

Supplemental information

Tables captions

Tab. S1: Particles fluxes and their transfer efficiencies (T) according to the sampling dates for both AMOP1 and AMOP2 datasets.

T is determined from $\%Flux_{149m}/Flux_{34m}$ and its uncertainty from logarithmic expansion calculation, and b coefficient from the Martin's curves theory (Suess, 1980; Martin et al., 1987). *Italic and non-italic values correspond to the fluxes at 34 m and 149 m, respectively. On the last lines of the table, bold colored values in red, yellow and blue correspond to particles fluxes averaged values for low, intermediate and high T_{eff} ranges, respectively, with the relative standard deviation between samples ($\pm SD\%$). Analysis accuracy on the particles total mass fluxes is $\pm 3\%$, inducing an absolute uncertainty on their vertical transfer efficiency estimated from a logarithmic expansion of $\pm 6\%$ (cf. Methods).*

Tab. S2: Organic elemental fluxes and their transfer efficiencies according to the sampling dates for both AMOP1 and AMOP2 datasets.

a), b), c) and d) POC, PON, POP and BSi fluxes in $mg.m^{-2}.d^{-1}$, $mmol.m^{-2}.d^{-1}$ and mol% (on POC+PON+POP+BSi), and their transfer efficiency in % (T_{eff} , T_{effPON} ; cf. Table 1 caption for calculation) in terms of Particulate Organic Carbon (POC), Nitrogen (PON), Phosphorus (POP) and Biogenic Silica (BSi) according to the sampling dates for both AMOP1 and AMOP2 datasets.

For a), b), c) and d), *italic and non-italic values correspond to the fluxes at 34 m and 149 m, respectively. On the last lines of the table, bold values correspond to particles fluxes averaged values for low, intermediate and high T_{eff} ranges, with the relative standard deviation between samples ($\pm SD\%$). Analysis accuracies on the elementary fluxes are $\pm 0.2\%$ for both POC and PON, $\pm 3\%$ for POP, and $\pm 5\%$ for BSi, inducing an absolute uncertainty of $\pm 0.2\%$ (T_{eff}), $\pm 0.2\%$ (T_{effPON}), $\pm 3\%$ (T_{effPOP}) and $\pm 5\%$ (T_{effBSi}) on the transfer efficiency (cf. Methods).*

Tab. S3: Molar ratios and their transfer efficiencies according to the sampling dates for both AMOP1 and AMOP2 datasets.

a) Values of elementary ratios (C:N, C:P and N:P) and transfer efficiency of these ratios in % ($T_{effC:N}$, $T_{effC:P}$, and $T_{effN:P}$; cf. Table 1 caption for calculation) according to the sampling dates for both AMOP1 and AMOP2 datasets.

b) Values of elementary ratios (Si:C, Si:N and Si:P) and transfer efficiency of these ratios in % ($T_{effSi:N}$, $T_{effSi:C}$ and $T_{effSi:P}$; cf. Table 1 caption for calculation) according to the sampling dates for both AMOP1 and AMOP2 datasets.

For a) and b), *italic and non-italic values correspond to the fluxes at 34 m and 149 m, respectively. On the last lines of the table, bold values correspond to particles fluxes averaged values for low, intermediate and high T_{eff} ranges, with the relative standard deviation between samples ($\pm SD\%$). Analysis accuracies on the elementary ratios are ± 0.4 , 3.2 , 3.2% and ± 5.2 , 5.2 , 8% for C:N, C:P and N:P and for Si:C, Si:N and Si:P, respectively, inducing an absolute uncertainty of $\pm 0.9\%$ ($T_{effC:N}$), $\pm 6.3\%$ ($T_{effC:P}$), $\pm 6\%$ ($T_{effN:P}$), and of $\pm 12\%$ ($T_{effSi:C}$), $\pm 13.4\%$ ($T_{effSi:N}$) and $\pm 19\%$ ($T_{effSi:P}$) on the transfer efficiency cf. Methods. Classical (reference) molar ratios have been reported on the second lines from Redfield et al. (1963) and Brezinski (1985).*

Tab. S4: Isotopic fluxes and their transfer efficiencies according to the sampling dates for both AMOP1 and AMOP2 datasets.

Carbon isotopic ratio ($\delta^{13}C$) and nitrogen isotopic ratio ($\delta^{15}N$) fluxes in ‰ and their transfer efficiencies in % (T_{eff13C} and T_{eff15N} ; cf. Table 1 caption for calculation) according to the sampling dates for both AMOP1 and AMOP2 datasets. *Italic and non-italic values correspond to the fluxes at 34 m and 149 m, respectively. On the last lines of the table, bold values correspond to particles fluxes averaged values for low, intermediate and high T_{eff} ranges, with the relative standard deviation between samples ($\pm SD\%$). Analysis accuracies on the isotopic values are $\pm 0.006\%$ for $\delta^{13}C$ and $\pm 0.007\%$ for $\delta^{15}N$, inducing an absolute uncertainty of $\pm 0.06\%$ (T_{eff13C}) and $\pm 0.26\%$ (T_{eff15N}) on the transfer efficiency (cf. Methods).*

Tab. S5: Inorganic calcium carbonate flux and its transfer efficiencies according to the sampling dates for both AMOP1 and AMOP2 datasets.

