APCA 6, 7/2 - 7/6 removed

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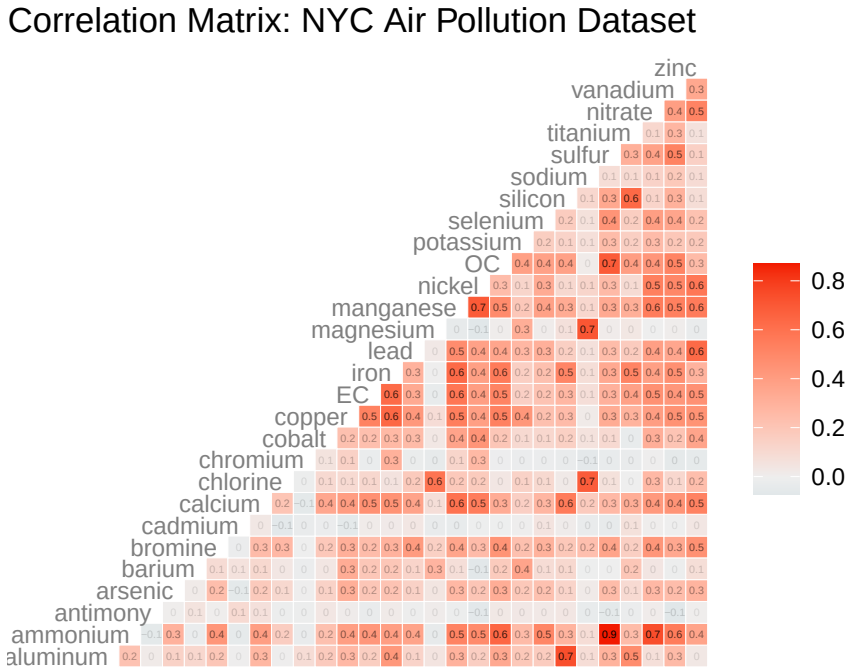
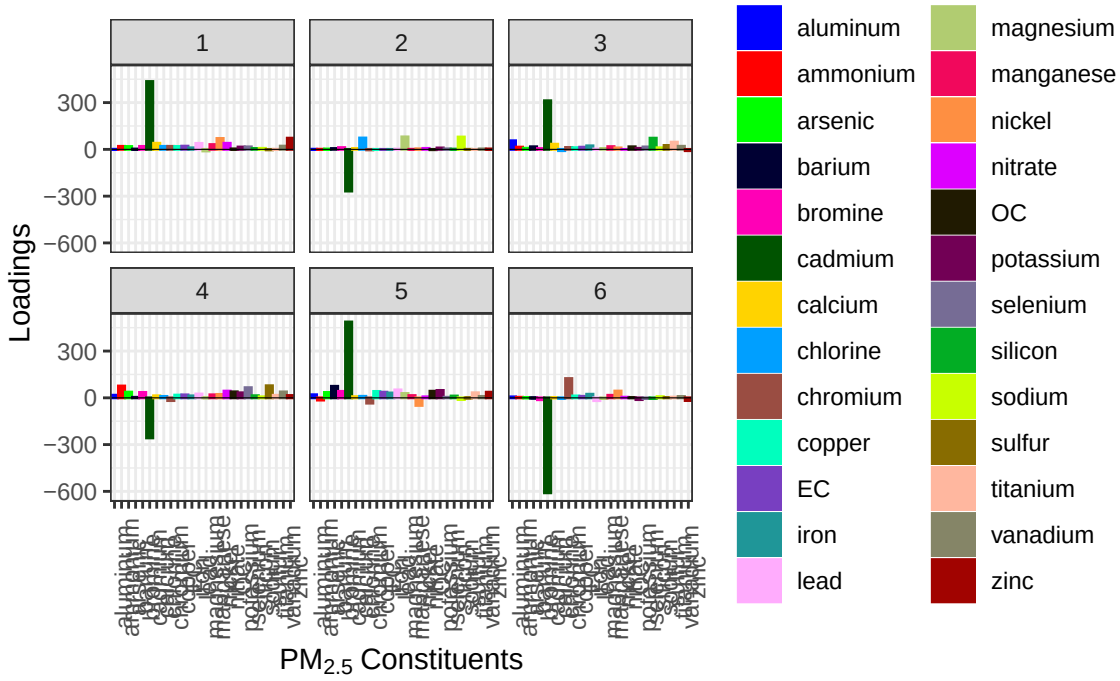
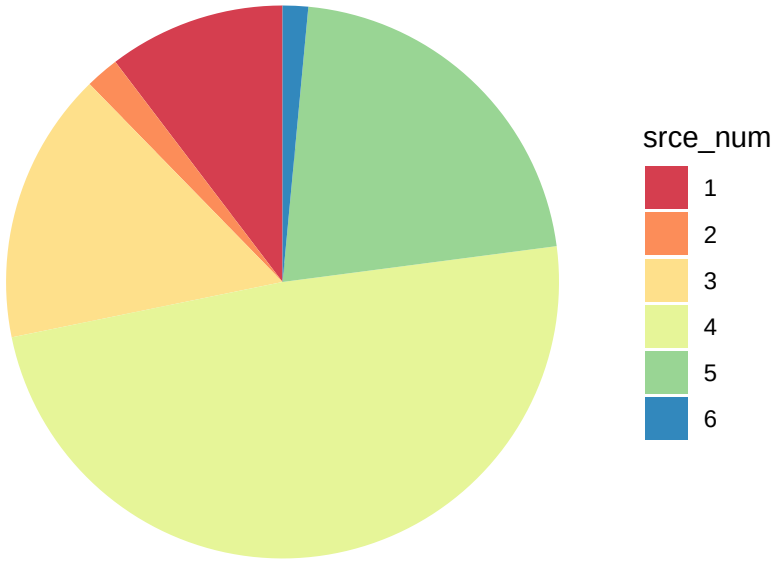


