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SUPPLEMENTARY MATERIAL

Temporal changes in nutrients in a deep oligomictic lake: the role of external loads *versus* climate change

Michela Rogora,[1]* Martina Austoni,[2] Rossana Caroni,[1] Paola Giacomotti,[1] Lyudmila Kamburska,[1] Aldo Marchetto,[1] Rosario Mosello,[1] Arianna Orrù,[1] Gabriele Tartari,[1] Claudia Dresti[1]

[1]National Research Council, Water Research Institute, Largo Tonolli 50, 28922 Verbania Pallanza (VB)
[2]ECODICTYA S.r.l., Via Bernasc, 21020 Comabbio (VA), Italy

***Corresponding author:** michela.rogora@irsa.cnr.it

Tab. 1S. Results of the Seasonal Kendall Test (SKT) applied to seasonal blocks of epilimnetic data (0-25 m) for the period 1988-2009 and 2010-2019. Seasons were defined as follows: spring: Mar-May; summer: Jun-Aug; autumn: Sep-Nov; winter: Dec-Feb.

a) 1988-2009

	Temp.	O_2	NO_3	NH_4	TN	RP	TP	Si
Spring								
p		*	***				*	***
B	-0.01	-0.02	4.24	-0.15	0.001	0.03	-0.12	0.03
Summer								
p	*	*	**				*	
B	0.04	-0.02	2.41	-0.14	-0.001	-0.01	-0.08	0.00
Autumn								
p	***	**		*	***		*	*
B	0.14	-0.03	0.25	-0.27	-0.004	0.00	-0.09	-0.01
Winter								
p	**	*	***					
B	0.03	-0.03	2.93	-0.01	0.00	0.03	-0.08	0.01

	Chl *a*	Total biovol.	Cyano	Diato	Chryso	Crypto	Dino	Chloro
Spring								
p			***			**		*
B	-0.003	-0.03	-6.12	-0.46	0.40	-2.80	-0.75	-0.93
Summer								
p	*	**	**					**
B	-0.06	-0.05	-22.17	9.72	0.41	0.64	-1.78	-2.44
Autumn								
p	*	**	**		*			
B	-0.05	-0.02	-8.88	2.60	0.87	0.61	-0.41	-0.47
Winter								
p	**	***	***					
B	-0.05	-0.02	-4.14	-2.42	0.04	0.21	-0.42	-0.12

b) 2010-2019

	Temp.	O_2	NO_3	NH_4	TN	RP	TP	Si
Spring								
p			***		**			
B	0.04	-0.03	-7.72	0.20	-0.01	-0.05	-0.10	0.01
Summer								
p			***		**			
B	-0.10	0.04	-7.76	-0.02	-0.01	0.02	0.00	0.00
Autumn								
p			*		*			
B	-0.08	0.00	-7.73	-0.19	-0.01	0.03	-0.08	0.00
Winter								
p	**		***		***		*	
B	0.06	-0.05	-9.67	-0.01	-0.01	-0.01	-0.11	0.01

	Chl *a*	Total biovol.	Cyano	Diato	Chryso	Crypto	Dino	Chloro
Spring								
p								
B	0.25	-0.02	-2.19	-18.41	3.49	-1.21	-2.30	-0.45
Summer								
p			**					*
B	0.06	-0.07	-17.09	-10.33	1.57	-2.80	-3.90	-6.78
Autumn								
p			*	*				
B	0.07	-0.06	-14.17	-28.06	1.61	-2.62	0.43	-1.86
Winter								
p			**					*
B	0.04	0.00	-2.57	-0.20	1.06	0.30	-0.92	-0.56

p: significance level, ***p<0.001, **p<0.01, *p<0.05, n.s. not significant. Positive trends are in red, negative trends in blue. Trend slope (B) units: Temp. °C y^{-1}. O_2. mg L^{-1} y^{-1}. NO_3, TN, Si mg L^{-1} y^{-1}. RP, TP, Chl a µg L^{-1} y^{-1}. Phytoplankton total biovolume and biovolume of taxonomic groups: cm^3 m^{-3} y^{-1}. Cyano: cyanobacteria; Diato: diatoms; Chryso: chrysophyta; Crypto: cryptophyta; Dino: dinophyta; Chloro: chlorophyta.