*Inorganic calcium carbonate (CaCO_3) fluxes in $\text{mgCa}\cdot\text{m}^2\cdot\text{d}^{-1}$ and in % of the total mass flux, and its transfer efficiency in % (T_{effCaCO_3} ; cf. Table 1 caption for calculation) according to the sampling dates for both AMOP1 and AMOP2 datasets. *Italic and non-italic values correspond to the fluxes at 34 m and 149 m, respectively. On the last lines of the table, bold values correspond to particles fluxes averaged values for low, intermediate and high T_{eff} ranges, with the relative standard deviation between samples ($\pm\text{SD}\%$). Analysis accuracies on the elementary fluxes are $\pm 3\%$ for CaCO_3 , inducing an absolute uncertainty of $\pm 3\%$ on the transfer efficiency (T_{effCaCO_3} ; cf. Methods).**

Sample name	Date in 2013		TOTAL MASS FLUX		Transfer efficiency	Error bar on T
	Start	End	mg.m ⁻² .d ⁻¹		%	%
			34 m	149 m	T	
AMOP1-S1	06/01	13/01	486.9	474.6	97	±1.2
AMOP1-S2	13/01	20/01	630.8	336.9	53	± 0.7
AMOP1-S3	20/01	27/01	748.3	419.3	56	± 0.6
AMOP1-S4	27/01	03/02	667.1	70.4	11	± 0.5
AMOP1-S5	03/02	10/02	431.9	165.4	38	± 1.0
AMOP1-S6	10/02	17/02	655.2	164.2	25	± 0.6
AMOP1-S7	17/02	24/02	256.9	118.4	46	± 1.7
AMOP1-S8	24/02	03/03	383.7	76.5	20	± 0.9
AMOP1-S9	03/03	10/03	386.8	127.5	33	± 1.0
AMOP1-S10	10/03	17/03	181.8	65.8	36	± 2.2
AMOP1-S11	17/03	24/03	65.6	38.2	58	± 7.2
AMOP1-S12	24/03	31/03	227.0	73.8	33	± 1.8
AMOP2-S1	28/06	09/07	260.5	488.0	187	± 3.3
AMOP2-S2	09/07	20/07	235.4	154.3	66	± 2.1
AMOP2-S3	20/07	31/07	81.9	123.8	151	± 9.2
AMOP2-S4	31/07	11/08	83.0	25.3	30	± 4.7
AMOP2-S5	11/08	22/08	82.2	82.2	100	± 7.3
AMOP2-S6	22/08	02/09	39.0	78.0	200	± 23.1
AMOP2-S7	02/09	13/09	4647.1	48.6	1	± 0.1
AMOP2-S8	13/09	24/09	2998.3	18.9	1	± 0.1
AMOP2-S9	24/09	05/10	1228.5	33.9	3	± 0.3
AMOP2-S10	05/10	16/10	814.9	47.0	6	± 0.4
AMOP2-S11	16/10	27/10	877.2	30.8	4	± 0.4
AMOP2-S12	27/10	07/11	484.5	12.1	3	± 0.6
			328.6	278.1	81	
High Teff			(±69%)	(±79%)	(±80%)	
			408.6	144.9	49	
Intermediate Teff			(±61%)	(±77%)	(±85%)	
			1767.5	42.9	36	
Low Teff			(±97%)	(±48%)	(±226%)	

Table S1

a) Sample name	Date in 2013		POC flux						Transfer efficiency
	Start	End	34 m			149 m			T _{eff}
			mgC.m ⁻² .d ⁻¹	mmolC.m ⁻² .d ⁻¹	%molC	mgC.m ⁻² .d ⁻¹	mmolC.m ⁻² .d ⁻¹	%molC	
AMOP1-S1	06/01	13/01	139.4	11.6	71	98.6	8.2	62	71
AMOP1-S2	13/01	20/01	127.9	10.7	66	70.7	5.9	60	55
AMOP1-S3	20/01	27/01	149.5	12.5	64	85.9	7.2	62	57
AMOP1-S4	27/01	03/02	92.2	7.7	69	22.1	1.8	65	24
AMOP1-S5	03/02	10/02	107.4	9.0	68	45.5	3.8	65	42
AMOP1-S6	10/02	17/02	132.7	11.1	64	41.5	3.5	61	31
AMOP1-S7	17/02	24/02	41.2	3.4	49	18.0	1.5	46	44
AMOP1-S8	24/02	03/03	86.3	7.2	63	20.4	1.7	63	24
AMOP1-S9	03/03	10/03	109.7	9.1	72	37.9	3.2	70	35
AMOP1-S10	10/03	17/03	51.3	4.3	73	19.2	1.6	72	38
AMOP1-S11	17/03	24/03	20.3	1.7	74	11.6	1.0	76	57
AMOP1-S12	24/03	31/03	54.1	4.5	65	20.1	1.7	65	37
AMOP2-S1	28/06	09/07	41.2	3.4	49	55.5	4.6	42	135
AMOP2-S2	09/07	20/07	37.1	3.1	48	21.1	1.8	46	57
AMOP2-S3	20/07	31/07	17.2	1.4	53	18.2	1.5	48	106
AMOP2-S4	31/07	11/08	19.4	1.6	65	6.2	0.5	69	32
AMOP2-S5	11/08	22/08	17.9	1.5	56	12.2	1.0	47	68
AMOP2-S6	22/08	02/09	6.4	0.5	51	9.6	0.8	47	149
AMOP2-S7	02/09	13/09	470.5	39.2	41	8.3	0.7	59	2
AMOP2-S8	13/09	24/09	395.1	32.9	48	4.9	0.4	63	1
AMOP2-S9	24/09	05/10	172.9	14.4	56	7.2	0.6	51	4
AMOP2-S10	05/10	16/10	135.0	11.3	58	7.0	0.6	40	5
AMOP2-S11	16/10	27/10	180.9	15.1	60	4.8	0.4	62	3
AMOP2-S12	27/10	07/11	83.0	6.9	63	3.0	0.3	71	4
High Teff			70.5	5.9	61	40.3	3.4	58	59
			(±89%)	(±89%)	(±16%)	(±88%)	(±88%)	(±21%)	(±9%)
Intermediate Teff			77.1	6.4	65	25.7	2.1	64	34
			(±49%)	(±49%)	(±11%)	(±50%)	(±50%)	(±12%)	(±21%)
Low Teff			239.6	20.0	54	5.9	0.5	57	3
			(±65%)	(±65%)	(±15%)	(±33%)	(±33%)	(±18%)	(±48%)

