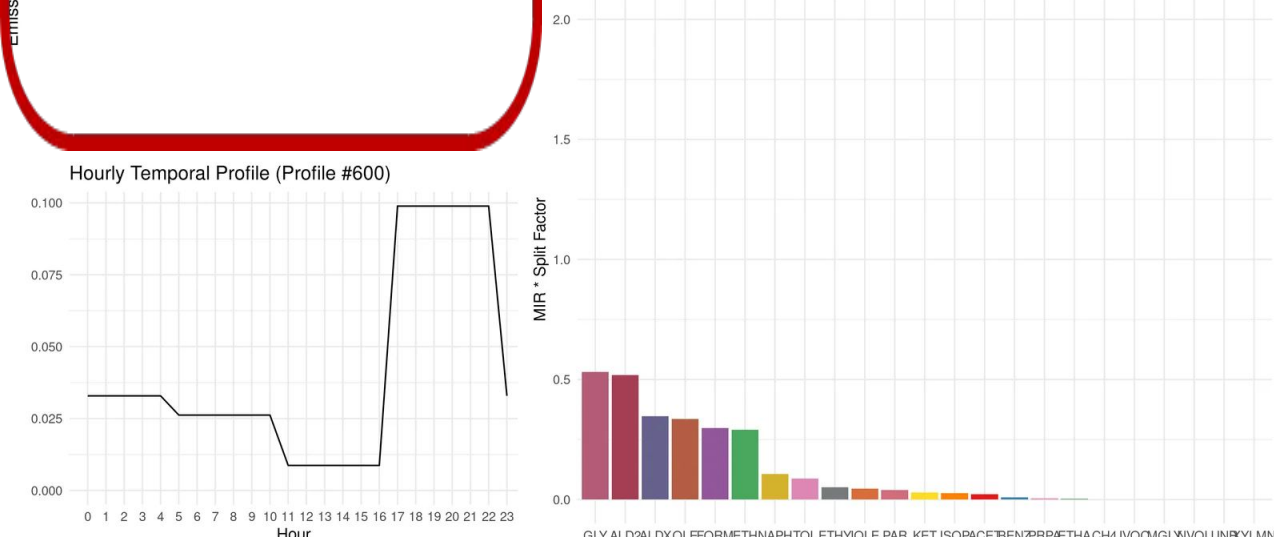


NOx: 53.3 tons/yr (0.33% of total); VOC: 2374 tons/yr (7.89% of total); PM2.5: 34.8 tons/yr (6.45% of total)

