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Supplement of

Phosphomonoesterase and phosphodiesterase activities in the eastern Mediterranean in two contrasting seasonal situations

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Supplementary Material

1 Supplementary Tables

Table S1. Statistical results of the log - log regressions of the bulk Vm of both phosphoesterases (PME, PDE), their specific activities per unit hprok cell, per unit TChla and per unit biomass (phytoC+HprokC, see methods) versus DIP concentrations, during autumn (PERLE1) and winter (PERLE2) cruises.

	units Y*	Y mean ± sd*	Y range*	equation	r^2	P
Vm PME PERLE1	nmol l^{-1} h^{-1}	1.1 ± 1.0	0.014-2.76	log(Y) = 2.70-2.71 log(DIP)	0.45	< 0.0001
Vm PME PERLE2	nmol l^{-1} h^{-1}	2.5 ± 3.4	0.018-18.8	log(Y) = 2.30-1.93 log(DIP)	0.79	< 0.0001
per cell VmPME PERLE1	x 10^{-18} mol hprok $cell^{-1}$ h^{-1}	3.4 ± 3.0	0.09-8.9	log(Y) = 2.58-2.08 log(DIP)	0.37	< 0.0001
per cell Vm PME PERLE2	x 10^{-18} mol hprok $cell^{-1}$ h^{-1}	5.5 ± 7.1	0.08-41	log(Y) = 2.29-1.56 log(DIP)	0.72	< 0.0001
per chl Vm PME PERLE1	nmol µg $chla^{-1}$ h^{-1}	22.4 ± 23.5	0.59-67	log(Y) = 3.19-2.07 log(DIP)	0.23	< 0.0005
per chl Vm PME PERLE2	nmol µg $chla^{-1}$ h^{-1}	7.9 ± 9.8	0.18-62	Log(Y) = 2.43-1.54 log(DIP)	0.7	< 0.0001
per biom Vm PME PERLE1	nmol µg C^{-1} h^{-1}	0.15 ± 0.14	0.004-0.38	log(Y) = 1.14-2.10 log(DIP)	0.31	< 0.0001
per biom Vm PME PERLE2	nmol µg C^{-1} h^{-1}	0.10 ± 0.13	0.0027-0.70	log(Y) = 0.50-1.47 log(DIP)	0.67	< 0.0001
Vm PDE PERLE1	nmol l^{-1} h^{-1}	1.7 ± 1.6	0.011-5.74	log(Y) = 2.66-2.60 log(DIP)	0.32	< 0.0005
Vm PDE PERLE2	nmol l^{-1} h^{-1}	4.3 ± 5.1	0.017-23.4	log(Y) = 2.95-2.35 log(DIP)	0.79	< 0.0001
per cell VmPDE PERLE1	x 10^{-18} mol hprok $cell^{-1}$ h^{-1}	5.1 ± 4.8	0.07-16.1	log(Y) = 2.72-2.19 log(DIP)	0.26	<0.001
per cell Vm PDE PERLE2	x 10^{-18} mol hprok $cell^{-1}$ h^{-1}	10.0 ± 11.4	0.07-54.3	log(Y) = 3.00-2.03 log(DIP)	0.77	< 0.0001
per chl Vm PDE PERLE1	nmol µg $chla^{-1}$ h^{-1}	37 ± 40	0.24-168	log(Y) = 3.58-2.36 log(DIP)	0.16	<0.05
per chl Vm PDE PERLE2	nmol µg $chla^{-1}$ h^{-1}	14 ± 16	0.17-94	log(Y) = 3.00-1.90 lo (DIP)	0.72	< 0.0001
per biom Vm PDE PERLE1	nmol µg C^{-1} h^{-1}	0.24 ± 0.23	0.003-0.81	log(Y) = 1.21-2.08 log(DIP)	0.17	<0.05
per biom Vm PDE PERLE2	nmol µg C^{-1} h^{-1}	0.19 ± 0.21	0.002-1.0	log(Y) = 1.26-2.01 log(DIP)	0.75	< 0.0001

Table S2. Statistical results of the log - log regressions (9 single regressions and 1 multiple regression) between Vm PME rates and flow cytometric group abundances, during autumn (PERLE1) and winter (PERLE2) cruises. The range of abundances of flow cytometric groups (X variables) are indicated: Proc: *Prochlorococus*, Syn: *Synechococcus*, Picoeuk: picophytoeukaryotes, Nanoeuk: Nanophytoeukaryotes, Crypto: Cryptophyte-like cells, HNF: heterotrophic nanoflagellates, LNA: heterotrophic prokaryotes with low nucleic acid content, HNA: heterotrophic prokaryotes with high nucleic acid content, Hprok: heterotrophic prokaryotes. We considered only layers in which all variables were available and above limits of detection simultaneously. For PERLE2 regressions: range of Vm PME (Y variable) were 0.020-18.8 nmol l^{-1} h^{-1}, n = 84. For PERLE 1 regressions: range of Vm PME (Y variable) were 0.048-2.71 nmol l^{-1} h^{-1}, n = 36. In the multiple regression, we included 8 X variables (Proc, Syn Pico Nano Crypto, HNF, LNA and HNA).*: before log-transformation, ns: not significant.