Table S2a

b) Sample name	Date in 2013		PON flux						Transfer efficiency
	Start	End	mgN.m ⁻² .d ⁻¹	mmolN.m ⁻² .d ⁻¹	%molN	mgN.m ⁻² .d ⁻¹	mmolN.m ⁻² .d ⁻¹	%molN	%
			34 m			149 m			T _{effPON}
AMOP1-S1	06/01	13/01	23.6	1.7	10	15.7	1.1	8	67
AMOP1-S2	13/01	20/01	19.8	1.4	9	10.5	0.8	8	53
AMOP1-S3	20/01	27/01	20.8	1.5	8	11.5	0.8	7	55
AMOP1-S4	27/01	03/02	14.3	1.0	9	3.6	0.3	9	25
AMOP1-S5	03/02	10/02	14.3	1.0	8	6.3	0.5	8	44
AMOP1-S6	10/02	17/02	17.3	1.2	7	7.1	0.5	9	41
AMOP1-S7	17/02	24/02	5.7	0.4	6	2.2	0.2	5	39
AMOP1-S8	24/02	03/03	12.0	0.9	7	2.4	0.2	6	20
AMOP1-S9	03/03	10/03	15.5	1.1	9	5.0	0.4	8	32
AMOP1-S10	10/03	17/03	7.4	0.5	9	2.4	0.2	8	32
AMOP1-S11	17/03	24/03	2.7	0.2	8	1.8	0.1	10	65
AMOP1-S12	24/03	31/03	6.2	0.4	6	2.9	0.2	8	47
AMOP2-S1	28/06	09/07	6.4	0.5	7	7.1	0.5	5	110
AMOP2-S2	09/07	20/07	6.0	0.4	7	2.8	0.2	5	46
AMOP2-S3	20/07	31/07	2.9	0.2	8	2.5	0.2	6	84
AMOP2-S4	31/07	11/08	3.8	0.3	11	1.0	0.1	10	26
AMOP2-S5	11/08	22/08	3.4	0.2	9	1.7	0.1	6	51
AMOP2-S6	22/08	02/09	1.1	0.1	8	1.4	0.1	6	123
AMOP2-S7	02/09	13/09	77.3	5.5	6	1.1	0.1	7	1
AMOP2-S8	13/09	24/09	67.3	4.8	7	0.8	0.1	8	1
AMOP2-S9	24/09	05/10	26.0	1.9	7	1.0	0.1	6	4
AMOP2-S10	05/10	16/10	23.6	1.7	9	0.9	0.1	4	4
AMOP2-S11	16/10	27/10	36.7	2.6	10	0.9	0.1	10	3
AMOP2-S12	27/10	07/11	16.5	1.2	11	0.7	0.0	14	4
			10.6	0.8	8	5.7	0.4	7	54
			(±85%)	(±85%)	(±11%)	(±87%)	(±87%)	(±26%)	(±13%)
			10.7	0.8	8	3.7	0.3	8	34
			(±46%)	(±46%)	(±20%)	(±56%)	(±56%)	(±19%)	(±27%)
			41.2	2.9	8	0.9	0.1	8	3
			(±61%)	(±61%)	(±24%)	(±18%)	(±18%)	(±41%)	(±47%)

Table S2b

c) Sample name	Date in 2013		POP flux						Transfer efficiency
	Start	End	mgP.m ⁻² .d ⁻¹	mmolP.m ⁻² .d ⁻¹	%molP	mgP.m ⁻² .d ⁻¹	mmolP.m ⁻² .d ⁻¹	%molP	%
			34 m			149 m			T _{effPOP}
AMOP1-S1	06/01	13/01	17.3	0.6	4	5.6	0.2	1	32
AMOP1-S2	13/01	20/01	7.1	0.2	1	2.4	0.1	1	34
AMOP1-S3	20/01	27/01	5.9	0.2	1	2.1	0.1	1	35
AMOP1-S4	27/01	03/02	3.5	0.1	1	0.9	0.0	1	26
AMOP1-S5	03/02	10/02	4.7	0.2	1	1.3	0.0	1	27
AMOP1-S6	10/02	17/02	3.9	0.1	1	2.6	0.1	2	66
AMOP1-S7	17/02	24/02	2.2	0.1	1	0.9	0.0	1	40
AMOP1-S8	24/02	03/03	3.4	0.1	1	0.9	0.0	1	27
AMOP1-S9	03/03	10/03	6.4	0.2	2	1.6	0.1	1	25
AMOP1-S10	10/03	17/03	2.7	0.1	2	1.4	0.0	2	53
AMOP1-S11	17/03	24/03	1.0	0.0	1	0.5	0.0	1	45
AMOP1-S12	24/03	31/03	3.0	0.1	1	0.9	0.0	1	31
AMOP2-S1	28/06	09/07	1.8	0.1	1	2.7	0.1	1	152
AMOP2-S2	09/07	20/07	2.0	0.1	1	1.6	0.1	1	80
AMOP2-S3	20/07	31/07	0.8	0.0	1	0.8	0.0	1	104
AMOP2-S4	31/07	11/08	3.7	0.1	5	0.4	0.0	2	12
AMOP2-S5	11/08	22/08	0.5	0.0	1	0.5	0.0	1	107
AMOP2-S6	22/08	02/09	0.2	0.0	1	0.5	0.0	1	267
AMOP2-S7	02/09	13/09	9.2	0.3	0	0.2	0.0	1	3
AMOP2-S8	13/09	24/09	8.3	0.3	0	0.1	0.0	1	2
AMOP2-S9	24/09	05/10	2.8	0.1	0	0.5	0.0	2	19
AMOP2-S10	05/10	16/10	2.2	0.1	0	0.6	0.0	1	25
AMOP2-S11	16/10	27/10	5.1	0.2	1	1.5	0.1	8	30
AMOP2-S12	27/10	07/11	2.0	0.1	1	0.2	0.0	2	9
	High Teff		3.3	0.1	1	1.4	0.0	1	60
			(±91%)	(±91%)	(±32%)	(±63%)	(±63%)	(±32%)	(±53%)
	Intermediate Teff		3.7	0.1	2	1.2	0.0	1	34
			(±33%)	(±33%)	(±79%)	(±50%)	(±50%)	(±36%)	(±48%)
	Low Teff		4.9	0.2	0	0.5	0.0	2	15
			(±64%)	(±64%)	(±33%)	(±98%)	(±98%)	(±120%)	(±81%)

