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Supplement of

Downpour dynamics: outsized impacts of storm events on unprocessed atmospheric nitrate export in an urban watershed

Joel T. Bostic et al.

Correspondence to: Joel T. Bostic (jbostic@umces.edu)

Supplementary Material for Downpour Dynamics: Outsized impacts of storm events on unprocessed atmospheric nitrate export

Supplementary tables

Table S1. Rainfall depth and chemistry for sampled events.

Date	Rainfall (cm)		NO_3^- (mg N L^{-1})		NO_3^- (g N ha^{-1})		$\delta^{15}N$ (‰)		$\delta^{18}O$ (‰)		$\Delta^{17}O$ (‰)		$\delta^{18}O_{H2O}$ (‰)	
	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN
9/9/18	4.90	3.60	0.08	0.07	38	26	n/a	n/a	56.5 ± 0.2	58.8 ± 0.9	19.8 ± 0.4	21.3 ± 0.5	-7.6 ± 0.2	-7.2 ± 0.2
10/27/18	1.90	2.30	0.09	0.10	18	22	-3.2 ± 0.3	-4.3 ± 0.4	56.5 ± 0.5	55.1 ± 0.7	19.8 ± 0.5	19.3 ± 0.4	-14.9 ± 0.2	-15.0 ± 0.2
12/28/18	3.30	3.00	0.12	0.17	38	52	-1.4 ± 0.3	-1.9 ± 0.5	56.6 ± 0.8	66.7 ± 0.9	21.4 ± 0.2	24.9 ± 0.4	-6.0 ± 0.2	-5.7 ± 0.2
3/21/19	8.10	6.80	0.05	0.07	44	49		-1.6 ± 1.4	48.0 ± 0.6	53.7 ± 0.9	20.5 ±0.4	20.4 ± 0.6	-11.8 ± 0.2	-11.6 ± 0.2
5/4/19	3.90	3.80	0.13	0.20	52	77	-5.8 ± 0.2	-2.2 ± 0.6	63.7 ± 0.5	69.6 ± 0.5	23.1 ± 0.4	23.0 ± 0.7	-5.5 ± 0.2	-4.8 ± 0.2
7/12/19	3.00	3.80	0.26	0.17	79	63	-5.5 ± 0.3	-8.7 ± 0.4	66.9 ± 0.7	53.4 ± 0.1	22.9 ± 0.2	16.4 ± 0.6	-4.8 ± 0.2	-5.0 ± 0.2
7/22/19	5.30	2.00	0.17	0.16	88	31	-4.4 ± 0.2	-4.8 ± 0.8	58.3 ± 0.2	48.9 ± 0.5	18.4 ± 0.4	13.6 ± 0.5	-6.8 ± 0.2	-6.3 ± 0.2
10/16/19	3.60	3.90	0.06	0.05	20	21	-8.0 ± 0.5	-6.9 ± 0.7	56.8 ± 0.3	51.2 ± 0.6	18.8 ± 0.4	19.0 ± 0.7	-10.7 ± 0.2	-11.4 ± 0.2

Rainfall depth is the spatially averaged mean for the entire watershed.

Table S2. Hydrologic characteristics of sampled storm events and antecedent conditions.

Date	**Q_{mean} (mm hr^{-1})**		**Q_{median} (mm hr^{-1})**		**Q_{min} (mm hr^{-1})**		**Q_{max} (mm hr^{-1})**		**$Q_{EventSampled}$ (cm)**		**$Q_{EventTotal}$ (cm)**		**7-day antecedent Q (cm)**		**$\delta^{18}O$-H_2O Baseflow**		**$\delta^{18}O$-H_2O Peak**		**$f_{Event\ Water}$ Peak**	
	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN
9/9/18	0.33	1.37	0.36	1.59	0.11	0.40	0.41	1.77	0.95	2.22	1.50	2.90	1.31	2.07	n/a	n/a	-7.1	-6.9	n/a	n/a
10/27/18	0.08	0.24	0.08	0.23	0.06	0.04	0.11	0.42	0.25	0.41	0.23	0.54	0.80	0.60	-7.2	-7.7	-7.8	-11.3	0.08 ± 0.09	0.49 ± 0.12
12/28/18	0.22	0.48	0.23	0.39	0.12	0.06	0.38	1.14	0.82	1.26	0.89	1.33	2.90	2.01	-7.3	-7.8	-7.3	-6.8	0.00 ± 0.61	0.48 ± 0.27
3/21/19	0.25	0.66	0.21	0.54	0.09	0.05	0.76	2.00	2.16	2.60	2.35	2.92	1.67	1.02	-7.7	-7.7	-9.1	-10.8	0.34 ± 0.17	0.79 ± 0.25
5/4/19	0.14	0.38	0.12	0.32	0.08	0.05	0.22	0.94	0.53	1.23	0.56	1.27	1.29	0.79	-7.6	-6.1	-7.4	-5	0.10 ± 0.36	0.85 ± 0.40
7/12/19	0.17	0.75	0.14	0.45	0.07	0.04	0.33	1.99	0.26	1.25	0.29	1.38	0.92	2.52	-8	-7.1	-7.4	-5.0	0.19 ± 0.22	1.00 ± 0.29
7/22/19	0.14	0.16	0.12	0.11	0.05	0.03	0.24	0.51	0.32	0.44	0.33	0.43	1.11	1.02	-7.3	-7.3	-6.7	-6.3	1.06 ± 1.39	0.96 ± 0.64
10/16/19	0.05	0.25	0.04	0.13	0.02	0.01	0.09	0.81	0.12	0.57	0.09	0.57	0.33	0.20	-7.9	-7.6	-8.4	-10.4	0.18 ± 0.26	0.72 ± 0.24

$Q_{EventSampled}$ equals the discharge representing the duration of sampling. $Q_{EventTotal}$ equals the total event discharge as quantified using the constant slope method (Dingman, 1994). $f_{Event\ Water}$ = fraction of event water at peak discharge.

Table S3. Water chemistry of sampled storm events. Concentrations and isotope ratios are discharge-weighted means (i.e., EMC, EMV).