	Single regressions			Multiple regression
Vm PME, PERLE 2	X range* (cells ml^{-1})	r^2	P (F test)	p (t test)
Proc	18-5903	0.48	< 0.0001	ns
Syn	13-6317	0.78	< 0.0001	< 0.0001
Picoeuk	1-547	0.2	< 0.0001	ns
Nanoeuk	1-63	0.56	< 0.0001	ns
Crypto	1-81	0.48	< 0.0001	< 0.0001
HNF	99-409	0.04	ns	ns
LNA	122213-619930	0.22	< 0.0001	ns
HNA	34394-371834	0.16	< 0.0005	ns
hprok	155342-736928	0.38	< 0.0001	not included
Vm PME, PERLE 1				
Proc	106-47460	0.37	< 0.0001	ns
Syn	81-14511	0.87	< 0.0001	< 0.0001
Picoeuk	133-689	0.32	< 0.005	< 0.05
Nanoeuk	2-138	0.77	< 0.0001	ns
Crypto	2-11	0.007	ns	ns
HNF	101-274	0.14	< 0.05	ns
LNA	157346-392444	0.15	< 0.05	ns
HNA	57796-152040	0.24	< 0.005	ns
hprok	220284-545065	0.21	< 0.005	not included

Table S3. Statistical results of the log - log regressions (9 single regressions and 1 multiple regression) between Vm PDE and flow cytometric group abundances, during autumn (PERLE1) and winter (PERLE2) cruises. See the Table 1 legend for more details and abbreviation's code. For PERLE2 regressions: range of Vm PDE (Y variable) were 0.017-23.4 nmol l^{-1} h^{-1}, n = 72. For PERLE 1 regressions: range of Vm PDE (Y variable) were 0.026-5.74 nmol l^{-1} h^{-1}, n = 32. In the multiple regression, we included 8 X variables (Proc, Syn Pico Nano Crypto, HNF, LNA and HNA).*: before log-transformation, ns: not significant.

	single regressions			multiple regression
Vm PDE, PERLE 2	X range* (cells ml^{-1})	r^2	P(F test)	p (t test)
Proc	49-5903	0.38	< 0.0001	ns
Syn	13-6317	0.74	< 0.0001	< 0.0001
Pico	1-647	0.11	< 0.002	ns
Nano	1-63	0.5	< 0.0001	ns
Crypto	1-81	0.43	< 0.0001	< 0.0001
HNF	108-409	0.06	< 0.05	ns
LNA	124637-619930	0.09	< 0.05	ns
HNA	36589-371834	0.19	< 0.0001	ns
hprok	163976-736928	0.27	< 0.0001	not included
Vm PDE, PERLE 1				
Proc	106-47460	0.68	< 0.0001	ns
Syn	121-14511	0.58	< 0.0001	< 0.0005
Pico	133-689	0.17	< 0.05	ns
Nano	15-138	0.56	< 0.0001	ns
Crypto	2-11	0.002	ns	ns
HNF	107-274	0.02	ns	ns
LNA	157346-392444	0.11	ns	ns
HNA	61167-152040	0.12	ns	ns
hprok	220284-545065	0.01	ns	not included

2 Supplementary Figures

Figure S1. Vertical distributions of density excess (a, b, c) and Total Chlorophyll a derived from fluorescence (d, e, f). a, d: PERLE1 cruise (October 2018), b, e: Mixed stations of PERLE2 cruise (Feb-March 2019); c, f: other stations of PERLE2 cruise.

Figure S2. Vertical distributions of NOx:DIP ratios and Vm PDE:Vm PDE ratios. a: PERLE1 cruise (October 2018), b: Mixed stations of PERLE2 cruise (Feb-March 2019); c: other stations of PERLE2 cruise.

Figure S3. Relationships between L_{DOP} and DOP (a) and L_{DOP} and DIP (b) for the 2 cruises.

