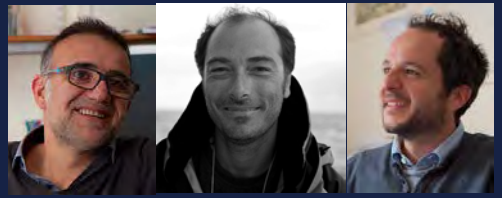
MERCATOR OCEAN INTERNATIONAL

The BGC-Argo floats: a new tool to validate ocean biogeochemical models

Mercator Ocean (France)

Alexandre MIGNOT Julien LAMOUROUX Coralie PERRUCHE Elodie GUTKNECHT

LOV (France)

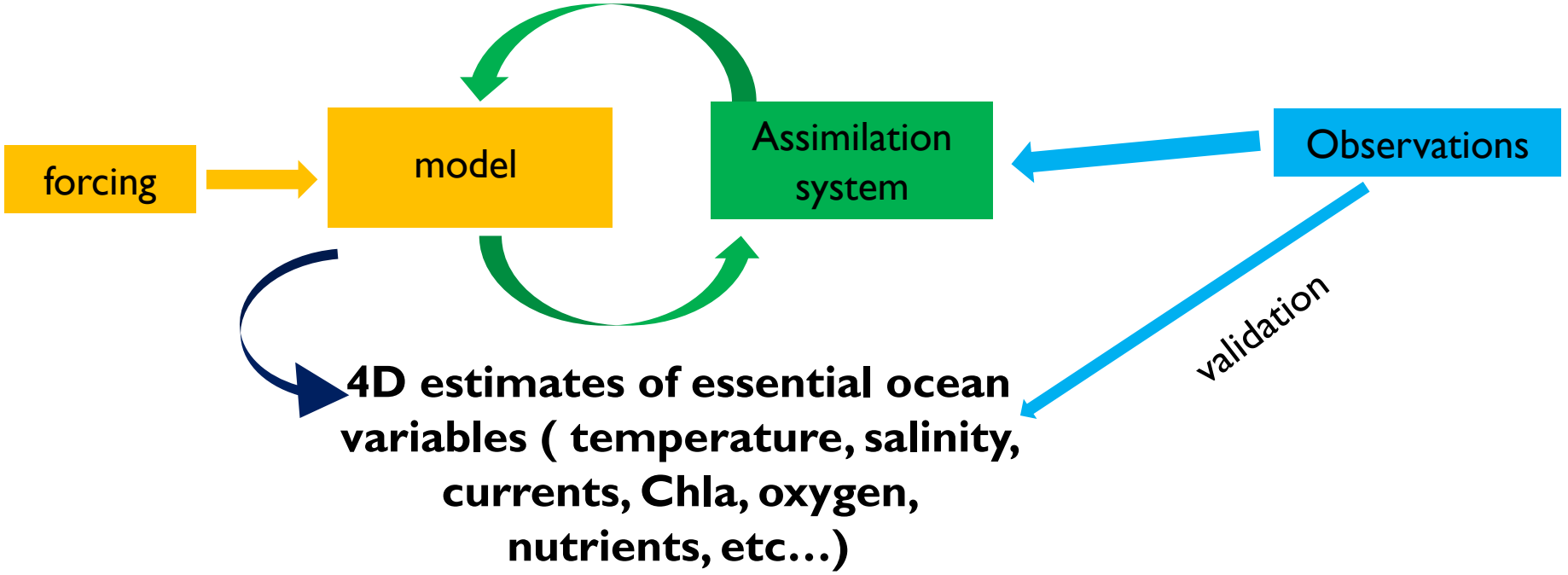


Hervé CLAUSTRE Fabrizio D'ORTENZIO Vincent TAILLANDIER

OGS (Italy)

Anna TERUZZI Gianpiero COSSARINI Stefano SALON Paolo LAZZARI

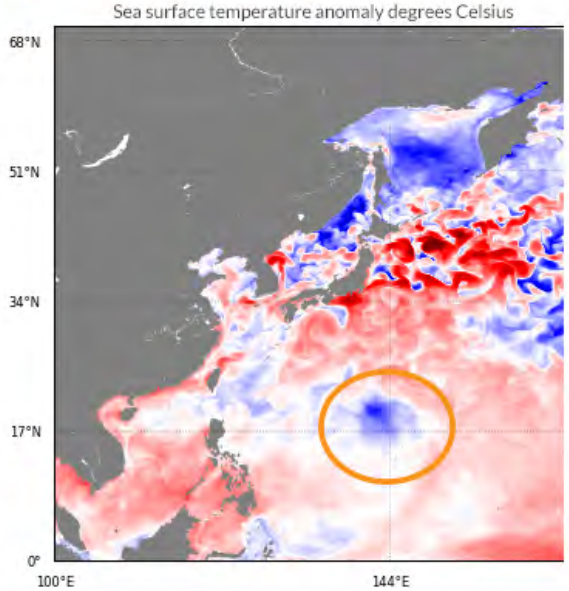
Mercator Ocean is a research center that produces 4D ocean state estimates for the global ocean