Date	NO_3^- (mg N L^{-1})		$NO_3^-{}_{Atm}$ (mg N L^{-1})		NO_3^- (g N ha^{-1})		$NO_3^-{}_{Atm}$ (g N ha^{-1})		$\delta^{15}N$ (‰)		$\delta^{15}N_{Terr}$ (‰)		$\delta^{18}O$ (‰)		$\delta^{18}O_{Terr}$ (‰)		$\Delta^{17}O$ (‰)	
	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN	GUN	GWN
9/9/18	1.68	0.39	0.03	0.02	163	83	3	5	5.9	5.5	6.0	6.0	1.7	6.0	0.5	2.1	0.5	1.2
10/27/18	2.96	1.11	0.06	0.06	77	48	2	2	6.3	6.6	6.3	6.7	2.3	5.9	1.1	2.7	0.4	1.2
12/28/18	2.52	0.68	0.03	0.05	213	87	2	7	6.2	5.0	6.4	5.2	2.3	7.6	1.6	1.9	0.3	2.0
3/21/19	2.75	0.59	0.07	0.05	737	160	18	13	5.1	3.6	5.5	3.7	2.4	5.3	2.8	-1.1	0.5	2.0
5/4/19	2.88	0.63	0.03	0.07	161	80	2	9	5.8	4.5	5.7	4.7	3.5	9.3	3.6	0.9	0.2	2.5
7/12/19	2.17	0.48	0.08	0.10	58	61	2	13	6.2	2.8	6.4	6.1	4.9	14.4	2.3	-1.8	0.9	3.8
7/22/19	1.94	1.07	0.05	0.10	66	36	2	4	5.8	6.6	5.9	7.1	4.7	7.2	2.9	1.8	0.5	1.4
10/16/19	2.58	0.89	0.07	0.09	31	52	1	5	6.4	5.0	6.7	5.8	4.3	7.9	2.6	2.1	0.5	2.0

Table S4. Nitrate concentration and isotope data and discharge for individual storm samples.

Date and Time	Discharge (m^3 s^{-1})	Event	Site	NO_3^- (mg N L^{-1})	$\delta^{15}N$ (‰)	$\delta^{18}O$ (‰)	$\Delta^{17}O$ (‰)
9/9/18 7:30	12.9	1	GUN	1.988	7.0	4.8	0.6
9/9/18 8:45	16.1	1	GUN	1.8859	6.8	4.6	0.1
9/9/18 10:00	20.3	1	GUN	1.9059	6.8	4.1	0.4
9/9/18 11:15	25.3	1	GUN	2.0295	6.6	2.6	0.1
9/9/18 12:30	32.3	1	GUN	2.0581	6.4	2.6	0.1
9/9/18 13:45	39.9	1	GUN	1.9714	6.2	2.8	0.3
9/9/18 15:00	42.8	1	GUN	1.8393	6.1	2.9	0.1
9/9/18 16:15	44.2	1	GUN	1.5943	6.1	2.5	0.9
9/9/18 17:30	45.0	1	GUN	1.5003	5.2	1.9	0.2
9/9/18 18:45	46.2	1	GUN	1.555	5.5	1.5	0.3
9/9/18 20:00	47.6	1	GUN	1.5427	5.6	1.0	0.2
9/9/18 21:15	47.3	1	GUN	1.5613	6.8	2.4	0.2
9/9/18 22:30	45.6	1	GUN	1.5502	5.4	2.5	0.2
9/10/18 1:00	43.9	1	GUN	1.5403	5.9	1.1	1.0
9/10/18 3:30	41.9	1	GUN	1.5933	5.9	-0.5	0.9
9/10/18 9:45	34.8	1	GUN	1.7172	5.9	1.4	0.3
9/10/18 12:15	34.0	1	GUN	1.7746	6.0	1.3	0.8
9/9/18 9:00	39.1	1	GWN	0.3751	6.2	8.9	1.9
9/9/18 9:45	40.5	1	GWN	0.3731	4.4	6.0	1.6
9/9/18 10:30	41.1	1	GWN	0.38	4.4	5.4	1.9
9/9/18 11:15	41.3	1	GWN	0.3784	5.6	6.1	1.3
9/9/18 12:00	40.5	1	GWN	0.3858	5.2	6.3	1.3
9/9/18 12:45	39.9	1	GWN	0.3898	4.9	5.5	1.3
9/9/18 13:30	39.9	1	GWN	0.3923	5.6	6.1	0.7
9/9/18 14:15	38.5	1	GWN	0.3941	6.1	6.4	1.2

9/9/18 15:00	37.9	1	GWN	0.4013	6.0	5.6	1.0
9/9/18 15:45	37.7	1	GWN	0.3907	6.3	6.5	1.5
9/9/18 16:30	37.4	1	GWN	0.385	7.6	NA	1.0
9/9/18 17:15	36.5	1	GWN	0.3778	5.4	5.5	1.3
9/9/18 18:00	36.8	1	GWN	0.3775	6.4	6.3	1.5
9/9/18 20:15	28.2	1	GWN	0.3728	3.9	4.5	0.7
9/9/18 21:45	15.3	1	GWN	0.4287	NA	NA	0.5
9/9/18 23:15	11.0	1	GWN	0.4714	NA	NA	0.8
10/26/18 15:15	6.5	3	GUN	3.1987	6.5	1.8	0.7
10/27/18 0:00	7.1	3	GUN	3.1075	6.6	2.1	0.0
10/27/18 2:00	7.6	3	GUN	3.0399	6.6	1.1	0.0
10/27/18 4:00	8.4	3	GUN	2.9761	6.6	1.7	0.8
10/27/18 6:00	9.4	3	GUN	2.9277	6.6	1.8	0.0
10/27/18 8:00	11.0	3	GUN	2.8924	6.5	1.7	0.5
10/27/18 10:00	12.4	3	GUN	2.9341	6.1	3.5	1.0
10/27/18 12:00	13.0	3	GUN	2.9789	5.7	2.4	0.6
10/27/18 14:00	13.1	3	GUN	2.9423	5.4	1.7	0.7
10/27/18 16:00	12.9	3	GUN	2.8636	5.8	3.4	0.9
10/27/18 18:00	12.7	3	GUN	2.7768	6.6	2.4	-0.1
10/27/18 20:00	12.8	3	GUN	2.6858	6.7	3.0	-0.2
10/26/18 21:45	0.9	3	GWN	1.8838	7.4	4.1	0.7
10/26/18 23:15	1.9	3	GWN	1.4681	7.3	6.7	1.4

