

1 Supplement

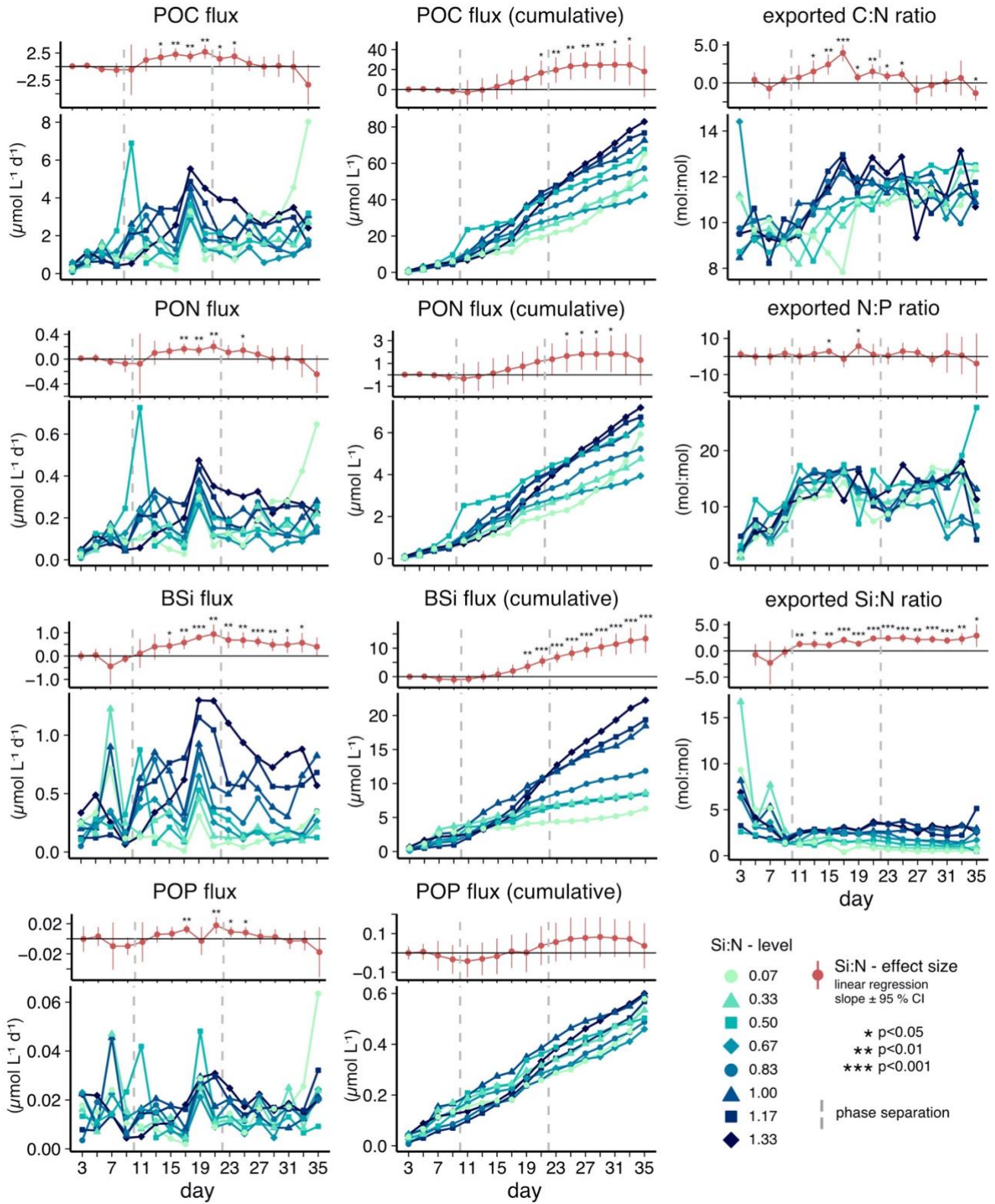


Figure S1. Particulate matter export flux (daily flux, cumulative flux and elemental ratios) and daily Si:N effect sizes. Effect sizes of exported C:N and exported Si:N ratios on day 3 were removed in order to improve readability (-1.64 ± 4.15 and -4.55 ± 9.14 mol mol⁻¹, respectively).

