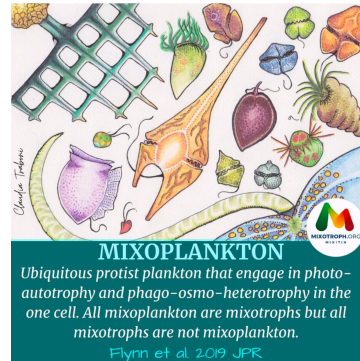




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Investigating primary producer dynamics with multispectral bio-optical models in the Mediterranean Sea

Paolo Lazzari, Eva Álvarez, Elena Terzić, Gianpiero Cossarini, Ilya Chernov,

Fabrizio D'Ortenzio and Emanuele Organelli

National Institute of Oceanography and Applied Geophysics - OGS, Italy

Institute of Applied Mathematical Research, RAS, Russia

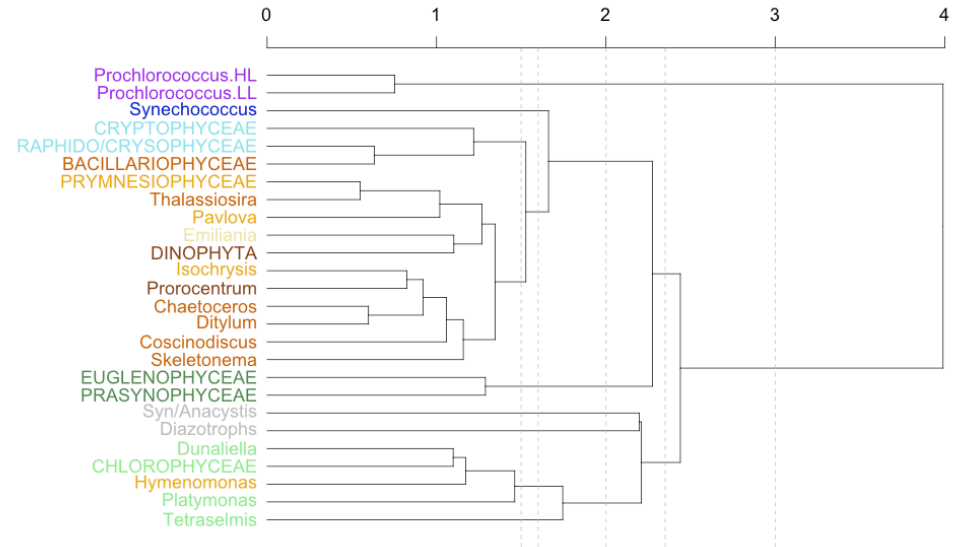
Sorbonne Université, CNRS, Laboratoire d'Océanographie de Villefranche, France

National Research Council (CNR), Institute of Marine Sciences (ISMAR), Italy

Inference of mixoplankton activity in terms of direct simulation of PFT in the Med



- Hierarchical cluster analysis on bio-optical dissimilarities from Euclidean distance.
- 9 PFTs proposed: optically different, present in the Mediterranean, observed by other methods.



Prochlorococcus
Synechococcus
Small Eukaryotes
Chlorophyceae
Eugleno & Prasinophyceae
Cocolithophores
Prymnesiophyceae
Diatoms
Dinoflagellates

Available optical info	Size class	Functional description	Validation				Relevance in the Med ⁴
			CHEMTAX	DP (Uitz06)	DP (DiCicco17)	CMEMS	
Synechococcus	pico		CYANO 2	Cyano	Prokaryotes	Prokar	2 - 75.7 %
Prochlorococcus	pico		CYANO 4	Prochlorococcus ¹			
Chlorophyta 1	nano		CHLORO		Green = pico-prokaryotes	Green = pico-prokar	5.3 - 21 %
Chlorophyta 2	nano		PRASINO	Chloro			
			EUGLENO	Crypto	Cryptophytes	Crypto	5.2 - 11.7 %
SmallEuk	pico		PELAGO	Chryso			4 - 33.8 %
	nano		CHRYSO ²				
Prymnesiophyceae	nano		PRYMNE	Prymnesiophyceae	Haptophytes	Hapto	31.8 - 38.3 %
Cocolithophores	nano	calcifiers	HAPTO 6				
Bacillariophyceae	micro	silifiers	DIATOMS	Bacillariophyceae	Diatoms	Diato	3.4 - 76 %
Dinoflagellates	micro		DINOS	Dinoflagellates	Dinophytes	Dino	4 - 43.8 %
Diazotrophs	micro	N ₂ -fixers	CYANO 1 ³	-	-	-	negligible
Syn/Anacystis	pico		-	-	-	-	negligible

¹ separation of Prochlorococcus with DVChla as in (Hirata et al. 2011).