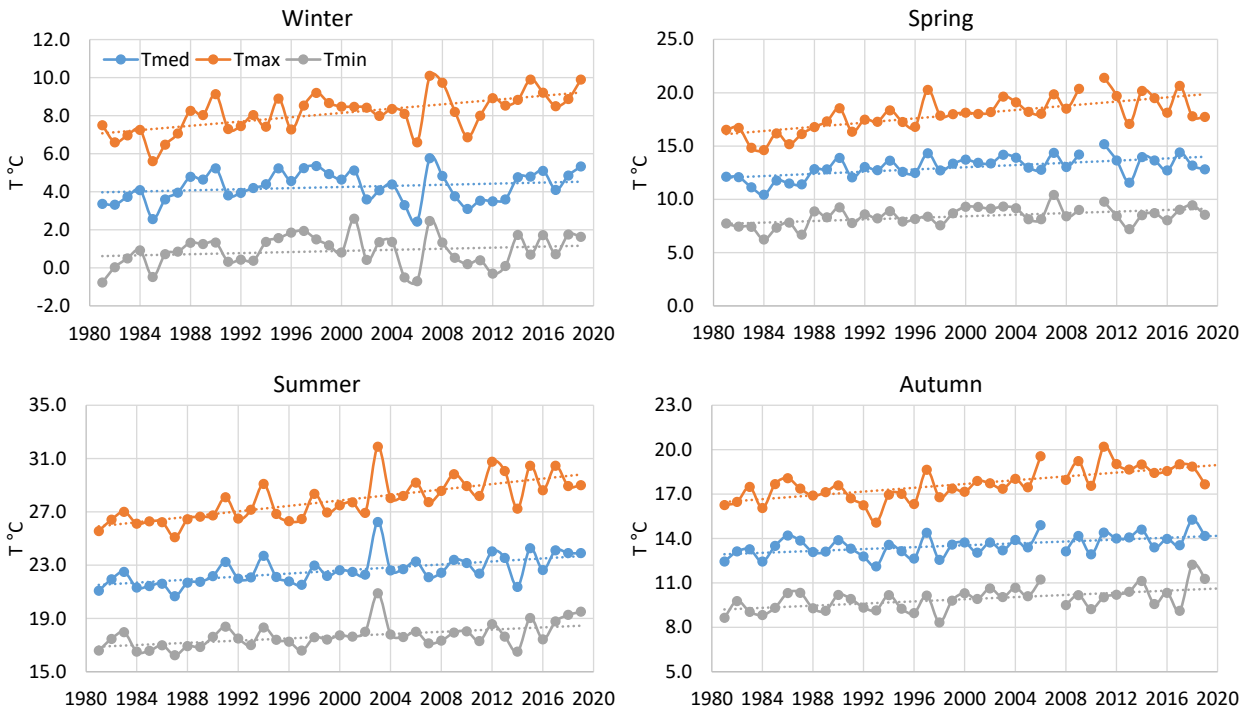

Fig. 1S. Air temperature trend in Lake Maggiore area over 1981-2019: monthly average data from the Pallanza meteorological station. Seasonal data were calculated as follows: winter is December to February, spring is March to May, summer is June to August, autumn is September to November.