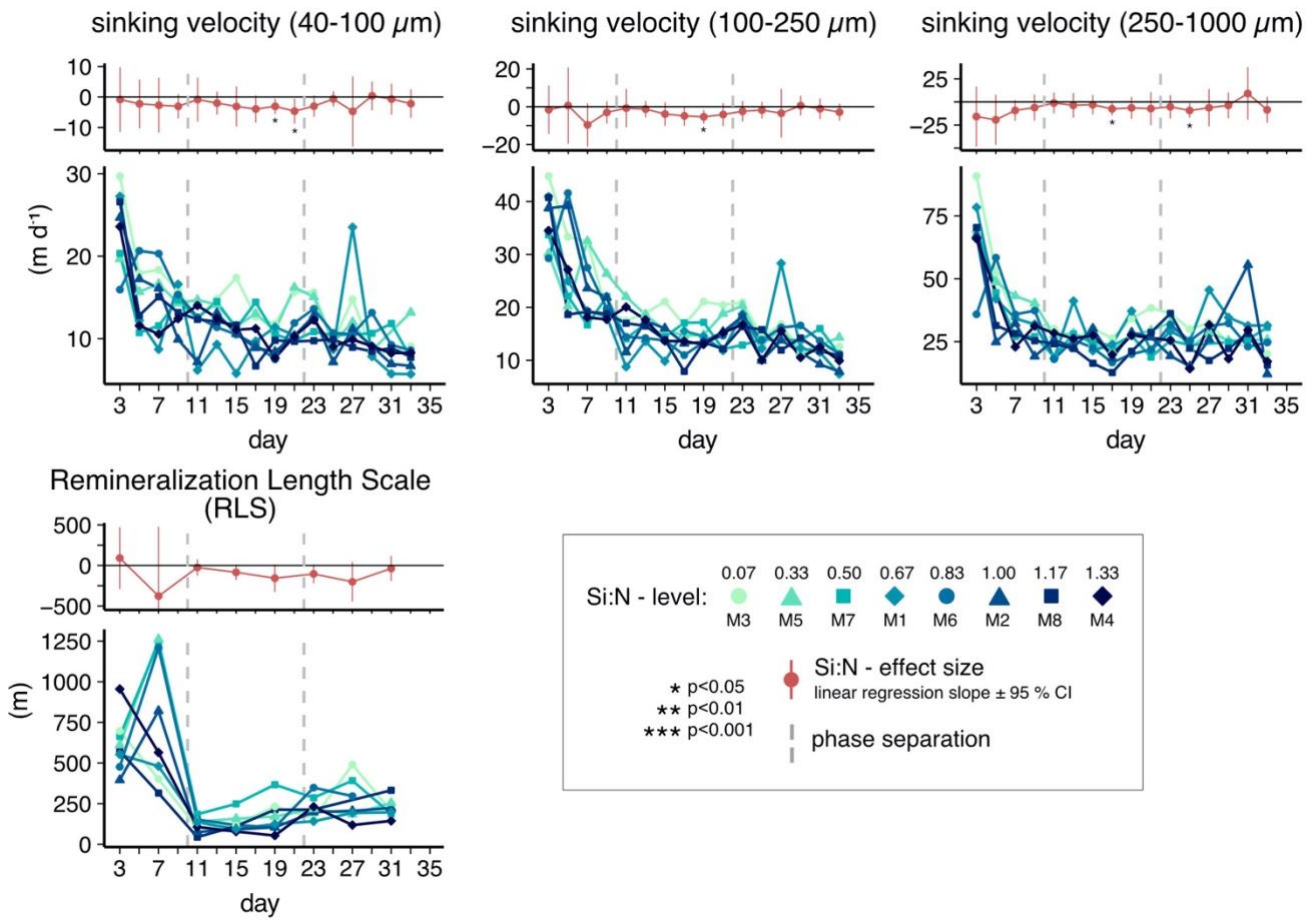


Figure S2. Sinking velocities for different size fractions of the 40–1000 μm size spectrum and remineralization length scale (RLS) including daily Si:N effect sizes. RLS was calculated by dividing velocities of the fastest 10 % of sinking particles (SV_{fast}) by particle remineralization rates (C_{remin}) and is limited to the days for which there are remineralization rate measurements.

Table S1. Linear mixed models showing the effects of artificial upwelling on particulate matter flux and stoichiometries. Si:N, Day (day 11–33) and Si:N \times Day were deployed as fixed effects and Mesocosm as random effect. Significant fixed effects to be interpreted are displayed in bold.

Response variable	Fixed effect	MS	df _{Num}	df _{Den}	F-value	p-value	R ² _{marginal}
a) Particulate organic carbon flux (POC)	Si:N	3.676	1	6	3.6	0.1064	0.43
	Day	4.041	12	72	3.96	0.0001	
	Si:N \times Day	3.254	12	72	3.19	0.0011	

