4/17/2018

Appendix to "Using Source Apportionment from Positive Matrix Factorization Receptor Modeling to Apportion the Carbon component of Natural and Anthropogenic Light Extinction at Class One Areas."

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Disclaimer: This work does not represent EPA policy or guidance.

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Appendix A. PMF factor chemical profiles and time series of mass attributions for each monitoring site.

Appendix B. For each monitoring site and time periods, 2000 – 2004 and 2011 – 2015, tables showing the number of days that comprise the 20% most impaired days, number of days that stay the same between the EPA draft metric and PMF methods, and the percent of days that are different between the two methods.

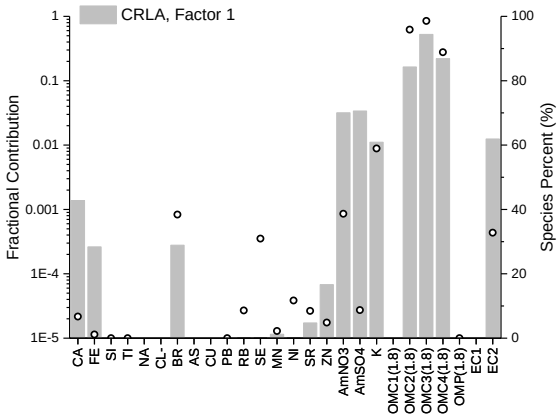
Appendix C. For each monitoring site and time periods, 2000 – 2004 and 2011 – 2015, plots showing the seasonal distribution of 20% most impaired days for the EPA draft metric and PMF methods.

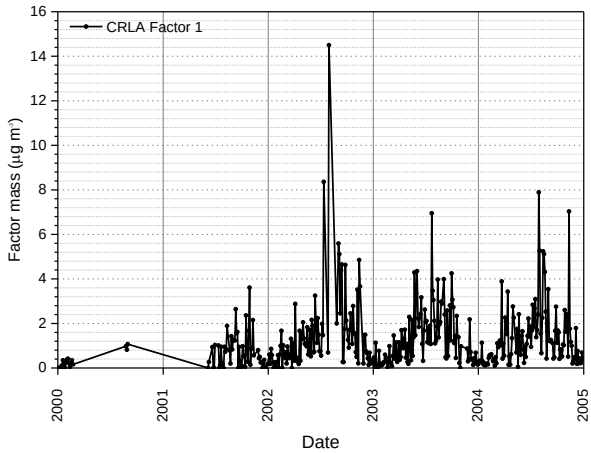
Appendix D. Tables showing the components of anthropogenic and natural light extinction on the 20% most impaired days, with days as determined by the EPA draft recommended metric but using the PMF method to apportion carbon extinction between natural and anthropogenic.

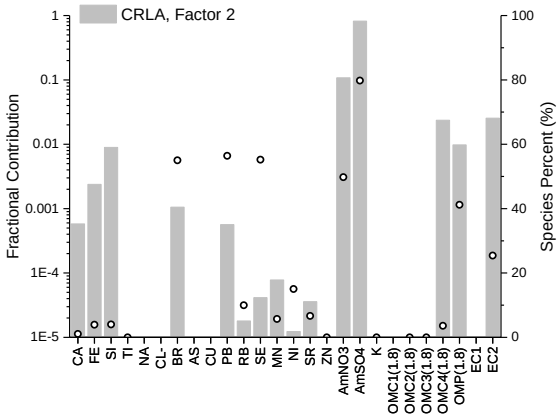
Appendix E. Plots showing the total deciviews on the 20% most impaired days, the derived natural conditions, the uniform rate of progress (URP) line, and the 2011 – 2015 20% most impaired days deciviews, for the EPA draft metric and the PMF method.

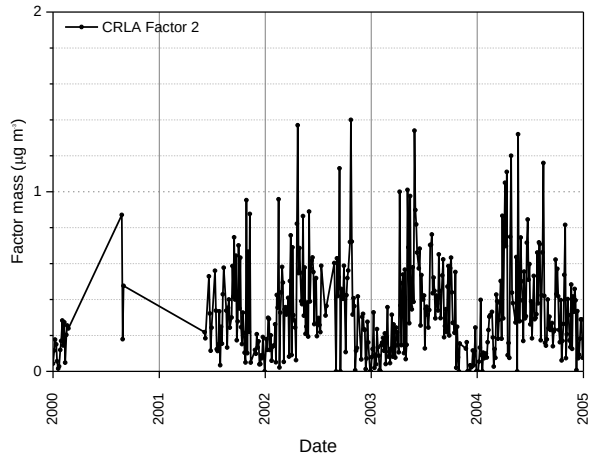
Appendix A. PMF factor chemical profiles and time series of mass attributions for each monitoring site. See main text for an explanation of what is plotted.

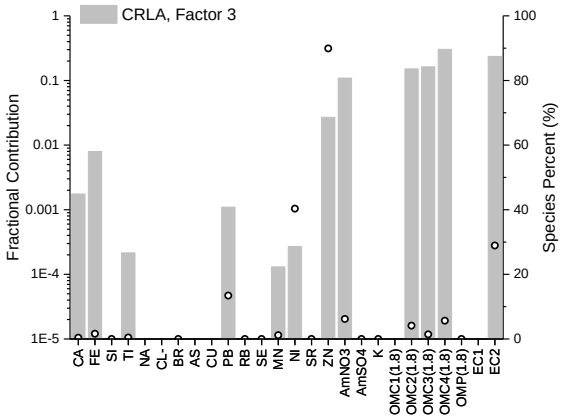
Crater Lake NP (CRLA1) Factors 1 – 3, 2000 - 2004

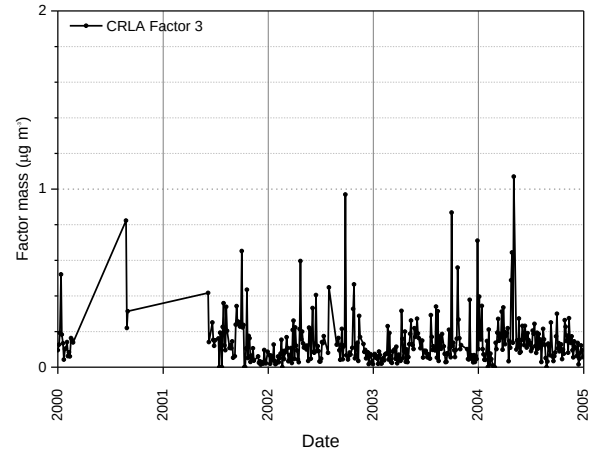












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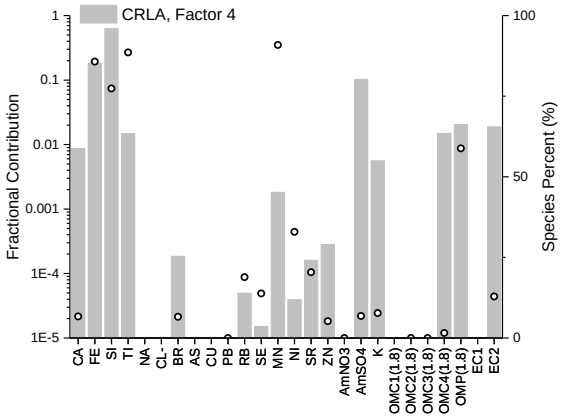

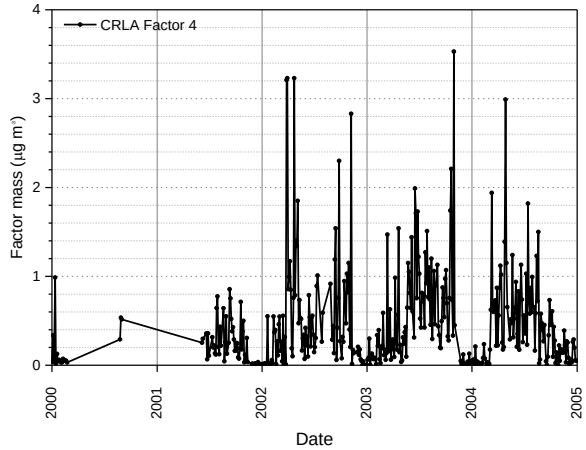

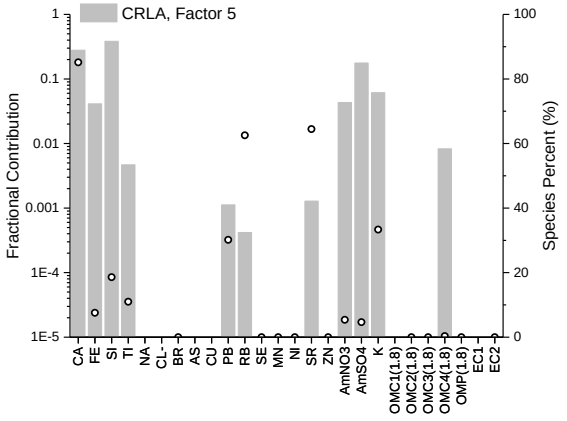

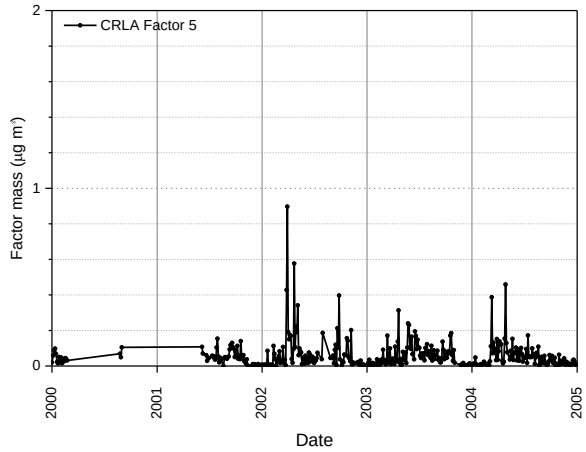

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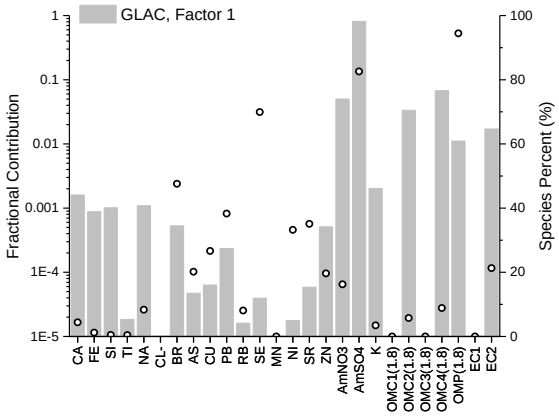

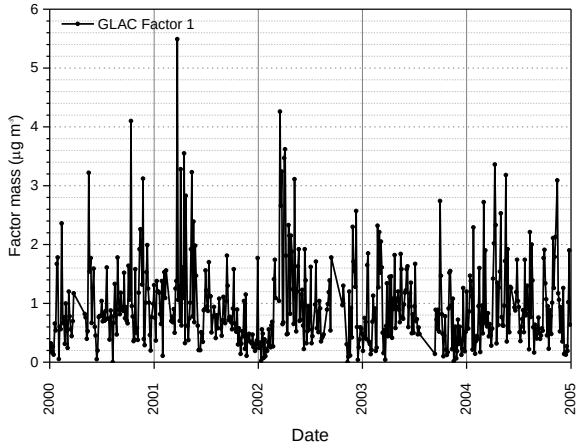

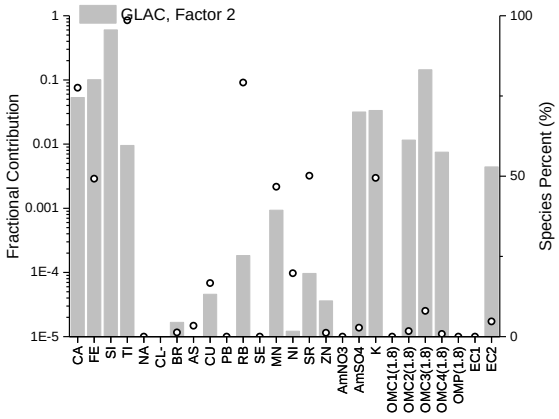

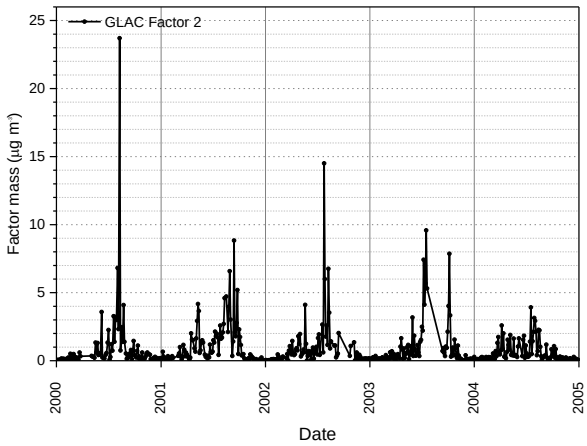

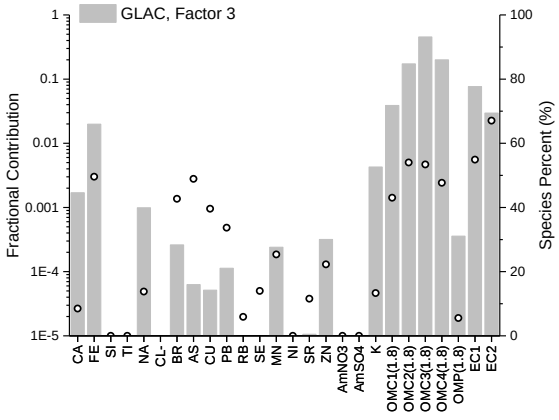

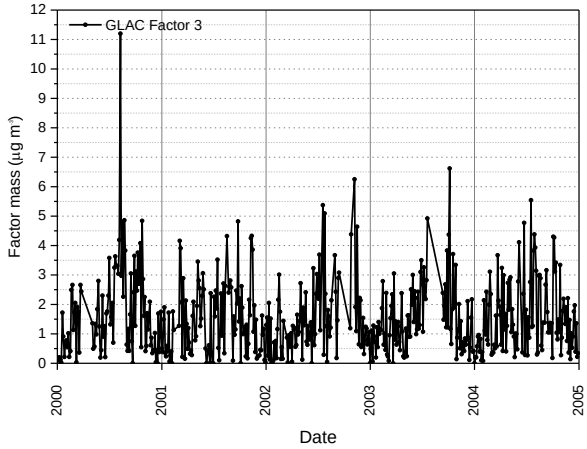

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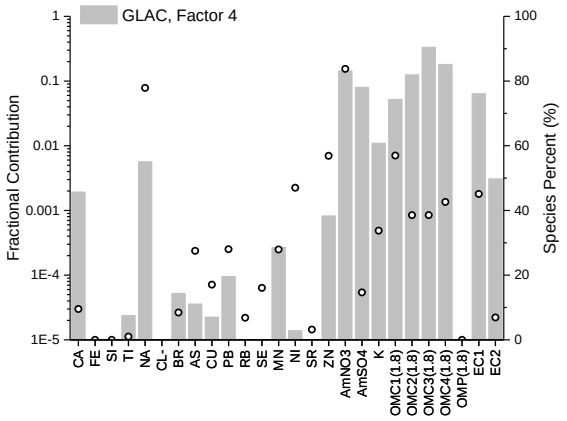
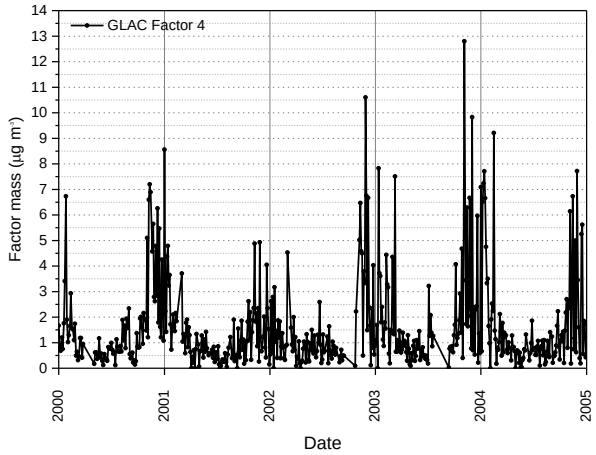
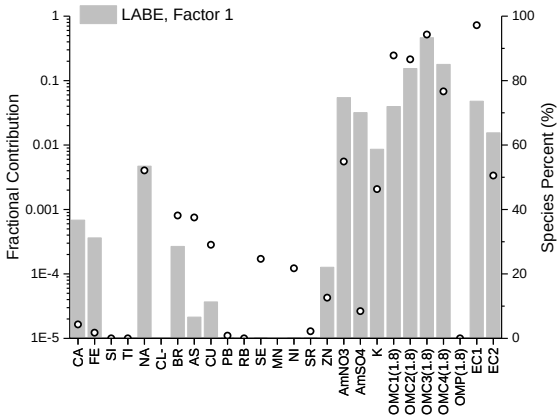
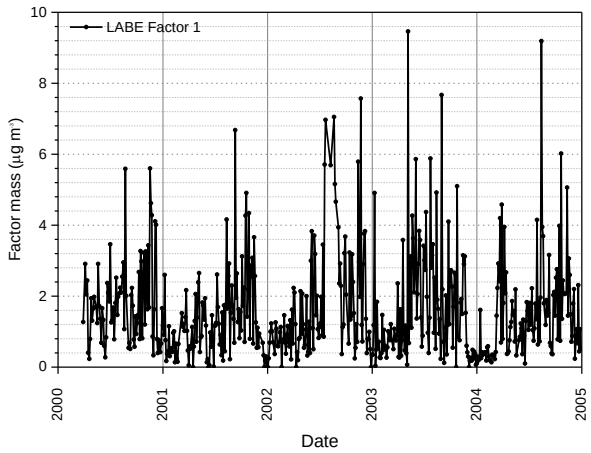
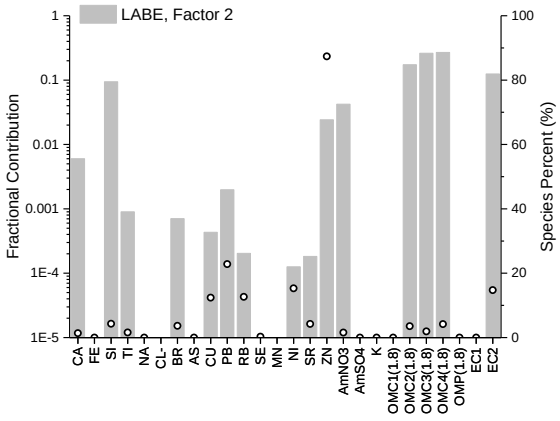