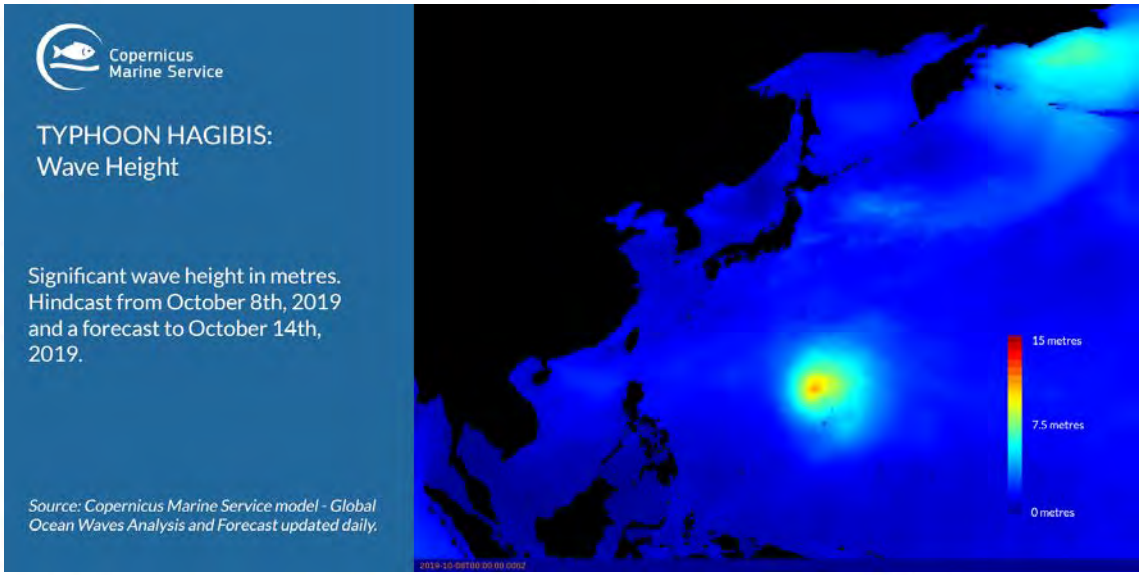


Forescasting extreme events in the ocean

Copernicus Marine Service | MERCATOR OCEAN INTERNATIONAL

Typhoon Hagibis, October 9th, 2019





Sea surface temperature (sst) anomaly and significant wave height for the typhoon Hagibis on October 9th 2019. The orange circle shows the signature of the storm through the sst. The storm removes energy/heat from the ocean surface layer, leading to a drop in 2 degrees Celcius. The significant wave height is a variable that accurately tracks the position of typhoons and storms.

BGC state estimation: current status

forcing

Model (NEMO-PISCES)

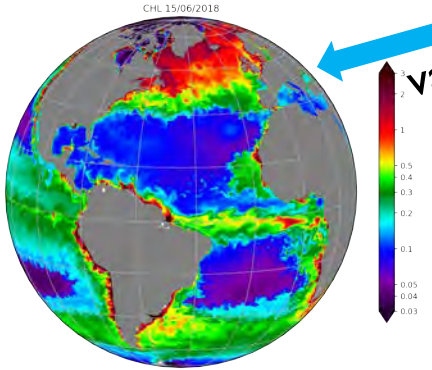
Assimilation system

Ocean color Observations

4D estimates of Chla, oxygen, nutrients, carbon, etc…

In situ Observations

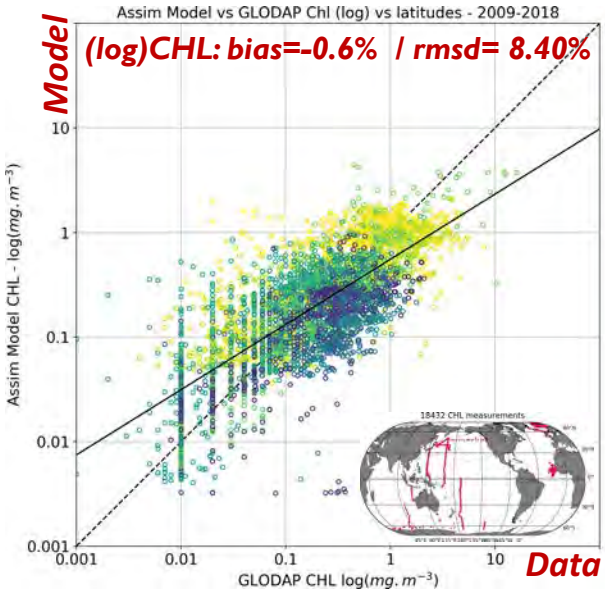
validation

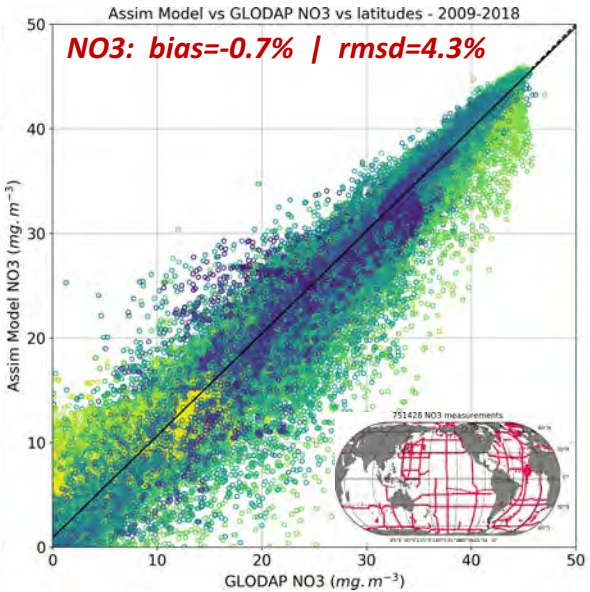


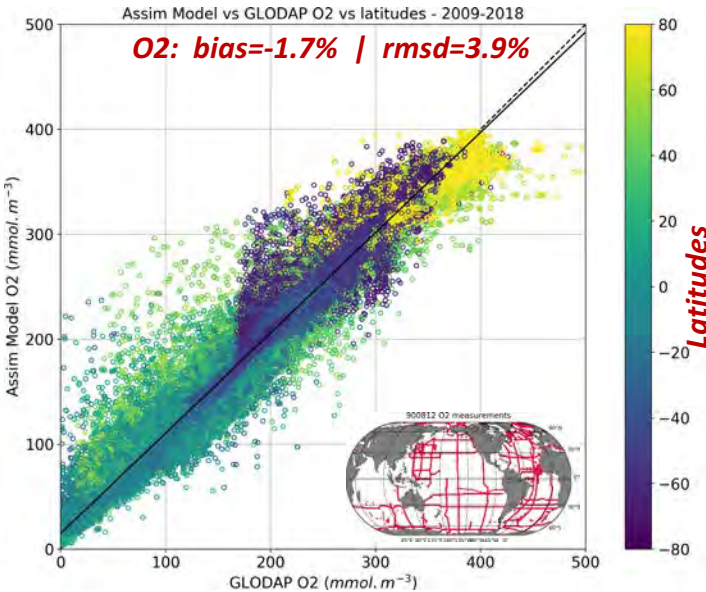
Map of modeled sea surface chlorophyll a concentrations in June 2018

BGC state estimation: current status

Space-time integrated - comparison to full-depth GLODAP* dataset (2009-2017)







➔ **Very encouraging scores**

**GLODAP 2019.v2*

%=100 x Y / range(Y)

