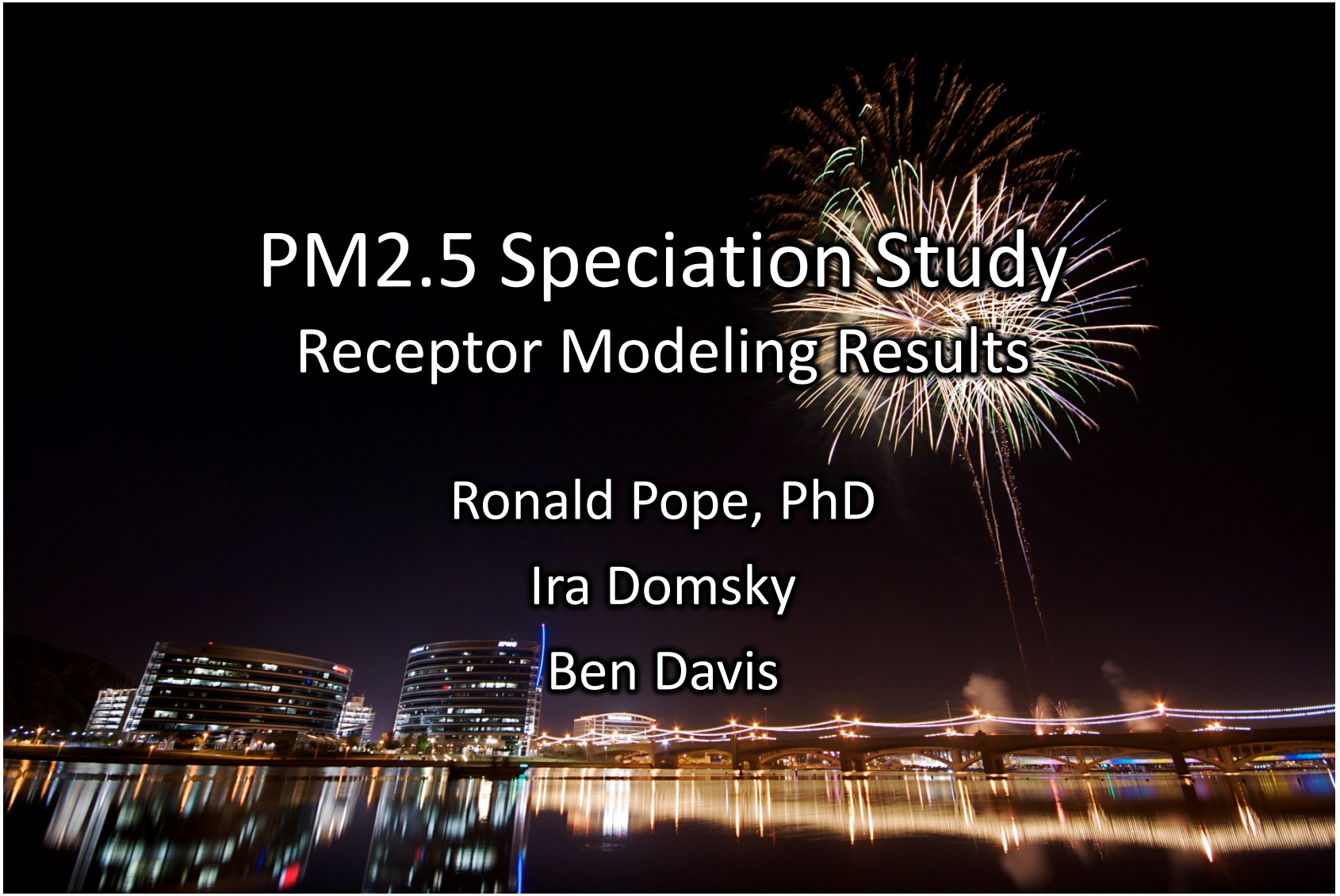

PM2.5 Speciation Study
Receptor Modeling Results

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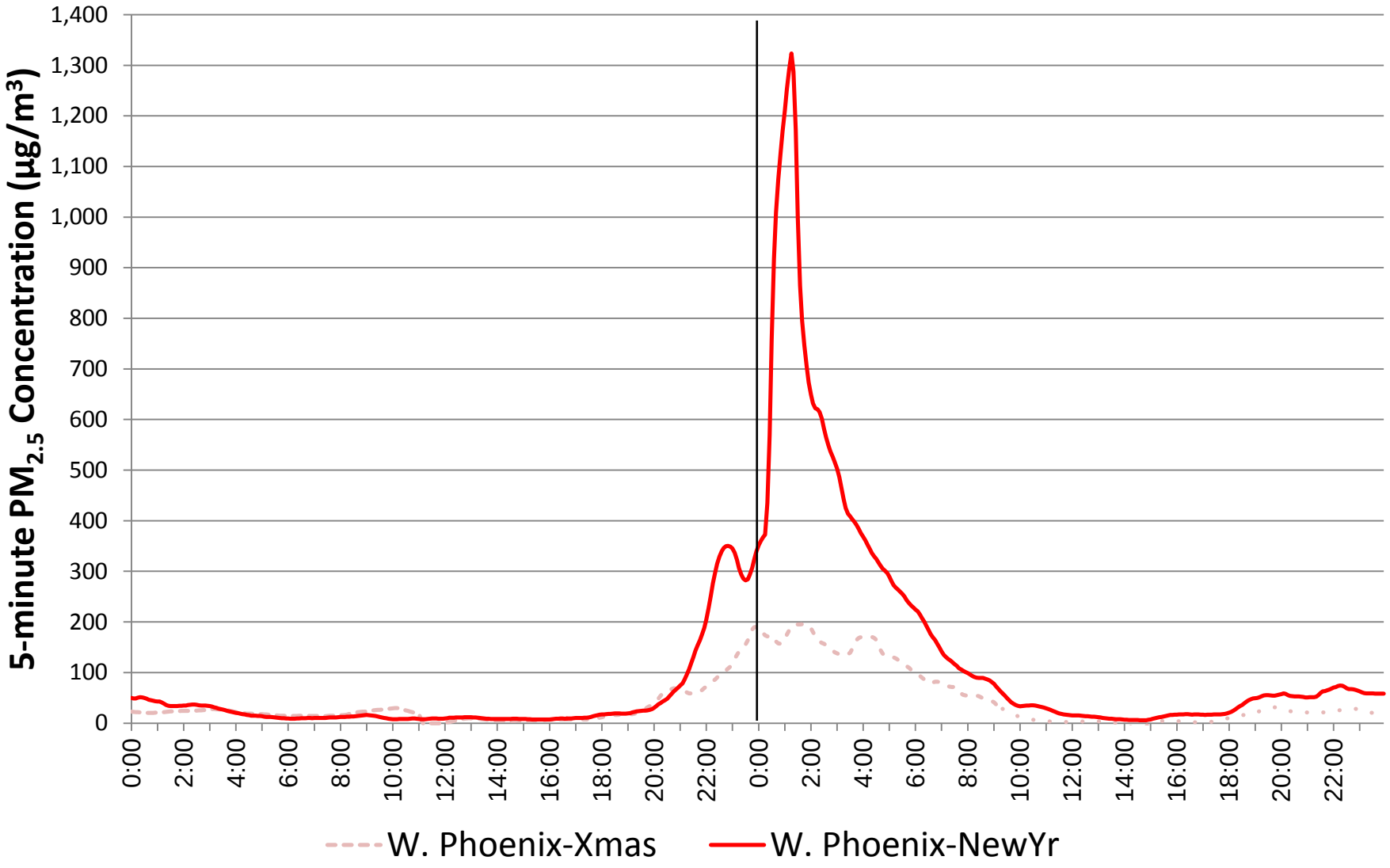
Air Quality Department


West Phoenix 5-Minute PM2.5 Concentrations New Year's Eve to Day '13-'14
5-minute PM2.5 Concentration (µg/m3)
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
W. Phoenix-Xmas
W. Phoenix-NewYr

What's the Issue

- Maintaining attainment with the $PM_{2.5}$ health standard
- The Christmas and New Year's holiday seasons have been the most problematic
- The trends for the holiday exceedances are flat or upward

Speciation Study Question

- What are the source contributions during the Christmas/New Year's holiday periods?
- On New Year's Day, how much did fireworks contribute to the total PM2.5?