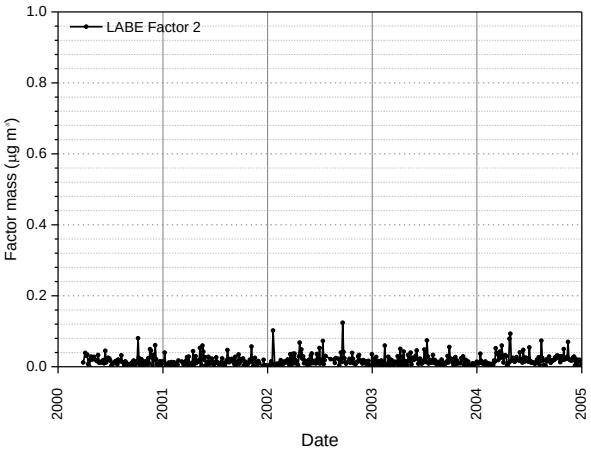


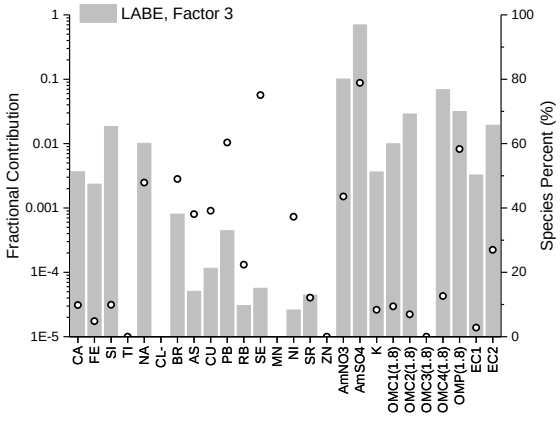
Lava Beds NM (LABE1) Factors 1 - 3, 2000 - 2004

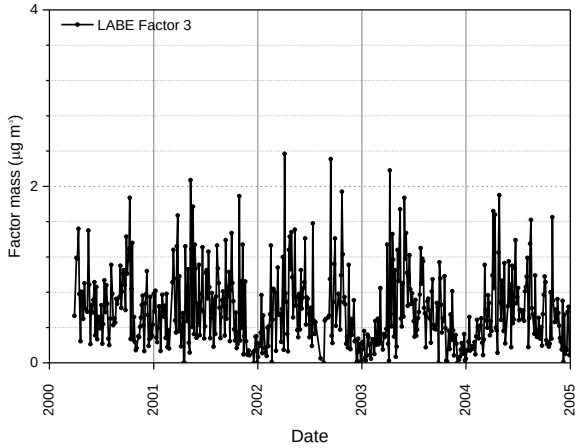












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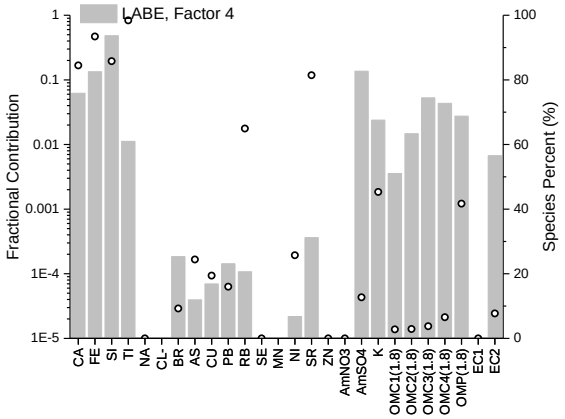
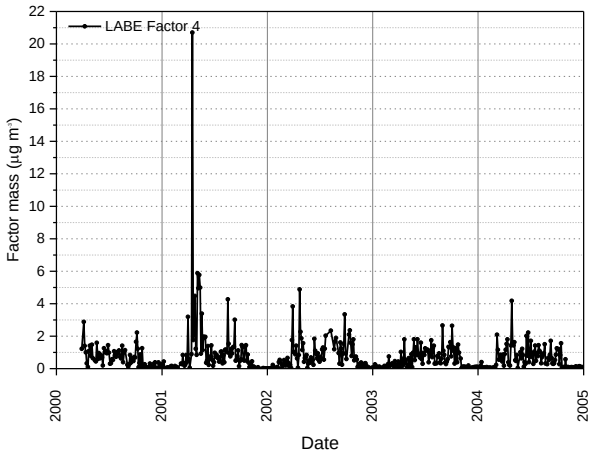
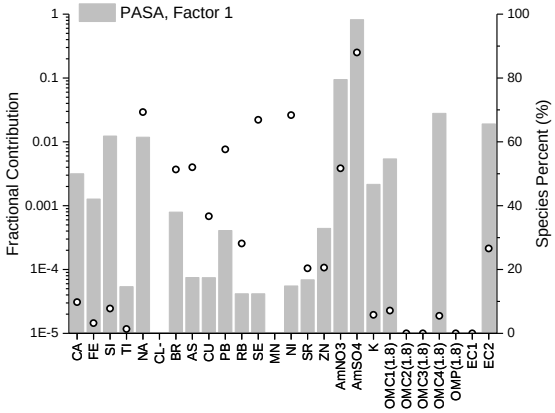
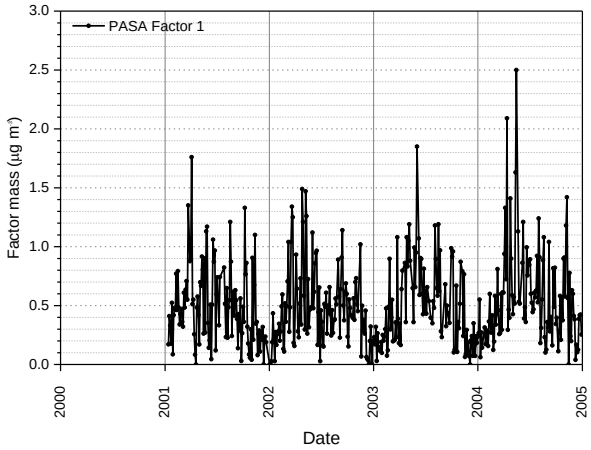
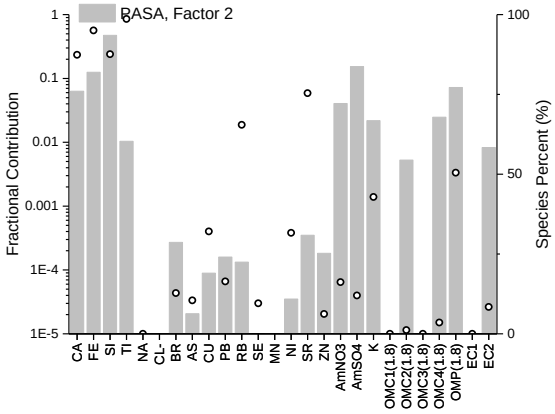


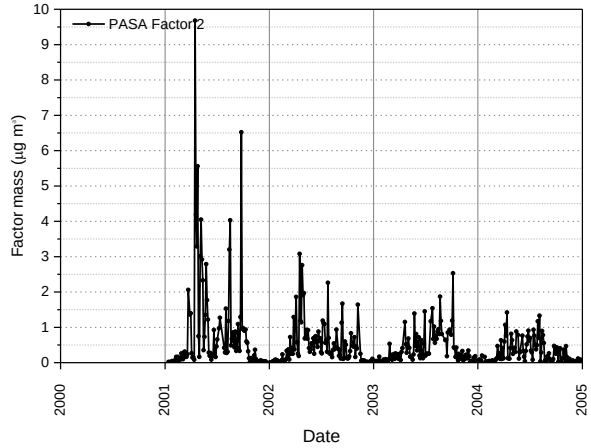


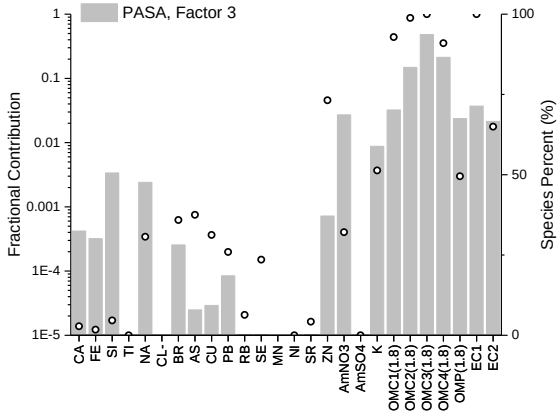
Pasayten (PASA1) Factors 1 – 3, 2000 - 2004

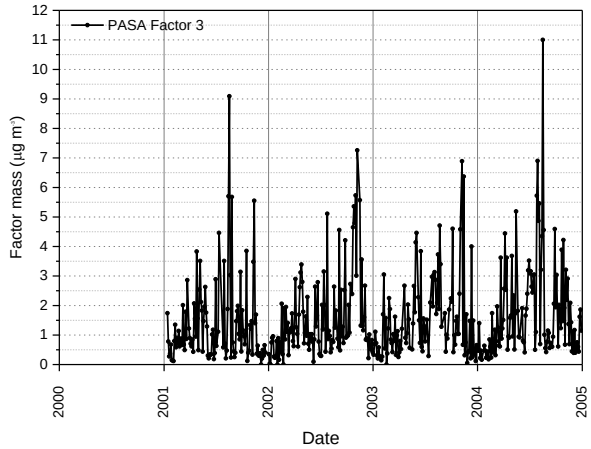




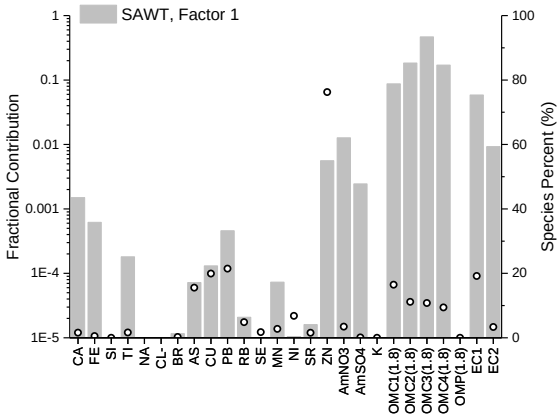


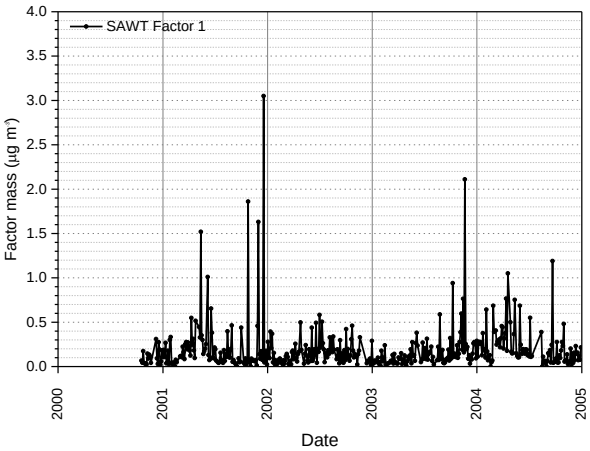


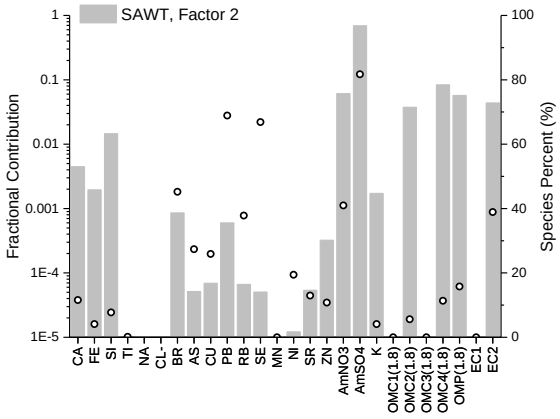


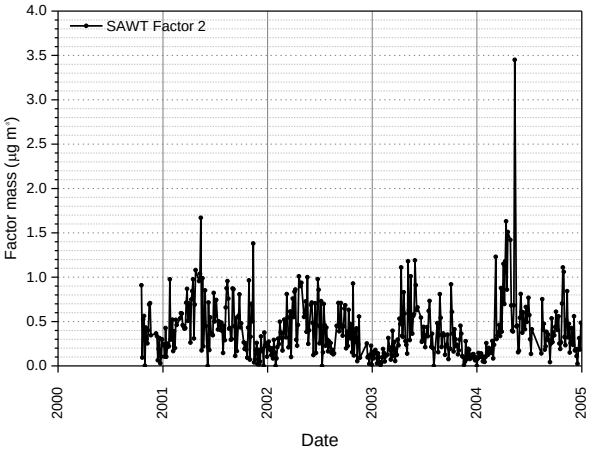


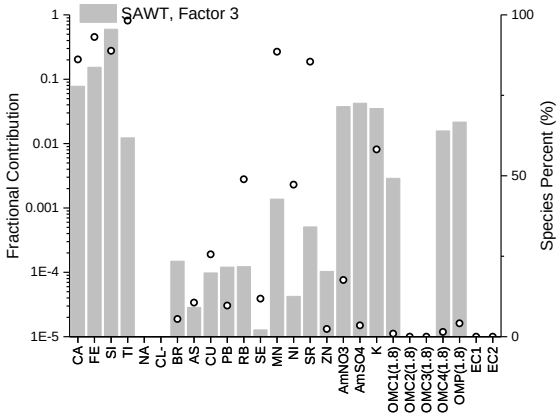
Sawtooth NF (SAWT1) Factors 1 – 3, 2000 - 2004

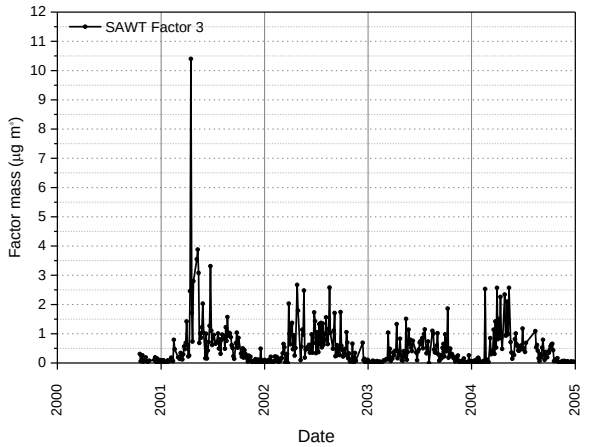












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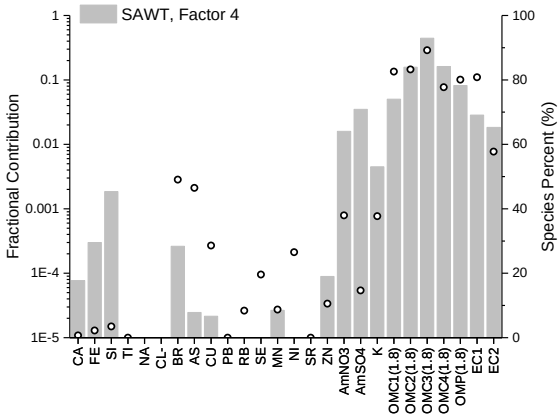
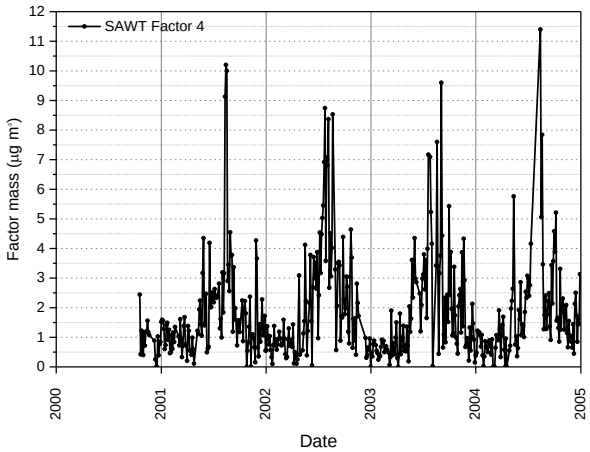
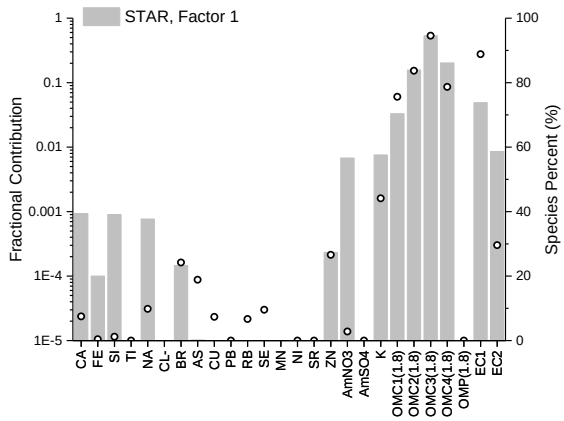
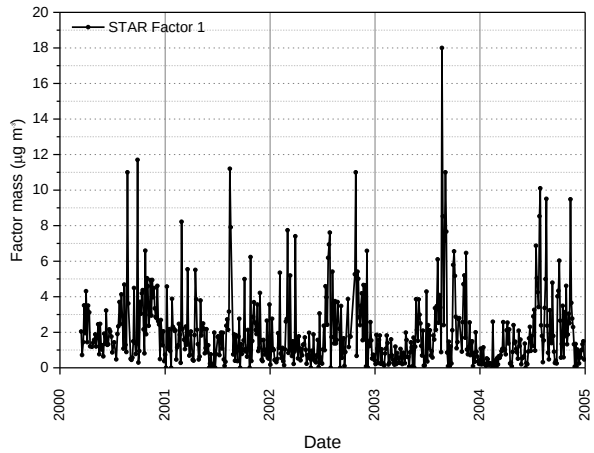
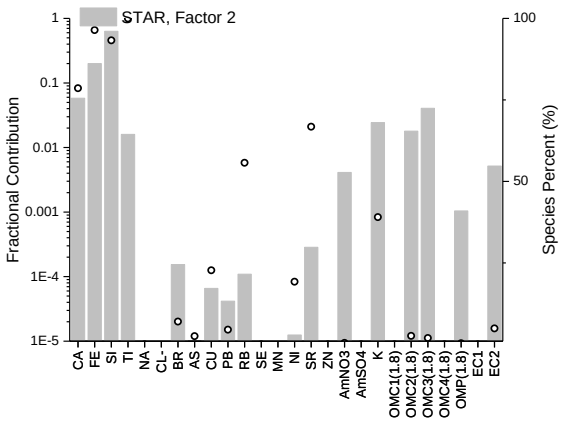


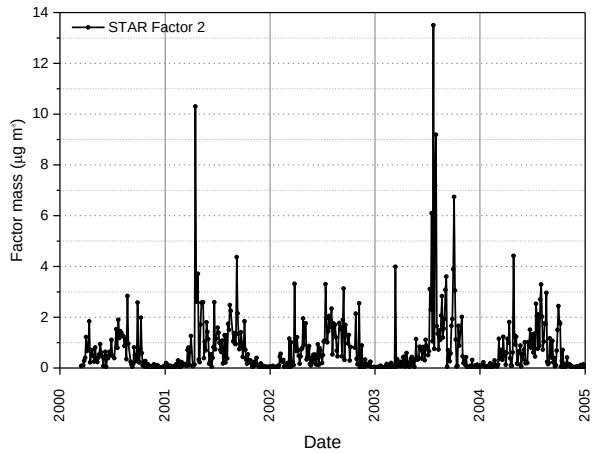


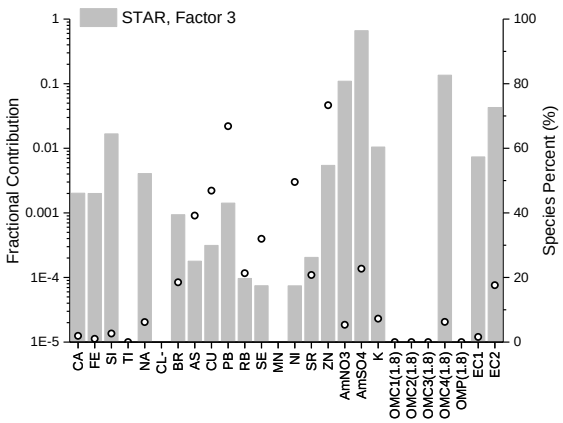
Starkey (STAR1) Factors 1 – 3, 2000 - 2004