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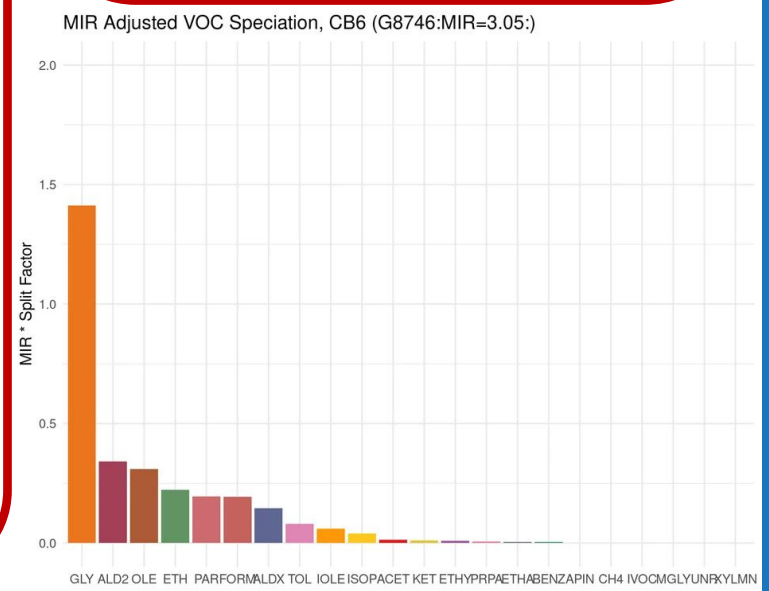
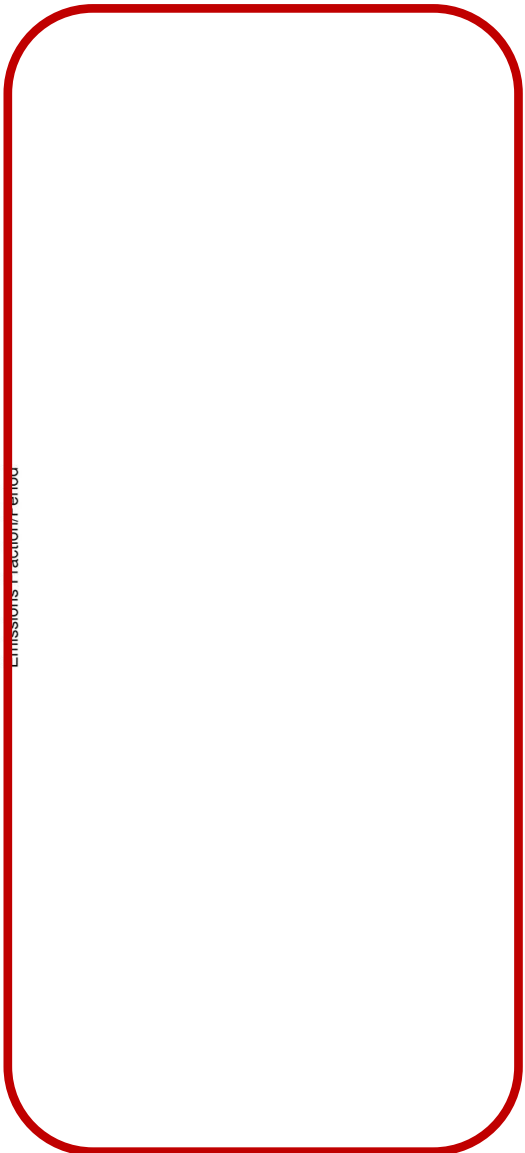