10/27/18 0:45	2.9	3	GWN	1.4609	7.2	6.5	0.6
10/27/18 2:15	4.3	3	GWN	1.0902	6.8	7.2	1.1
10/27/18 3:45	6.1	3	GWN	1.1555	6.7	5.9	1.2
10/27/18 5:15	7.6	3	GWN	1.2945	6.8	5.7	0.8
10/27/18 6:45	9.7	3	GWN	1.1601	7.0	5.5	1.0
10/27/18 13:30	4.5	3	GWN	0.7866	5.4	6.2	1.8
10/27/18 15:00	4.0	3	GWN	0.7575	6.0	5.7	1.2
12/27/18 18:00	14.0	4	GUN	3.0308	5.3	1.8	0.0
12/28/18 1:00	14.0	4	GUN	3.0378	6.9	1.6	0.3
12/28/18 3:00	14.0	4	GUN	3.0423	7.6	2.8	0.1
12/28/18 5:00	14.6	4	GUN	2.9797	5.4	2.7	-0.3
12/28/18 7:00	16.7	4	GUN	2.7953	5.5	2.5	0.6
12/28/18 9:00	21.9	4	GUN	2.5896	5.3	1.4	0.3
12/28/18 11:00	32.6	4	GUN	2.6074	5.5	2.2	0.2
12/28/18 13:00	43.6	4	GUN	2.5176	5.5	3.6	0.5
12/28/18 15:00	42.5	4	GUN	2.2658	5.0	0.3	-0.3
12/28/18 17:00	36.8	4	GUN	2.1428	5.5	3.1	0.2
12/28/18 19:00	33.1	4	GUN	2.1442	6.7	2.5	0.4
12/28/18 21:00	31.4	4	GUN	2.2302	6.7	2.6	0.5
12/28/18 23:00	29.7	4	GUN	2.3222	6.3	2.6	0.4
12/29/18 1:00	28.2	4	GUN	2.4008	8.5	3.0	0.3

12/29/18 3:00	27.1	4	GUN	2.462	8.0	3.1	0.4
12/29/18 5:00	26.1	4	GUN	2.5027	7.2	1.4	-0.1
12/29/18 7:00	25.2	4	GUN	2.5435	5.7	2.2	0.8
12/28/18 3:00	1.4	4	GWN	2.1313	6.7	4.7	0.5
12/28/18 4:00	1.6	4	GWN	2.0776	7.0	5.7	0.6
12/28/18 5:00	3.1	4	GWN	1.3976	6.1	8.9	1.8
12/28/18 6:00	6.3	4	GWN	1.3746	5.8	8.8	2.1
12/28/18 7:00	8.2	4	GWN	1.0737	6.1	10.3	3.0
12/28/18 8:00	13.5	4	GWN	0.9234	5.9	9.1	2.0
12/28/18 9:00	20.3	4	GWN	1.0286	5.8	9.0	1.9
12/28/18 10:00	23.3	4	GWN	0.9465	5.4	7.2	1.4
12/28/18 11:00	25.7	4	GWN	0.754	5.3	8.6	1.8
12/28/18 12:00	26.3	4	GWN	0.5106	6.8	10.1	2.4
12/28/18 13:00	24.0	4	GWN	0.4383	3.9	9.0	2.8
12/28/18 14:00	20.8	4	GWN	0.4076	4.1	9.4	2.7
12/28/18 15:00	16.7	4	GWN	0.4152	3.2	6.6	2.2
12/28/18 16:00	14.1	4	GWN	0.4332	2.9	6.5	2.2
12/28/18 17:00	12.5	4	GWN	0.4533	3.7	6.5	2.2
12/28/18 18:00	11.2	4	GWN	0.4833	4.8	6.6	1.9
12/28/18 19:00	10.0	4	GWN	0.5135	4.4	6.0	1.8

12/28/18 21:00	8.2	4	GWN	0.5767	5.1	4.9	1.8
12/28/18 23:00	5.9	4	GWN	0.6481	5.2	4.7	1.4
12/29/18 1:00	4.7	4	GWN	0.7176	5.8	6.5	1.2
12/29/18 3:00	4.0	4	GWN	0.7715	5.6	4.2	1.2
12/29/18 5:00	3.6	4	GWN	0.826	6.0	4.7	0.9
3/20/19 19:45	10.3	6	GUN	3.2293	6.1	3.3	0.5
3/21/19 8:00	10.8	6	GUN	3.2064	5.9	1.9	0.7
3/21/19 12:00	12.9	6	GUN	3.092	6.4	2.5	0.5
3/21/19 16:00	19.5	6	GUN	2.8435	7.5	2.3	0.2
3/21/19 18:00	25.2	6	GUN	2.7929	4.7	2.6	0.5
3/21/19 20:00	32.6	6	GUN	2.4956	4.3	3.0	0.4
3/22/19 11:45	67.1	6	GUN	2.4073	5.1	2.1	0.9
3/22/19 19:45	46.2	6	GUN	2.7163	5.0	2.5	0.5
3/23/19 7:45	32.6	6	GUN	2.8651	5.6	2.2	0.3
3/23/19 19:45	26.1	6	GUN	2.924	5.5	2.0	0.5
3/24/19 7:45	22.0	6	GUN	3.0226	4.6	2.3	0.6
3/24/19 19:45	20.0	6	GUN	3.0558	4.0	3.1	0.1
3/20/19 18:30	1.3	6	GWN	2.0393	6.8	2.9	0.9
3/21/19 8:00	2.2	6	GWN	1.8217	6.5	3.5	-0.2
3/21/19 11:00	4.9	6	GWN	1.3663	6.2	5.2	2.0
3/21/19 14:00	14.5	6	GWN	0.9246	5.5	5.0	1.5
3/21/19 17:00	18.8	6	GWN	0.7454	4.6	4.7	0.6
3/21/19 20:00	32.8	6	GWN	0.3981	2.5	5.9	2.0
3/21/19 23:00	44.7	6	GWN	0.3905	1.9	6.0	2.1
3/22/19 0:30	46.7	6	GWN	0.3821	3.2	6.7	2.9
3/22/19 2:00	43.9	6	GWN	0.4138	2.7	6.1	2.6