Figure S4. Vertical distributions of *Prochlorococcus* (a, b, c) and *Synechococcus* abundances (d, e, f). a, d: PERLE1 cruise (October 2018); b, e: Mixed stations of PERLE2 cruise (Feb-March 2019); c, f: other stations of PERLE2 cruise.

Figure S5. Vertical distributions of picophytoeukaryotes (Picoeuk, a, b, c) and nanophytoeukaryotes (Nanoeuk,d, e, f). a, d: PERLE1 cruise (October 2018); b, e: Mixed stations of PERLE2 cruise (Feb-March 2019); c, f: other stations of PERLE2 cruise.

Figure S6. Vertical distributions of cryptophyte-like cells (a, b, c) and heterotrophic prokaryotes (Hprok, d, e, f). a, d: PERLE1 cruise (October 2018); b, e: Mixed stations of PERLE2 cruise (Feb-March 2019); c, f: other stations of PERLE2 cruise.

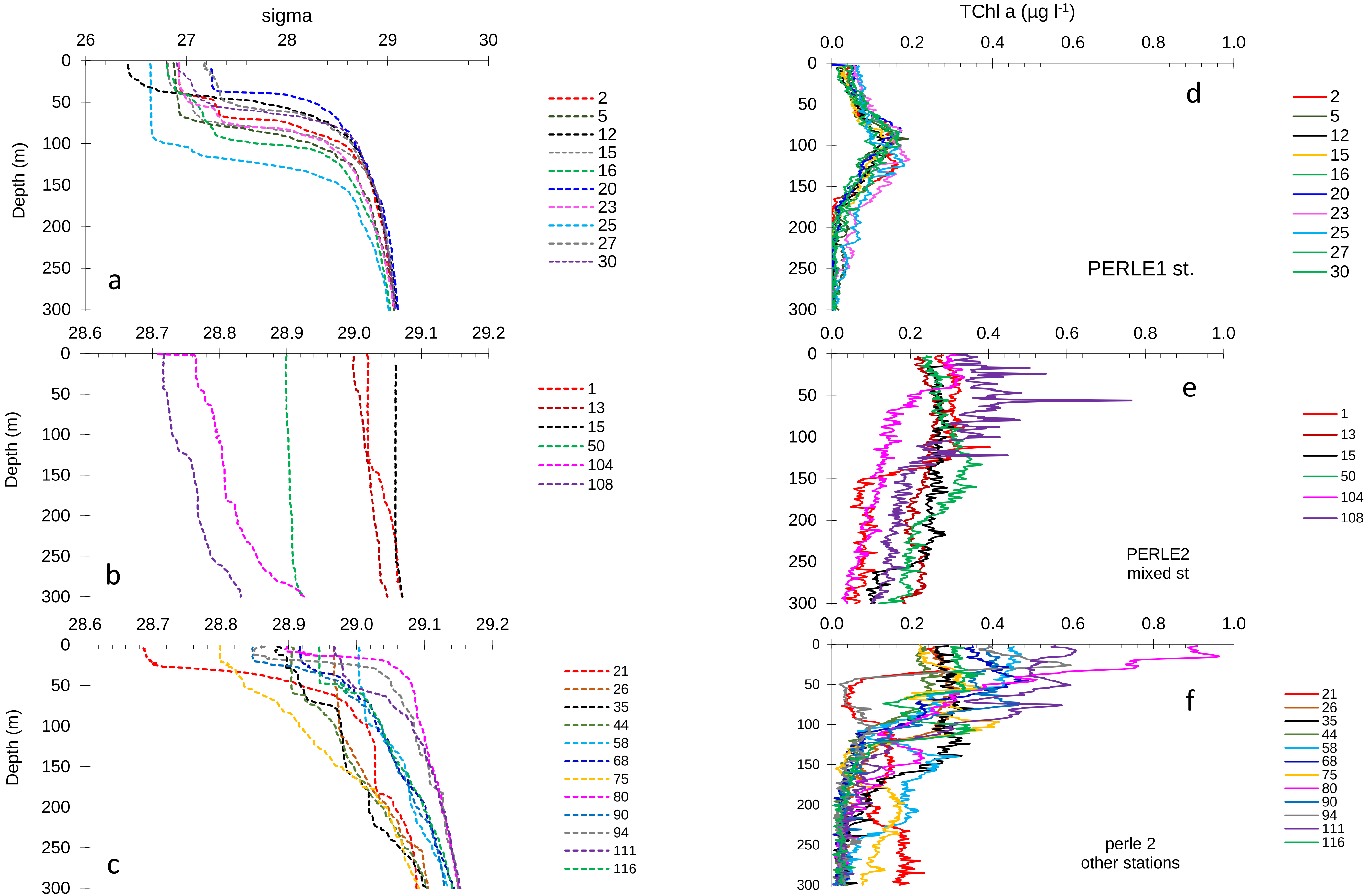

sigma
Depth (m)
a
2
5
12
15
16
20
23
25
27
30
b
1
13
15
50
104
108
c
21
26
35
44
58
68
75
80
90
94
111
116
TChl a (µg l-1)
d
PERLE1 st.
e
PERLE2
mixed st
f
perle 2
other stations