MIR Adjusted VOC Speciation, CB6 (4642:MIR=2.75:Fireplace wood combustion -

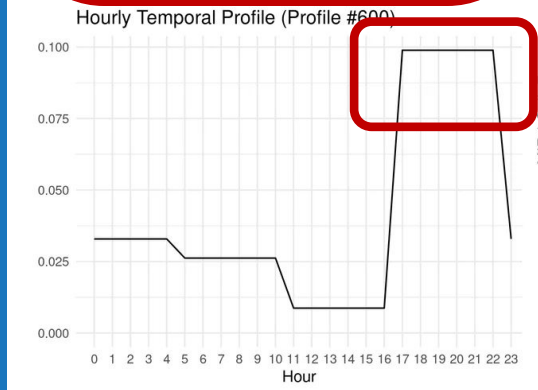
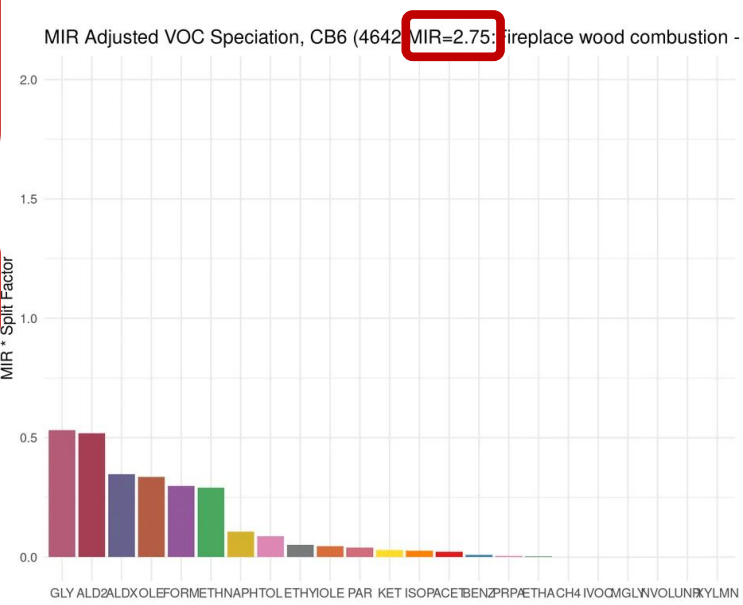
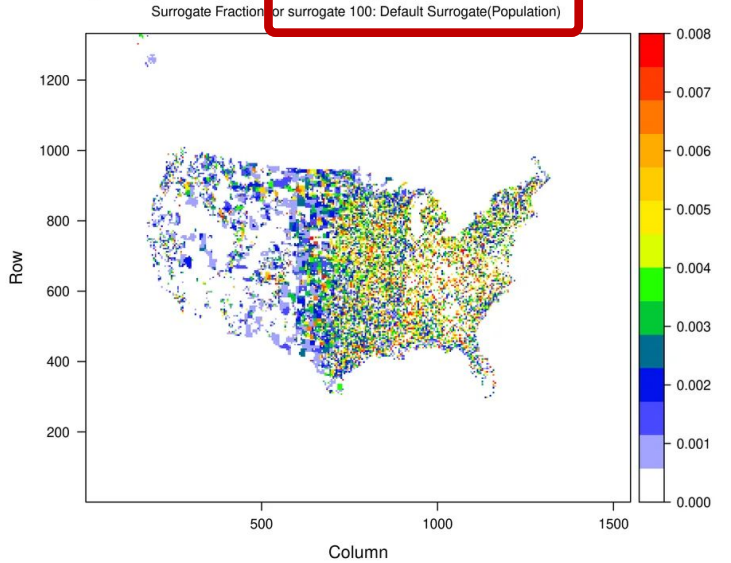
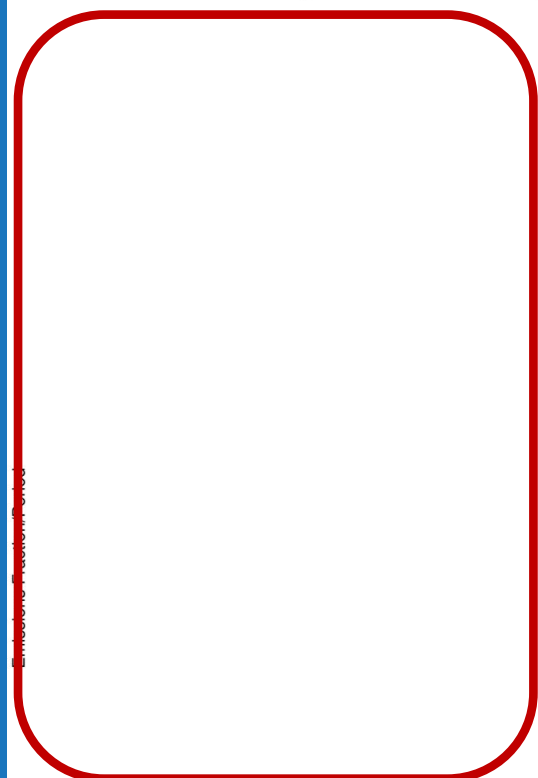


NOx: 9.84 tons/yr (0.347% of total); VOC: 186 tons/yr (0.649% of total); PM2.5: 108 tons/yr (0.368% of total)

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NOx: 71.6 tons/yr (76.6% of total); VOC: 287 tons/yr (79.4% of total); PM2.5: 155 tons/yr (71.1% of total)
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NOx: 8.31 tons/yr (0.291% of total); VOC: 157 tons/yr (0.547% of total); PM2.5: 90.8 tons/yr (0.309% of total)
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What are LADCO's priority in order

- Is month of year profile OK and do I have better
- Is day of week profile OK and do I have better
- Is hour of day profile OK and do I have better.
- Is Speciation/MIR impact my understanding of the source.
- Is there a better speciation profile available
- Is an alternate spatial surrogate available

LADCO KML file for point source review

- KML file can be used in Google Earth
 - <https://drive.google.com/file/d/10J4m95BJixla5yiywYMnG-f3AGbh7qd-/view?usp=sharing>
- Is NON-EGU Point > 100 TPY of Criteria Pollutants
- Review the Locations of large sources
 - Anything less than 1 km is probably overkill
- Review the Mass of large sources.
 - Problem of extra decimal places in activity/emissions

Coming Soon....