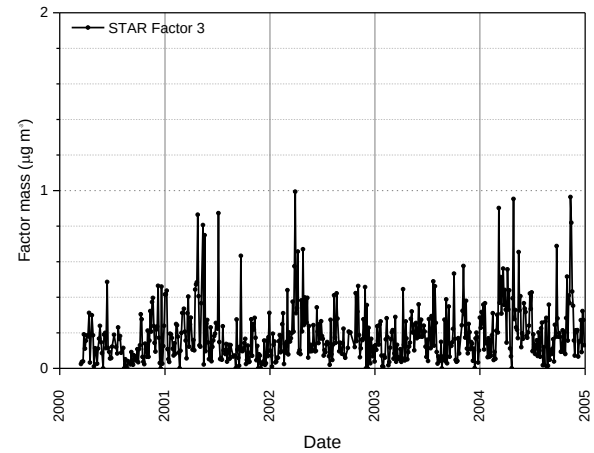












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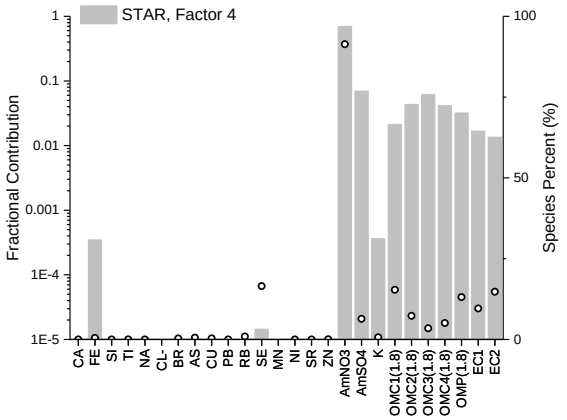

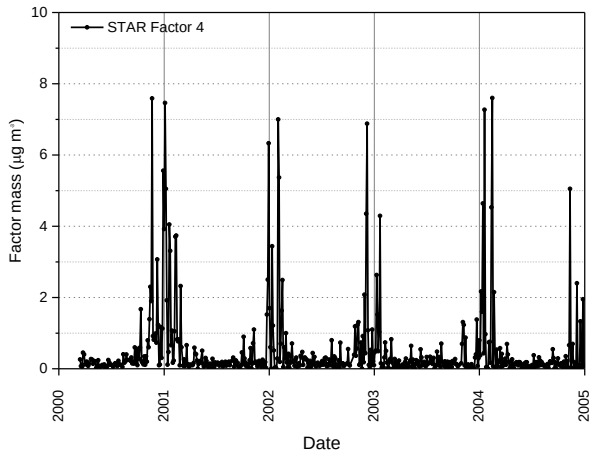

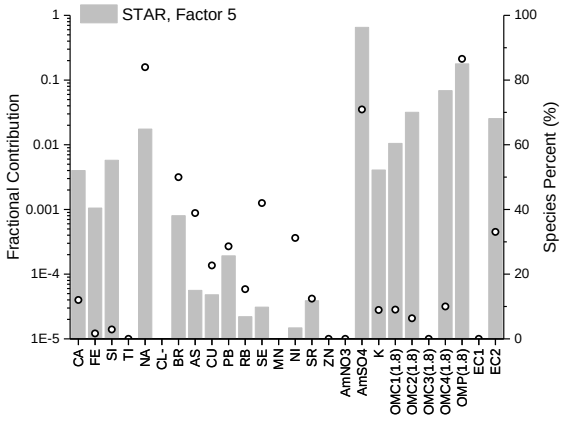

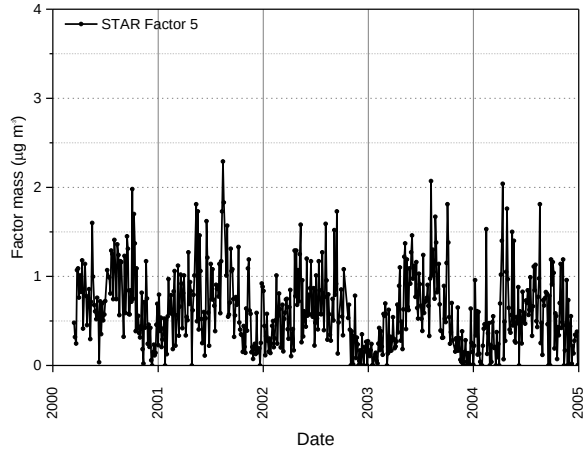

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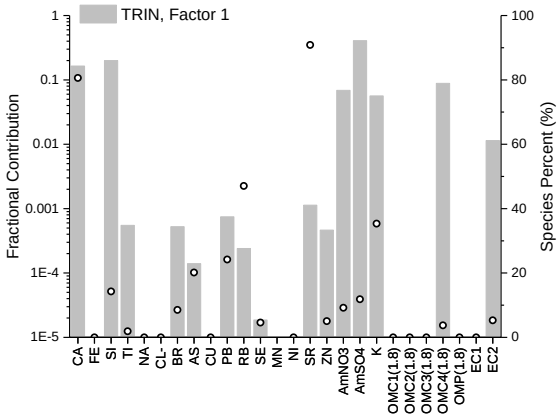

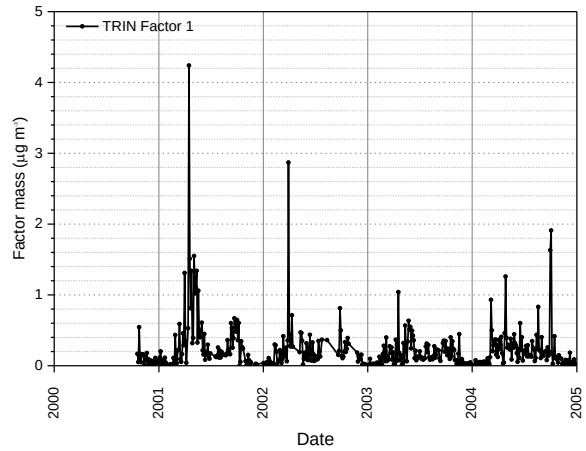

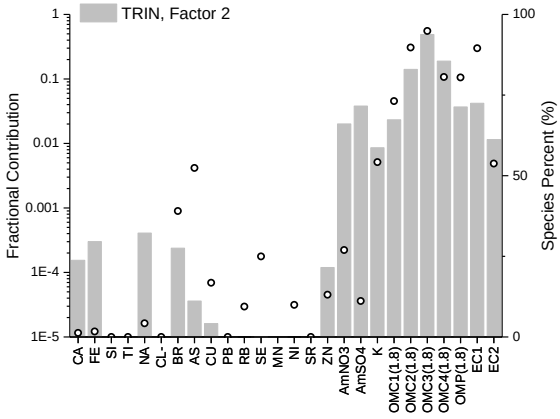

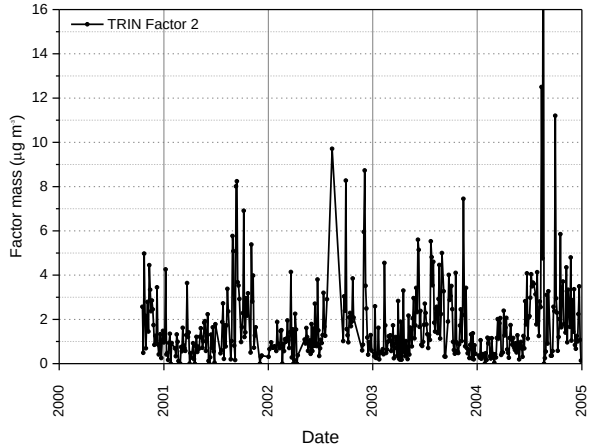

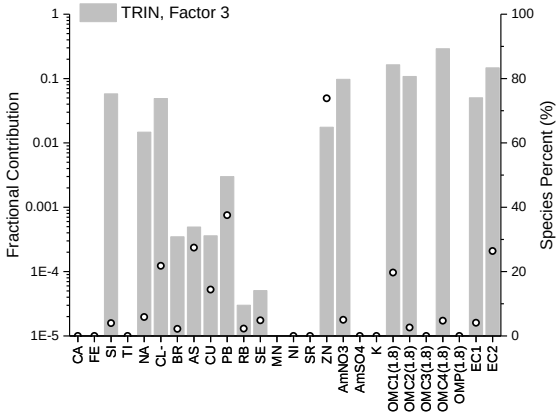

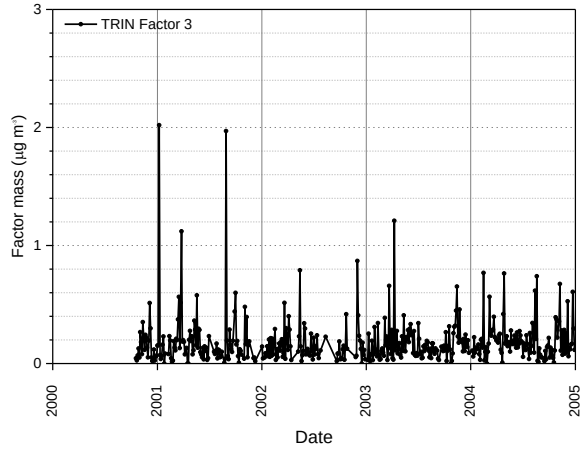

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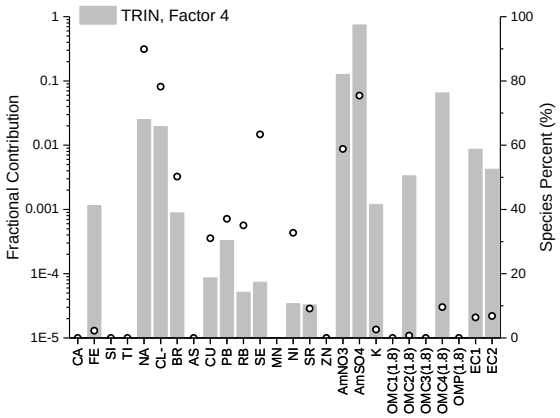
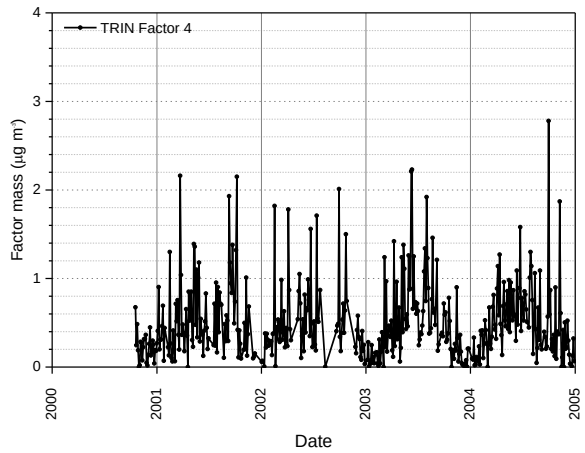
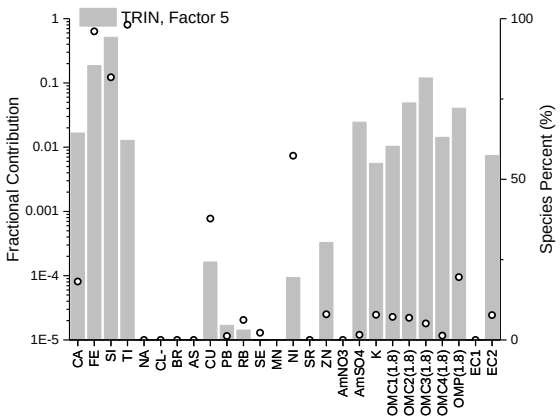
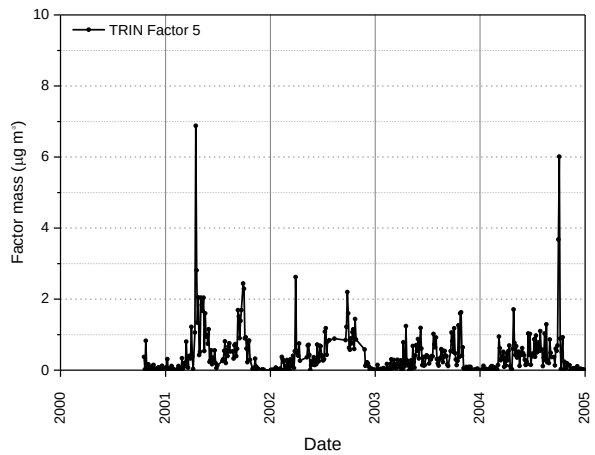
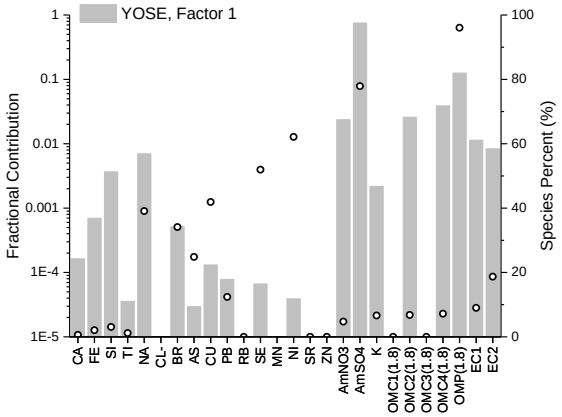


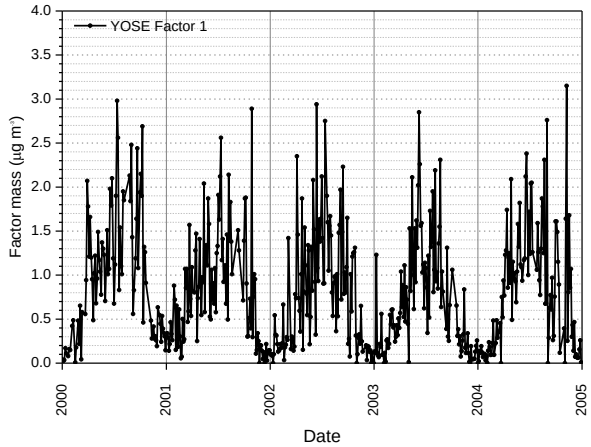


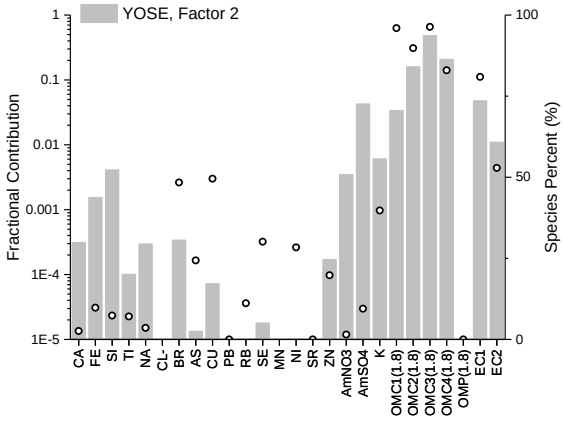


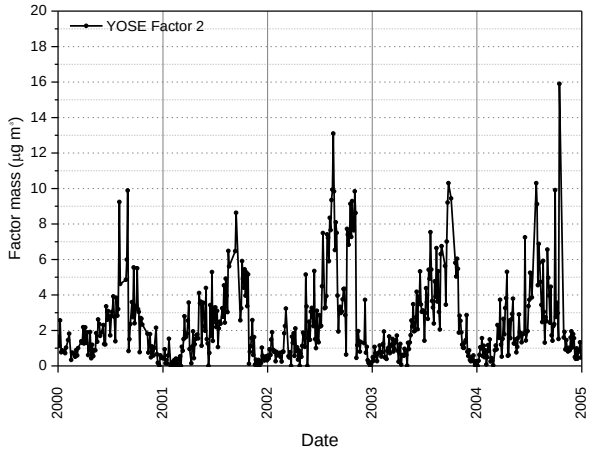


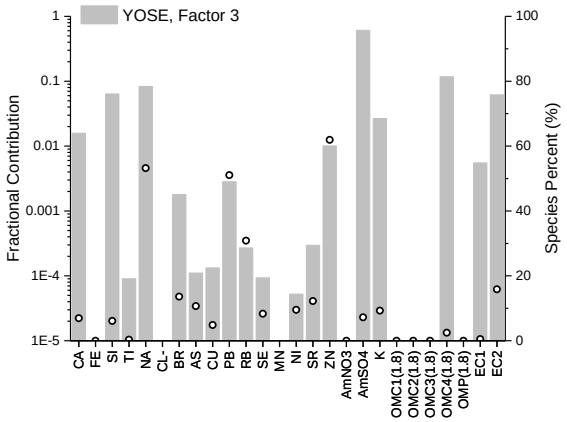
Yosemite NP (YOSE1) Factors 1 – 3, 2000 - 2004