Fig S1

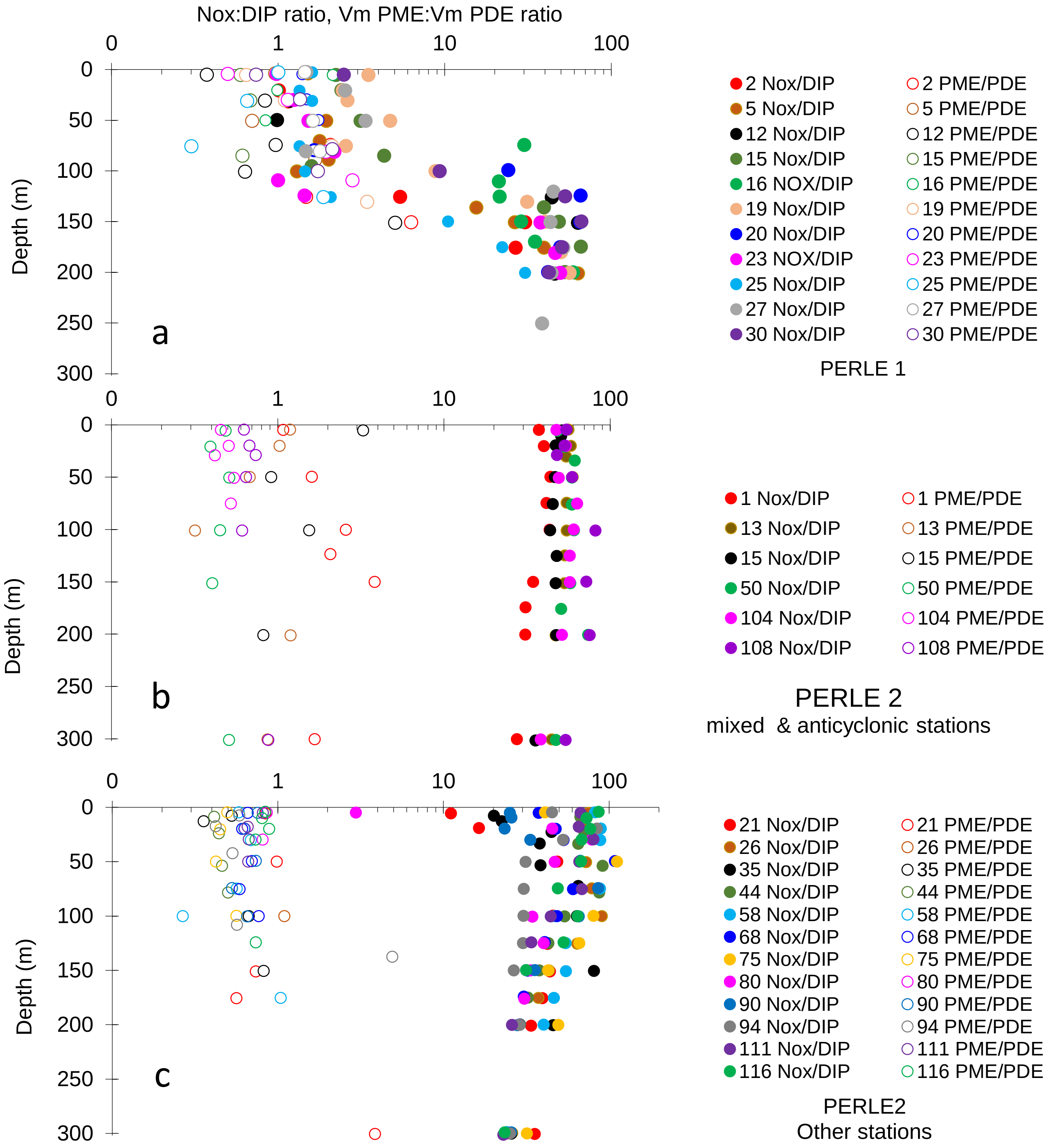

Nox:DIP ratio, Vm PME:Vm PDE ratio
0 1 10 100
Depth (m)
a
2 Nox/DIP
5 Nox/DIP
12 Nox/DIP
15 Nox/DIP
16 NOX/DIP
19 Nox/DIP
20 Nox/DIP
23 NOX/DIP
25 Nox/DIP
27 Nox/DIP
30 Nox/DIP
2 PME/PDE
5 PME/PDE
12 PME/PDE
15 PME/PDE
16 PME/PDE
19 PME/PDE
20 PME/PDE
23 PME/PDE
25 PME/PDE
27 PME/PDE
30 PME/PDE
PERLE 1
b
1 Nox/DIP
13 Nox/DIP
15 Nox/DIP
50 Nox/DIP
104 Nox/DIP
108 Nox/DIP
1 PME/PDE
13 PME/PDE
15 PME/PDE
50 PME/PDE
104 PME/PDE
108 PME/PDE
PERLE 2
mixed & anticyclonic stations
c
21 Nox/DIP
26 Nox/DIP
35 Nox/DIP
44 Nox/DIP
58 Nox/DIP
68 Nox/DIP
75 Nox/DIP
80 Nox/DIP
90 Nox/DIP
94 Nox/DIP
111 Nox/DIP
116 Nox/DIP
21 PME/PDE
26 PME/PDE
35 PME/PDE
44 PME/PDE
58 PME/PDE
68 PME/PDE
75 PME/PDE
80 PME/PDE
90 PME/PDE
94 PME/PDE
111 PME/PDE
116 PME/PDE
PERLE2
Other stations