Groups ² not computed in the Mediterranean or ³ only in the clusters that include the Mediterranean from (Swan et al. 2016).

⁴ (Siokou-Frangou et al. 2010)

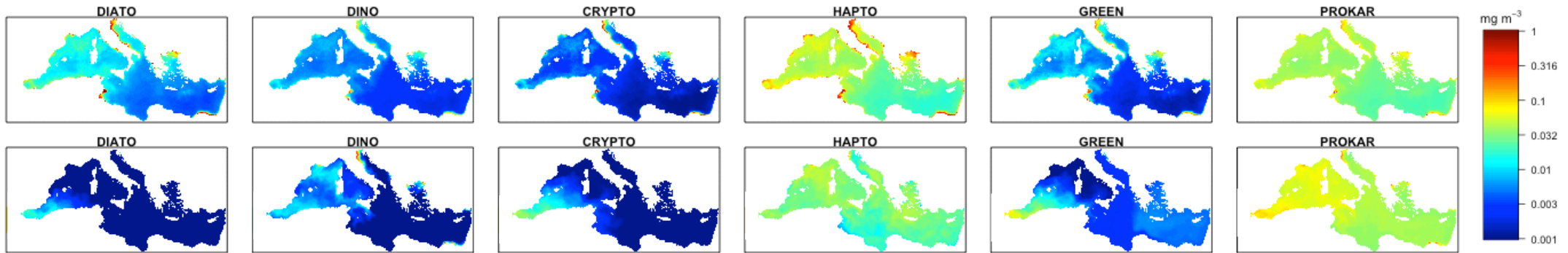
Inference of mixoplankton activity in terms of direct simulation of PFT in the Med



- Hierarchical cluster analysis (agnes:cluster) on dissimilarities from Euclidean distance (dist).
- 9 PETs proposed: optically different, present in



Sat (2015)



Model (2015)

Coccolithophores				CHRYSO ²	Chryso			
Prymnesiophyceae	Prymnesiophyceae	nano		PRYMNE	Prymnesiophyceae	Haptophytes	Hapto	31.8 - 38.3 %
	Coccolithophores	nano	calcifiers	HAPTO 6				
	Bacillariophyceae	micro	silifiers	DIATOMS	Bacillariophyceae	Diatoms	Diato	3.4 - 7.6 %
	Dinoflagellates	micro		DINOS	Dinoflagellates	Dinophytes	Dino	4 - 43.8 %
	Diazotrophs	micro	N ₂ -fixers	CYANO 1 ³	-	-	-	negligible
	Syn/Anacystis	pico		-	-	-	-	negligible