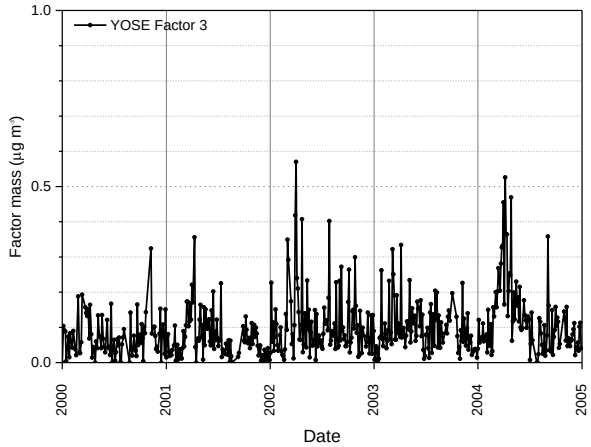




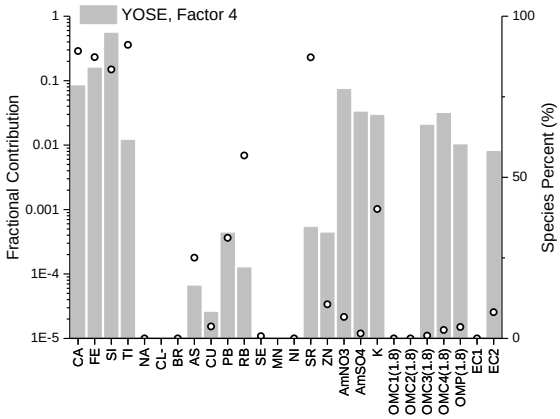


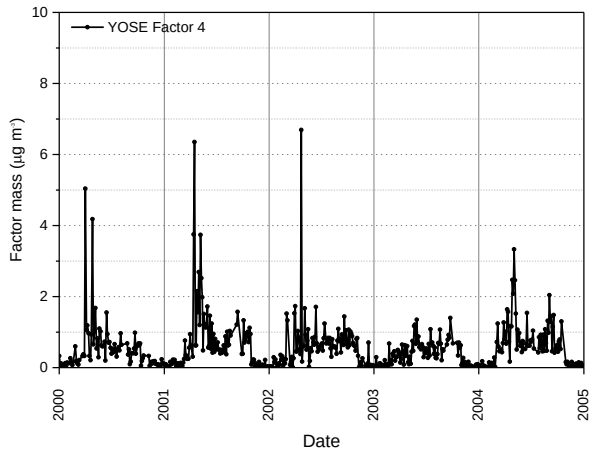


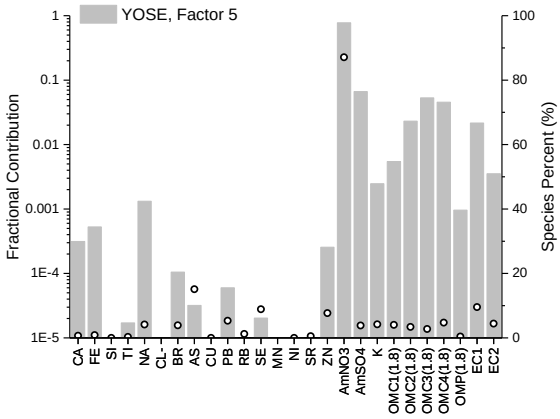


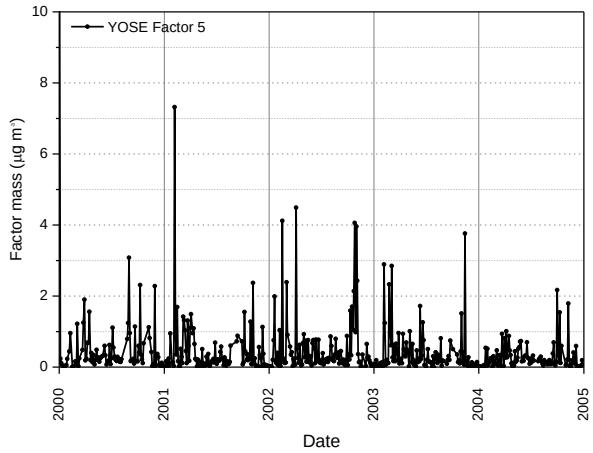


Yosemite NP (YOSE1) Factors 4 – 5, 2000 - 2004

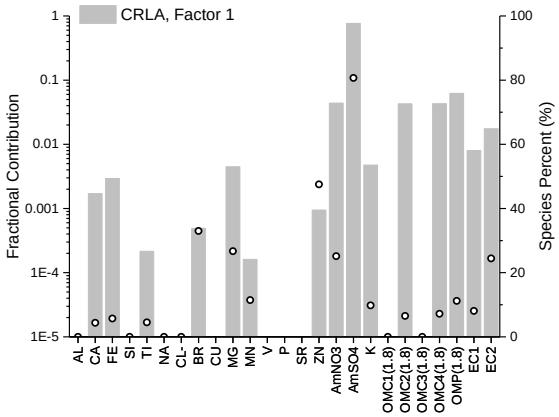


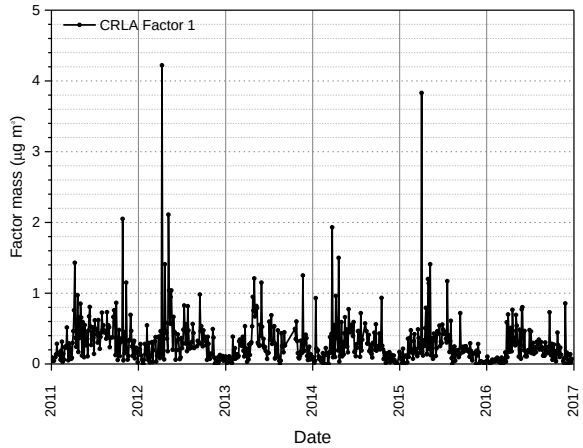


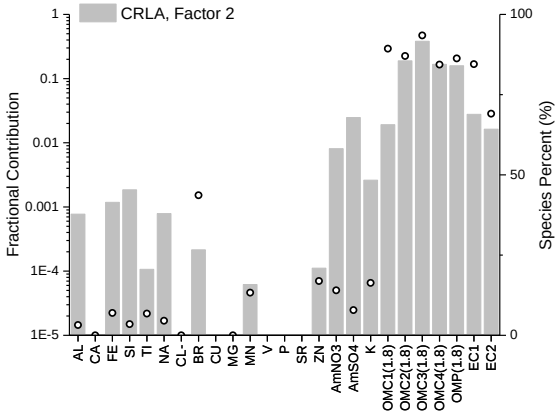


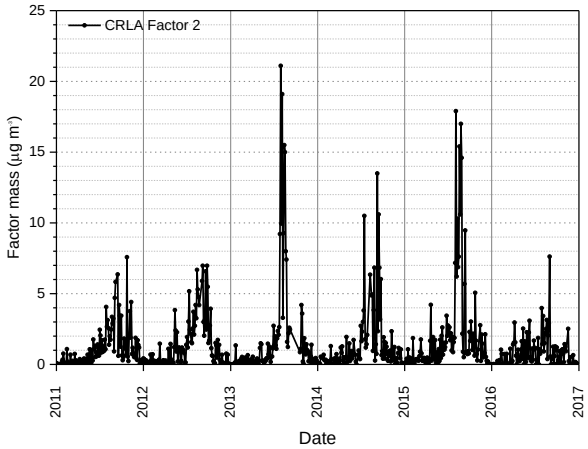


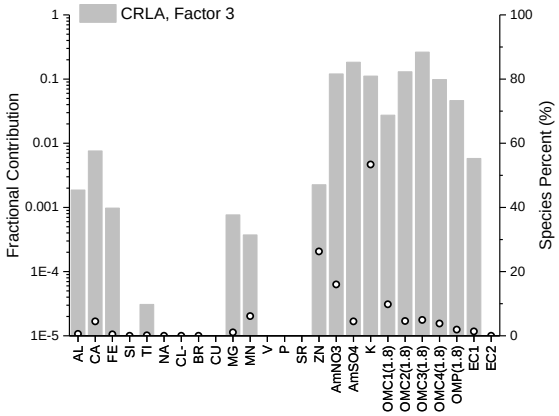
Crater Lake NP (CRLA1) Factors 1 – 3, 2011 - 2016

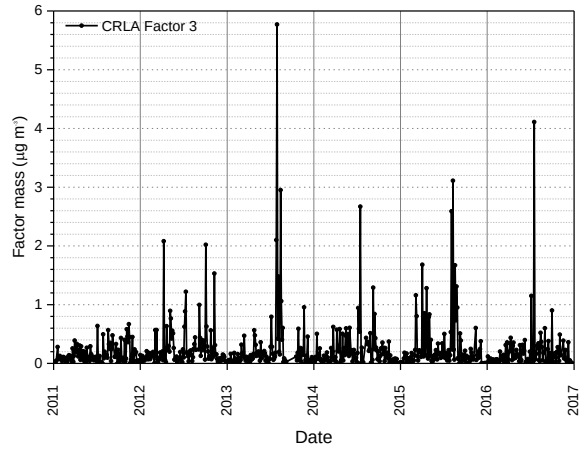




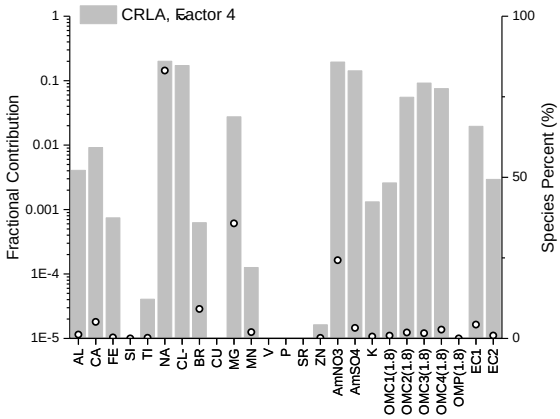


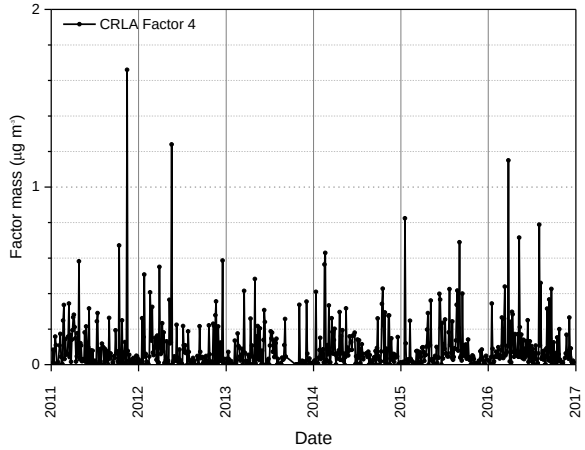


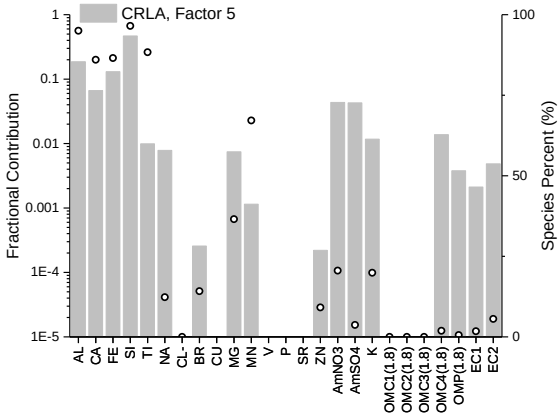


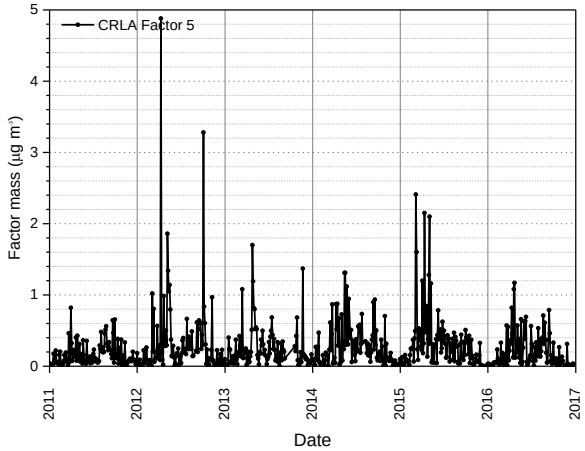


Crater Lake NP (CRLA1) Factors 4 - 5 , 2011 - 2016

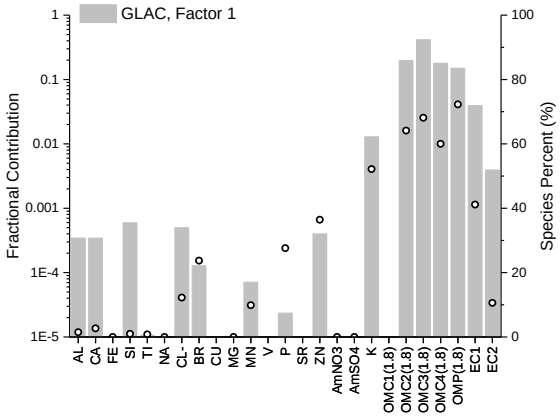


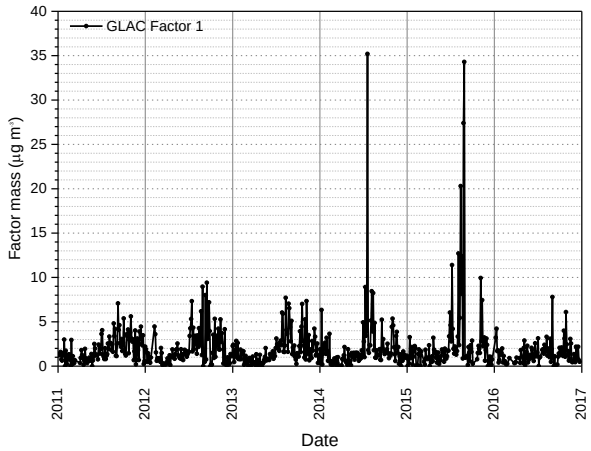


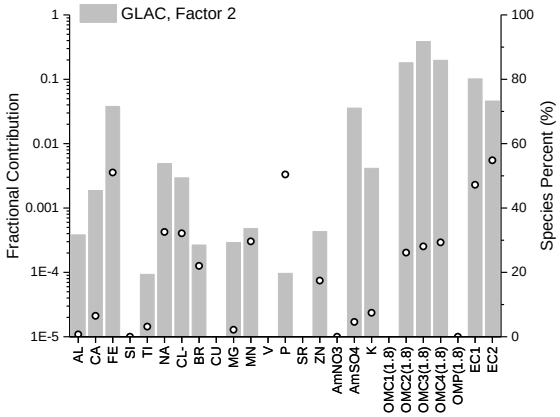


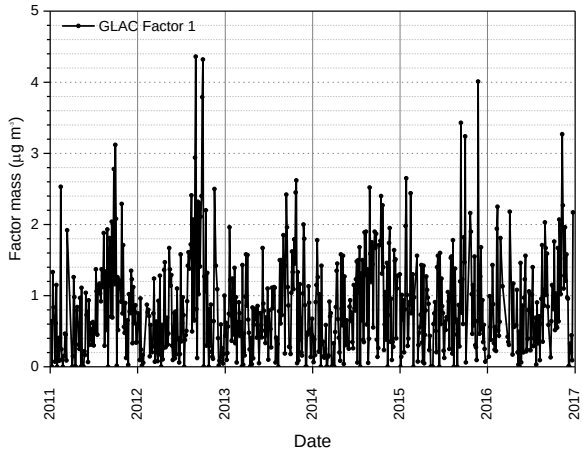


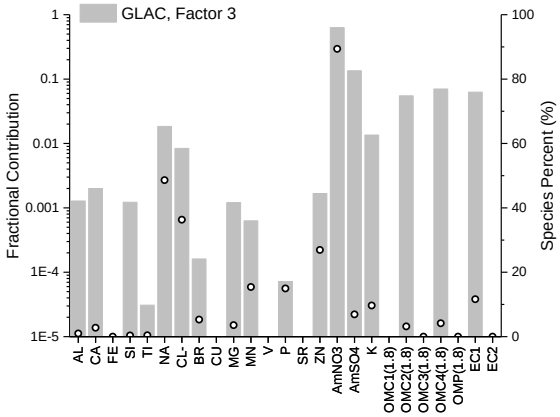
Glacier NP (GLAC1) Factors 1 - 3, 2011 - 2016