What about BGC-Argo observations ?

forcing

Model (NEMO-PISCES)

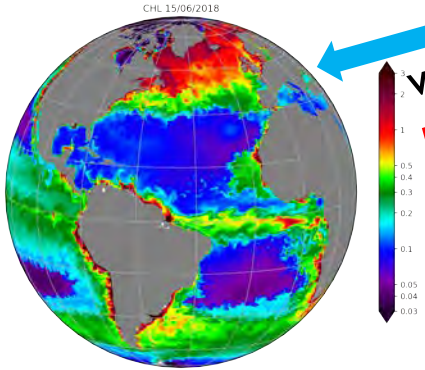
Assimilation system

Ocean color Observations

In preparation

BGC-Argo Observations

4D estimates of Chla, oxygen, nutrients, carbon, etc…



Map of modeled sea surface chlorophyll a concentrations in June 2018

validation

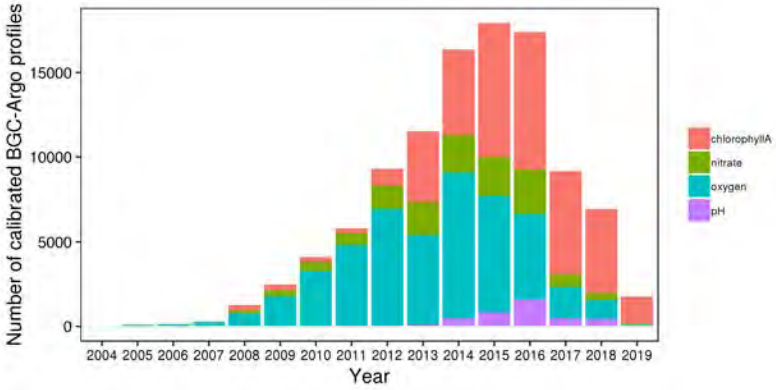
In situ Observations

validation

BGC-Argo Observations

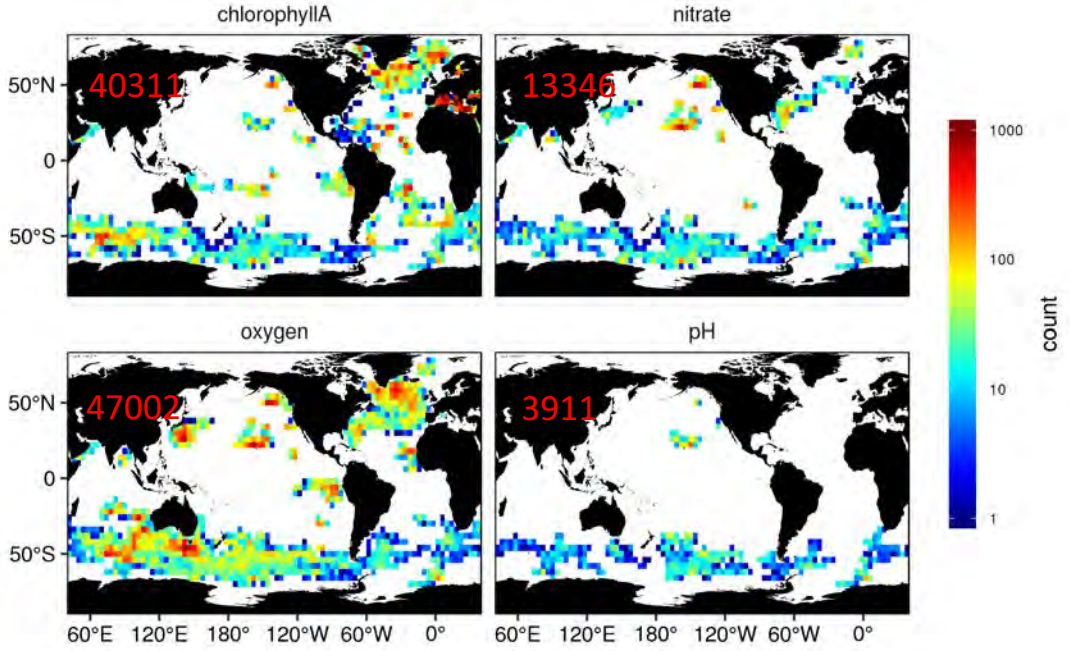
(in collaboration with LOV and OGS)

A new tool to validate ocean biogeochemical models



There is a large amount of delayed mode data* acquired by BGC-Argo and it is greater than any other data collection.

… but the are still large regions that are undersampled:
Pacific, Indian Ocean and the Equatorial band

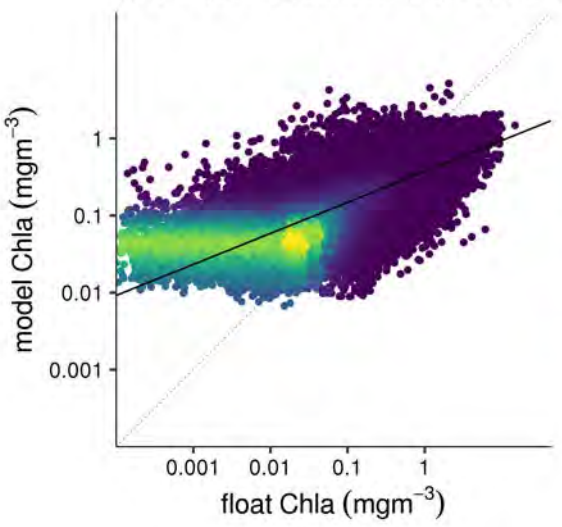


Number of QC profiles in 4°x 4°bins acquired by the network for each variable as of May 2019

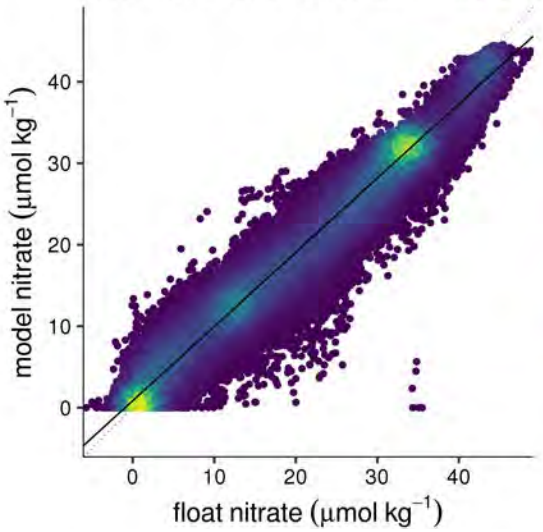
*for the variable Chla, the adjusted mode data are displayed