3/22/19 3:30	29.2	6	GWN	0.4721	2.6	6.3	2.4
3/22/19 6:30	19.7	6	GWN	0.5358	5.4	0.9	2.1
3/22/19 9:30	11.5	6	GWN	0.6429	5.7	5.0	2.0
5/4/19 18:00	9.7	8	GUN	3.1931	6.1	3.7	0.1
5/5/19 6:00	10.1	8	GUN	3.1464	6.5	3.2	0.1
5/5/19 9:00	10.8	8	GUN	3.0147	4.9	2.6	0.3
5/5/19 10:30	12.8	8	GUN	2.81	4.4	2.0	0.5
5/5/19 13:30	15.1	8	GUN	2.8875	4.4	2.6	0.7
5/5/19 15:00	20.6	8	GUN	3.0023	5.0	3.3	0.2
5/5/19 16:30	21.7	8	GUN	3.0624	6.7	3.8	0.7
5/5/19 18:00	21.4	8	GUN	2.9315	4.2	4.0	0.5
5/5/19 19:30	22.1	8	GUN	2.6489	5.5	4.1	0.1
5/5/19 21:00	22.6	8	GUN	2.5525	6.0	3.7	-0.1
5/5/19 22:30	23.9	8	GUN	2.5971	5.2	4.6	-0.1
5/6/19 0:00	25.9	8	GUN	2.6583	7.1	3.1	0.2
5/6/19 1:30	25.6	8	GUN	2.6873	5.8	4.2	0.1
5/6/19 3:00	24.2	8	GUN	2.7133	6.0	3.8	-0.1
5/6/19 4:30	22.3	8	GUN	2.7509	6.4	3.4	0.3
5/6/19 6:00	21.1	8	GUN	2.8211	6.2	4.0	0.1
5/6/19 7:30	20.2	8	GUN	2.892	6.2	3.2	1.1
5/4/19 23:00	1.1	8	GWN	1.2949	7.6	7.4	1.3
5/5/19 1:00	2.5	8	GWN	1.2467	7.5	7.9	1.8
5/5/19 3:00	5.0	8	GWN	1.0778	3.3	12.8	3.5
5/5/19 4:00	6.1	8	GWN	1.1079	5.4	10.0	3.1
5/5/19 6:00	5.9	8	GWN	1.1589	5.5	8.2	2.5
5/5/19 8:00	4.7	8	GWN	1.0437	5.6	7.3	3.6
5/5/19 9:00	5.9	8	GWN	0.8227	4.4	12.5	4.2
5/5/19 10:00	7.5	8	GWN	0.8122	5.0	12.1	3.8

5/5/19 11:00	12.2	8	GWN	0.7355	4.0	12.1	4.3
5/5/19 12:00	17.1	8	GWN	0.8037	5.3	9.6	3.1
5/5/19 13:00	17.8	8	GWN	0.607	4.6	11.3	3.1
5/5/19 14:00	13.1	8	GWN	0.5702	3.6	10.7	3.4
5/5/19 15:00	9.8	8	GWN	0.5467	3.5	12.2	3.1
5/5/19 17:00	7.4	8	GWN	0.4982	2.7	12.0	3.4
5/5/19 19:00	10.0	8	GWN	0.4987	3.5	10.9	3.3
5/5/19 21:00	19.3	8	GWN	0.5622	5.0	8.5	1.4
5/5/19 23:00	18.6	8	GWN	0.3928	4.5	7.9	1.9
5/6/19 1:00	10.1	8	GWN	0.3905	4.2	7.0	1.5
5/6/19 3:00	6.3	8	GWN	0.4309	4.1	6.2	0.8
5/6/19 7:00	3.7	8	GWN	0.5487	4.6	5.5	0.9
7/11/19 16:00	7.6	9	GUN	3.0092	6.9	3.8	0.4
7/11/19 17:00	8.0	9	GUN	2.8493	5.8	2.7	0.4
7/11/19 18:00	9.0	9	GUN	2.8417	7.4	3.9	0.5
7/11/19 19:00	14.2	9	GUN	2.82	7.0	3.7	1.2
7/11/19 20:00	36.5	9	GUN	2.8085	6.8	3.8	0.8
7/11/19 21:00	36.0	9	GUN	1.8034	5.5	5.8	0.8
7/11/19 22:00	29.4	9	GUN	1.5675	5.6	7.5	0.8
7/11/19 23:00	27.4	9	GUN	1.5645	5.9	6.2	1.3
7/12/19 0:00	26.0	9	GUN	1.6447	5.5	6.0	0.9
7/12/19 1:00	21.4	9	GUN	2.0192	5.4	4.5	0.8
7/12/19 2:00	17.7	9	GUN	2.3167	6.8	4.5	1.5
7/12/19 3:00	15.7	9	GUN	2.2879	7.1	4.2	1.1
7/12/19 5:00	13.6	9	GUN	2.3147	6.2	3.8	1.1
7/12/19 7:00	12.6	9	GUN	2.375	6.1	4.7	0.1
7/11/19 15:30	1.0	9	GWN	1.5733	7.3	3.0	0.7
7/11/19 16:15	1.1	9	GWN	1.5258	7.2	3.1	1.0