Fig S2

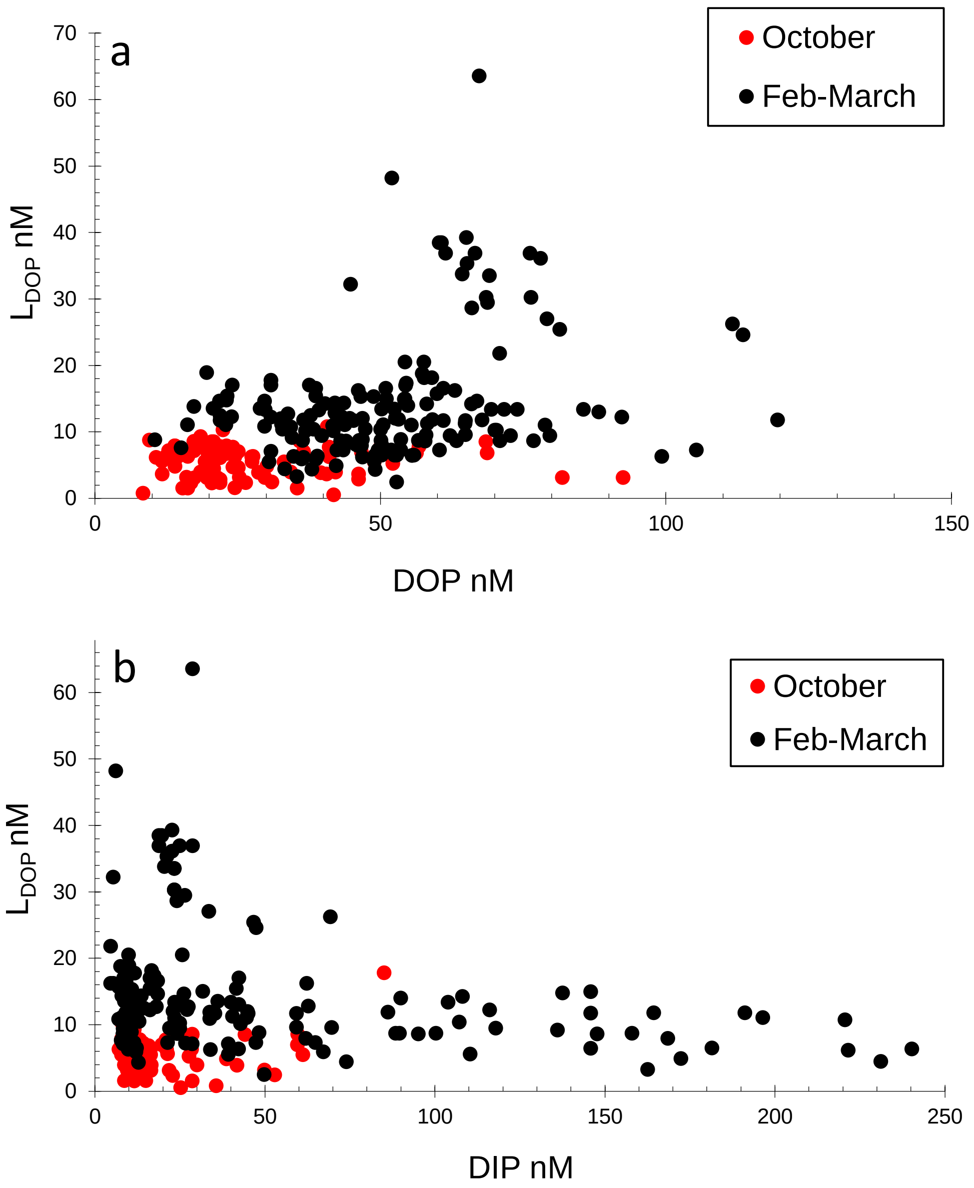