Space-time integrated - comparison to full-depth BGC-Argo dataset (2008-2017)

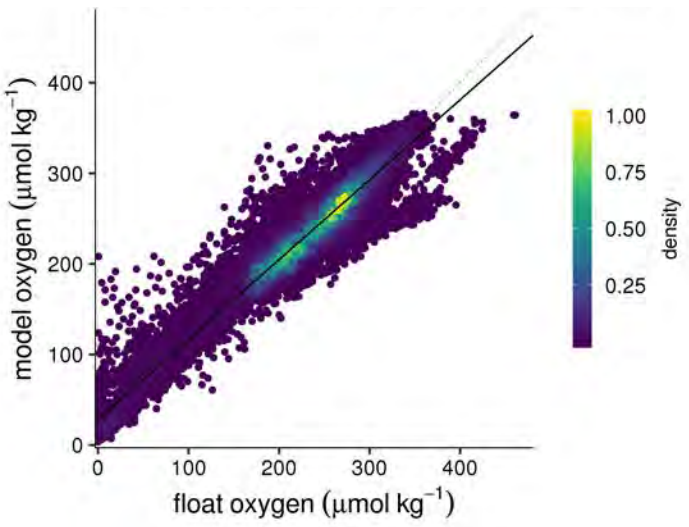
(log)CHL: bias=3.7% / rmse= 8.42%



NO3: bias=-1.8% | rmse=5.6%



O2: bias= 1.9% | rmse=4.1%



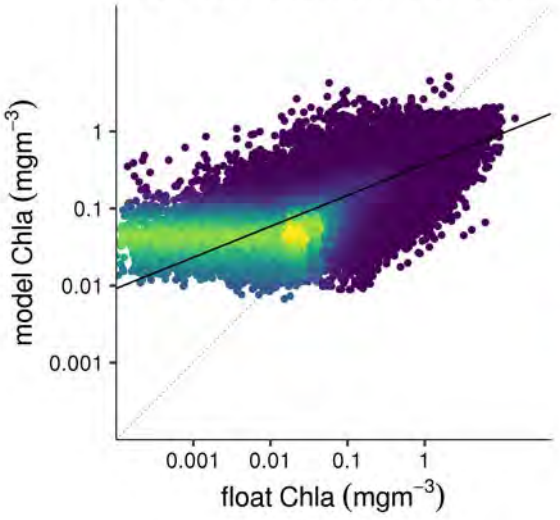
%=100 x Y / range(Y)

Global Comparison

Space-time integrated - comparison to full-depth BGC-Argo dataset (2008-2017)

(log)CHL: bias=3.7% / rmse= 8.42%

glodap : bias=-0.6% / rmse= 8.40%



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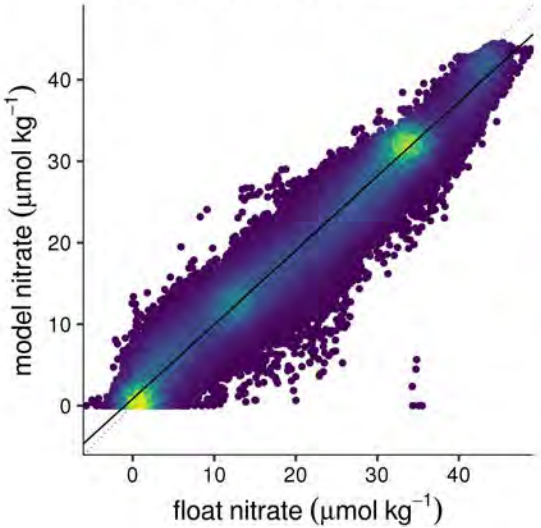

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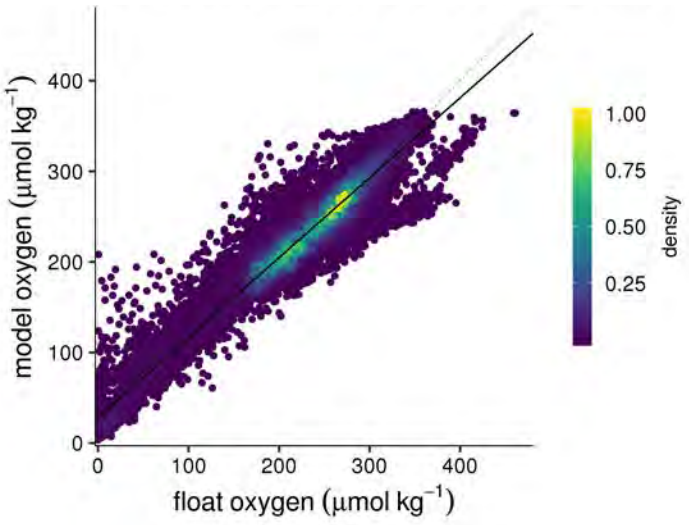


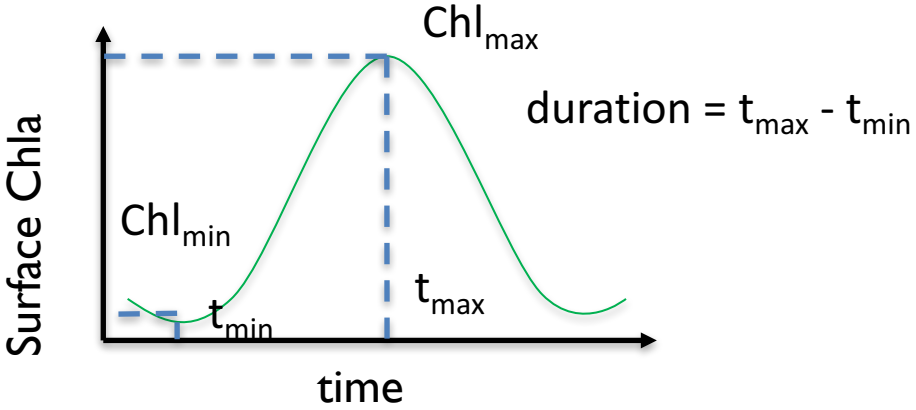
➔ **Consistency with GLODAP dataset**

Good summary figures but it does not tell us much about how the model represents BGC processes (phytoplankton blooms, oxygen minimum zones, etc…)