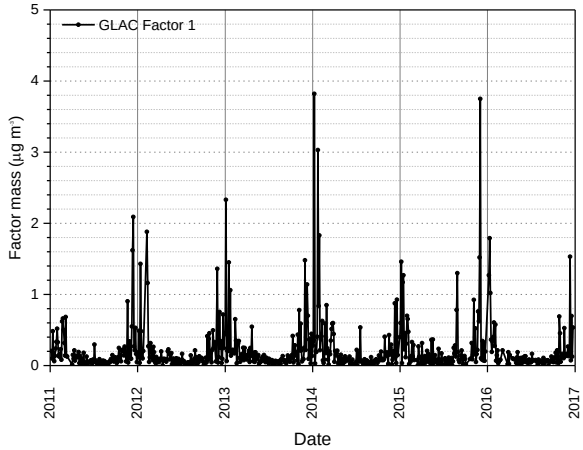




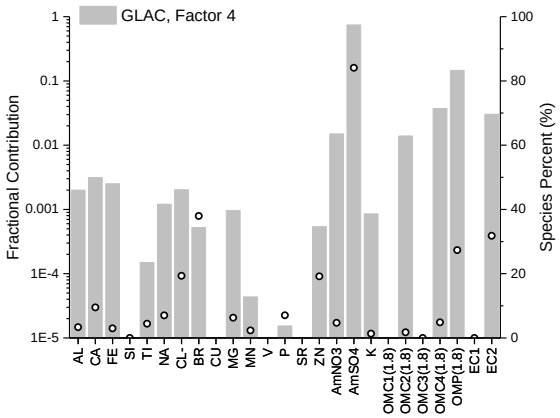


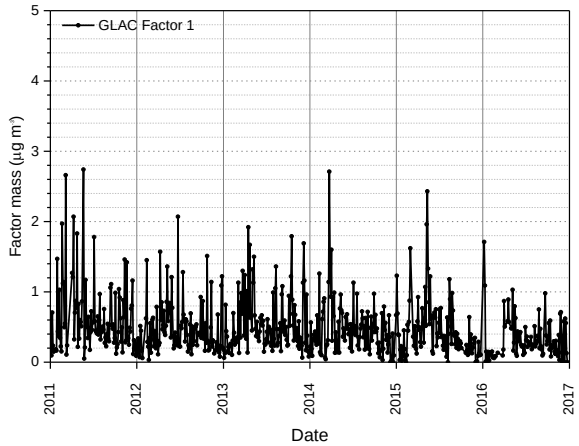


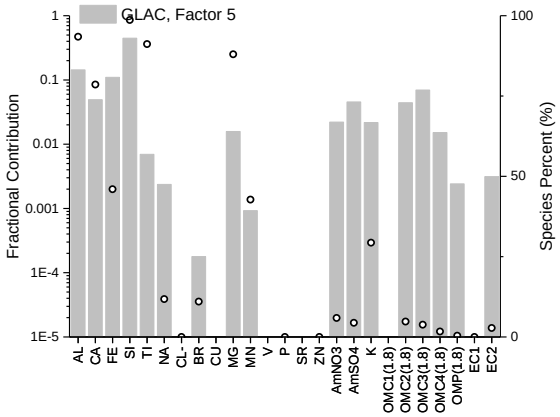


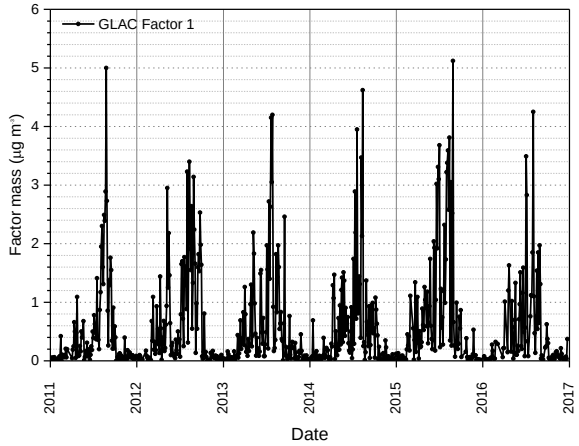


Glacier NP (GLAC1) Factors 4 – 5, 2011 - 2016

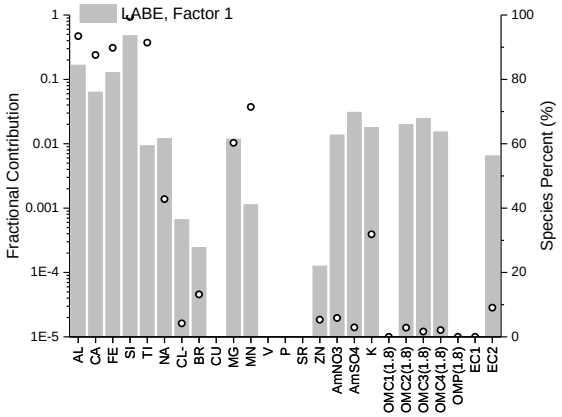


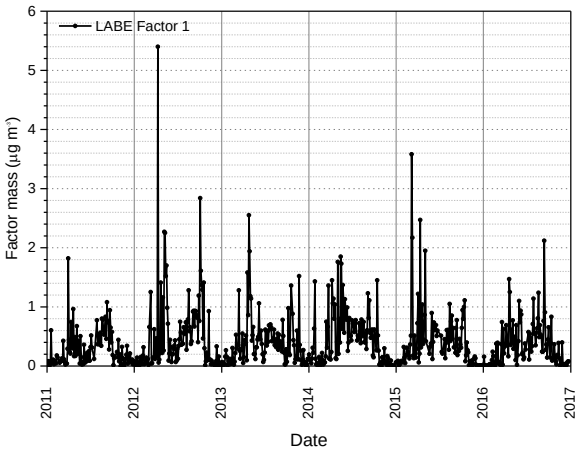


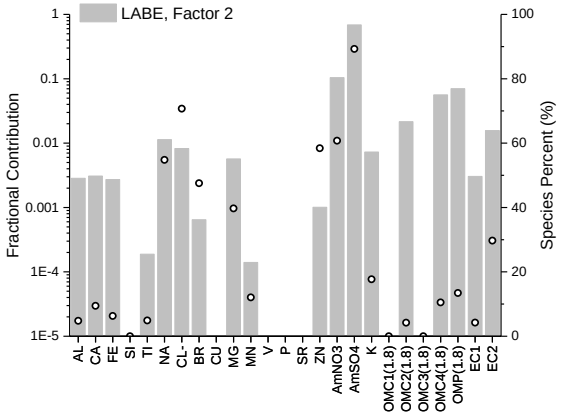


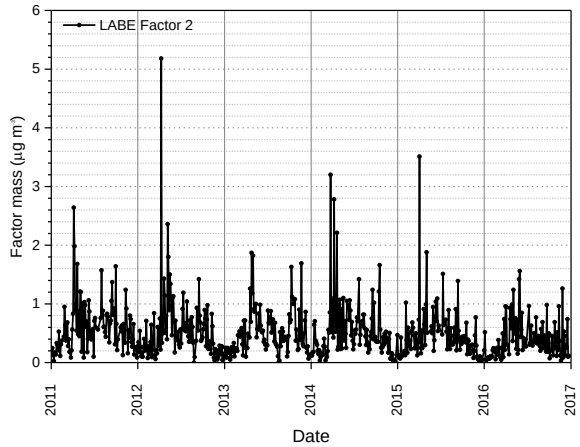


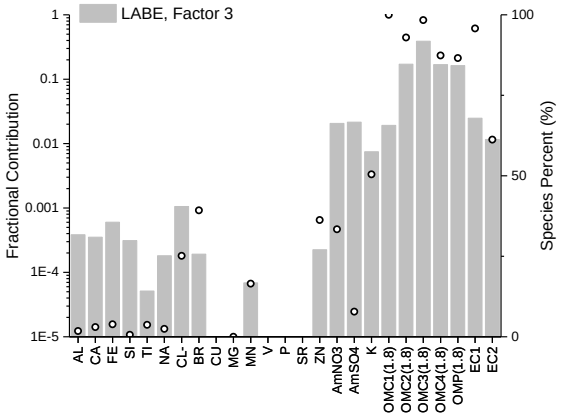
Lava Beds NM (LABE1) Factors 1 - 3, 2011 - 2016

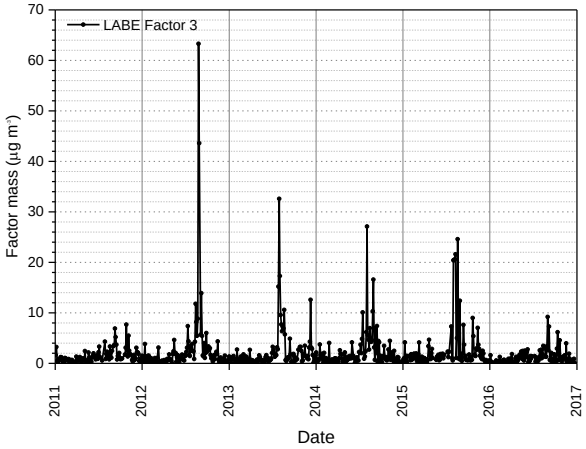




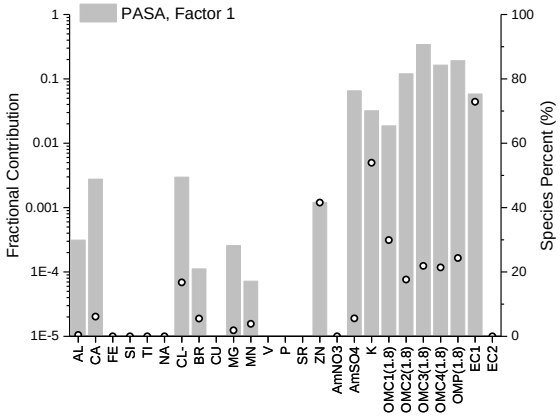


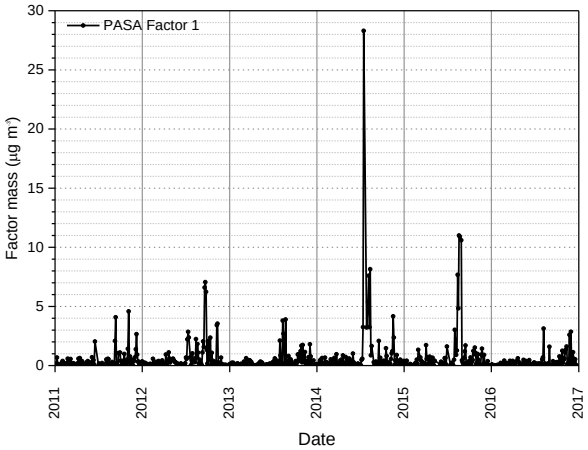


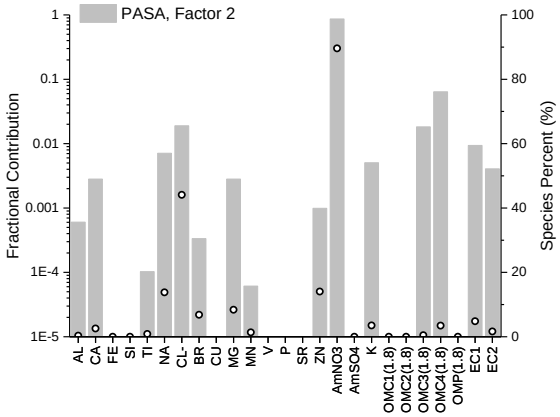


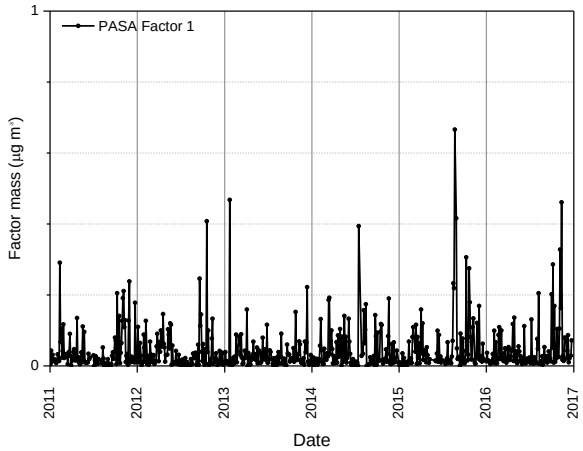


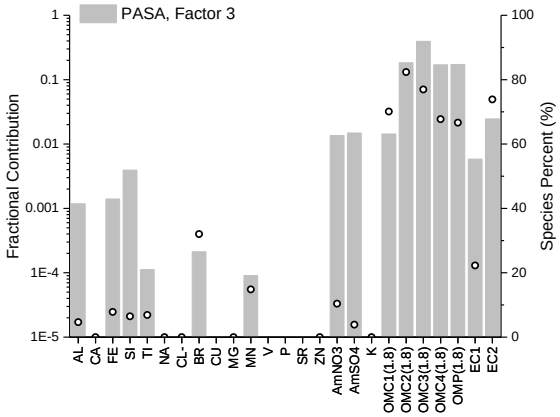
Pasayten (PASA1) Factors 1 – 3, 2011 - 2016

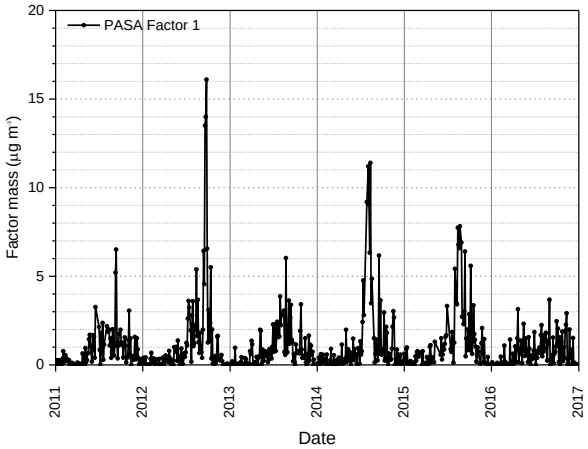




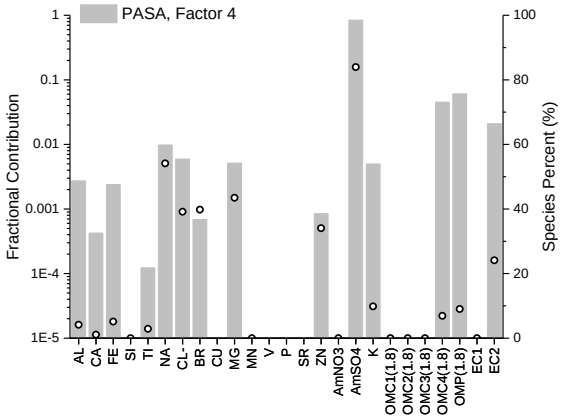


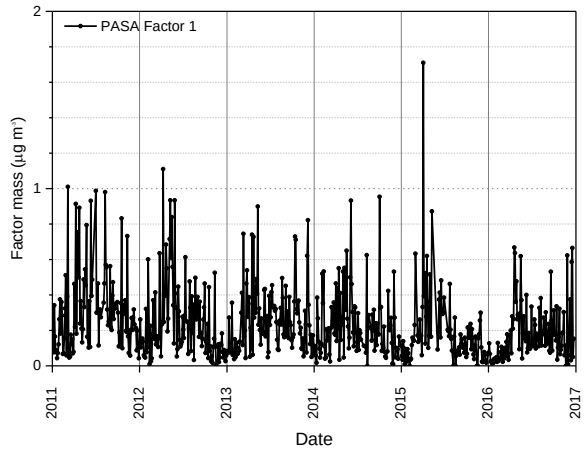


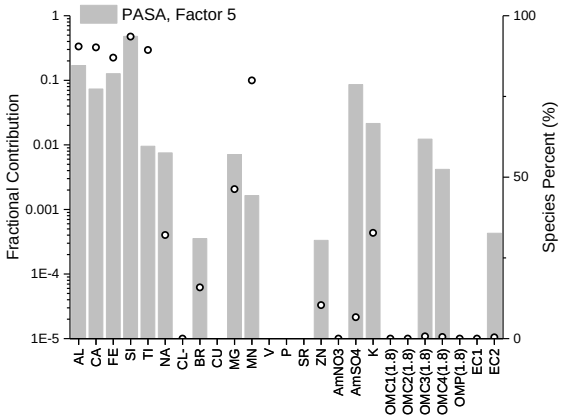


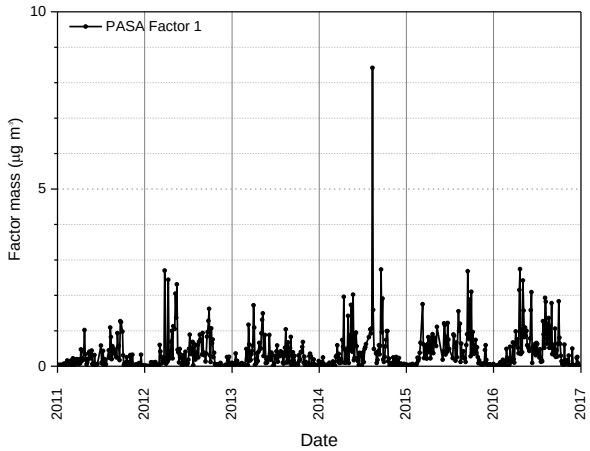


Pasayten (PASA1) Factors 4 – 5, 2011 - 2016

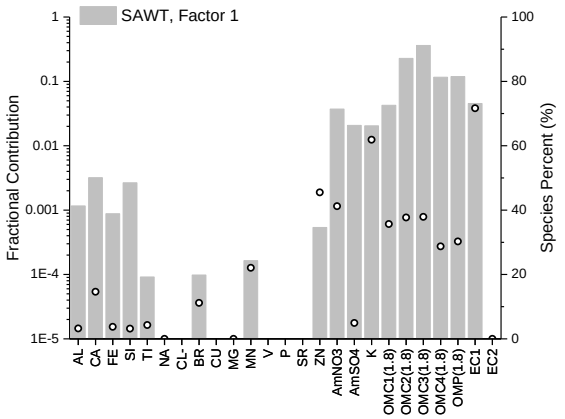


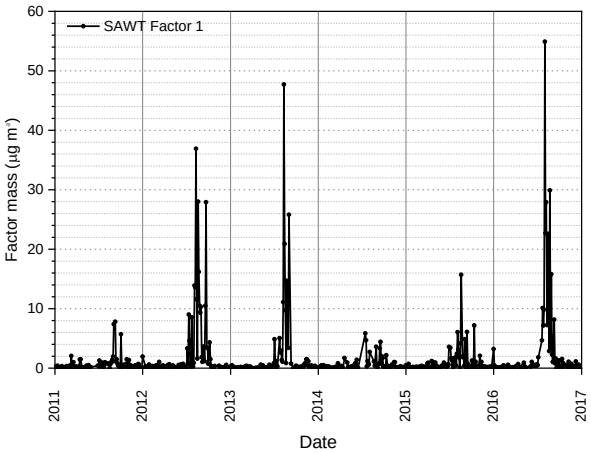


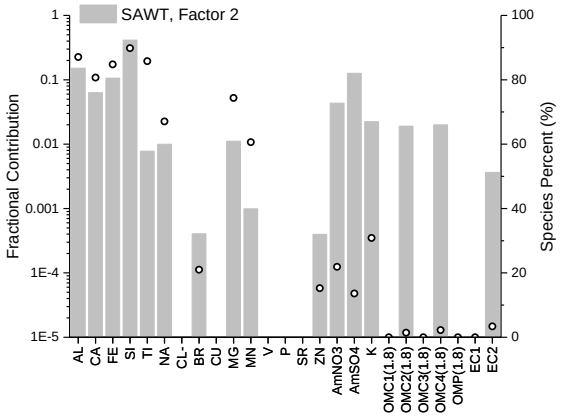


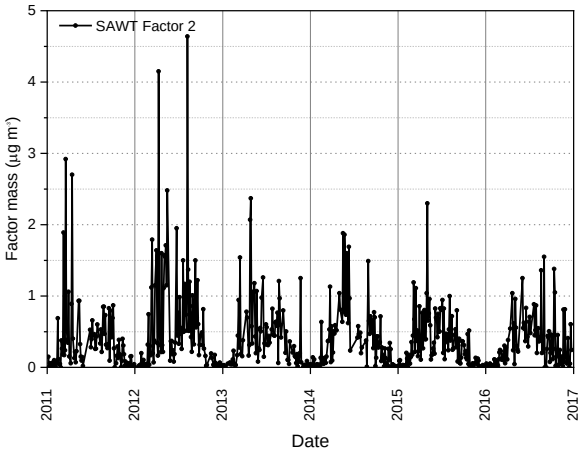


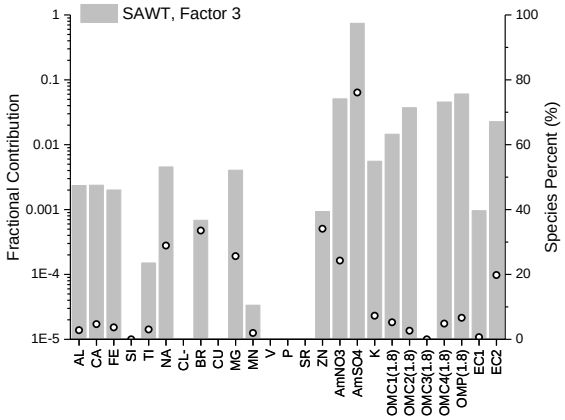
Sawtooth NF (SAWT1) Factors 1 – 3, 2011 - 2016

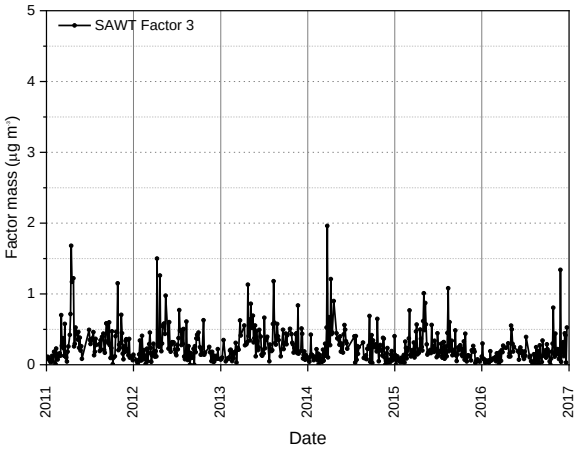




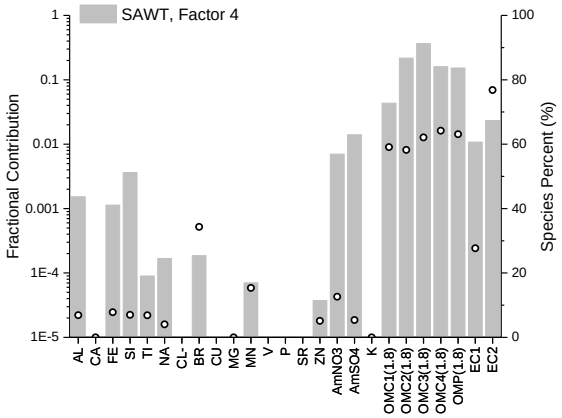


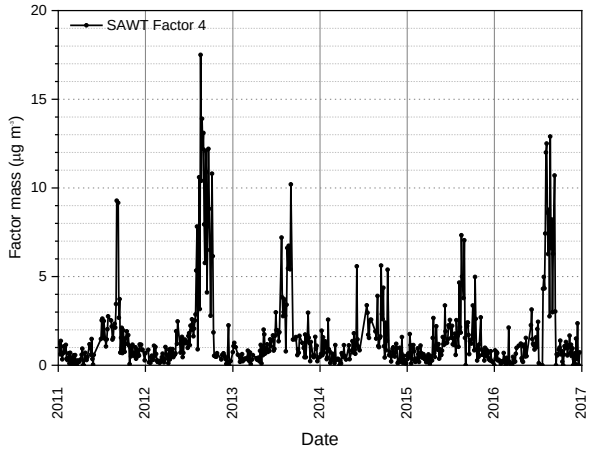




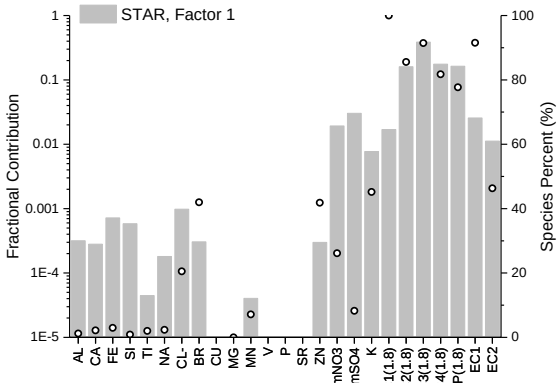


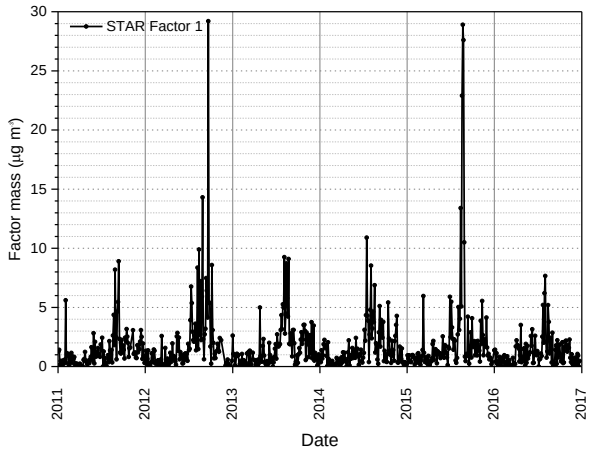
Sawtooth NF (SAWT1) Factor 4, 2011 - 2016