7/11/19 17:00	9.7	9	GWN	0.6233	5.1	11.8	3.2
7/11/19 17:45	27.8	9	GWN	0.6222	4.7	11.8	3.5
7/11/19 18:30	37.1	9	GWN	0.7386	5.4	10.1	1.8
7/11/19 19:15	42.5	9	GWN	0.4576	2.1	15.0	4.3
7/11/19 20:00	45.3	9	GWN	0.3847	1.3	17.2	5.2
7/11/19 20:45	46.4	9	GWN	0.3787	1.9	18.6	4.4
7/11/19 21:30	43.9	9	GWN	0.399	1.9	15.8	4.4
7/11/19 22:15	26.1	9	GWN	0.4097	2.2	15.7	3.8
7/11/19 23:00	18.2	9	GWN	0.4146	2.3	15.5	3.7
7/11/19 23:45	15.3	9	GWN	0.4268	2.2	14.2	4.6
7/12/19 0:30	12.4	9	GWN	0.4354	2.0	14.0	3.4
7/12/19 1:15	10.8	9	GWN	0.4506	2.8	13.6	4.0
7/12/19 2:00	9.3	9	GWN	0.4547	2.9	13.0	3.2
7/12/19 2:45	8.1	9	GWN	0.4621	2.5	12.4	3.3
7/12/19 5:45	4.9	9	GWN	0.4928	3.7	10.9	2.9
7/12/19 7:15	4.1	9	GWN	0.5004	4.2	10.1	1.9
7/12/19 8:45	3.6	9	GWN	0.5159	4.7	9.4	2.4
7/22/19 17:30	6.3	10	GUN	2.6436	6.3	2.2	0.8
7/22/19 19:00	5.6	10	GUN	2.6434	6.2	3.7	0.0
7/22/19 19:45	9.7	10	GUN	2.6548	6.0	4.1	0.2
7/22/19 20:30	21.3	10	GUN	2.7974	5.2	4.1	0.3
7/22/19 21:15	23.1	10	GUN	2.4194	5.6	4.9	0.6
7/22/19 22:00	20.3	10	GUN	1.7422	5.5	6.2	0.8
7/22/19 23:30	13.8	10	GUN	1.5579	5.2	5.3	1.0
7/23/19 1:00	9.6	10	GUN	1.5162	6.8	6.8	1.1
7/23/19 2:30	8.0	10	GUN	1.6195	6.0	5.5	0.6
7/23/19 3:15	9.4	10	GUN	1.575	5.8	6.1	1.4
7/23/19 4:00	14.9	10	GUN	1.5941	6.2	5.4	0.4

7/23/19 4:45	21.3	10	GUN	1.733	6.0	4.5	0.7
7/23/19 5:30	25.4	10	GUN	1.7484	6.4	5.0	0.6
7/23/19 6:15	27.2	10	GUN	1.6492	6.0	4.1	-0.1
7/23/19 7:00	27.7	10	GUN	1.9003	6.2	4.5	0.5
7/23/19 7:45	26.3	10	GUN	1.6922	6.5	4.3	0.6
7/23/19 9:15	21.7	10	GUN	1.5075	6.0	4.1	0.5
7/23/19 10:45	17.2	10	GUN	1.425	5.0	4.5	0.7
7/23/19 17:15	10.7	10	GUN	2.1051	5.6	4.4	0.2
7/22/19 16:30	1.2	10	GWN	1.5458	7.7	7.5	1.4
7/22/19 17:15	1.6	10	GWN	1.6271	8.2	6.4	0.6
7/22/19 18:00	1.8	10	GWN	1.7912	8.9	6.1	1.1
7/22/19 18:45	1.3	10	GWN	1.7226	8.0	6.7	1.7
7/22/19 19:30	1.3	10	GWN	1.6032	7.6	7.5	1.6
7/22/19 20:15	2.4	10	GWN	1.5508	6.8	7.8	1.8
7/22/19 21:00	4.9	10	GWN	1.5711	7.0	7.0	1.2
7/22/19 21:45	4.7	10	GWN	1.7214	7.7	5.4	1.0
7/22/19 22:30	4.0	10	GWN	1.5925	7.0	6.7	1.1
7/23/19 10:45	3.8	10	GWN	0.6579	5.8	7.9	1.6
7/23/19 12:15	2.9	10	GWN	0.5908	6.3	8.6	1.9
7/23/19 13:45	2.3	10	GWN	0.5693	6.5	6.9	1.6
7/23/19 15:15	2.0	10	GWN	0.532	4.7	7.4	1.2
7/23/19 16:45	1.7	10	GWN	0.5218	7.2	7.5	1.2
10/16/19 11:30	2.2	11	GUN	2.8503	7.5	4.7	-0.2
10/16/19 12:30	2.3	11	GUN	3.0919	6.3	4.3	0.6
10/16/19 13:30	2.7	11	GUN	2.6542	7.0	5.3	0.4

10/16/19 14:30	3.4	11	GUN	2.4925	7.1	4.7	0.2
10/16/19 15:30	4.1	11	GUN	2.453	7.9	4.9	-0.1
10/16/19 16:30	4.4	11	GUN	2.3354	6.9	5.1	0.5
10/16/19 17:30	4.6	11	GUN	2.3001	6.7	2.4	0.9
10/16/19 18:30	5.3	11	GUN	2.3473	7.3	6.1	-0.4
10/16/19 19:30	6.5	11	GUN	2.3506	7.2	5.5	0.4
10/16/19 20:30	9.1	11	GUN	2.4236	6.1	4.2	0.7
10/16/19 21:30	10.5	11	GUN	2.4615	6.8	3.6	-0.1
10/16/19 22:30	10.6	11	GUN	2.6067	6.7	5.4	0.9
10/16/19 23:30	9.8	11	GUN	2.6868	5.9	3.6	0.7
10/17/19 0:30	8.7	11	GUN	2.6744	6.6	4.8	0.5
10/17/19 1:30	7.6	11	GUN	2.645	5.8	4.8	0.4
10/17/19 2:30	6.5	11	GUN	2.6359	6.4	2.7	0.6
10/17/19 3:30	5.8	11	GUN	2.6104	6.1	4.9	1.0
10/17/19 5:30	4.7	11	GUN	2.8481	5.3	3.9	1.0
10/17/19 7:30	4.0	11	GUN	2.6048	7.5	2.9	0.7
10/17/19 9:30	3.5	11	GUN	2.6228	6.0	3.5	0.3
10/17/19 12:00	3.2	11	GUN	2.605	4.9	5.3	0.7
10/16/19 13:00	0.7	11	GWN	1.5844	7.9	5.9	1.0