Table S2c

d) Sample name	Date in 2013		BSi flux						Transfer efficiency
	Start	End	mgSi.m ⁻² .d ⁻¹	mmolSi.m ⁻² .d ⁻¹	%molSi	mgSi.m ⁻² .d ⁻¹	mmolSi.m ⁻² .d ⁻¹	%molSi	%
				34 m			149 m		
AMOP1-S1	06/01	13/01	69.3	2.5	15	105.6	3.8	28	152
AMOP1-S2	13/01	20/01	110.6	3.9	24	85.5	3.1	31	77
AMOP1-S3	20/01	27/01	151.8	5.4	28	97.4	3.5	30	64
AMOP1-S4	27/01	03/02	66.3	2.4	21	19.6	0.7	25	30
AMOP1-S5	03/02	10/02	84.5	3.0	23	43.1	1.5	26	51
AMOP1-S6	10/02	17/02	138.5	4.9	28	46.4	1.7	29	33
AMOP1-S7	17/02	24/02	84.9	3.0	44	44.1	1.6	48	52
AMOP1-S8	24/02	03/03	93.0	3.3	29	22.2	0.8	29	24
AMOP1-S9	03/03	10/03	61.8	2.2	17	26.2	0.9	21	42
AMOP1-S10	10/03	17/03	27.1	1.0	17	11.4	0.4	18	42
AMOP1-S11	17/03	24/03	10.3	0.4	16	4.8	0.2	13	47
AMOP1-S12	24/03	31/03	51.7	1.8	27	18.2	0.7	25	35
AMOP2-S1	28/06	09/07	84.1	3.0	43	158.5	5.7	52	188
AMOP2-S2	09/07	20/07	78.1	2.8	44	50.6	1.8	47	65
AMOP2-S3	20/07	31/07	28.7	1.0	38	39.9	1.4	45	139
AMOP2-S4	31/07	11/08	13.5	0.5	19	4.1	0.1	20	30
AMOP2-S5	11/08	22/08	26.0	0.9	35	28.4	1.0	47	109
AMOP2-S6	22/08	02/09	12.1	0.4	41	21.6	0.8	46	178
AMOP2-S7	02/09	13/09	1394.8	49.8	53	11.2	0.4	34	1
AMOP2-S8	13/09	24/09	863.8	30.8	45	5.2	0.2	28	1
AMOP2-S9	24/09	05/10	256.4	9.2	36	13.5	0.5	41	5
AMOP2-S10	05/10	16/10	179.8	6.4	33	21.9	0.8	54	12
AMOP2-S11	16/10	27/10	199.4	7.1	28	3.7	0.1	20	2
AMOP2-S12	27/10	07/11	78.9	2.8	26	1.3	0.0	13	2
High Teff			75.4	2.7	29	53.3	1.9	34	72
			(±78%)	(±78%)	(±36%)	(±72%)	(±72%)	(±41%)	(±32%)
Intermediate Teff			69.0	2.5	25	26.2	0.9	27	38
			(±54%)	(±54%)	(±33%)	(±58%)	(±58%)	(±33%)	(±26%)
Low Teff			495.5	17.7	37	9.5	0.3	32	4
			(±105%)	(±105%)	(±28%)	(±81%)	(±81%)	(±46%)	(±120%)

Table S2d

a) Sample name	Date in 2013		C:N		T _{effC:N}	C:P		T _{effC:P}	N:P		T _{effN:P}
	Start	End	6.625		%	16		%	16		%
			34 m	149 m		34 m	149 m		34 m	149 m	
AMOP1-S1	06/01	13/01	6.89	7.31	106	20.83	45.75	220	3.02	6.26	207
AMOP1-S2	13/01	20/01	7.52	7.83	104	46.48	75.02	161	6.18	9.58	155
AMOP1-S3	20/01	27/01	8.37	8.72	104	65.64	106.59	162	7.84	12.23	156
AMOP1-S4	27/01	03/02	7.53	7.13	95	67.8	62.03	91	9.00	8.7	97
AMOP1-S5	03/02	10/02	8.78	8.36	95	58.99	92.12	156	6.72	11.02	164
AMOP1-S6	10/02	17/02	8.94	6.83	76	88.38	41.67	47	9.89	6.1	62
AMOP1-S7	17/02	24/02	8.48	9.55	113	48.6	52.87	109	5.73	5.53	97
AMOP1-S8	24/02	03/03	8.39	10.03	120	66.48	58.57	88	7.93	5.84	74
AMOP1-S9	03/03	10/03	8.25	8.81	107	44.4	60.43	136	5.38	6.86	127
AMOP1-S10	10/03	17/03	8.09	9.39	116	49.11	34.94	71	6.07	3.72	61
AMOP1-S11	17/03	24/03	8.7	7.67	88	51.68	65.93	128	5.94	8.6	145
AMOP1-S12	24/03	31/03	10.11	8.01	79	46.78	55.48	119	4.63	6.93	150
AMOP2-S1	28/06	09/07	7.47	9.14	122	59.29	52.59	89	7.93	5.75	72
AMOP2-S2	09/07	20/07	7.17	8.81	123	48.7	34.62	71	6.79	3.93	58
AMOP2-S3	20/07	31/07	6.8	8.62	127	55.06	56.17	102	8.1	6.52	80
AMOP2-S4	31/07	11/08	5.91	7.13	121	13.49	36.27	269	2.28	5.09	223
AMOP2-S5	11/08	22/08	6.18	8.30	134	91.12	57.91	64	14.75	6.98	47
AMOP2-S6	22/08	02/09	6.62	7.99	121	96.15	53.67	56	14.52	6.72	46
AMOP2-S7	02/09	13/09	7.1	8.55	120	132.48	88.43	67	18.66	10.35	55
AMOP2-S8	13/09	24/09	6.85	7.53	110	123.45	88.11	71	18.02	11.7	65
AMOP2-S9	24/09	05/10	7.75	8.05	104	159.21	34.67	22	20.53	4.31	21
AMOP2-S10	05/10	16/10	6.69	9.21	138	160.16	32.63	20	23.95	3.54	15
AMOP2-S11	16/10	27/10	5.75	5.95	103	90.7	8.1	9	15.78	1.36	9
AMOP2-S12	27/10	07/11	5.86	5.00	85	105.16	42.17	40	17.94	8.43	47
	High Teff		7.59 (±13%)	8.26 (±6%)	111 (±16%)	60.72 (±31%)	68.01 (±39%)	117 (±41%)	8.3 (±44%)	8.26 (±37%)	112 (±49%)
	Intermediate Teff		8.27 (±14%)	8.36 (±14%)	102 (±16%)	53.78 (±38%)	54.93 (±32%)	121 (±54%)	6.4 (±36%)	6.64 (±32%)	117 (±46%)
	Low Teff		6.67 (±11%)	7.38 (±22%)	110 (±16%)	128.53 (±22%)	49.02 (±66%)	38 (±68%)	19.15 (±15%)	6.61 (±62%)	35 (±67%)