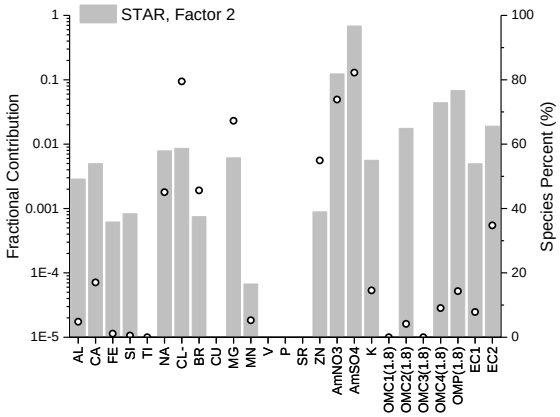


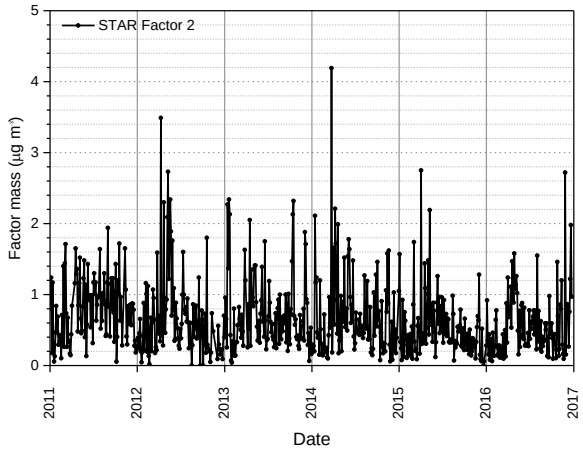


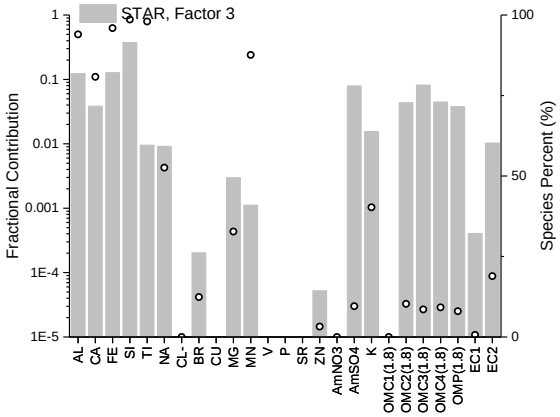
Starkey (STAR1) Factors 1 – 3, 2011 - 2016

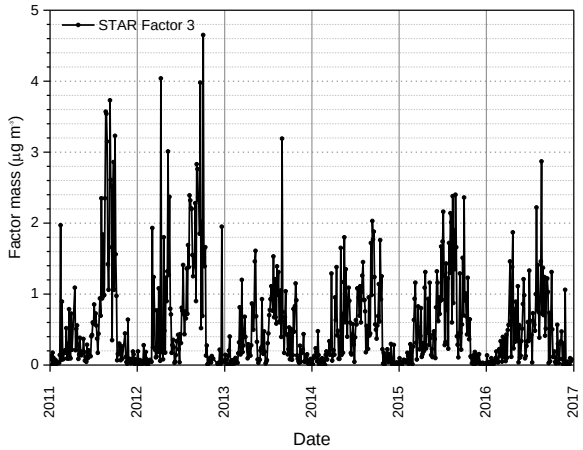




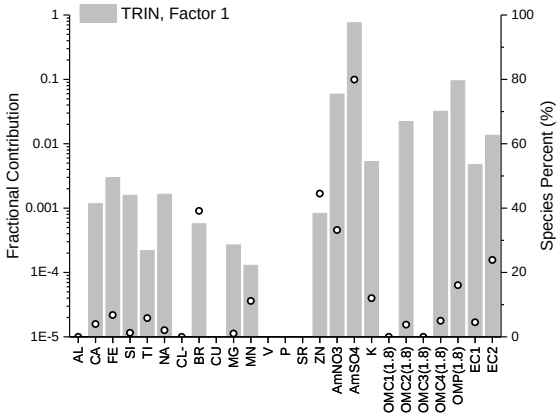


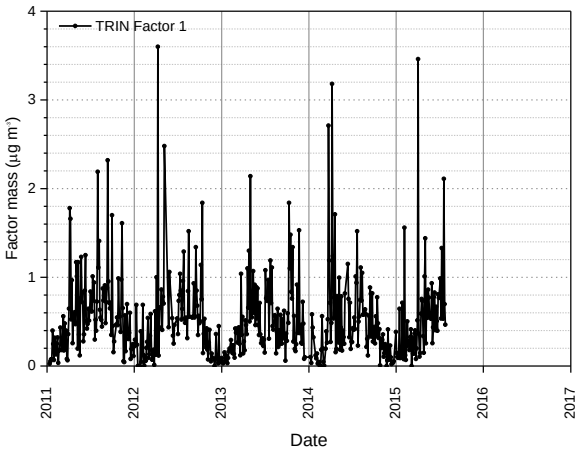


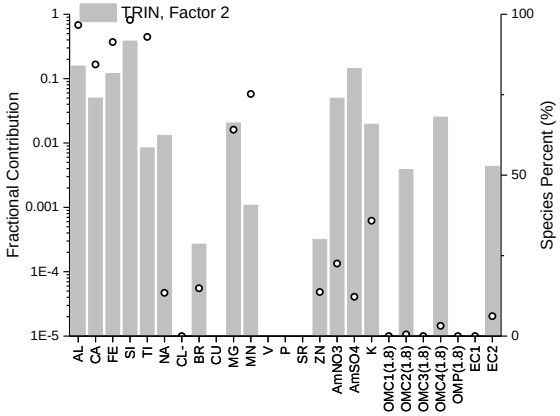


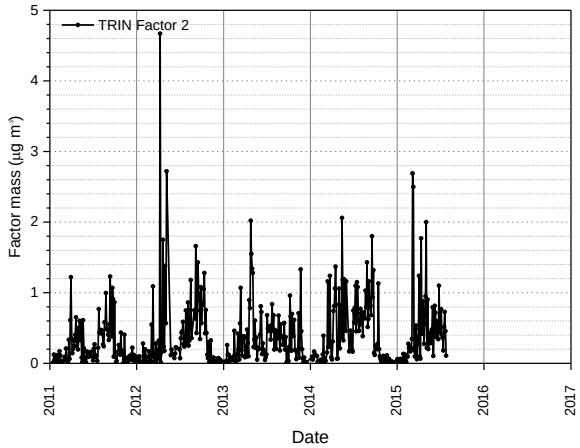


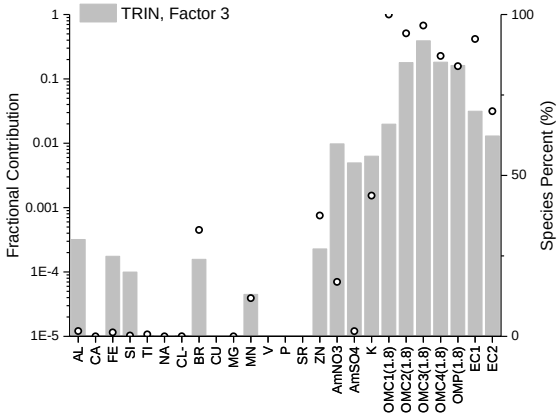
Trinity (TRIN1) Factors 1 – 3, 2011 - 2016

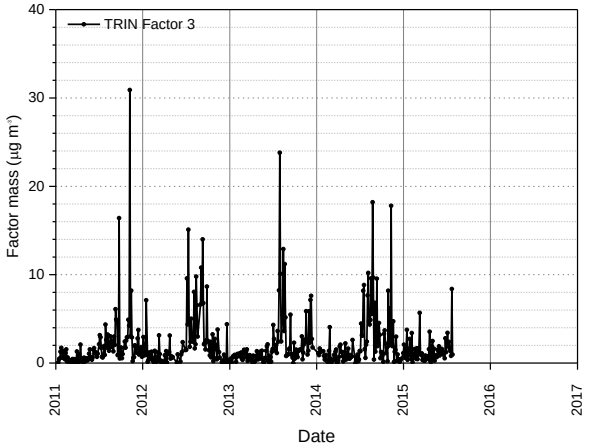




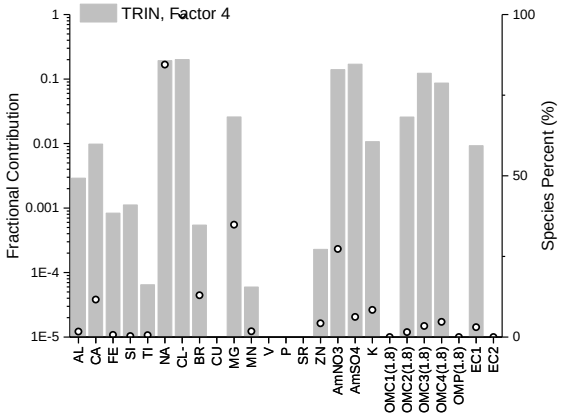


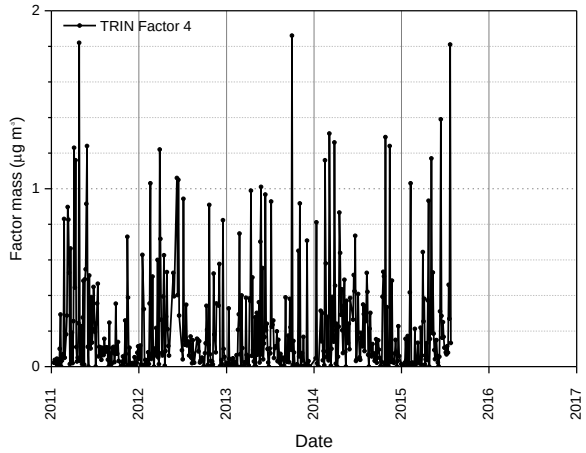




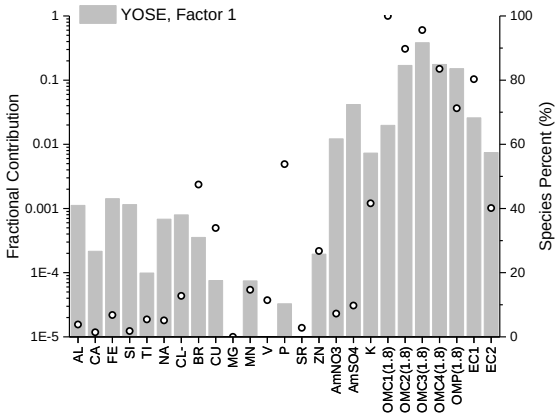


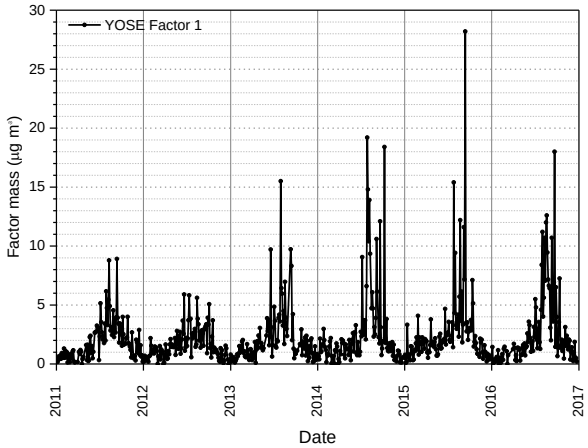
Trinity (TRIN1) Factor 4, 2011 - 2016

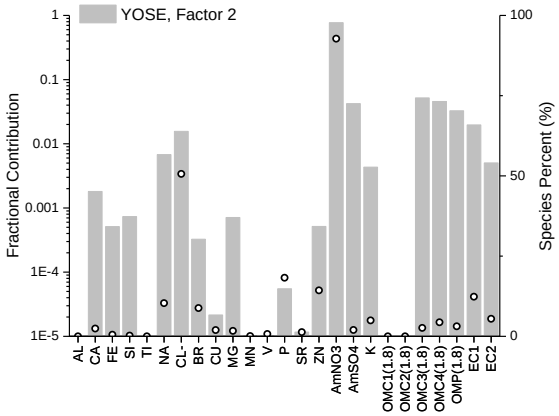


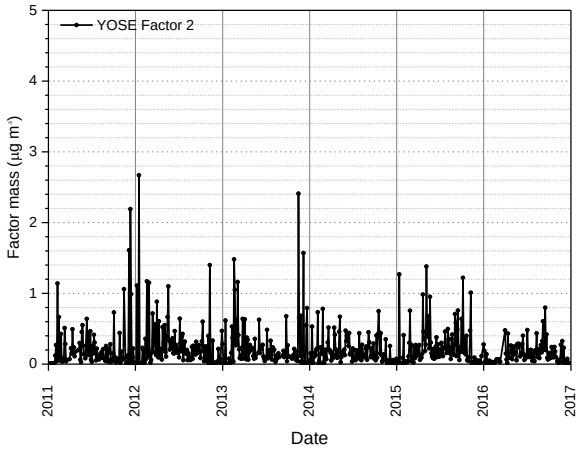


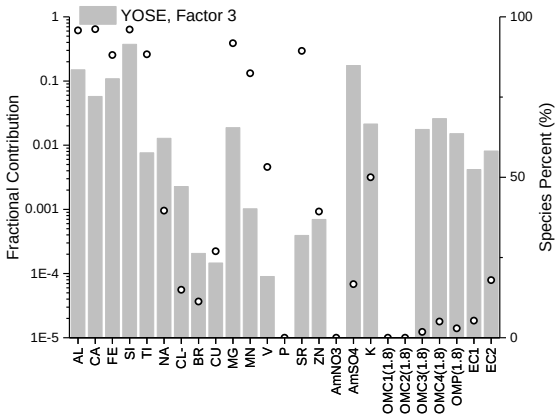
Yosemite NP (YOSE1) Factors 1 – 3, 2011 - 2016

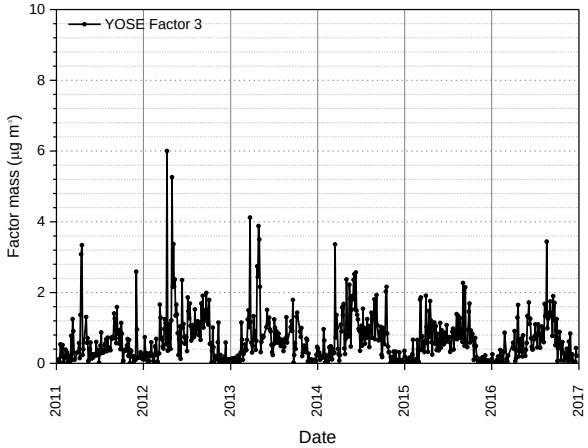




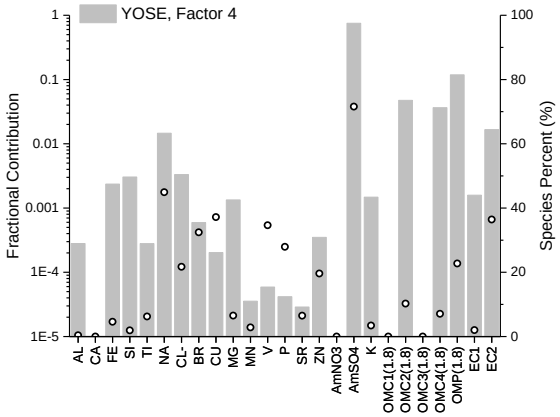


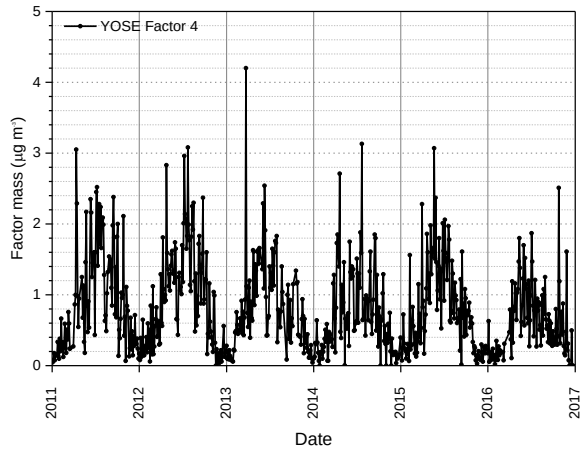






Yosemite NP (YOSE1) Factor 4, 2011 - 2016





Appendix B. For each monitoring site and time periods, 2000 – 2004 and 2011 – 2015, tables showing the number of days that comprise the 20% most impaired days, number of days that stay the same between the EPA draft metric and PMF methods, and the percent of days that are different between the two methods.

Table B1. For the 2000 – 2004 period, the number of days that comprise the 20% most impaired days, number of days that stay the same between the EPA draft metric and PMF methods, and the percent of days that are different between the two methods.