Project Details

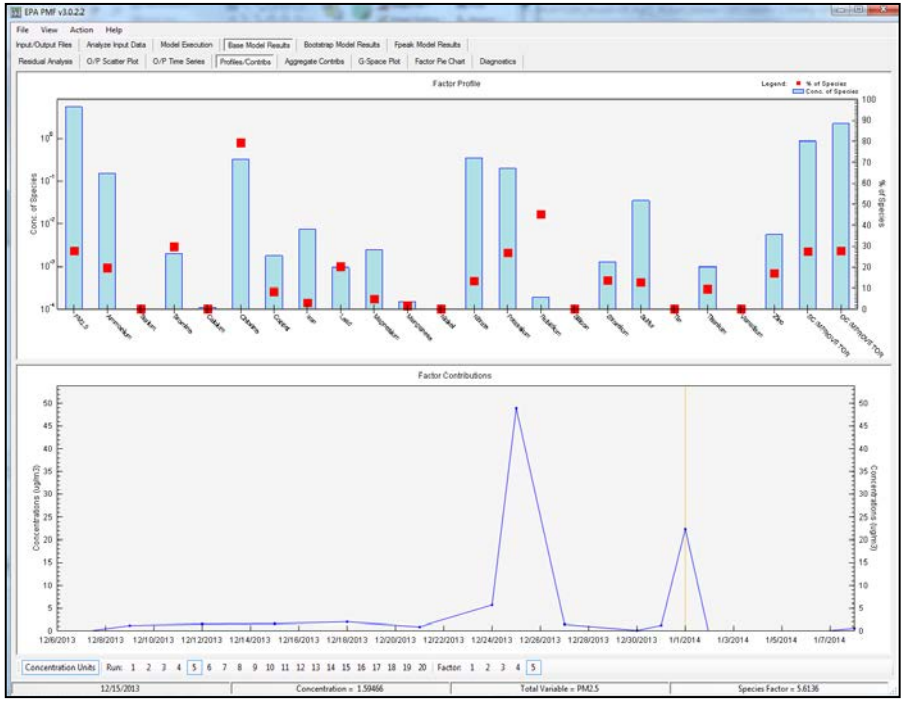
- MCAQD operated a Super-SASS speciation monitor at Tempe and Durango Complex.
- Study period is: December 3, 2013 – January 8, 2014

Comparison of Monitoring Methods

Site	Holiday	Total $PM_{2.5}$ from Speciation Monitor	$PM_{2.5}$ from Continuous Monitor
Durango			
	Christmas Eve	26.2	26.0
	Christmas Day	46.8	55.9
	New Year's Eve	18.3	18.6
	New Year's Day	50.1	56.5
Tempe			
	Christmas Eve	10.6	11.6
	Christmas Day	N/A	32.3
	New Year's Eve	13.9	16.1
	New Year's Day	46.6	44.0