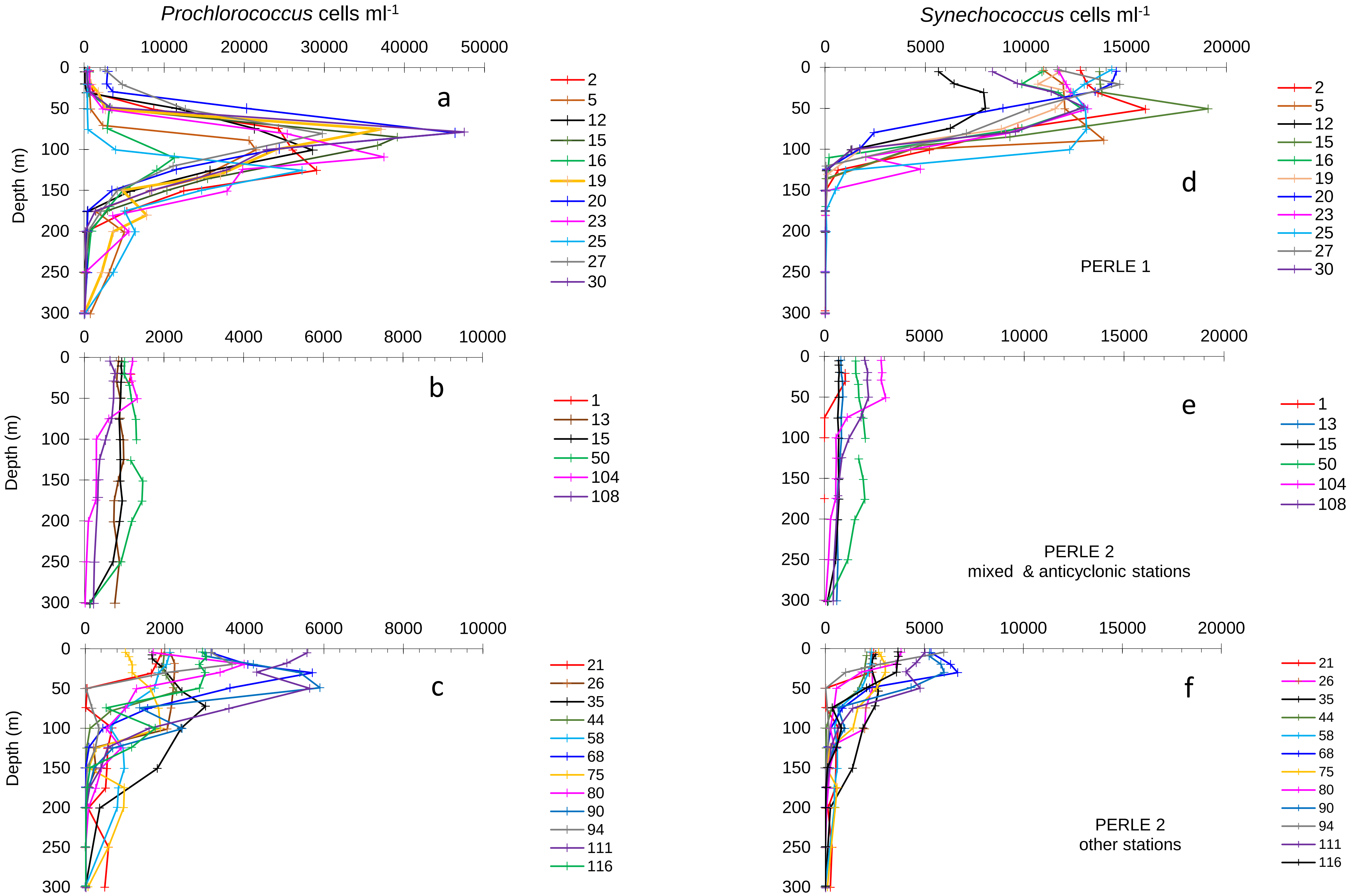