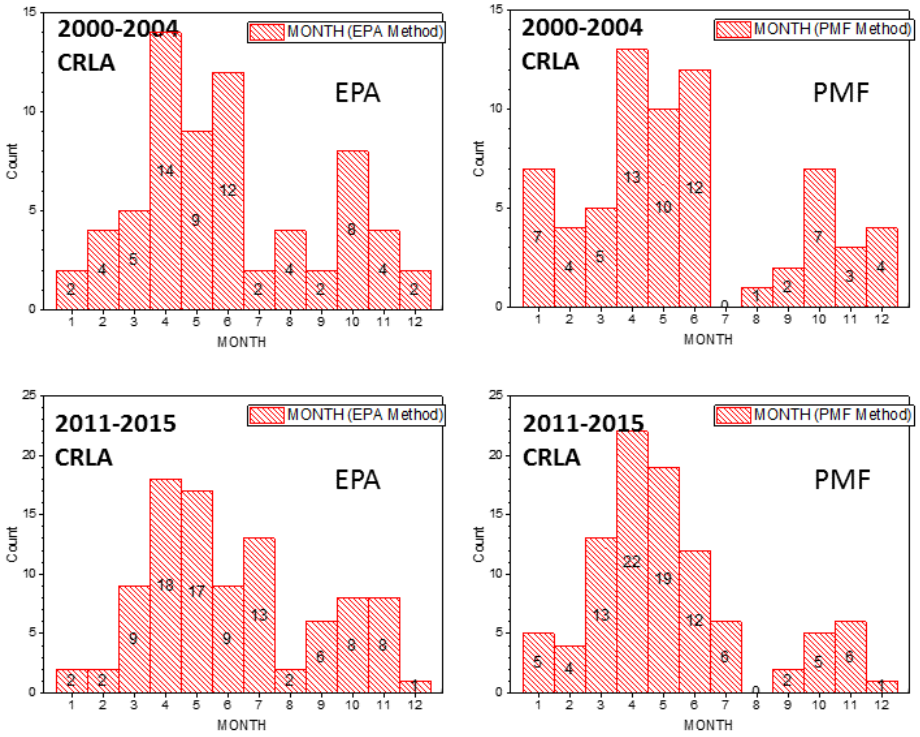
Site	Number of 20% worst days	Number of same days in both methods	Percent of different days
CRLA1	68	53	22.1
GLAC1	63	46	27.0
LABE1	93	59	36.6
PASA1	91	64	29.7
SAWT1	90	27	70.0
STAR1	95	73	23.2
TRIN1	66	43	34.8
YOSE1	108	75	30.6

Table B2. For the 2011 – 2015 period, the number of days that comprise the 20% most impaired days, number of days that stay the same between the EPA draft metric and PMF methods, and the percent of days that are different between the two methods.

Site	Number of 20% worst days	Number of same days in both methods	Percent of different days
CRLA1	95	70	26.3
GLAC1	117	60	48.7
LABE1	115	72	37.4
PASA1	115	93	19.1
SAWT1	106	51	51.9
STAR1	118	90	23.7
TRIN1	90	55	38.9
YOSE1	116	82	29.3

Appendix C. For each monitoring site and time periods, 2000 – 2004 and 2011 – 2015, plots showing the seasonal distribution of 20% most impaired days for the EPA draft metric and PMF methods.

Figure C1. Monthly distribution of 20% most impaired days for the CRLA1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).



2000-2004
CRLA
22% different days

2011-2015
CRLA
26% different days

Figure C2. Monthly distribution of 20% most impaired days for the GLAC1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

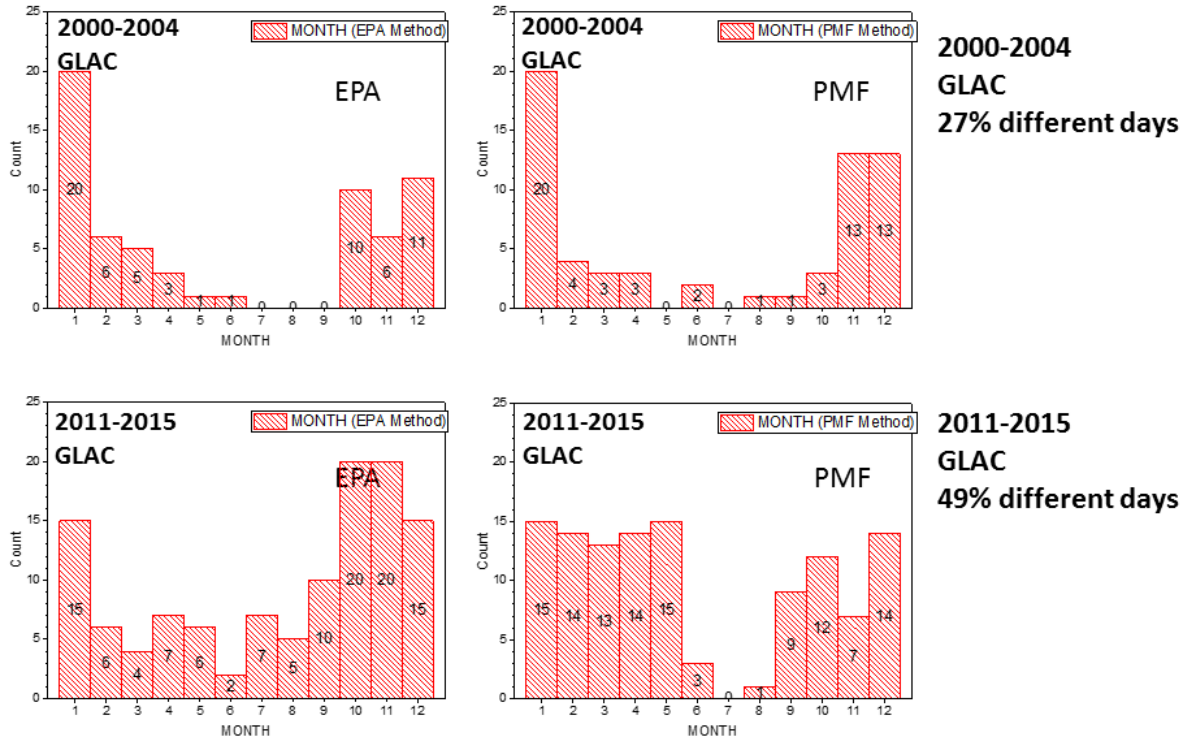


Figure C3. Monthly distribution of 20% most impaired days for the LABE1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

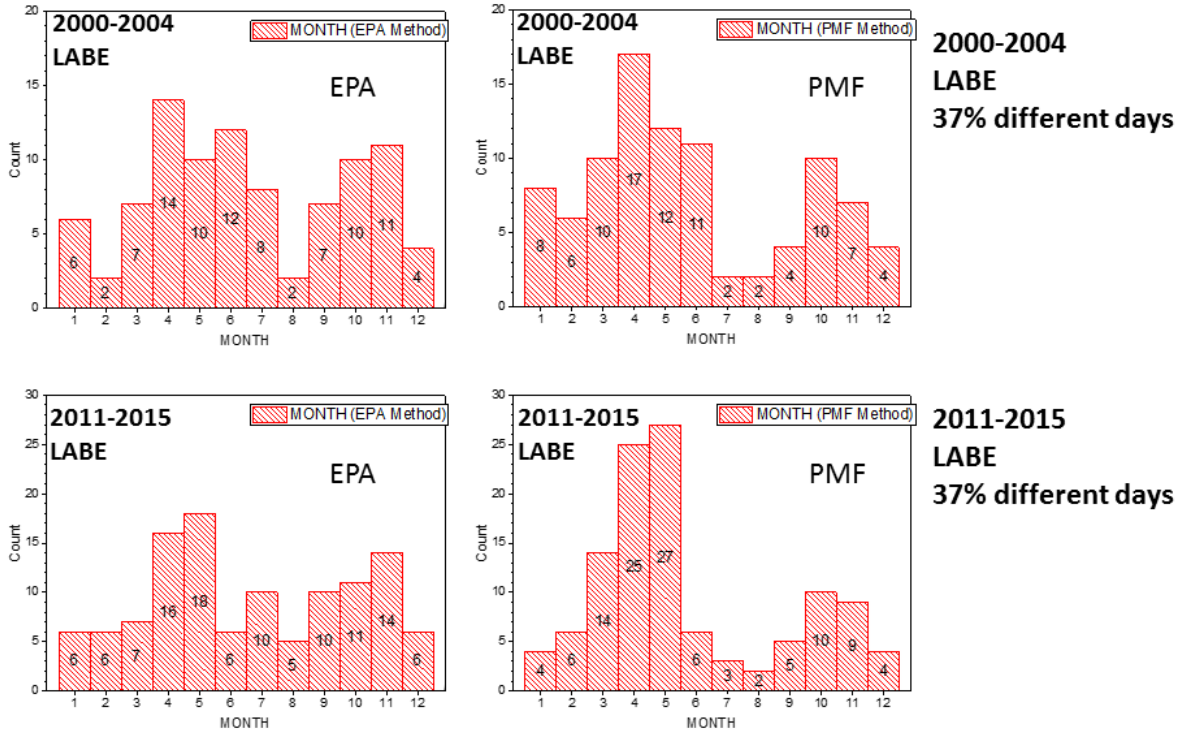


Figure C4. Monthly distribution of 20% most impaired days for the PASA1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

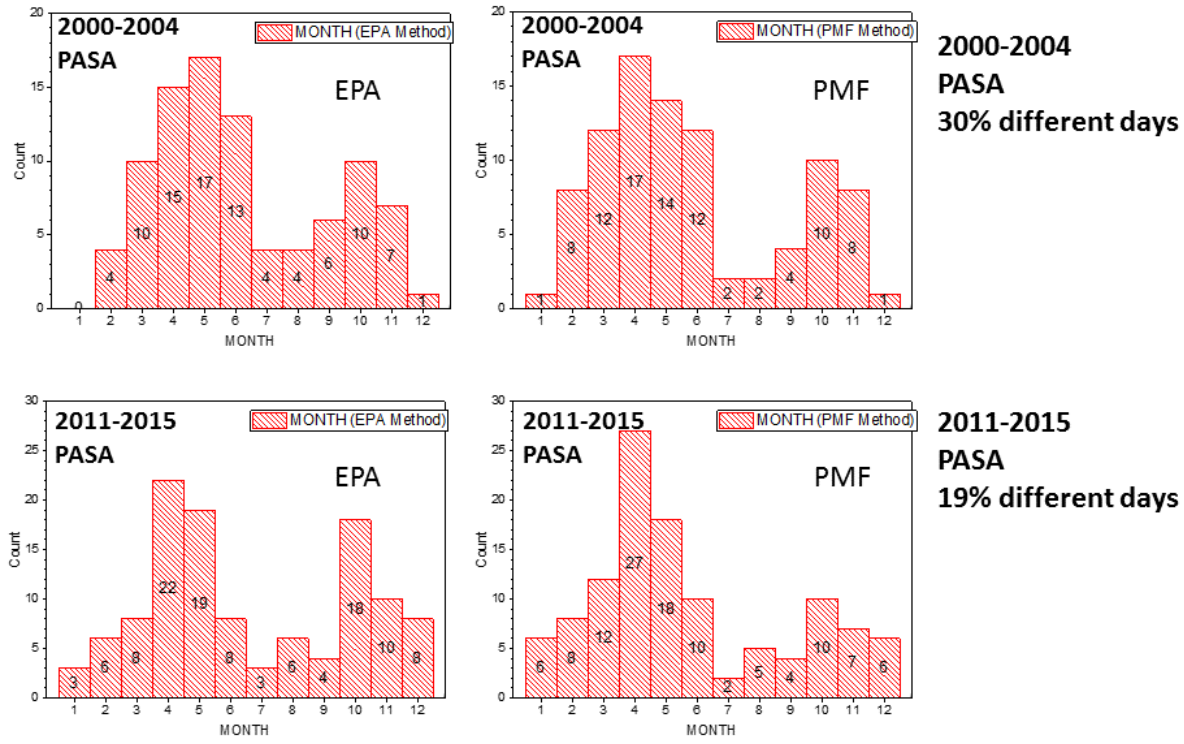


Figure C5. Monthly distribution of 20% most impaired days for the SAWT1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

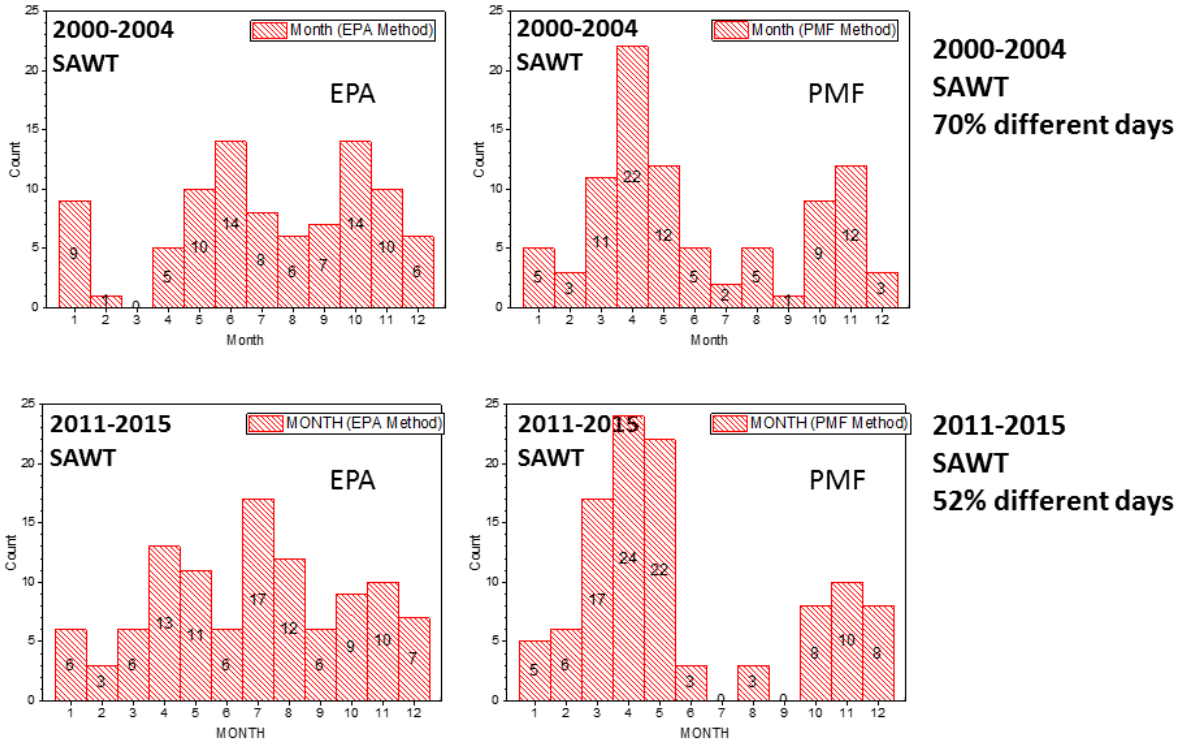


Figure C6. Monthly distribution of 20% most impaired days for the STAR1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

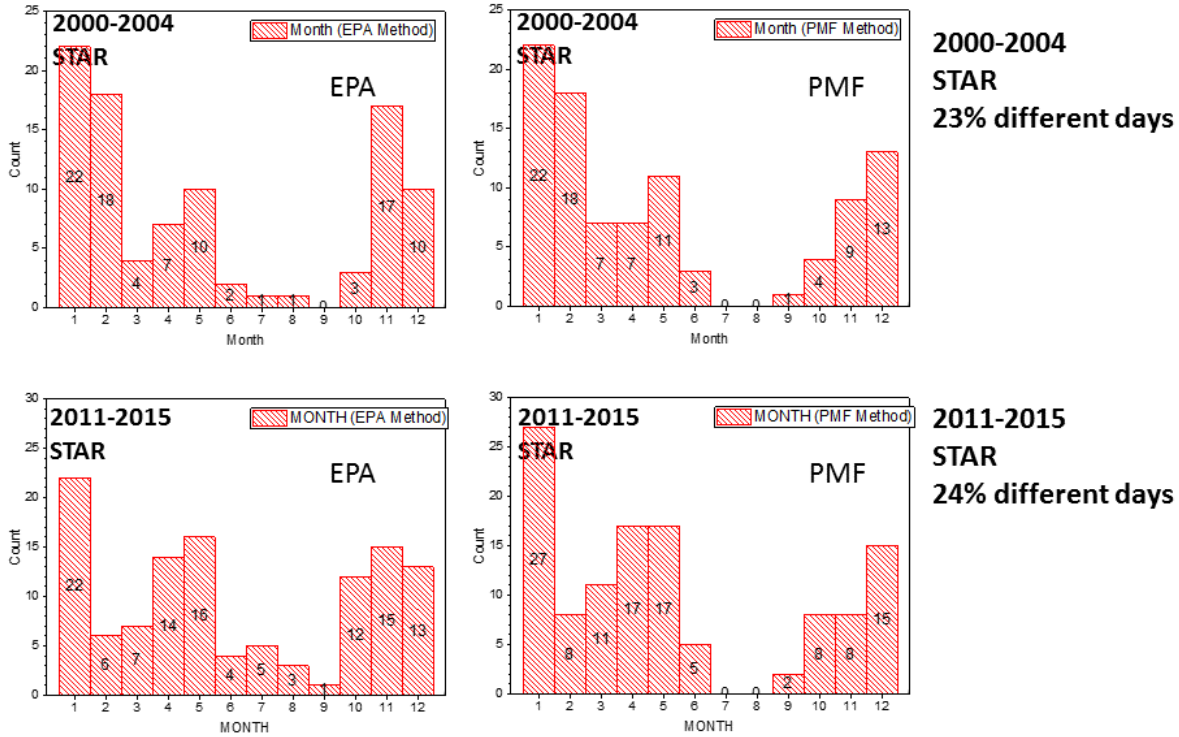


Figure C7. Monthly distribution of 20% most impaired days for the TRIN1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).