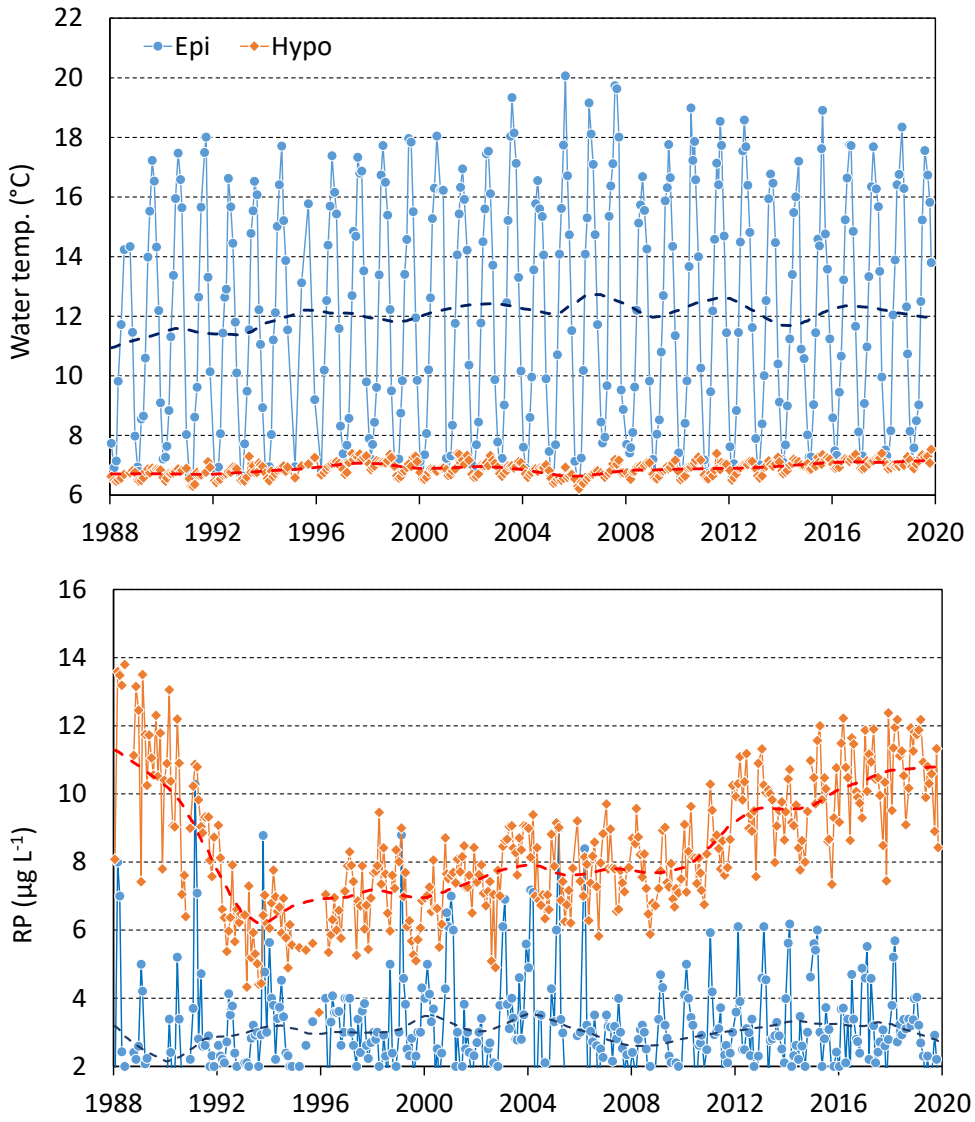

Fig. 2S. Monthly epilimnetic and hypolimnetic water temperatures (a) and reactive phosphorus concentrations (b) in Lake Maggiore within 1988-2019. The dashed lines are the trend components obtained by SDL.

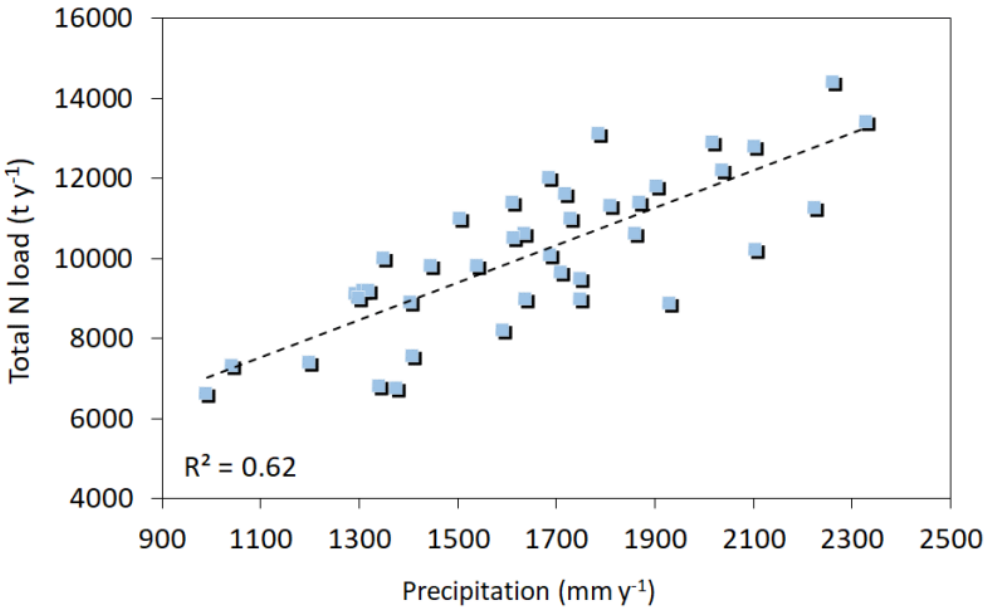

Fig. 3S. Relationship between the annual precipitation amount over Lake Maggiore watershed and the calculated total N load to the lake. Data for the period 1980-2019.