Modeling Plan

EPA Positive Matrix Factorization (PMF) Receptor Model

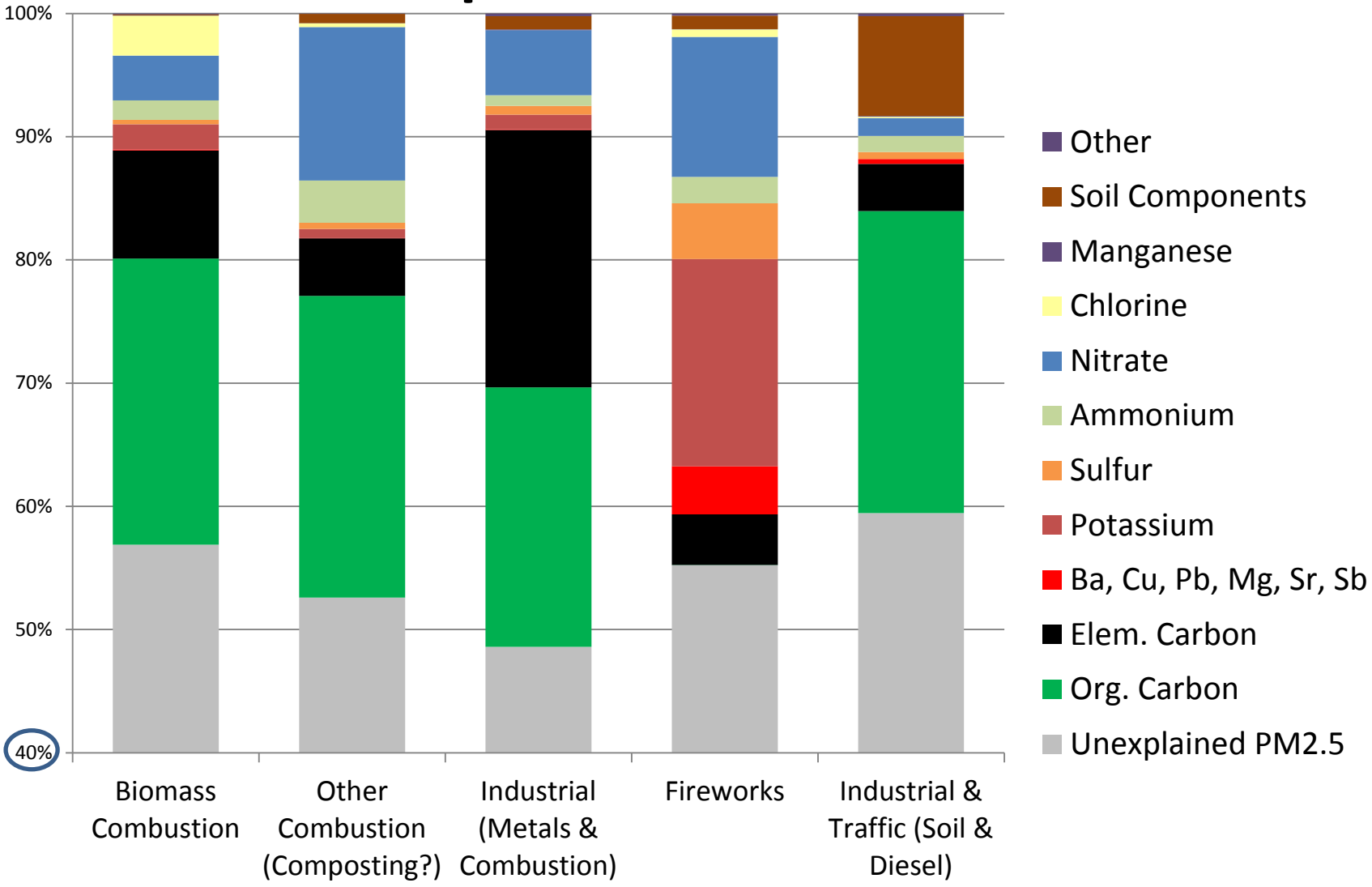


RESULTS

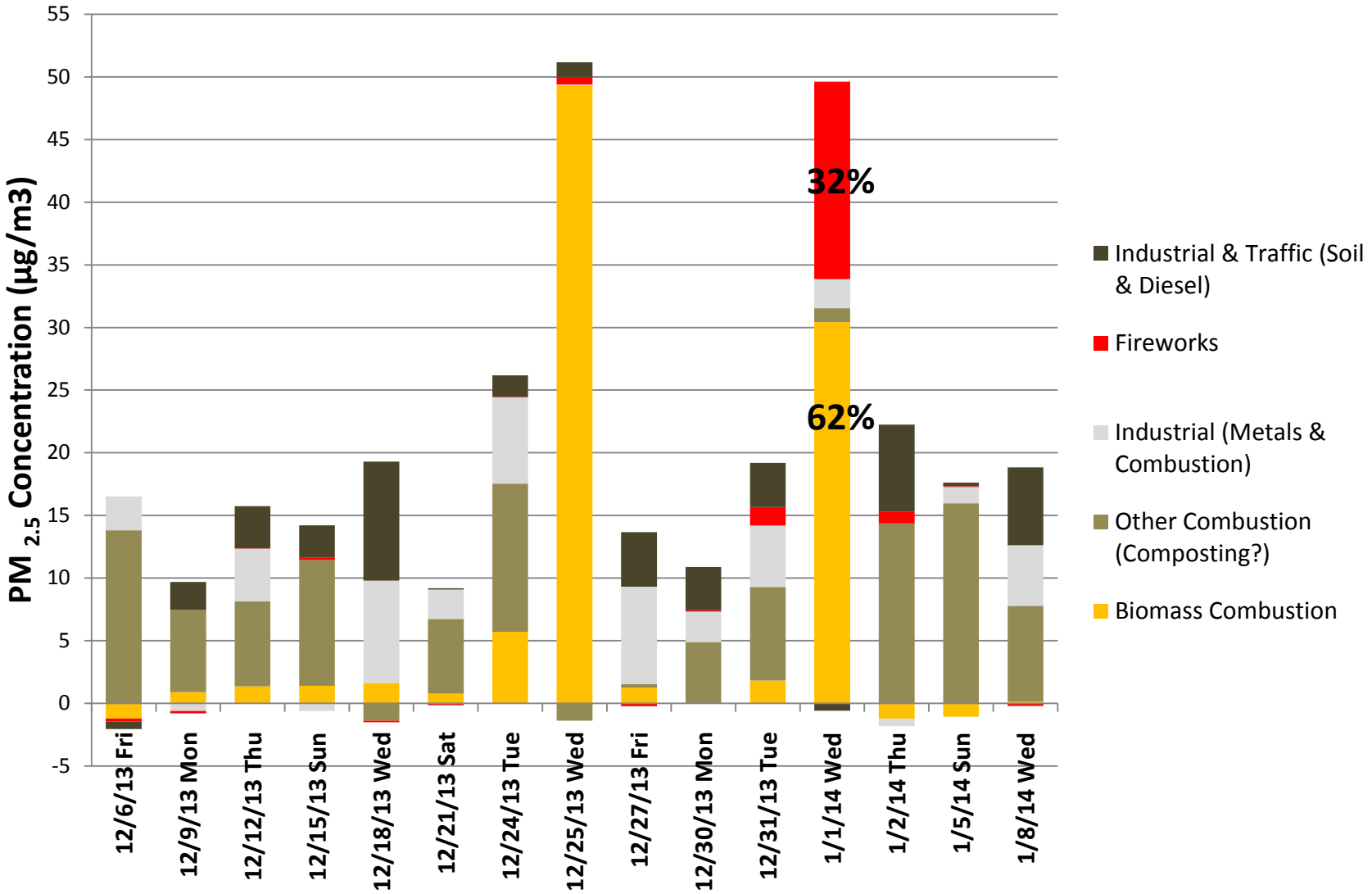
Durango Complex

- “Best” model had 5 factors.
- Actual $PM_{2.5}$ measured on 1/1/14: 50.1 $\mu g/m^3$
  - Model Predicted: 49.0 $\mu g/m^3$
- One factor was almost exclusive to New Year’s Day
- This factor contributed 15.8 $\mu g/m^3$ (32%) to the daily $PM_{2.5}$ total