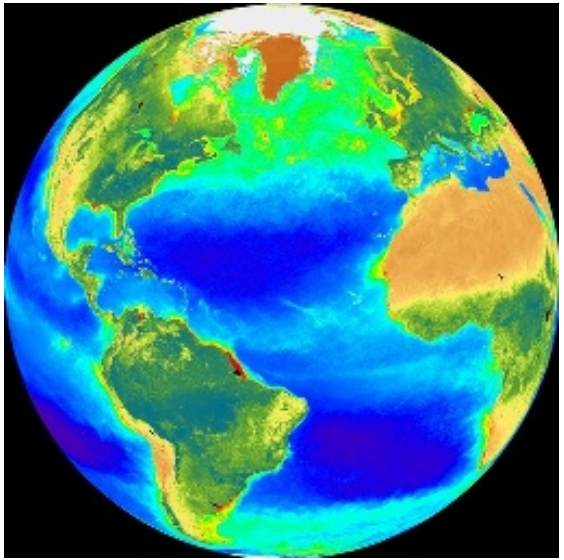
**GLODAP 2019.v2*

%=100 x Y / range(Y)

Phytoplankton blooms

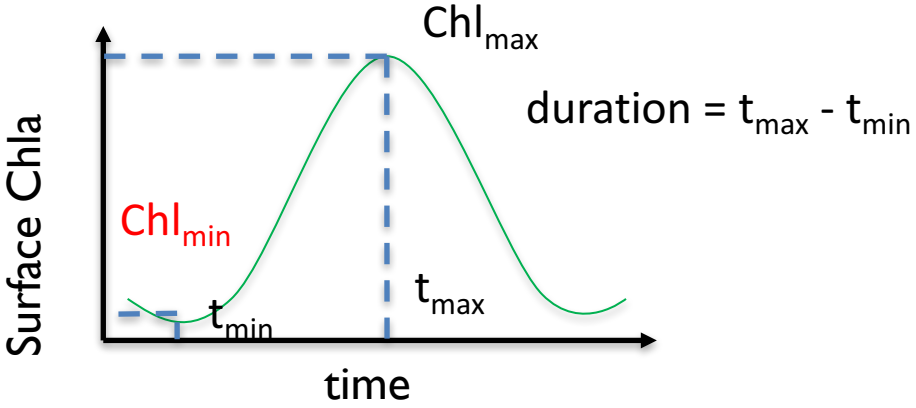


A phytoplankton bloom is a rapid and huge increase in phytoplankton biomass (Chla)

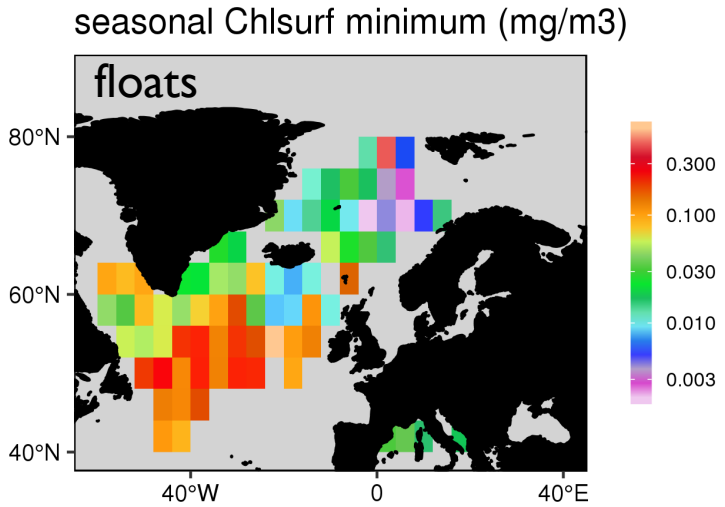


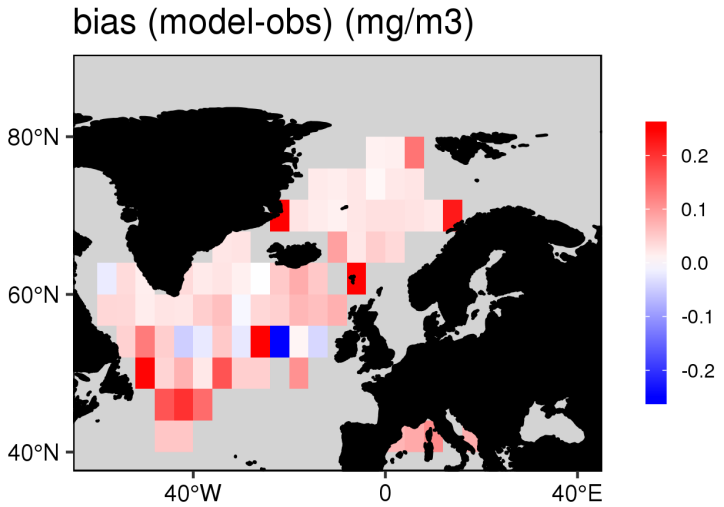
Phytoplankton blooms in the North Atlantic observed by ocean color satellites