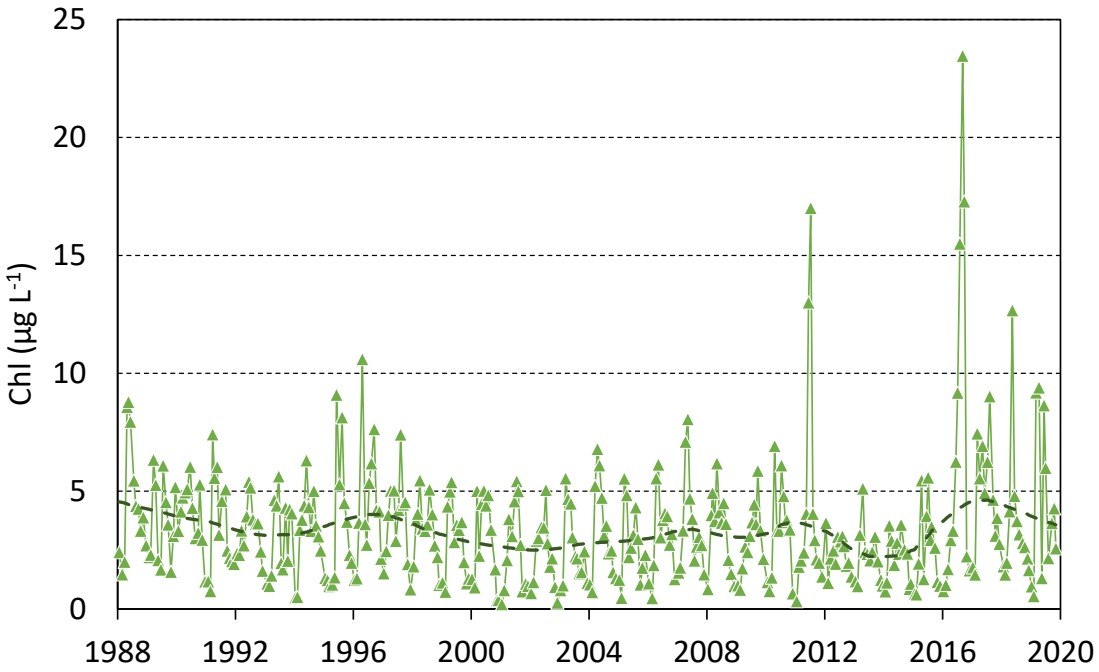

Fig. 4S. Monthly values of Chl-a concentrations in Lake Maggiore within 1988-2019 (integrated data over 0-20 depth).

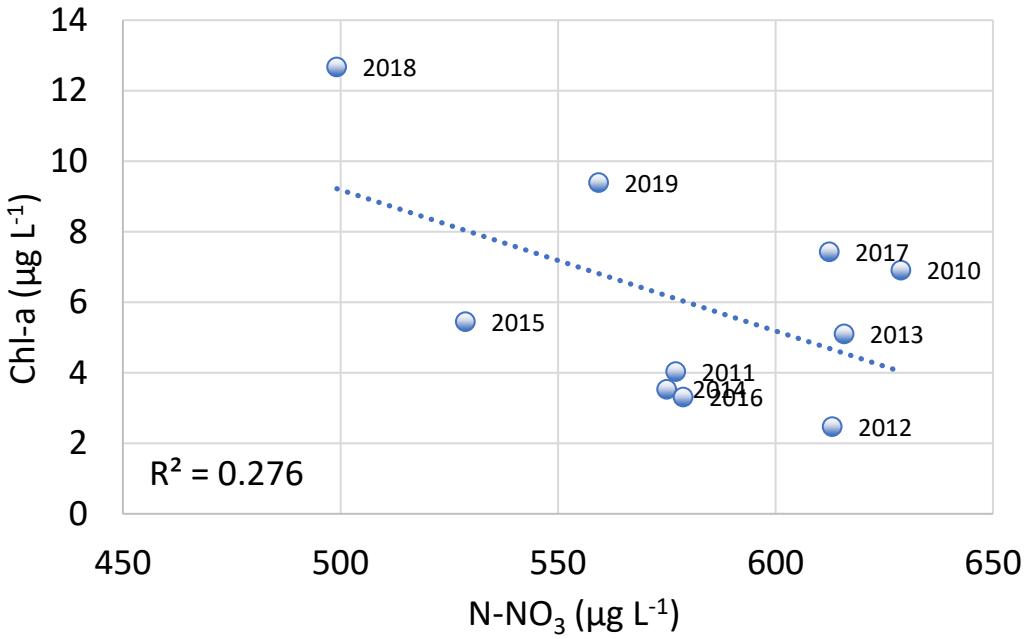

Fig. 5S. Relationship between the maximum Chl-a concentration in spring (March-May) and the minimum N-NO_3 concentrations in summer (Jun-Aug) in Lake Maggiore within 2010-2019.