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b) Particulate organic nitrogen flux (PON)	Si:N	0.026	1	6	2.83	0.1434	0.375
	Day	0.026	12	72	2.9	0.0025	
	Si:N × Day	0.019	12	72	2.11	0.0269	
c) Biogenic silica flux (BSi)	Si:N	1.933	1	6	69.67	0.0002	0.692
	Day	0.043	12	72	1.54	0.1291	
	Si:N × Day	0.055	12	72	1.99	0.0373	
d) Particulate organic phosphorus flux (POP)	Si:N	0	1	6	2.15	0.1932	0.483
	Day	0	12	72	4.74	<0.0001	
	Si:N × Day	0	12	72	2.08	0.0288	
e) Particulate inorganic carbon flux (PIC)	Si:N	0.015	1	6	4.35	0.0821	0.693
	Day	0.022	12	72	6.59	<0.0001	
	Si:N × Day	0.006	12	72	1.82	0.0609	
f) Exported Si:N ratio	Si:N	25.263	1	6	155.12	<0.0001	0.801
	Day	0.471	12	72	2.89	0.0026	
	Si:N × Day	0.39	12	72	2.39	0.0115	
g) Exported C:N ratio	Si:N	12.027	1	78	30.49	<0.0001	0.663
	Day	3.12	12	78	7.91	<0.0001	
	Si:N × Day	2.472	12	78	6.27	<0.0001	
h) Exported Si:C ratio	Si:N	0.161	1	6	150.41	<0.0001	0.814
	Day	0.006	12	72	5.62	<0.0001	
	Si:N × Day	0.004	12	72	3.59	0.0003	
i) Exported N:P ratio	Si:N	4.803	1	6	0.49	0.5106	0.229
	Day	10.832	12	72	1.1	0.3715	
	Si:N × Day	7.555	12	72	0.77	0.6795	
j) Exported PIC:POC (rain) ratio	Si:N	0	1	6	0.92	0.3747	0.692
	Day	0.003	12	72	4.97	<0.0001	
	Si:N × Day	0	12	72	0.62	0.8176	
k) BSi fraction of total flux	Si:N	0.138	1	6	131.31	<0.0001	0.846
	Day	0.006	12	72	8.5	<0.0001	
	Si:N × Day	0.009	12	72	5.46	<0.0001	

15 MS: mean squares; df_{Num} and df_{Den} : numerator and denominator degrees of freedom;
 $R^2_{marginal}$: proportion of variation explained by all fixed effects

20 **Table S2. (a)–(e):** Linear mixed models showing the effects of artificial upwelling on sinking velocities and carbon-specific remineralization rate. **(f)–(i):** Linear mixed models showing the relationship between sinking velocities and the Si:N ratio of the particulate export flux (BSi:PON). Si:N (or exported Si:N ratio for (f)–(i)), Day (day 11–33) and Si:N \times Day were deployed as fixed effects and Mesocosm as random effect. Significant fixed effects to be interpreted are displayed in bold.

Response variable	Fixed effect	MS	df_{Num}	df_{Den}	F-value	p-value	$R^2_{marginal}$
a) Sinking velocity (fastest 10 % of particles)	Si:N	2002.393	1	69	44.86	<0.0001	0.627
	Day	215.627	11	69	4.83	<0.0001	
	Si:N \times Day	64.169	11	69	1.44	0.1763	
b) Sinking velocity (40–100 μ m size fraction)	Si:N	72.263	1	6	12.25	0.0131	0.392
	Day	11.177	11	63	1.9	0.0567	
	Si:N \times Day	3.406	11	63	0.58	0.8399	
c) Sinking velocity (100–250 μ m size fraction)	Si:N	101.653	1	69	11.68	0.0011	0.398
	Day	12.206	11	69	1.4	0.1919	
	Si:N \times Day	4.066	11	69	0.47	0.9173	
d) Sinking velocity (250–1000 μ m size fraction)	Si:N	222.494	1	6	5.61	0.0534	0.301
	Day	20.888	11	63	0.53	0.8781	
	Si:N \times Day	27.532	11	63	0.69	0.7391	
e) Carbon-specific remineralization rate	Si:N	0.008	1	36	1.37	0.249	0.447
	Day	0.011	5	36	1.87	0.1242	
	Si:N \times Day	0.001	5	36	0.24	0.9424	
f) Sinking velocity (fastest 10 % of particles)	exported Si:N ratio	1429.212	1	9	33.75	0.0002	0.633
	Day	222.733	11	65	5.26	<0.0001	
	exported Si:N ratio \times Day	80.567	11	65	1.9	0.0552	
g) Sinking velocity (40–100 μ m size fraction)	exported Si:N ratio	112.339	1	69	20.43	<0.0001	0.435
	Day	14.105	11	69	2.57	0.0087	

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	exported Si:N ratio × Day	4.821	11	69	0.88	0.5664	
h) Sinking velocity (100–250 μm size fraction)	exported Si:N ratio	146.11	1	69	18.35	< 0.0001	0.442
	Day	16.789	11	69	2.11	0.0309	
	exported Si:N ratio × Day	6.395	11	69	0.8	0.6367	
i) Sinking velocity (250–1000 μm size fraction)	exported Si:N ratio	116.466	1	10	3.32	0.0976	0.349
	Day	29.585	11	64	0.84	0.5989	
	exported Si:N ratio × Day	49.29	11	64	1.4	0.1931	

MS: mean squares; df_{Num} and df_{Den}: numerator and denominator degrees of freedom;
R²_{marginal}: proportion of variation explained by all fixed effects