Phytoplankton blooms

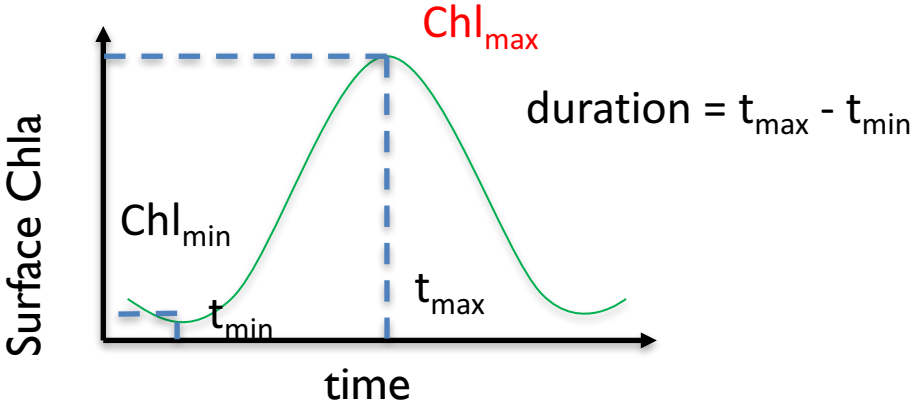


A phytoplankton bloom is a rapid and huge increase in phytoplankton biomass





Phytoplankton blooms



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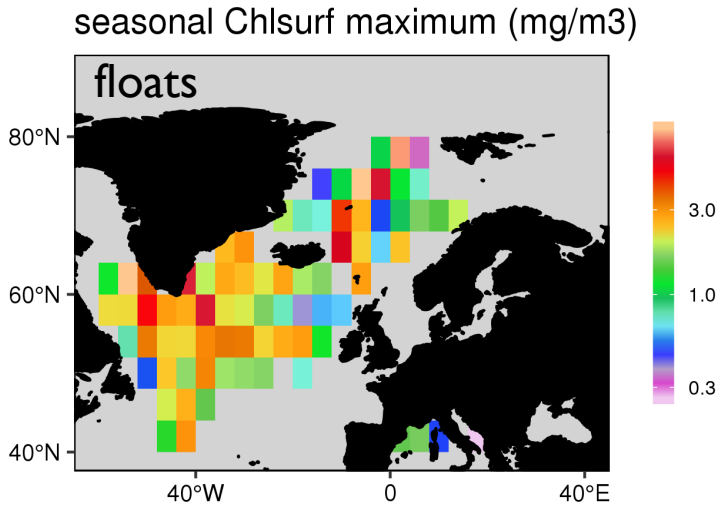
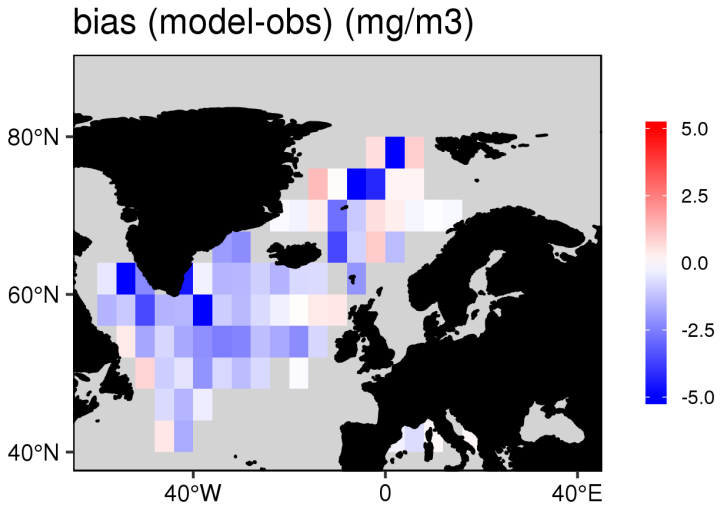
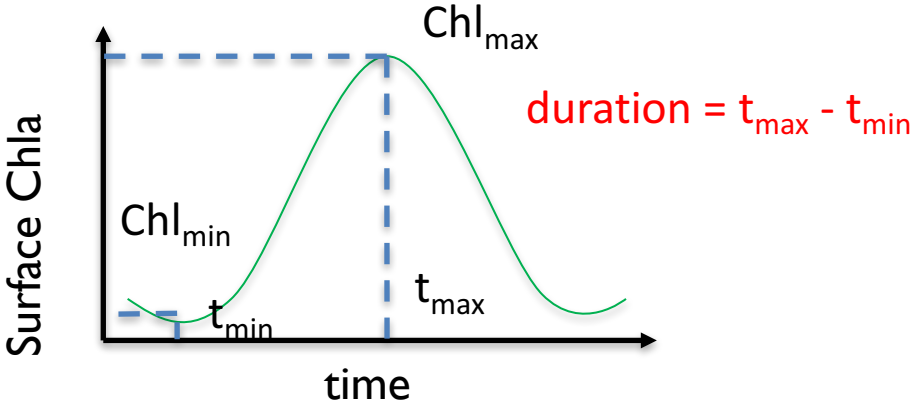