Table S3a

b) Sample name	Date in 2013		Si:C		T _{effSi:C}	Si:N		T _{effSi:N}	Si:P		T _{effSi:P}
	Start	End	0.14		%	0.94		%	15		%
			<i>34 m</i>	149 m		<i>34 m</i>	149 m		<i>34 m</i>	149 m	
AMOP1-S1	06/01	13/01	0.21	0.46	215	1.46	3.34	228	4.42	20.92	473
AMOP1-S2	13/01	20/01	0.37	0.52	140	2.78	4.05	146	17.17	38.77	226
AMOP1-S3	20/01	27/01	0.43	0.48	112	3.63	4.22	116	28.49	51.65	181
AMOP1-S4	27/01	03/02	0.31	0.38	123	2.31	2.7	117	20.83	23.52	113
AMOP1-S5	03/02	10/02	0.34	0.41	121	2.95	3.39	115	19.84	37.33	188
AMOP1-S6	10/02	17/02	0.45	0.48	107	3.99	3.26	82	39.42	19.89	50
AMOP1-S7	17/02	24/02	0.88	1.05	119	7.47	10.00	134	42.83	55.34	129
AMOP1-S8	24/02	03/03	0.46	0.46	101	3.86	4.66	121	30.62	27.21	89
AMOP1-S9	03/03	10/03	0.24	0.3	123	1.99	2.61	131	10.68	17.87	167
AMOP1-S10	10/03	17/03	0.23	0.25	112	1.83	2.38	130	11.08	8.85	80
AMOP1-S11	17/03	24/03	0.22	0.18	82	1.89	1.36	72	11.23	11.73	104
AMOP1-S12	24/03	31/03	0.41	0.39	95	4.13	3.1	75	19.10	21.44	112
AMOP2-S1	28/06	09/07	0.87	1.22	140	6.52	11.16	171	51.71	64.17	124
AMOP2-S2	09/07	20/07	0.9	1.02	114	6.46	9.01	139	43.88	35.41	81
AMOP2-S3	20/07	31/07	0.72	0.94	131	4.86	8.08	166	39.37	52.63	134
AMOP2-S4	31/07	11/08	0.3	0.28	95	1.75	2.02	115	4.01	10.26	256
AMOP2-S5	11/08	22/08	0.62	0.99	160	3.83	8.24	215	56.5	57.5	102
AMOP2-S6	22/08	02/09	0.8	0.96	120	5.32	7.69	145	77.26	51.67	67
AMOP2-S7	02/09	13/09	1.27	0.58	46	8.99	4.94	55	167.81	51.11	30
AMOP2-S8	13/09	24/09	0.93	0.45	49	6.4	3.42	53	115.31	39.96	35
AMOP2-S9	24/09	05/10	0.63	0.8	127	4.91	6.46	132	100.85	27.84	28
AMOP2-S10	05/10	16/10	0.57	1.34	236	3.81	12.36	325	91.14	43.79	48
AMOP2-S11	16/10	27/10	0.47	0.33	70	2.71	1.95	72	42.71	2.66	6
AMOP2-S12	27/10	07/11	0.41	0.19	46	2.38	0.93	39	42.70	7.87	18
			0.51	0.64	121	3.72	5.38	138	31.45	39.01	139
			(±52%)	(±57%)	(±25%)	(±46%)	(±59%)	(±38%)	(±60%)	(±45%)	(±45%)
			0.4	0.44	111	3.36	3.79	113	22.04	24.63	132
			(±50%)	(±54%)	(±11%)	(±54%)	(±65%)	(±19%)	(±60%)	(±58%)	(±48%)
			0.71	0.62	95	4.87	5.01	113	93.42	28.87	28
			(±46%)	(±67%)	(±79%)	(±51%)	(±82%)	(±97%)	(±51%)	(±69%)	(±52%)