10/16/19 13:45	2.4	11	GWN	0.7846	6.3	12.1	3.1
10/16/19 14:30	8.6	11	GWN	0.9735	6.9	8.1	1.4
10/16/19 15:15	10.1	11	GWN	0.7647	6.0	10.2	2.9
10/16/19 16:00	11.0	11	GWN	0.5754	5.0	12.2	3.2
10/16/19 16:45	14.4	11	GWN	0.7113	5.6	8.6	2.3
10/16/19 17:30	18.4	11	GWN	1.1845	6.5	7.0	1.4
10/16/19 18:15	18.5	11	GWN	1.0188	5.8	8.8	1.6
10/16/19 19:00	17.4	11	GWN	1.2245	4.7	6.5	1.9
10/16/19 19:45	15.1	11	GWN	0.9308	4.8	6.0	1.9
10/16/19 20:30	11.6	11	GWN	0.7805	4.4	8.0	2.0
10/16/19 21:15	8.6	11	GWN	0.715	3.3	8.0	2.0
10/16/19 22:00	6.6	11	GWN	0.7056	3.7	7.8	2.2
10/16/19 22:45	5.1	11	GWN	0.7154	4.1	7.7	2.2
10/17/19 0:15	3.7	11	GWN	0.7219	3.2	7.5	2.0
10/17/19 1:45	2.8	11	GWN	0.7006	4.1	6.1	2.1
10/17/19 3:15	2.2	11	GWN	0.708	3.4	7.0	1.5
10/17/19 7:45	1.4	11	GWN	0.7314	4.5	6.4	1.0

Table S5. Nitrate concentration and isotope data and discharge for individual pre-event baseflow samples and monthly routine samples

Date and Time	**Discharge (m^3 s^{-1})**	**Site**	**NO_3^- (mg N L^{-1})**	**$\delta^{15}N$ (‰)**	**$\delta^{18}O$ (‰)**	**$\Delta^{17}O$ (‰)**
1/3/2019 0000	17.4	GUN	2.871	5.9	2.6	0.2
10/16/2019 1130	2.1	GUN	2.8503	7.5	4.7	-0.2
10/2/2018 0000	16.3	GUN	2.4575	7.0	2.9	0.4
10/26/2018 1515	6.5	GUN	3.1987	6.5	1.8	0.7
11/1/2018 0000	8.0	GUN	2.8801	6.9	2.9	0.7
12/27/2018 1800	14.0	GUN	3.0308	5.3	1.8	0.0
12/3/2018 0000	15.6	GUN	2.7001	5.9	2.2	0.6
2/4/2019 0000	12.8	GUN	3.1907	4.8	3.3	0.5
3/20/2019 1945	10.3	GUN	3.2293	6.1	3.3	0.5
3/5/2019 0000	13.5	GUN	3.068	5.8	2.4	0.6
4/2/2019 0000	12.5	GUN	3.3432	5.6	2.8	0.2
5/2/2019 0000	8.5	GUN	3.2976	6.2	3.6	0.2
5/4/2019 1800	9.7	GUN	3.1931	6.1	3.7	0.1
6/3/2019 0000	8.3	GUN	3.2957	6.4	3.7	0.0
7/11/2019 1600	7.6	GUN	3.0092	6.9	3.8	0.4
7/2/2019 0000	5.5	GUN	3.1634	6.7	3.4	0.6
7/22/2019 1900	5.6	GUN	2.6434	6.2	3.7	0.0
8/1/2019 0000	5.9	GUN	3.0593	6.6	3.8	0.2
9/4/2018 0000	8.6	GUN	2.5264	7.3	3.5	0.4
1/3/2019 0000	1.7	GWN	1.8075	7.6	2.5	0.3
10/16/2019 1300	0.7	GWN	1.5844	7.9	5.9	1.0
10/2/2018 0000	1.2	GWN	1.72	8.7	2.7	0.9

10/26/2018 2145	0.9	GWN	1.8838	7.4	4.1	0.7
11/1/2018 0000	0.9	GWN	1.7973	8.3	2.4	0.0
12/28/2018 0300	1.4	GWN	2.1313	6.7	4.7	0.5
12/3/2018 0000	1.6	GWN	1.3706	7.5	5.0	1.0
2/4/2019 0000	1.4	GWN	2.3079	9.7	0.2	0.0
3/20/2019 1830	1.3	GWN	2.0393	6.8	2.9	0.9
3/5/2019 0000	2.2	GWN	1.3703	5.9	3.3	1.1
4/2/2019 0000	1.2	GWN	2.0227	7.2	5.4	0.4
5/2/2019 0000	1.0	GWN	1.9522	7.0	3.7	-0.2
5/4/2019 2300	1.1	GWN	1.2949	7.6	7.4	1.3
6/3/2019 0000	0.3	GWN	1.4346	8.4	4.1	0.2
7/11/2019 1530	1.0	GWN	1.5733	7.3	3.0	0.7
7/2/2019 0000	0.6	GWN	1.6625	8.2	5.0	0.7
8/1/2019 0000	0.6	GWN	1.7765	9.1	4.9	0.7
9/4/2018 0000	0.6	GWN	1.7249	NA	3.2	0.2