Phytoplankton blooms



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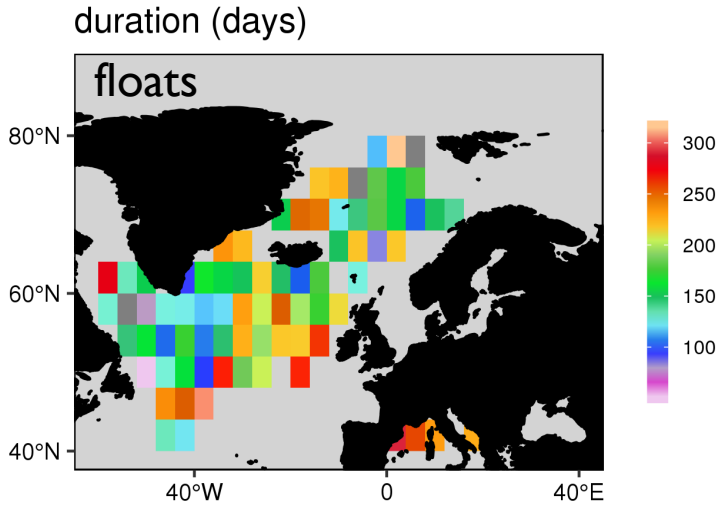
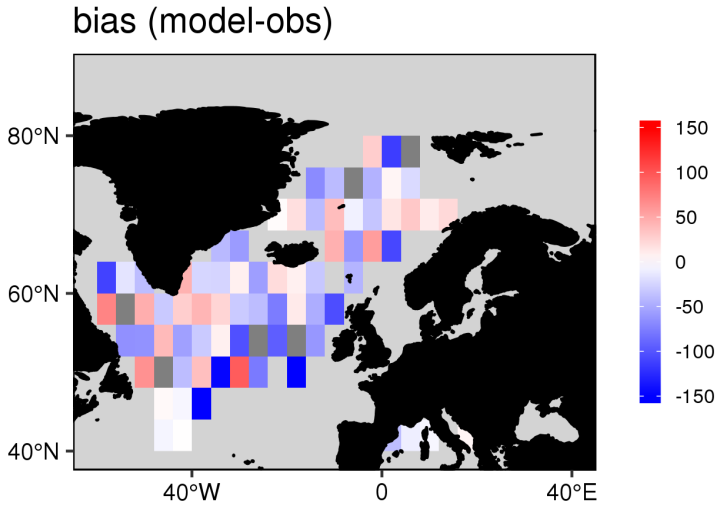
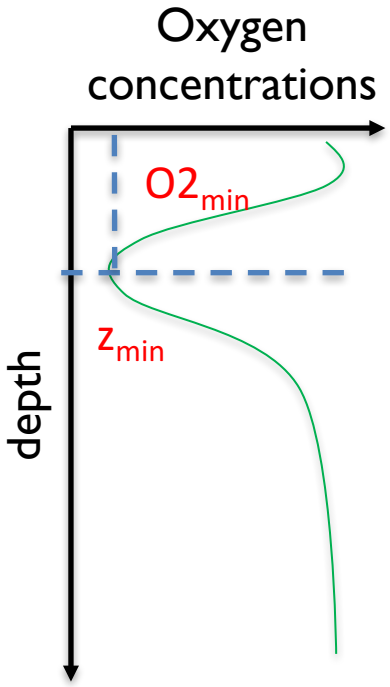
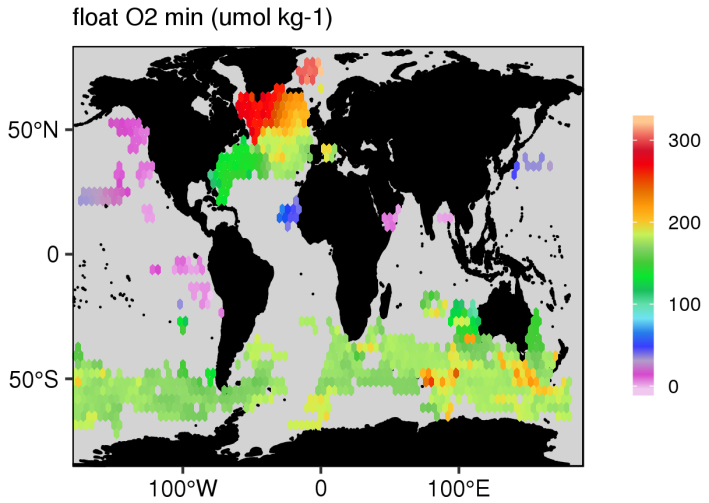
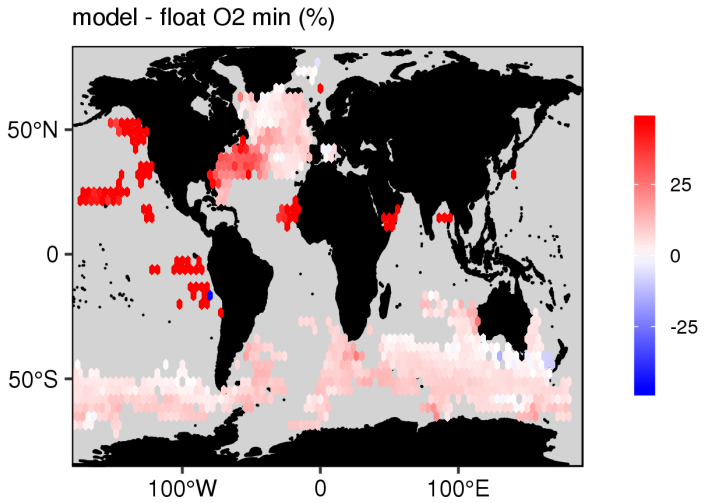




Oxygen minimums







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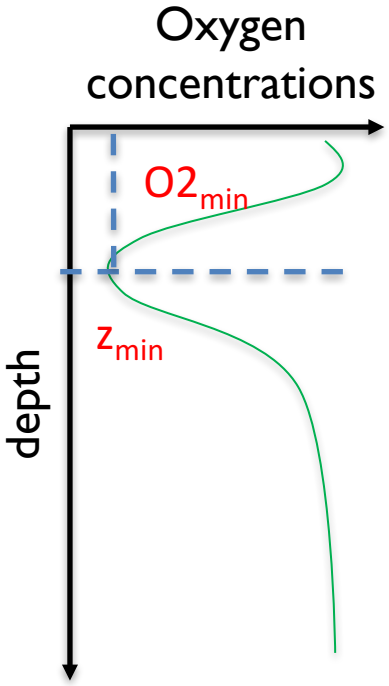
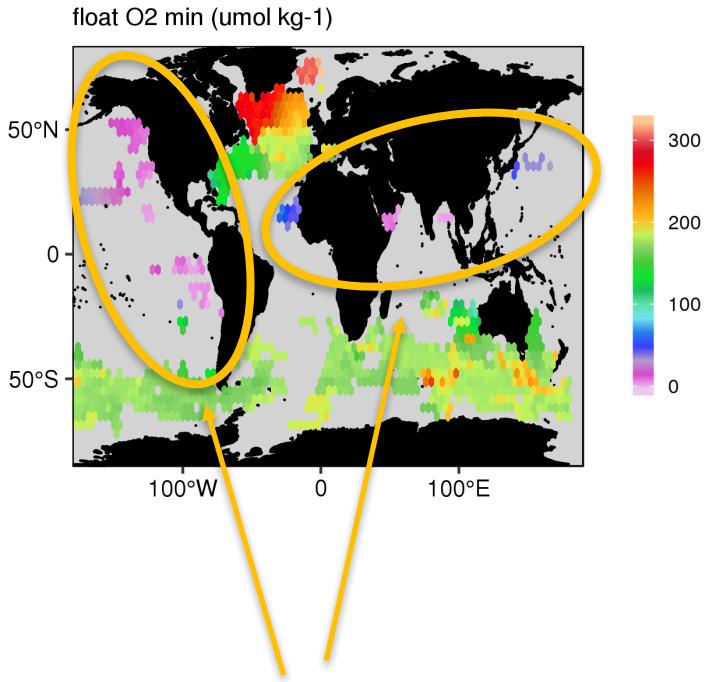
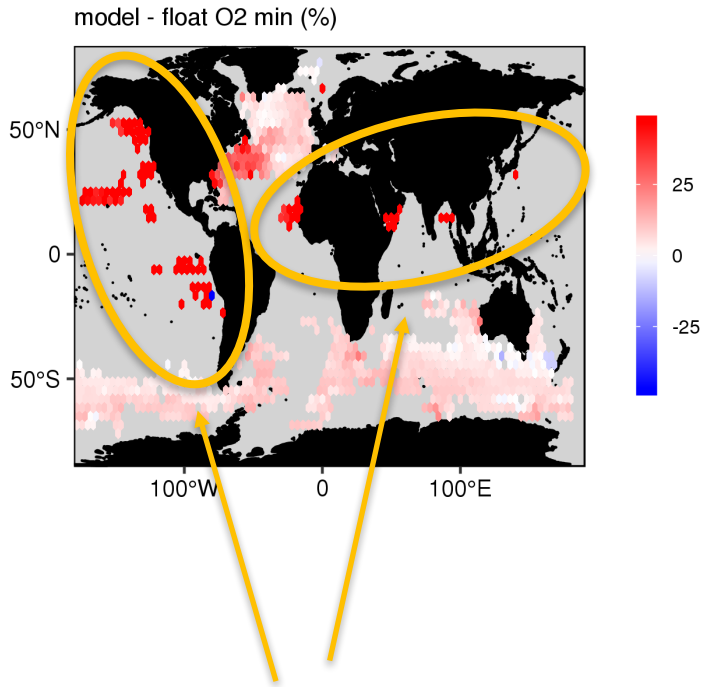