Chemical Species Contribution to Durango Complex Source Profiles



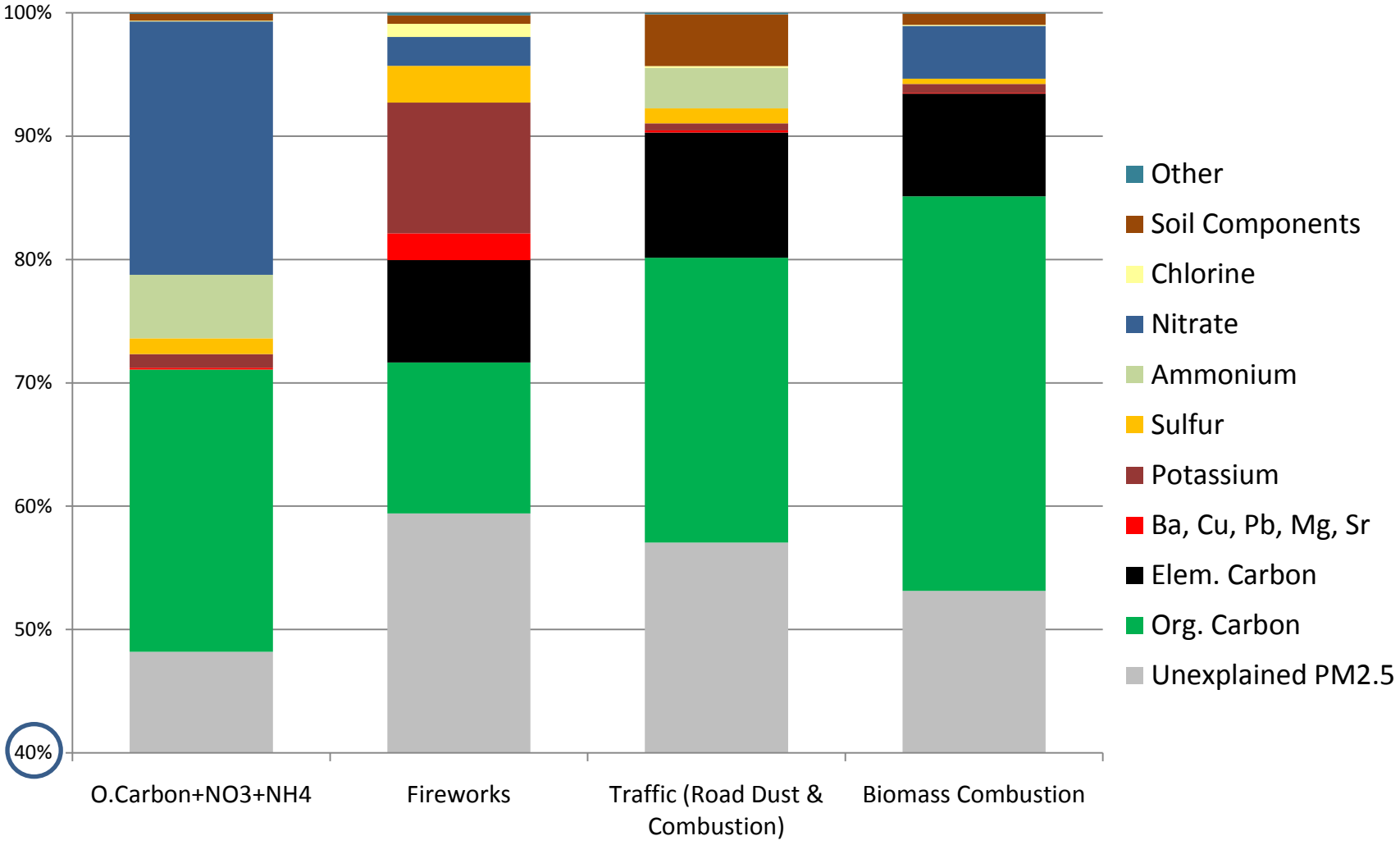
Source Contribution by Day at Durango



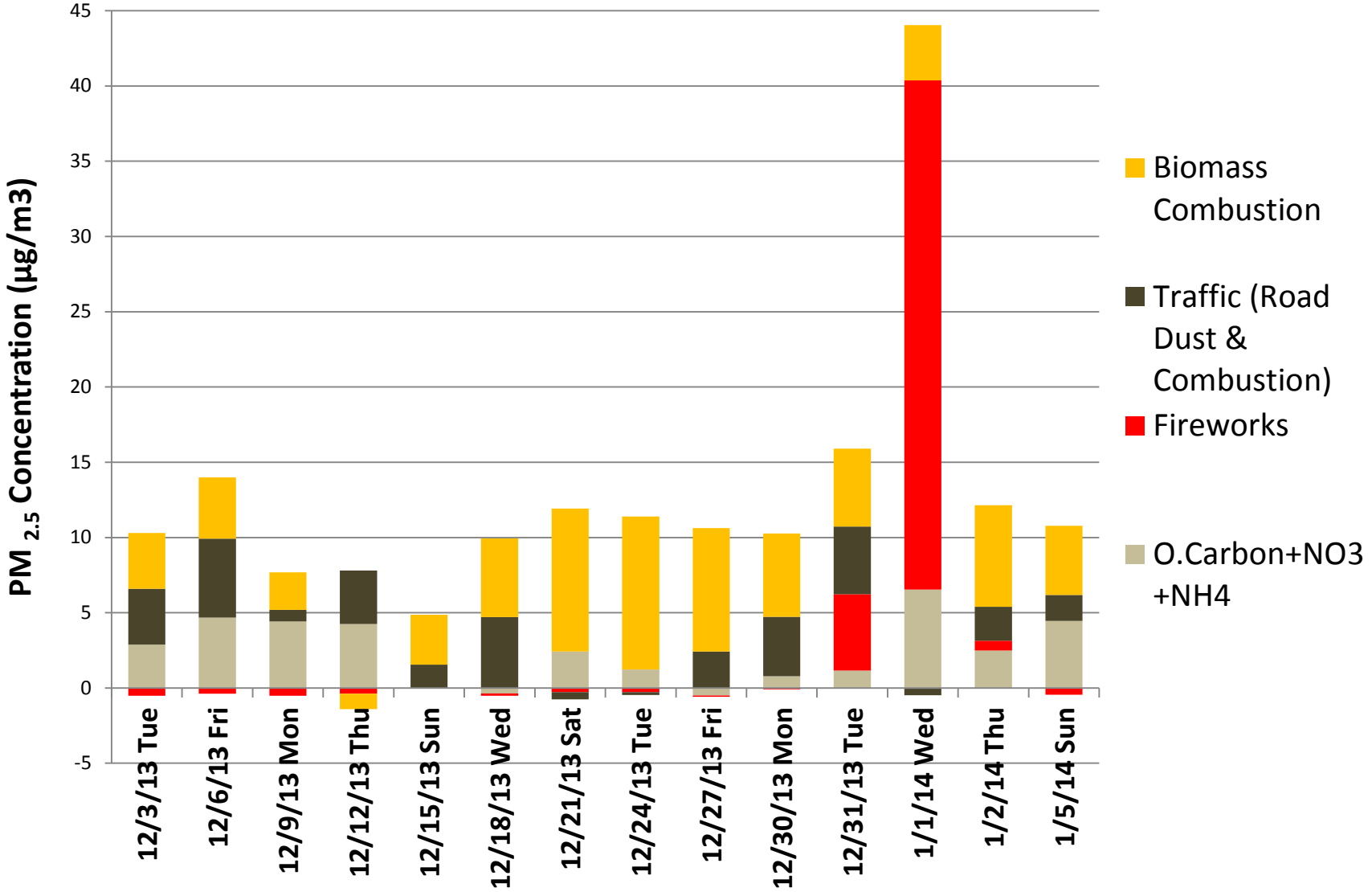
Tempe Results

- “Best” model had 4 factors.
- Actual $PM_{2.5}$ Measured: 46.6 µg/m^3
  - Model predicted: 43.6 µg/m^3
- There was one factor that was almost exclusive to New Year’s Day.
- This factor contributed 33.8 µg/m^3 (78%) to the daily $PM_{2.5}$ total