Table S3b

Sample name	Date in 2013		$\delta^{13}\text{C}$		Teff13C	$\delta^{15}\text{N}$		T _{eff15N}
	Start	End	‰			‰		
			34 m	149 m	%	34 m	149 m	%
AMOP1-S1	06/01	13/01	-20.8	-18.4	88	9.0	8.9	99
AMOP1-S2	13/01	20/01	-20.3	-18.8	93	6.6	8.4	127
AMOP1-S3	20/01	27/01	-20.3	-19.1	94	5.9	8.6	146
AMOP1-S4	27/01	03/02	-20.3	-19.3	95	3.5	9.3	267
AMOP1-S5	03/02	10/02	-21.0	-19.8	94	5.5	10.1	185
AMOP1-S6	10/02	17/02	-21.0	-19.8	94	5.9	13.1	224
AMOP1-S7	17/02	24/02	-21.0	-20.8	99	9.2	8.0	86
AMOP1-S8	24/02	03/03	-21.2	-19.7	93	6.3	8.2	130
AMOP1-S9	03/03	10/03	-21.5	-20.2	94	5.9	8.0	135
AMOP1-S10	10/03	17/03	-21.6	-20.2	94	4.5	7.9	177
AMOP1-S11	17/03	24/03	-21.1	-19.3	91	7.9	9.1	116
AMOP1-S12	24/03	31/03	-20.7	-19.1	92	7.5	8.6	115
AMOP2-S1	28/06	09/07	-22.0	-21.0	95	4.3	4.3	100
AMOP2-S2	09/07	20/07	-22.1	-21.9	99	5.9	4.9	83
AMOP2-S3	20/07	31/07	-22.7	-21.9	96	7.7	6.9	89
AMOP2-S4	31/07	11/08	-22.3	-20.5	92	9.3	8.0	86
AMOP2-S5	11/08	22/08	-22.4	-20.2	90	7.3	6.7	92
AMOP2-S6	22/08	02/09	-19.4	-17.6	91	5.6	6.5	115
AMOP2-S7	02/09	13/09	-19.4	-17.4	90	4.9	7.4	152
AMOP2-S8	13/09	24/09	-19.8	-17.6	89	7.7	8.3	108
AMOP2-S9	24/09	05/10	-18.4	-17.8	97	6.9	6.8	98
AMOP2-S10	05/10	16/10	-19.1	-19.0	100	7.8	8.0	90
AMOP2-S11	16/10	27/10	-19.7	-19.9	101	9.3	8.4	90
AMOP2-S12	27/10	07/11	-20.4	-21.4	105	7.9	8.1	103
High Teff			-21.2	-19.8	93	6.7	7.5	113
			(±5%)	(±6%)	(±4%)	(±13%)	(±23%)	(±23%)
Intermediate Teff			-21.2	-19.9	94	6.4	9.0	156
			(±3%)	(±3%)	(±2%)	(±31%)	(±19%)	(±40%)
Low Teff			-19.5	-18.9	97	7.4	7.7	107
			(±3%)	(±8%)	(±6%)	(±20%)	(±9%)	(±22%)

Table S4

Sample name	Date in 2013		CaCO ₃		T _{effCaCO₃} %
	Start	End	mgCa.m ⁻² .d ⁻¹		
			34 m	149 m	
AMOP1-S1	06/01	13/01	10.61	19.48	184
AMOP1-S2	13/01	20/01	9.92	13.22	133
AMOP1-S3	20/01	27/01	33.57	11.93	36
AMOP1-S4	27/01	03/02	24.27	4.54	19
AMOP1-S5	03/02	10/02	16.16	4.64	29
AMOP1-S6	10/02	17/02	19.25	3.73	19
AMOP1-S7	17/02	24/02	4.43	2.16	49
AMOP1-S8	24/02	03/03	10.16	2.11	21
AMOP1-S9	03/03	10/03	23.29	5.00	21
AMOP1-S10	10/03	17/03	9.82	7.04	72
AMOP1-S11	17/03	24/03	2.45	1.64	67
AMOP1-S12	24/03	31/03	6.29	2.06	33
AMOP2-S1	28/06	09/07	2.46	14.54	591
AMOP2-S2	09/07	20/07	4.39	5.82	133
AMOP2-S3	20/07	31/07	0.63	6.14	969
AMOP2-S4	31/07	11/08	17.00	1.28	8
AMOP2-S5	11/08	22/08	0.70	1.87	267
AMOP2-S6	22/08	02/09	2.84	2.59	91
AMOP2-S7	02/09	13/09	373.38	2.02	1
AMOP2-S8	13/09	24/09	157.72	0.73	0
AMOP2-S9	24/09	05/10	49.12	1.05	2
AMOP2-S10	05/10	16/10	22.77	0.99	4
AMOP2-S11	16/10	27/10	14.95	4.78	32
AMOP2-S12	27/10	07/11	25.32	0.96	4
			10.21	6.9	127
			(±132%)	(±79%)	(±70%)
			14.52	3.62	30
			(±50%)	(±52%)	(±65%)
			107.21	1.76	7
			(±131%)	(±88%)	(±170%)

Table S5

Figures captions

Figure S1: Time series in 2013 for particle fluxes (left handed scale) at 34 m (black bar) and 149 m (white bar) and the corresponding transfer efficiency (T ; similarly to T_{eff} defined from Eq.1, gray line, right-handed scale), covering AMOP1 (a) and AMOP2 (b) periods. Error bars correspond to the accuracy of analytical determination for the particle flux and is estimated through a logarithmic expansion of Eq. 1 for T as for T_{eff} . (cf. Methods, and Tab. S1 for details).

Figure S2: Relationship between the mass flux and the flux of carbon and nitrogen, and between their Transfer Efficiencies. a) Total mass fluxes versus the POC fluxes and b) total mass fluxes versus the PON fluxes, at 34 m (filled dots) and at 149 m (empty dots). c) Transfer efficiency of the total mass (T) versus the transfer efficiency of the POC fluxes (T_{eff}) and d) transfer efficiency of the total mass (T) versus the transfer efficiency of the PON fluxes (T_{effPON}). The color of the dots symbolizes the three different main T_{eff} ranges (red, yellow and blue for low, intermediate and high T_{eff} , respectively).

Figure S3: Vertical cross-shore section at 12°S at the latitude of the AMOP fixed mooring for the oxygen concentration and pH value. Data were acquired in the framework of R/V L'Atalante AMOP cruise from January 27 to February 3, 2014. AMOP mooring location is indicated by the vertical white line near the coast on the right. The upper panel (a) represents the oxygen concentration ($\mu\text{mol.kg}^{-1}$) and the lower panel (b) represents the pH values. On both graphs the white dashed isopleth corresponds to the averaged oxygen concentration at the depth where the oxygen gradient is the strongest over all the available AMOP cruise casts (lower oxycline boundary at $O_2=87 \mu\text{mol.kg}^{-1}$) in a-b. The black isopleth corresponds to $\text{pH}=7.6$ (average in the oxycline in b).

Figure S4: Transfer efficiency for the total mass fluxes and for Organic Matter. The black line represents the mass flux transfer efficiency (T). The green line represents the transfer efficiency of the OM, where the OM is estimated as twice the POC fluxes according to Klaas and Archer (2002). Error bars are estimated from a logarithmic expansion of Eq. 1 and the analysis accuracies (cf. Methods), for both AMOP1 and AMOP2 periods in 2013.