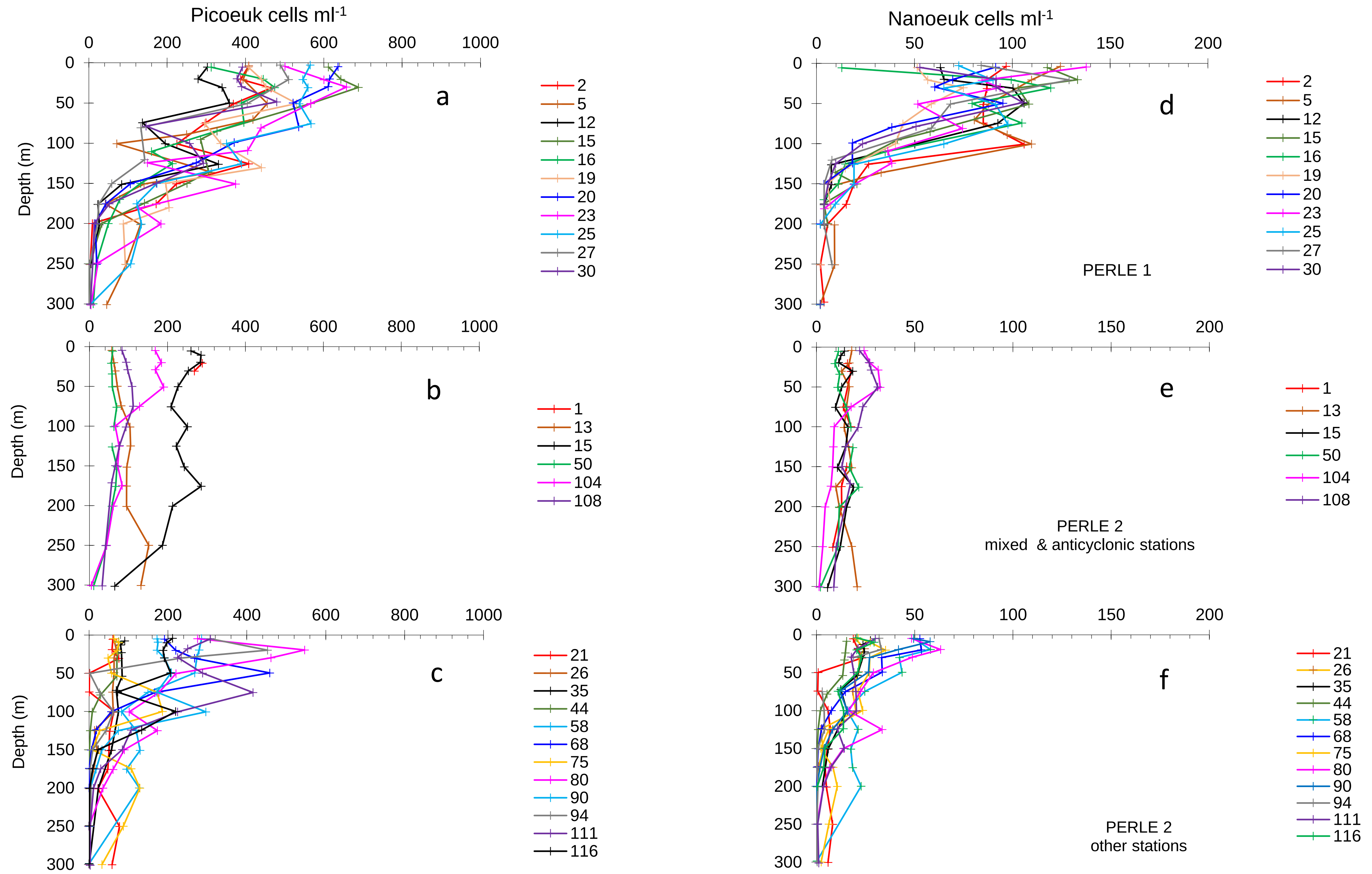