Supplementary figures

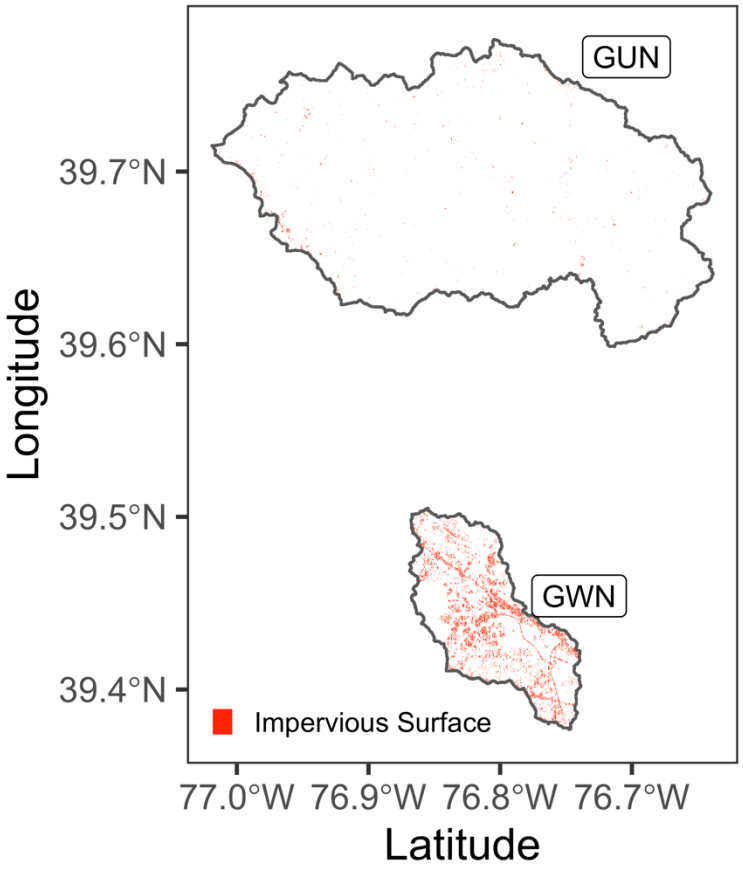

Figure S1. Watershed map showing impervious surfaces in Gunpowder Falls

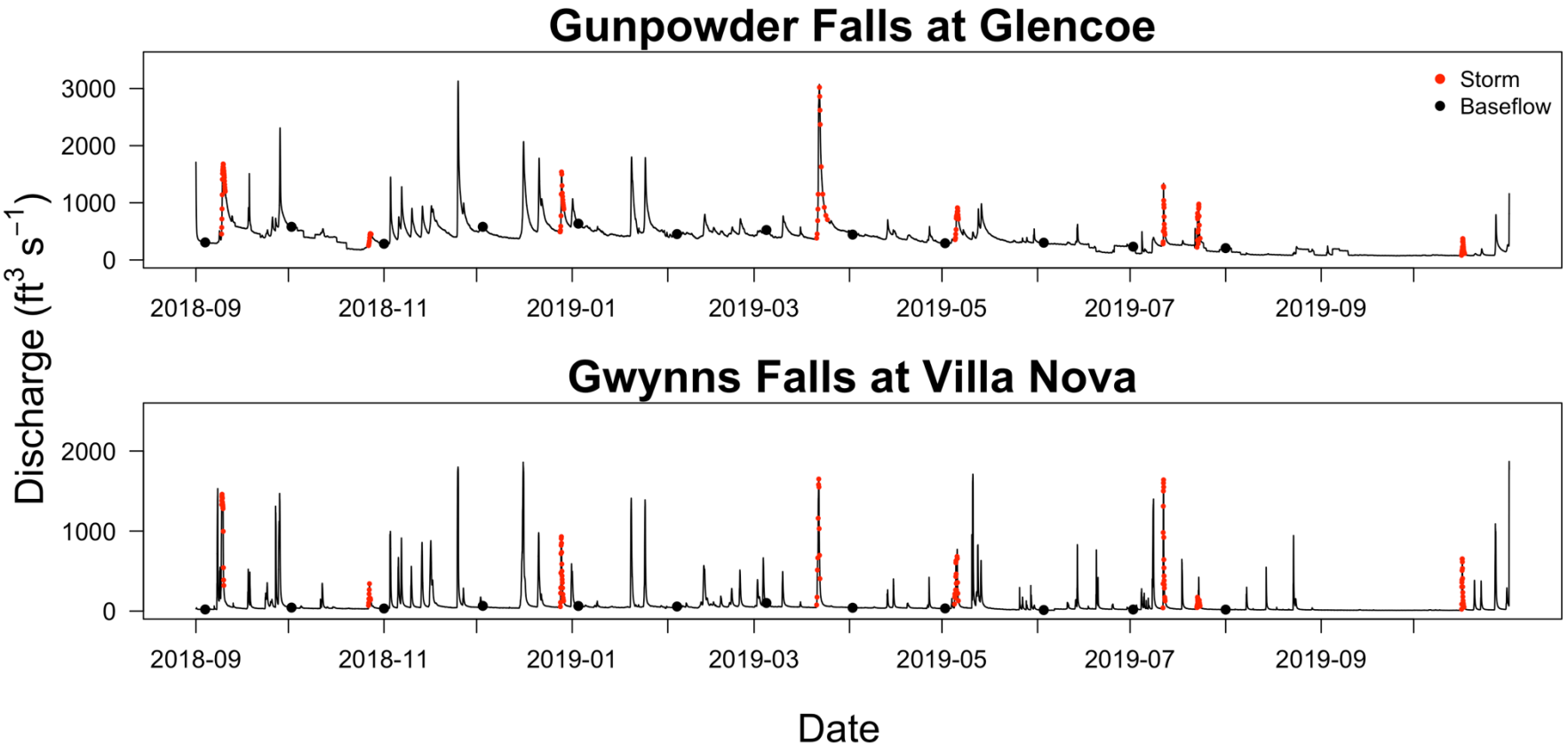

Figure S2. Hydrographs from September 2018 – October 2019 showing baseflow samples (black dots) and storm samples (red dots) for both watersheds.