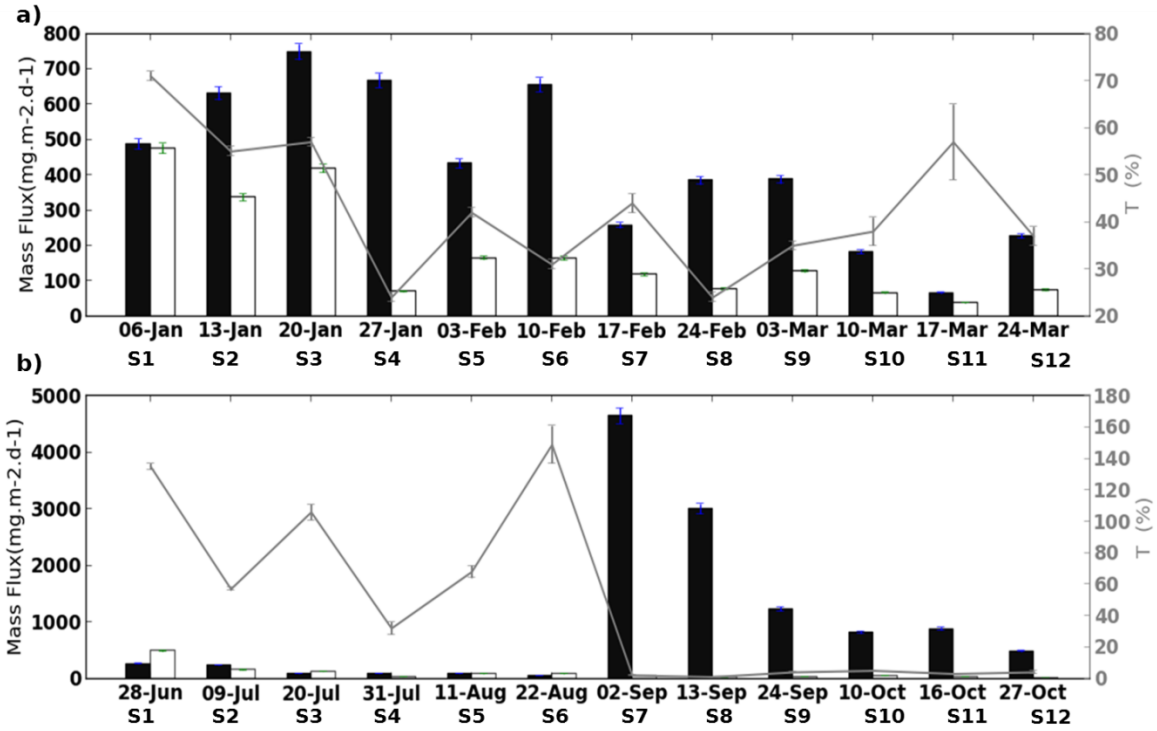


Figure S1

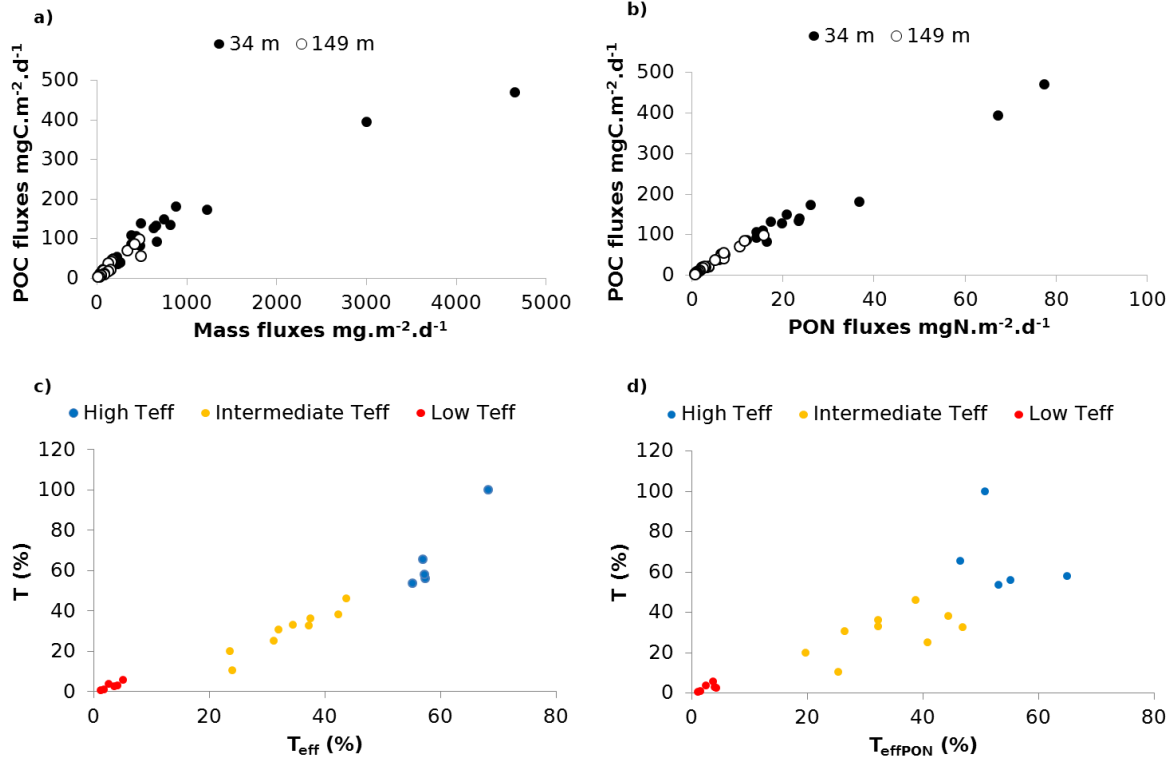


Figure S2