a
October
Feb-March
L_{DOP} nM
DOP nM
0
10
20
30
40
50
60
70
0
50
100
150
b
October
Feb-March
L_{DOP} nM
DIP nM
0
10
20
30
40
50
60
0
50
100
150
200
250

Fig S3



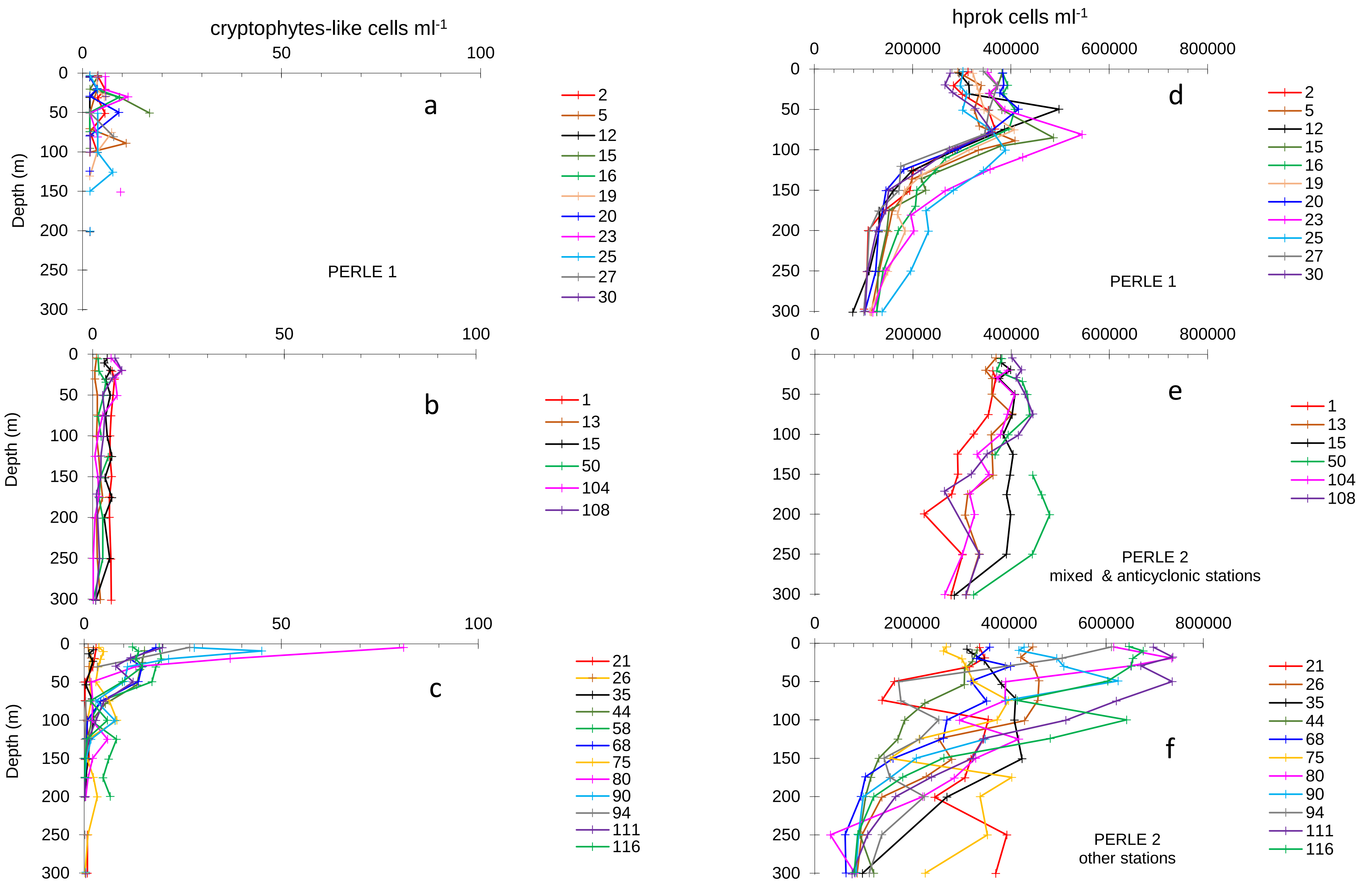
Prochlorococcus cells ml-1
Synechococcus cells ml-1
Depth (m)
a
b
c
d
e
f
PERLE 1
PERLE 2
mixed & anticyclonic stations
PERLE 2
other stations

Fig S4



Picoeuk cells ml-1
Nanoeuk cells ml-1
Depth (m)
0
200
400
600
800
1000
0
50
100
150
200
250
300
a
b
c
d
e
f
2
5
12
15
16
19
20
23
25
27
30
1
13
15
50
104
108
21
26
35
44
58
68
75
80
90
94
111
116
PERLE 1
PERLE 2
mixed & anticyclonic stations
PERLE 2
other stations

Fig S5



cryptophytes-like cells ml-1
hprok cells ml-1
Depth (m)
a
b
c
d
e
f
PERLE 1
PERLE 2
mixed & anticyclonic stations
PERLE 2
other stations

Fig S6