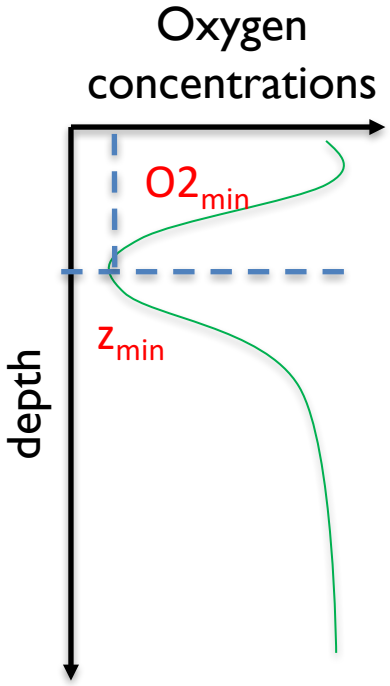


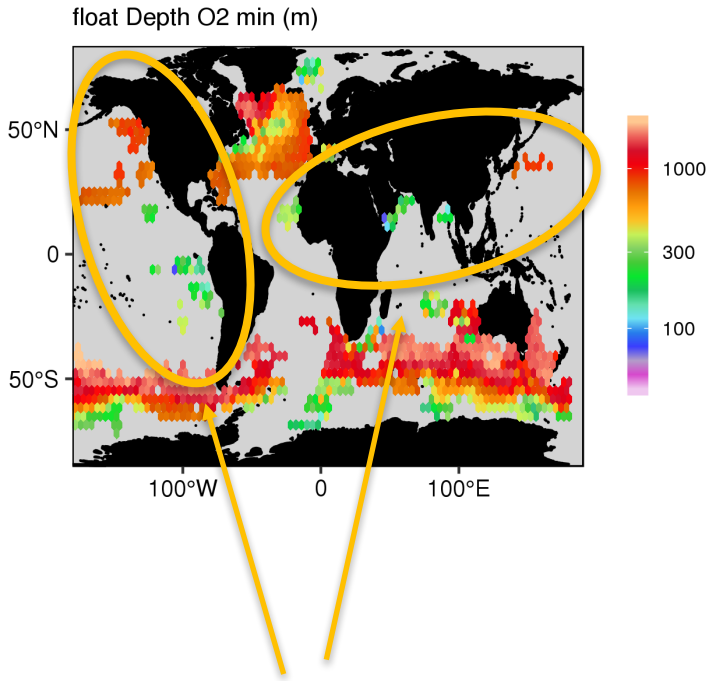
Oxygen Minimum Zones



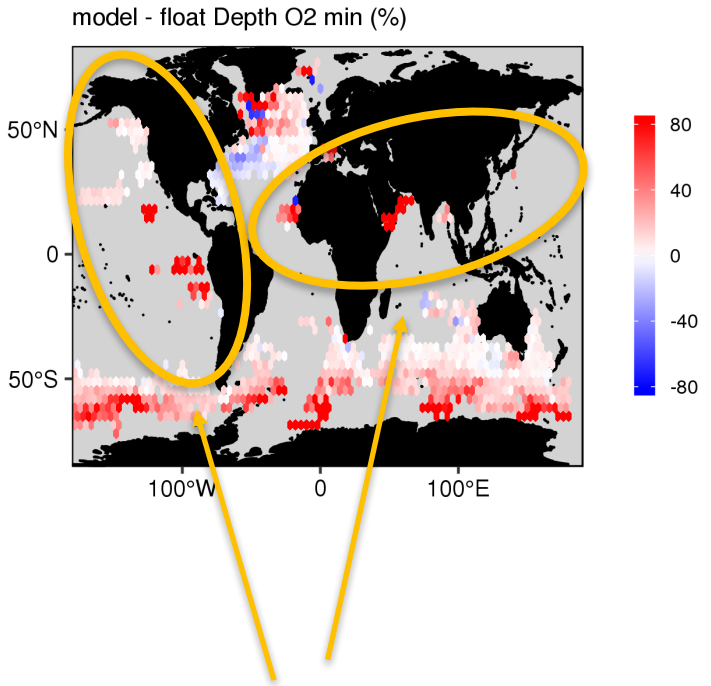
Oxygen Minimum Zones

Oxygen minimums





Oxygen Minimum Zones



Oxygen Minimum Zones

Summary

- We use the BGC-Argo float observations to validate ocean models
- We can assess BGC processes (phytoplankton blooms, deep chlorophyll maximum, OMZs, cycling of nitrate, etc…)

- Regions are still largely undersampled
- There are still a large number of profiles that are not in D-mode

Thanks for your attention !

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Any questions ?

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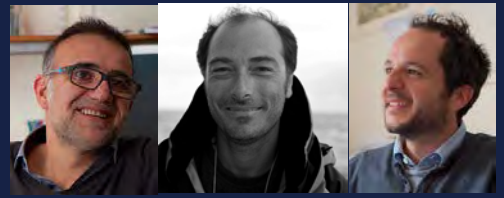

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