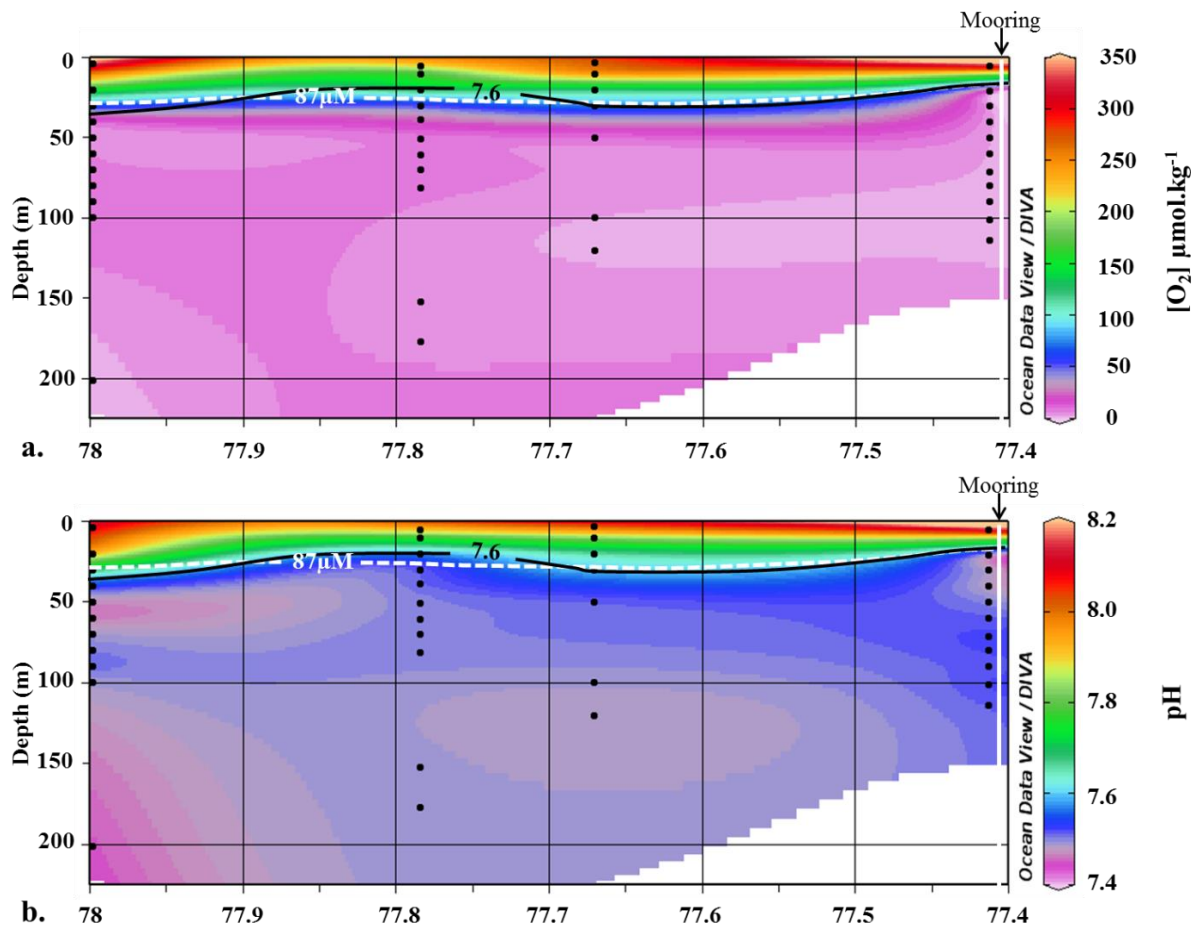


Figure S3

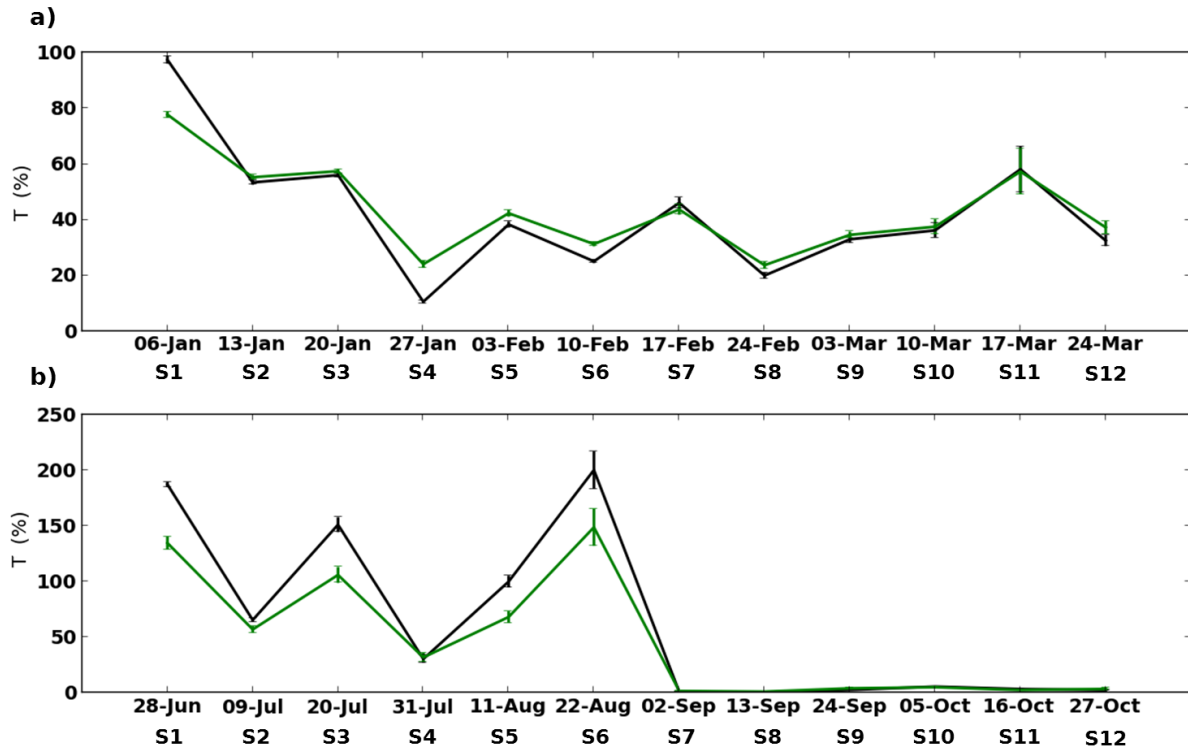


Figure S4