Loadings

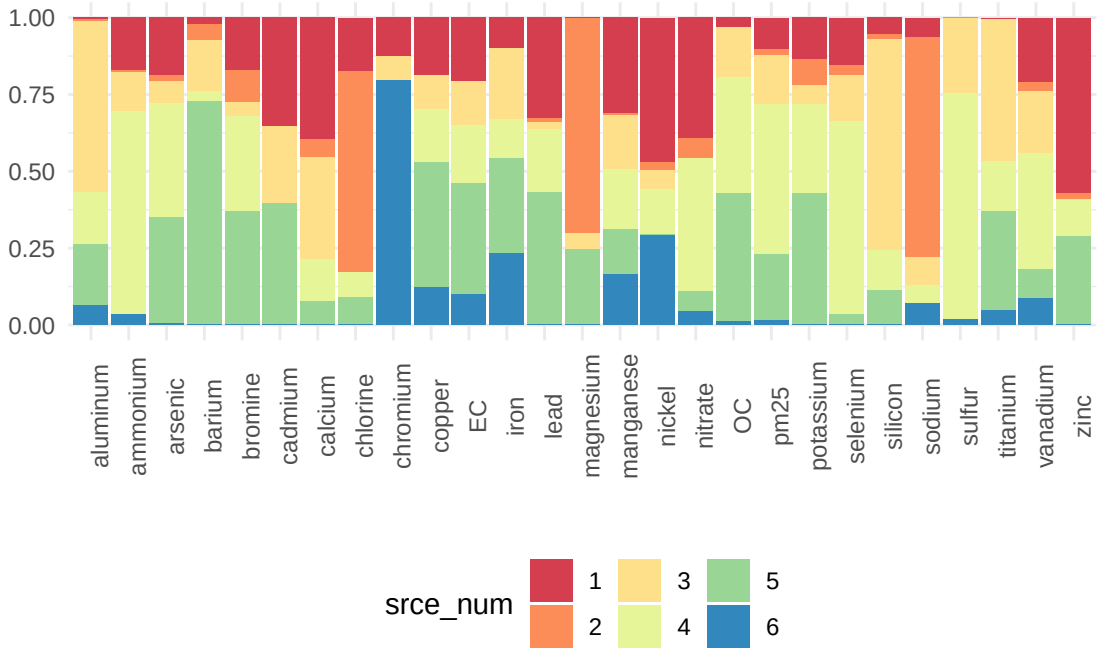
element	MeanConc	source_1	source_2	source_3	source_4	source_5	source_6	r_squared	PredConc	Pct_error
aluminum	22.18	0.13	0.20	14.69	4.47	5.33	1.68	0.44	26.51	19.51
ammonium	1120.78	205.57	9.02	153.02	799.87	-154.09	40.46	0.93	1053.86	-5.97
arsenic	0.49	0.07	0.01	0.03	0.15	0.14	0.00	0.16	0.40	-17.98
barium	1.87	0.07	0.16	0.52	0.11	2.30	-0.06	0.26	3.10	65.68
bromine	3.06	0.51	0.31	0.14	0.92	1.10	-0.32	0.38	2.66	-13.12
cadmium	1.68	0.12	-0.07	0.09	-0.07	0.13	-0.17	0.01	0.03	-98.37
calcium	51.85	16.07	2.49	13.58	5.46	3.11	0.07	0.56	40.78	-21.35
chlorine	37.07	11.45	42.81	-4.87	5.40	5.83	-2.02	0.69	58.58	58.04
chromium	2.13	0.50	-0.09	0.32	-0.46	-0.88	3.19	0.26	2.58	20.89
copper	4.55	1.07	-0.07	0.63	0.99	2.33	0.69	0.67	5.64	23.87
EC	707.73	145.70	-3.45	98.42	133.30	253.47	68.64	0.52	696.09	-1.64
iron	105.50	11.02	-0.32	24.81	13.89	33.86	25.18	0.96	108.45	2.79
lead	2.02	0.88	0.04	0.05	0.56	1.16	-0.41	0.51	2.28	13.15
magnesium	7.12	-0.81	6.30	0.47	-0.02	2.20	-0.30	0.88	7.84	10.22
manganese	2.10	0.71	0.01	0.40	0.44	0.34	0.38	0.73	2.28	8.74
nickel	4.94	2.49	0.13	0.34	0.78	-1.73	1.55	0.88	3.55	-28.14
nitrate	1613.47	608.43	101.61	0.31	670.44	103.38	66.42	0.56	1550.59	-3.90