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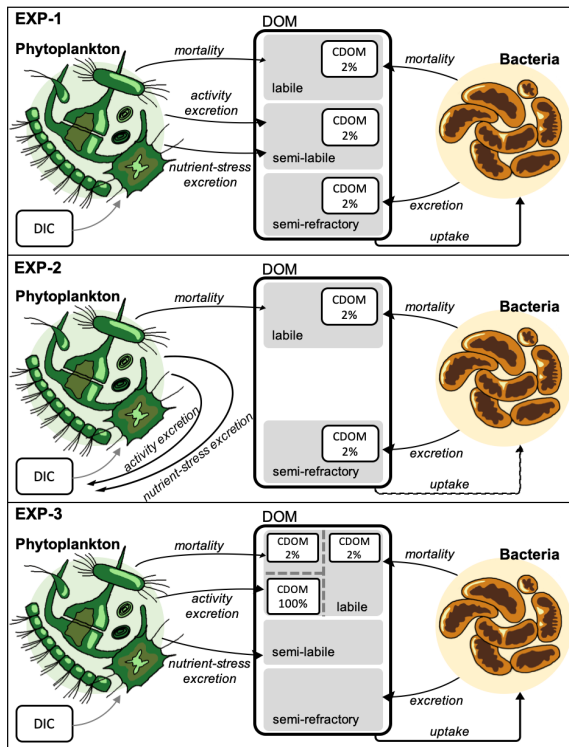
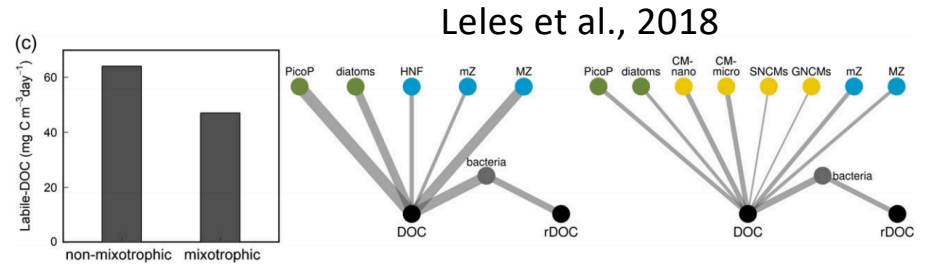
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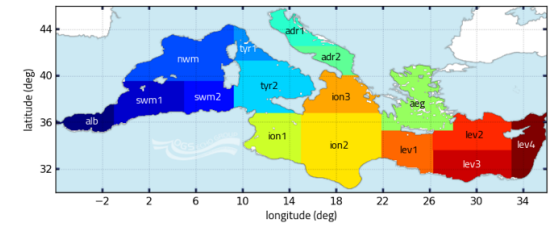
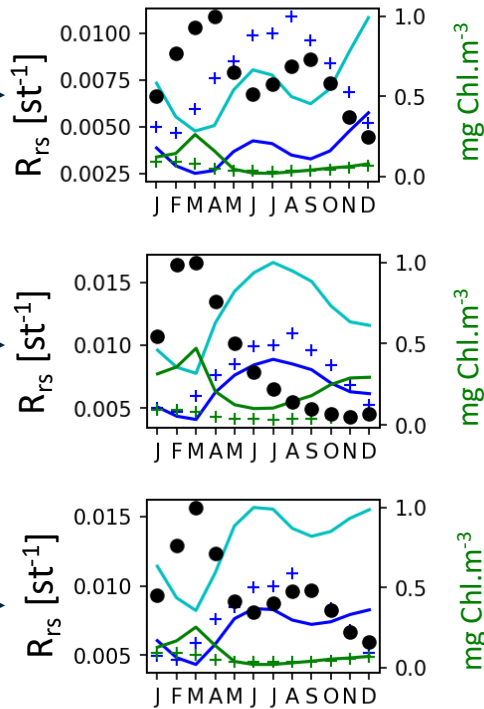
Inference of mixoplankton activity in terms of CDOM cycling



METRICS: Chlorophyll, Remote sensing reflectance (R_{rs} @ 412 nm) and BGC-Argo floats downward planar irradiance (Ed @ 380 nm and 412 nm)



Lev4 sub-basin



- + CMEMS R_{rs} (412,0+)
- MODEL R_{rs} (412,0+)
- MODEL R_{rs} (412,0-)
- + CMEMS Chl
- MODEL Chl
- CDOM [normalized]

- BIO-OPTICAL modelling introduces novel validation metrics for biogeochemical model
- BIO-OPTICAL modelling useful to better describe PFT dynamics in biogeochemical models
this can be combined with mixoplankton modelling for direct validation
- Improved description on CDOM dynamics could be used to infer impact of mixoplankton activity [indirect validation]
- Interesting to identify expected large scale signals in the Mediterranean Sea related to mixoplankton activity to be analyzed with biogeochemical models
- In the SEAMLESS project (<https://www.seamlessproject.org/>) we will apply novel numerical tools for biogeochemical model parameters estimation using data assimilation