Chemical Species Contribution to Tempe Source Profiles



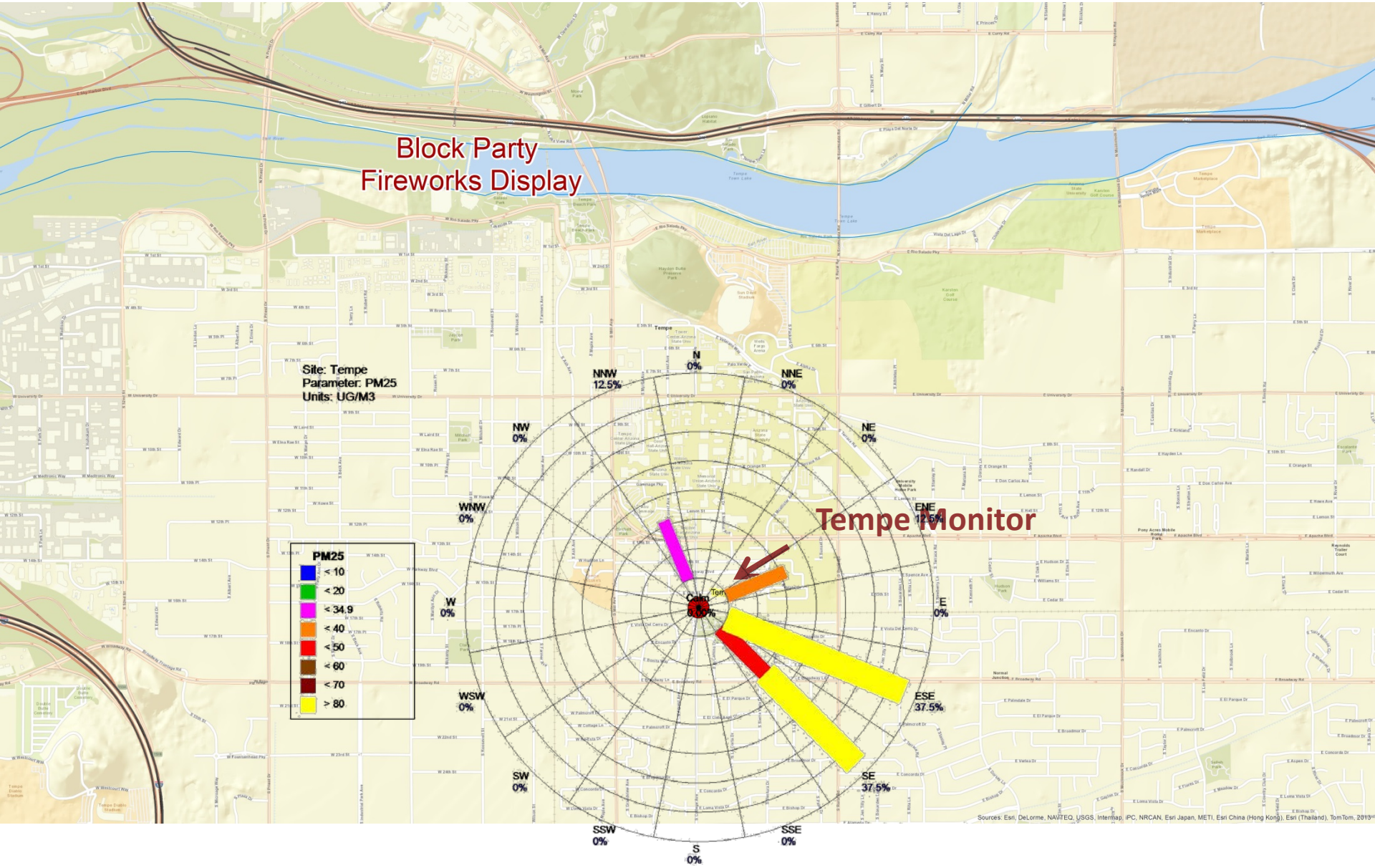
Source Contribution by Day at Tempe



Tempe New Year's Block Party

- Usually the only, and certainly the largest commercial fireworks display for the New Year
- Did it affect the Tempe monitor readings?
  - Unlikely that there was a substantial effect, it is more likely that effects came from consumer fireworks.

Tempe New Year's Block Party Effect on Tempe Monitor



Period: 12/31/2013-01/01/2014

8:00 PM – 4:00 AM

Conclusions

Site	Modeled Daily Average (µg/m^3)	Modeled Source Contribution (µg/m^3)	Modeled Daily Average without Source
Durango	49.0	15.8	33.2
Tempe	43.6	33.8	9.8

- Modeled data concludes that fireworks caused exceedances at these monitors on New Year's Day
- Consumer fireworks the most likely source

Next Steps

- Conduct additional sampling next season:
  - Speciation Monitoring from November-February, 2014-2015
  - Add a monitoring site (3 total)
  - Additional coordination with ADEQ
  - Reevaluate monitoring locations