OC	2693.20	64.84	-46.27	346.91	800.00	882.38	20.93	0.82	2068.79	-23.18
pm25	10322.11	901.08	170.76	1386.50	4257.78	1867.95	129.58	0.85	8713.65	-15.58
potassium	36.15	6.59	3.98	2.97	14.05	20.54	-4.98	0.32	43.14	19.34
selenium	0.40	0.05	0.01	0.05	0.22	0.01	-0.01	0.29	0.33	-15.71
silicon	61.01	3.59	1.09	46.19	8.85	7.53	-3.03	0.94	64.22	5.26
sodium	95.65	5.13	59.40	7.82	4.95	-8.24	5.69	0.90	74.77	-21.83
sulfur	788.05	-20.40	2.28	155.69	477.01	-10.82	10.88	0.83	614.64	-22.01
titanium	2.37	0.02	-0.02	1.23	0.44	0.86	0.12	0.48	2.65	11.89
vanadium	2.86	0.76	0.11	0.72	1.38	0.33	0.32	0.43	3.61	26.55
zinc	26.09	15.40	0.54	-1.79	3.20	7.76	-3.75	0.93	21.36	-18.14


1
2
3
4
5
6
300
0
−300
−600
Loadings
PM2.5 Constituents
aluminum
ammonium
arsenic
barium
bromine
cadmium
calcium
chlorine
chromium
copper
EC
iron
lead
magnesium
manganese
nickel
nitrate
OC
potassium
selenium
silicon
sodium
sulfur
titanium
vanadium
zinc

Source proportions



Bar graph of the above proportions



This dataset includes air pollution data from 3 monitors in NYC during the years 2007-2015, excluding the dates surrounding 4th of July (7/2-7/6) from each year.

For this experiment, we have a 6-factor solution.