- ZAC's R Shiny tool to review sectors by state.

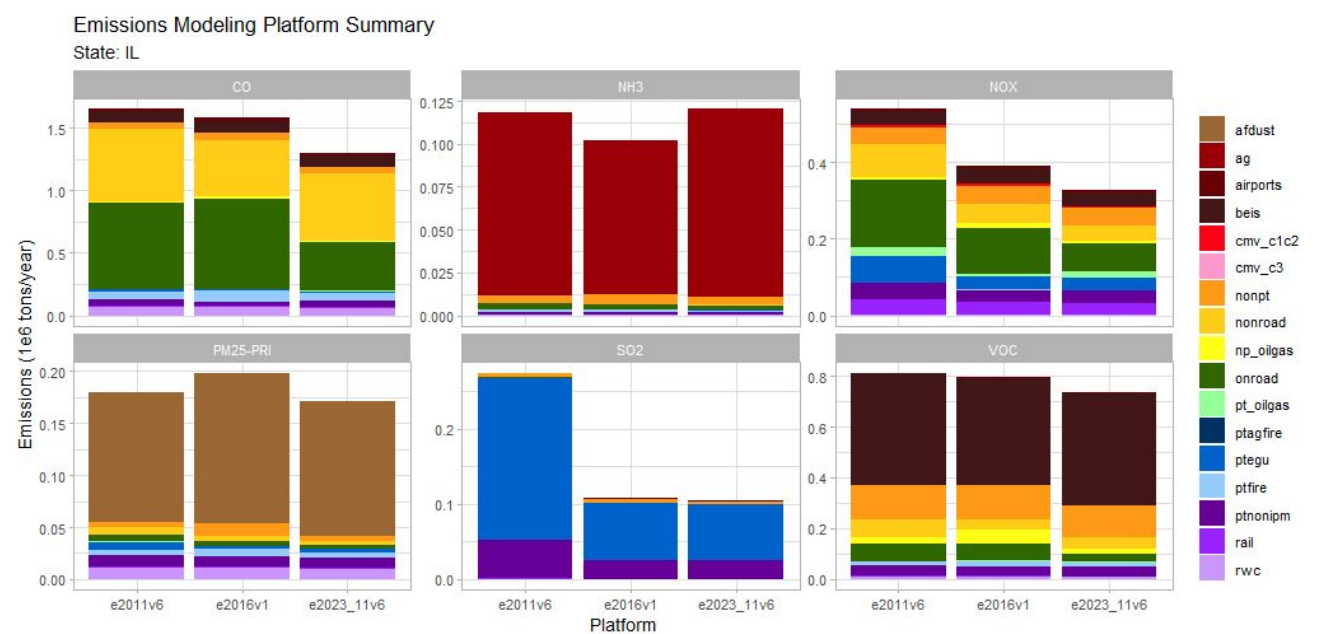
Emissions Modeling Platform Summary

Select a State

IL

Select Platforms (multiple)

e2011v6 e2016v1 e2023_11v6



Show 25 entries Search:

Poll	Sect	variable	value
CO	airports	e2011v6	18712.0
CO	beis	e2011v6	89040.5
CO	cmv_c1c2	e2011v6	1297.7
CO	cmv_c3	e2011v6	2.7
CO	nonpt	e2011v6	50389.4
CO	nonroad	e2011v6	583883.1
CO	np_oilgas	e2011v6	11562.3