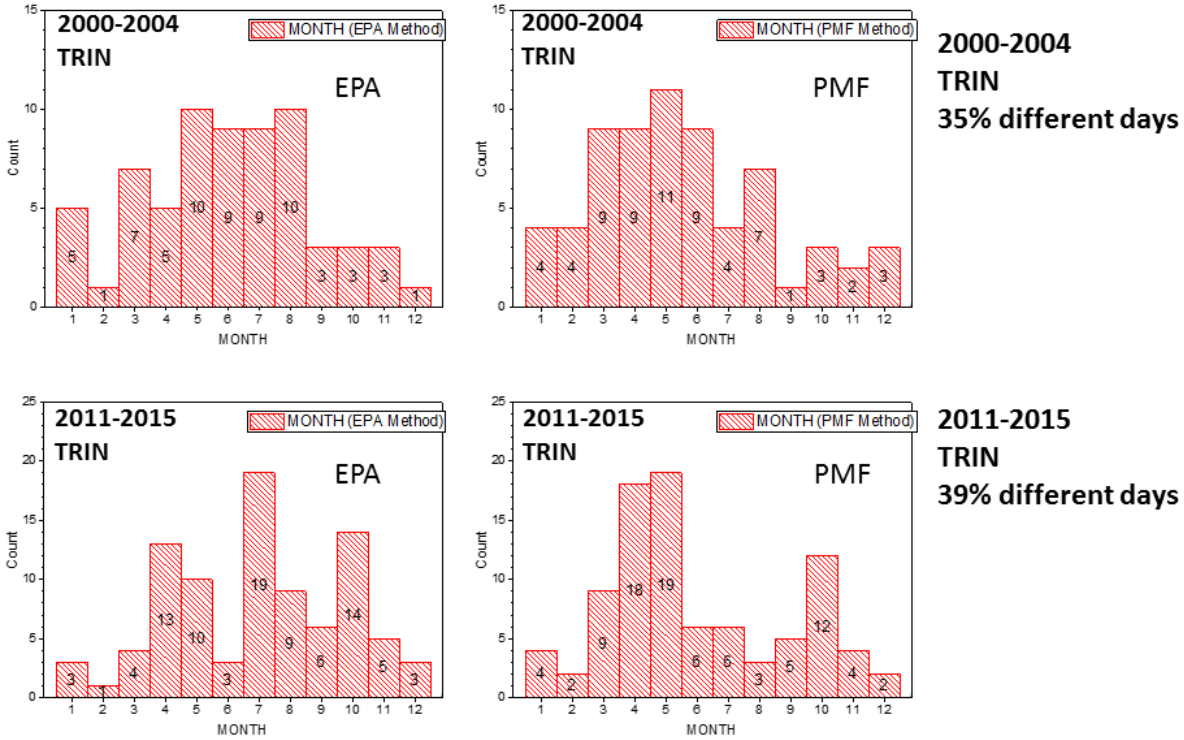
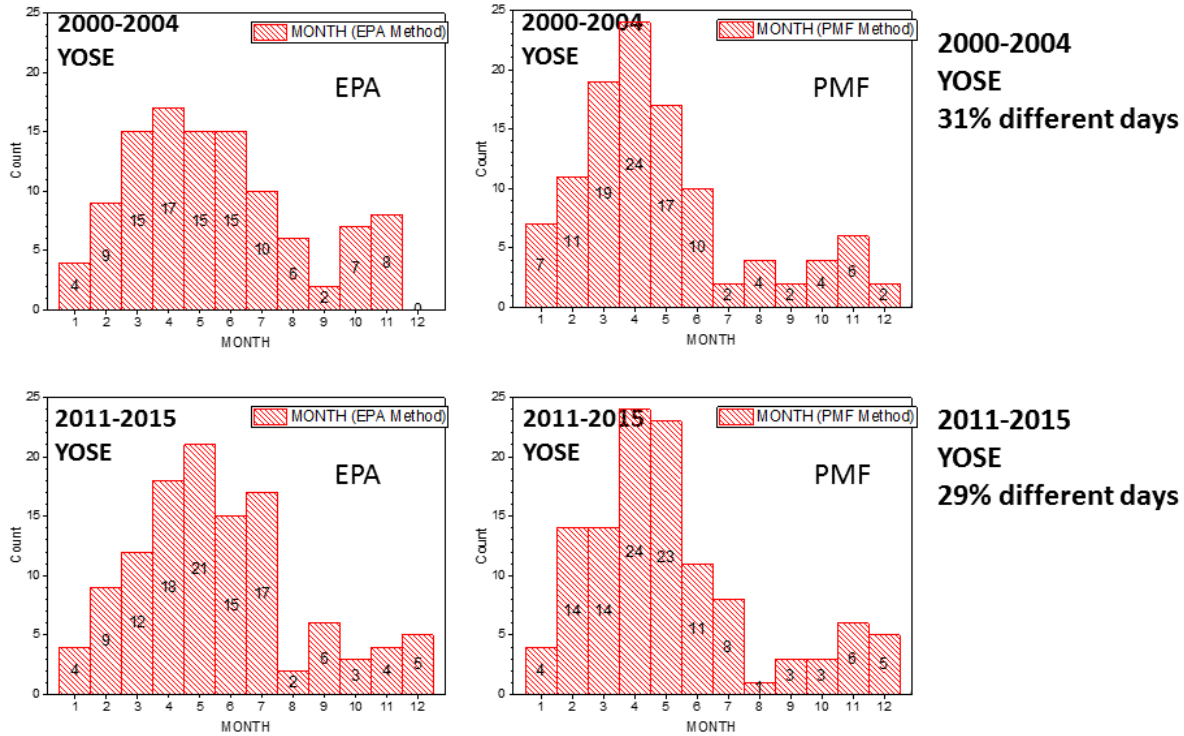


Figure C8. Monthly distribution of 20% most impaired days for the YOSE1 site using the EPA draft metric (left plots) and PMF method (right plots) for the 2000 – 2004 period (top plots) and 2011 – 2015 period (bottom plots).



Appendix D. Tables showing the components of anthropogenic and natural light extinction on the 20% most impaired days, with days as determined by the EPA draft recommended metric but using the PMF method to separate carbon extinction.

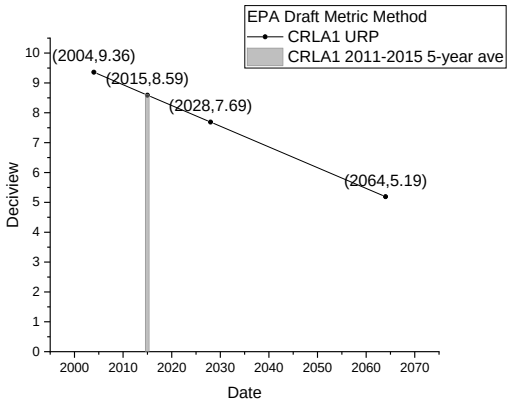
Table D1. Components of anthropogenic and natural light extinction on the 20% most impaired days, with days determined by the EPA draft recommended metric but using the PMF method to apportion carbon extinction between natural and anthropogenic, for 2000 – 2004 period.

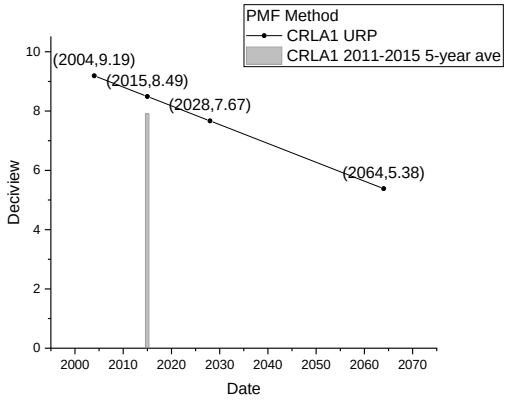
PMF Method (EPA draft metric days)	20% Most Impaired Days Anthropogenic Light Scattering (Mm-1)							20% Most Impaired Days Natural Light Scattering (Mm-1)						
Site Code	Ammonium Nitrate	Ammonium Sulfate	Coarse Mass	Elemental Carbon	Organic Mass	Soil	Total Anth.	Sea Salt	Rayleigh	Carbon E3	Dust E3	Routine Natural	Total Natural	Total (Mm-1)
CRLA1	0.332	5.565	0.000	1.193	0.343	0.000	7.432	0.077	9.000	1.705	0.282	7.609	18.672	26.105
GLAC1	8.446	10.834	0.216	3.000	8.849	0.019	31.364	0.083	11.000	3.357	0.016	8.181	22.638	54.003
LABE1	1.484	5.608	0.000	0.311	0.589	0.019	8.012	0.073	10.000	4.983	0.176	8.295	23.528	31.540
PASA1	0.849	6.675	0.000	0.168	0.095	0.018	7.805	0.057	10.000	3.545	0.105	7.671	21.379	29.184
SAWT1	0.025	2.482	0.000	0.561	1.088	0.000	4.156	0.010	10.000	6.478	0.162	5.574	22.224	26.380
STAR1	12.872	7.266	0.038	1.107	2.238	0.000	23.521	0.092	10.000	5.135	0.101	8.816	24.144	47.665
TRIN1	3.200	6.934	0.008	0.643	0.754	0.027	11.566	0.079	10.000	5.927	0.131	8.200	24.336	35.902
YOSE1	7.170	7.559	0.362	0.808	1.482	0.061	17.442	0.095	10.000	5.328	0.219	7.884	23.526	40.969

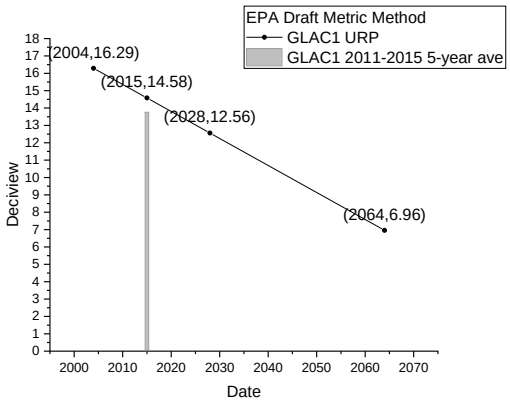
Table D2. Components of anthropogenic and natural light extinction on the 20% most impaired days, with days determined by the EPA draft recommended metric but using the PMF method to apportion carbon extinction between natural and anthropogenic, for 2011 – 2015 period.

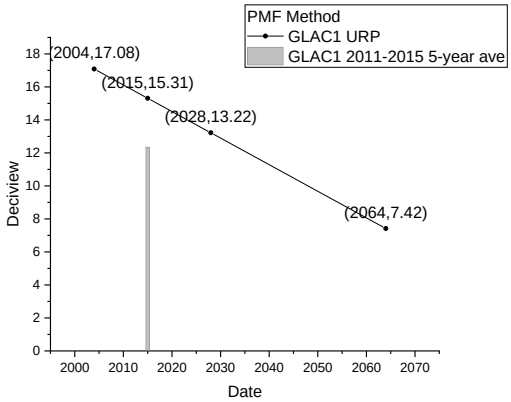
PMF Method (EPA draft metric days)	20% Most Impaired Days Anthropogenic Light Scattering (Mm-1)							20% Most Impaired Days Natural Light Scattering (Mm-1)						
Site Code	Ammonium Nitrate	Ammonium Sulfate	Coarse Mass	Elemental Carbon	Organic Mass	Soil	Total Anth.	Sea Salt	Rayleigh	Carbon E3	Dust E3	Routine Natural	Total Natural	Total (Mm-1)
CRLA1	0.000	5.689	0.000	0.330	0.251	0.000	6.270	0.189	9.000	1.691	0.252	7.468	18.601	24.870
GLAC1	2.185	6.024	0.212	2.060	3.309	0.000	13.790	0.108	11.000	6.738	0.047	8.941	26.834	40.624
LABE1	0.576	5.304	0.011	0.232	0.389	0.000	6.511	0.134	10.000	2.827	0.154	8.010	21.125	27.637
PASA1	0.206	5.335	0.047	0.125	0.132	0.000	5.845	0.083	10.000	1.336	0.106	7.737	19.263	25.108
SAWT1	0.040	2.707	0.008	0.178	0.315	0.000	3.248	0.021	10.000	4.632	0.202	5.800	20.654	23.902
STAR1	5.129	6.229	0.000	0.350	0.410	0.000	12.119	0.169	10.000	2.735	0.030	9.260	22.194	34.313
TRIN1	0.393	6.066	0.113	0.214	0.399	0.000	7.185	0.244	10.000	3.848	0.299	7.670	22.060	29.245
YOSE1	3.006	6.754	0.596	0.453	1.015	0.061	11.885	0.225	10.000	3.667	0.433	8.216	22.540	34.426

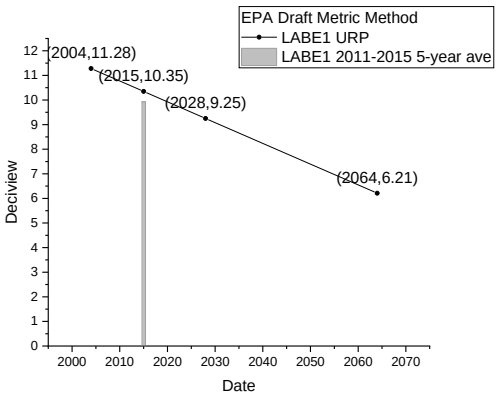
Appendix E. Plots showing the total deciviews on the 20% most impaired days, the derived natural conditions, the uniform rate of progress (URP) line, and the 2011 – 2015 20% most impaired days deciviews, for the EPA draft metric and the PMF method.

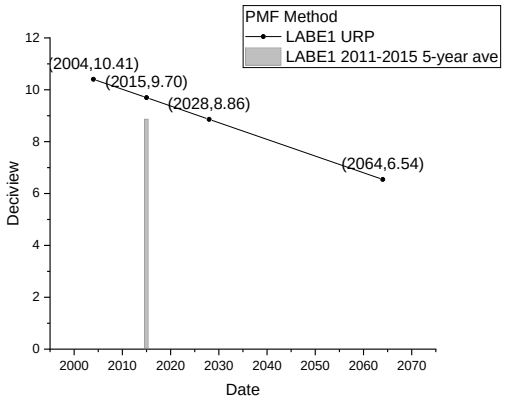


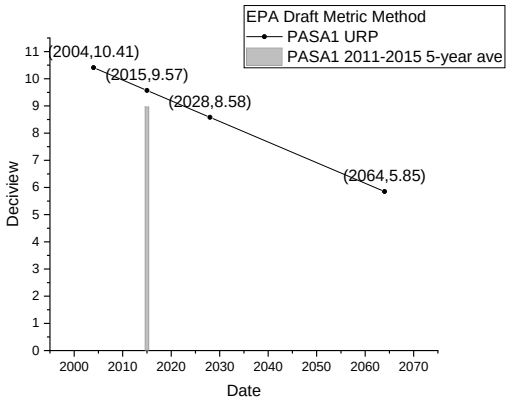








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PASA1 URP
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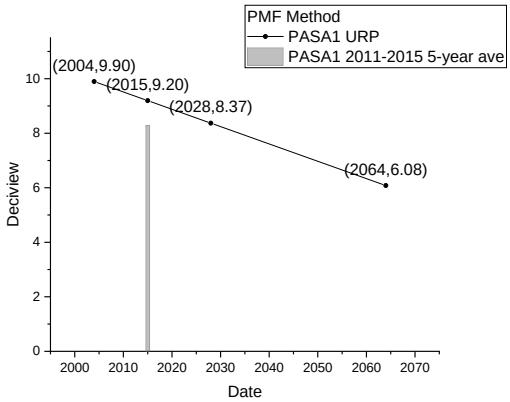
(2028,8.58)
(2064,5.85)
Deciview
Date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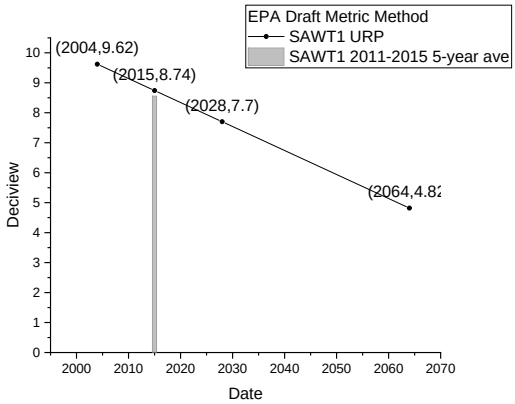
Deciview
Date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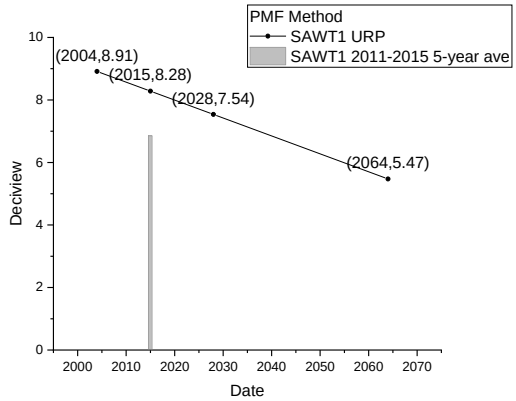
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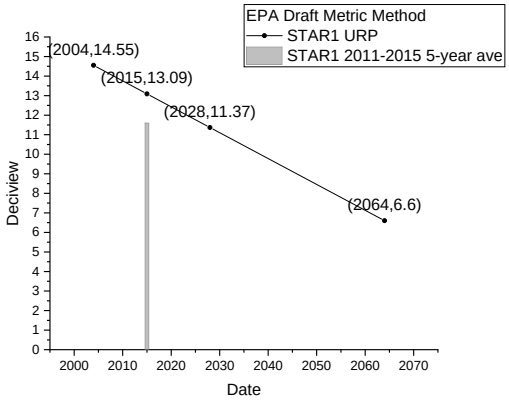
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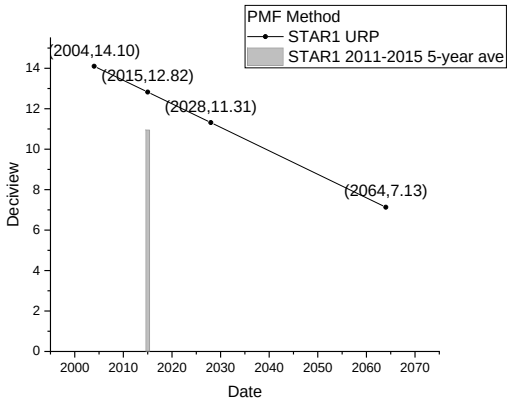
(2064,6.6)
Deciview
Date


PMF Method
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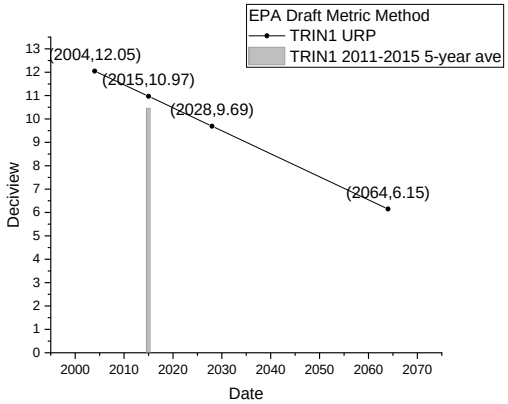
(2064,7.13)
Deciview
Date


EPA Draft Metric Method
TRIN1 URP
TRIN1 2011-2015 5-year ave
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(2015,10.97)
(2028,9.69)
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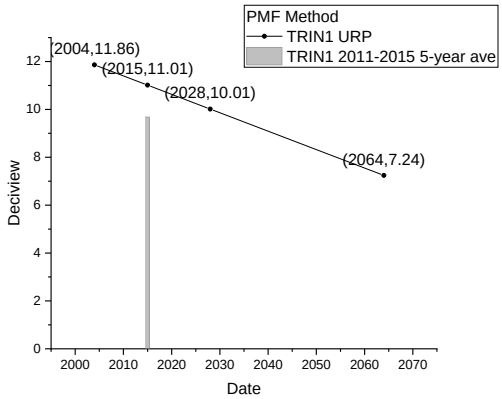
Deciview
Date


PMF Method
TRIN1 URP
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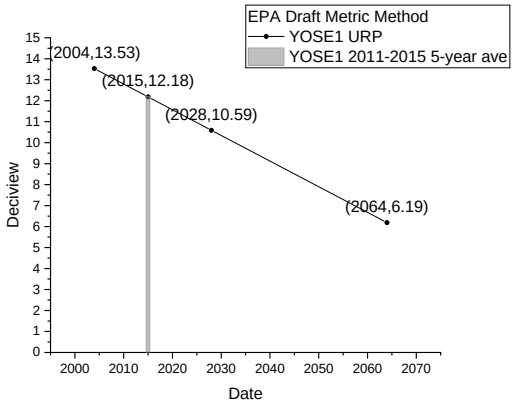
Deciview
Date


EPA Draft Metric Method
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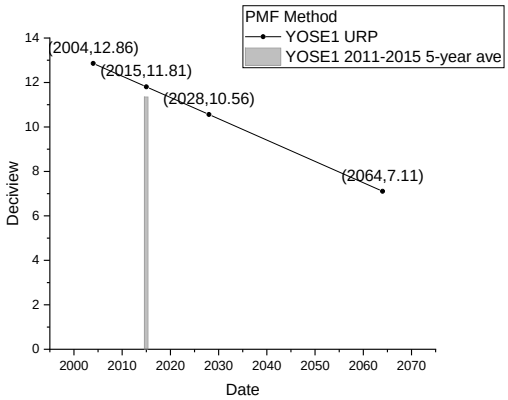
Deciview
Date


PMF Method
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Deciview
Date