Sources plus notes comparing with other studies:

1) traffic (?)

- Masiol et al. EC and OC from primaary engine dust, V, Mn, Fe, Cu from road traffic emissions
  - weekly patterns decreased on weekends
- Squizzato et al. spark-ignition and diesel: OC, EC, Mg, Al, Si, Ca, Fe, Cu, Zn, Mn

2) salt

- Masiol et al. fresh sea salt: chlorine, sodium, nitrate, sulfate, ammonium, EC, OC, Fe
  - no clear seasonal/weekly patterns, but may be higher in winter due to northeasters
  - possible crustaal particles in seawater leading to Al and Si
  - watch out for one-day high peaks due to storms

- Masiol et al. sodium, Br, OC, sulfate, nitrate
  - origin from coastal areas in southeaster US
  - less chlorine than fresh salt
- Squizzato et aal. aged sea salt: Na + Mg, suflate, nitrate, OC, EC, low Cl
- Squizzato et al. road salt: Cl + OC, EC, nitrate, sulfate, Si, Ca, Fe
- Squizzato et al. fresh sea salt: Cl + Na, Ca, Mg
- our salt is really just chlorine, sodium, and magnesium but does also include Ba, Br, Ca, Ni, nitrate, K, selenium, silicon, vanadium, zinc

3) crustal

- Masiol et al. Al, Si + some K, Ca, Mn, Fe
  - no weekly cycles, higher in spring and summer
- aluminum, silicon, titanium, sulfur, vanadium, caaadmium, calcium, manganese, iron

4) regional/seecondary

- Masiol et al. secndary ammonium sulfate: ammonium, sulfate, Br, OC, V
  - emissions of SO2 from coal-fired power plants in upper Ohio River Valley
  - biogenic and sea salt sulfate
  - highest in summer, minimum on Saturdays (may not be a true pattern)
- Masiol et al. secondary ammonium nitrate: ammonium, nitrate, Br, NO2
  - higher concentrations in winter, no weekly patterns
- Squizzato et al. secondary sulfate: sulfate, ammonium, OC, EC, selenium, vanadium, arsenic, bromine
  - decrease over the years becaause of decreased coal use. also talk about residual oil here (could be combined?)
- Squizzato et al. secondary nitrate: nitrate, ammonium, sulfate, OC, EC, higher in winter
  - reductions in NYC related to less traffic (?)
- We also have a lot of selenium, pretty high arsenic, and potassium in here (not mentioned in Masiol et al.)

5) road dust (?)

- Masiol et al. Zinc "At first glance, the factor 9 could be interpreted as road dust."
  - mostly zinc, with moderate values of nickel, calcium, copper, manganese, and potassium
  - mainly in winter
  - zinc is a tracer for lubricating oil combustion, brake and tire wear aalong with manganese, iron, and copper
  - decided this was not road dust because as particle sizes became smaller correlations increased even though mass-relevant contributions are mainly in the 1-10 range, and it was strongly correlated with SO2
  - instead thought this was a combustion source such as on-road diiesel truck traffic, ship traffic, or building heating
- Squizzato et al. road dust: Al, Si + Mg, Ca, Fe, Ti, Mn, Cu, OC, EC, sulfate, nitrate, Na, Cl

6) industrial (?)

- it doesn't look like this is in the Masiol paper
- Squizzato et al. industrial: Pb, Fe, Mn, Cu, Zn, As, Se

  - Coke production: As, Zn, Se, and Pb
  - Metal/steel: Pb, Fe, Mn, Cu, Zn
- lots of chromium, copper, EC, iron, manganese, nickel, nitrate, vanadium, aluminum, ammonium, OC

Masiol et al. Biomass Burning: K, OC, Br, EC, Ca, higher in summer Squizzato et al. biomass buring: K, OC, EC, sulfate, nitrate, Na, Al, Si, Cl, Ca, Fe, Zn, Br Masiol et al. Residual oil/domestic heating: vanadium, nickel, calcium, manganese, EC, iron, higher in winter Squizzato et al. residual oil: Ni, Mn, Zn, Ca