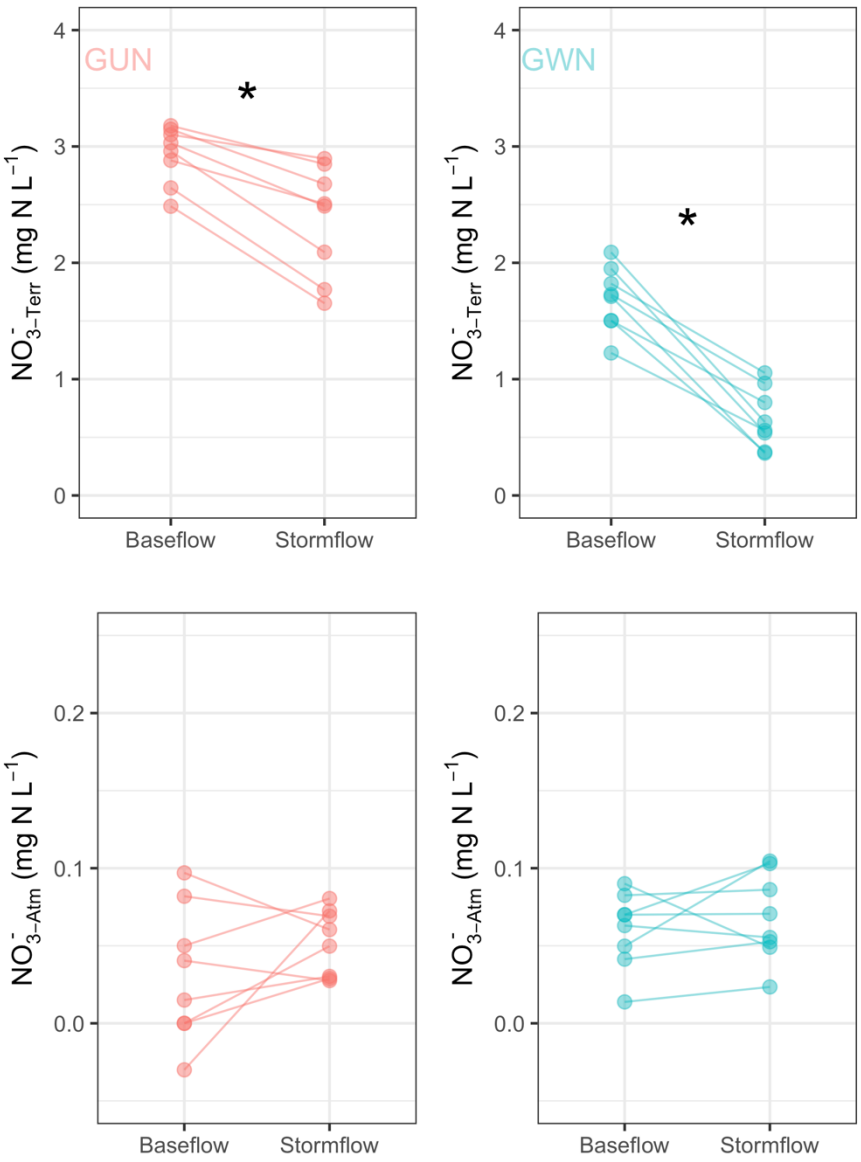

Figure S3. Baseflow and event mean concentrations ("Stormflow") for $NO_3^-{}_{Terr}$ and $NO_3^-{}_{Atm.}$ The asterisk (*) indicates a significant difference at $p < 0.05$.

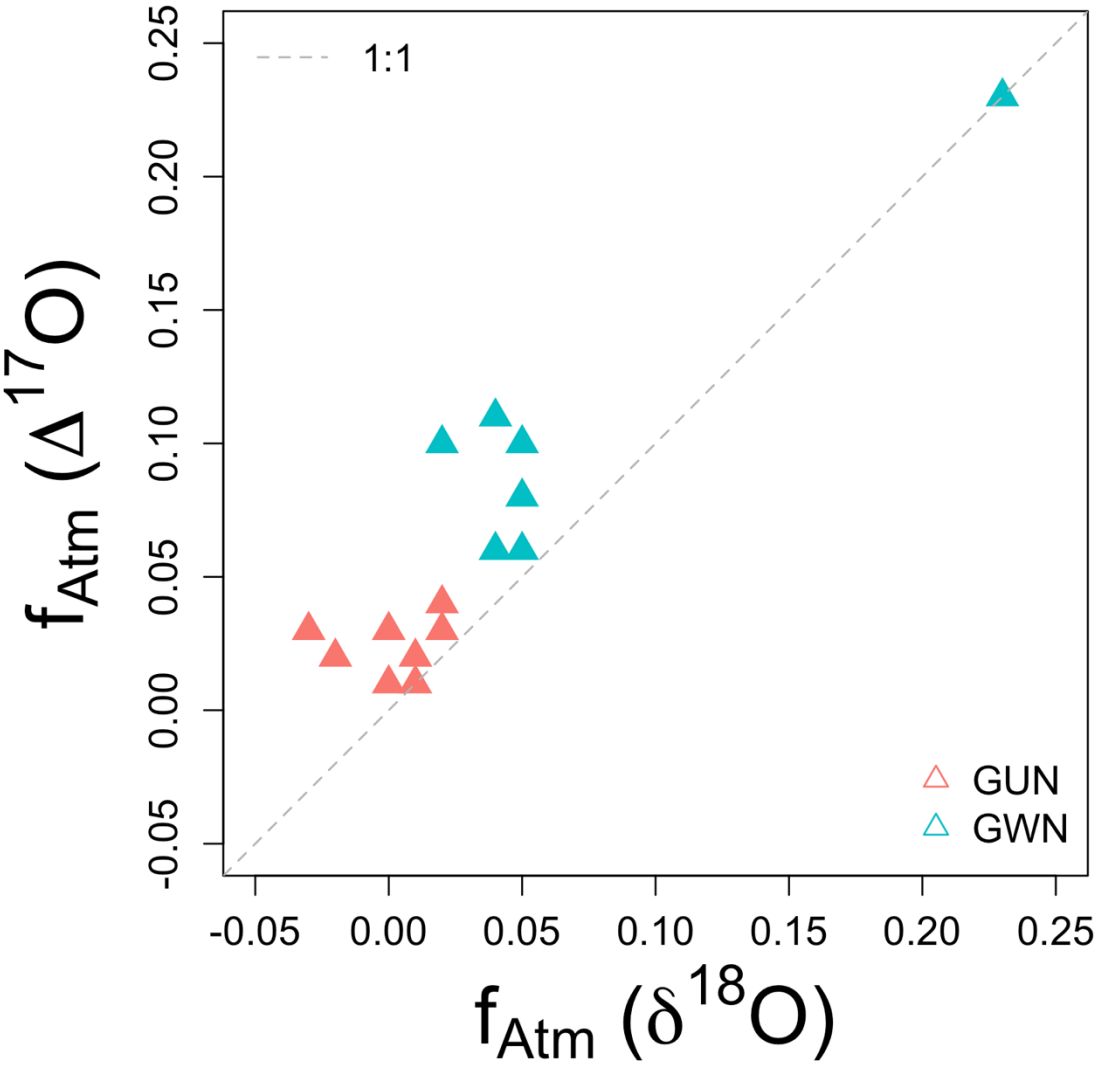

Figure S4. Average event fraction of unprocessed atmospheric NO_3^- (f_{Atm}) as calculated using $\Delta^{17}O$ and $\delta^{18}O$. Triangles above the dashed grey 1:1 line indicate f_{Atm} is underestimated by $\delta^{18}O$.