Copernicus Marine Service

PROGRAMME OF THE EUROPEAN UNION

implemented by MERCATOR OCEAN INTERNATIONAL

COPERNICUS MARINE

7th GENERAL ASSEMBLY

MERCATOR OCEAN INTERNATIONAL

Improving the offer: model products

Marina Tonani and the Monitoring and Forecasting Centres

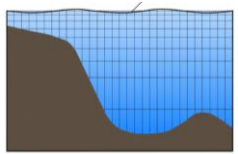
What are the modelling products?

Numerical models with data assimilation schemes

- the Global Ocean
- the Arctic
- the European regional seas.

Δx,y ~ 1 - 10 km

Δz ~ 1 - 500 m



PAST Multi-Year

Forecast FUTURE

Copernicus Marine Service

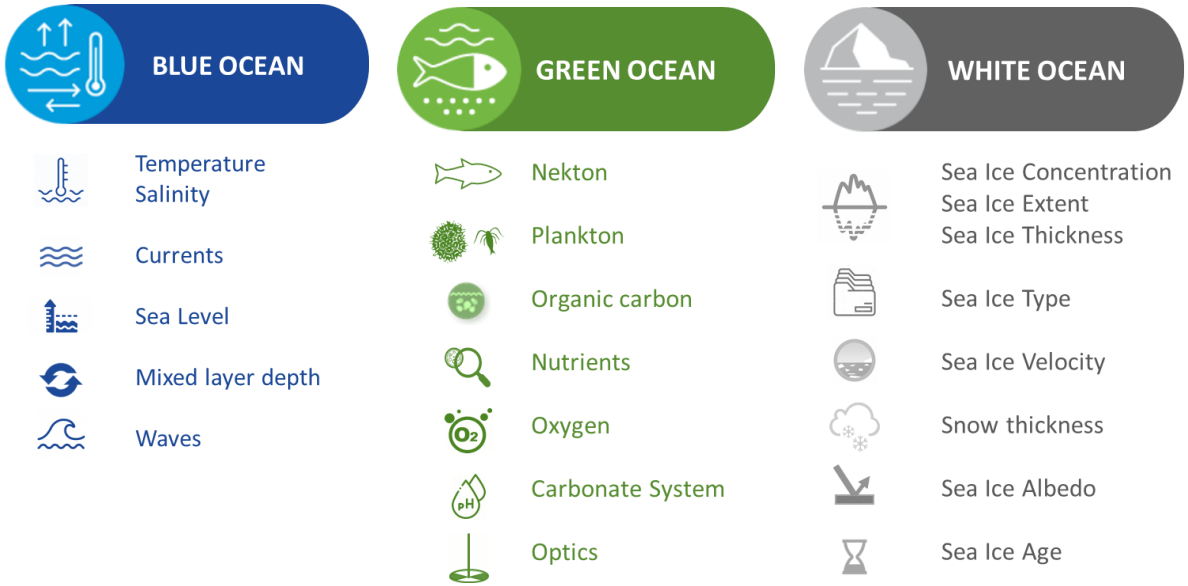
Catalogue offer

Forecast:

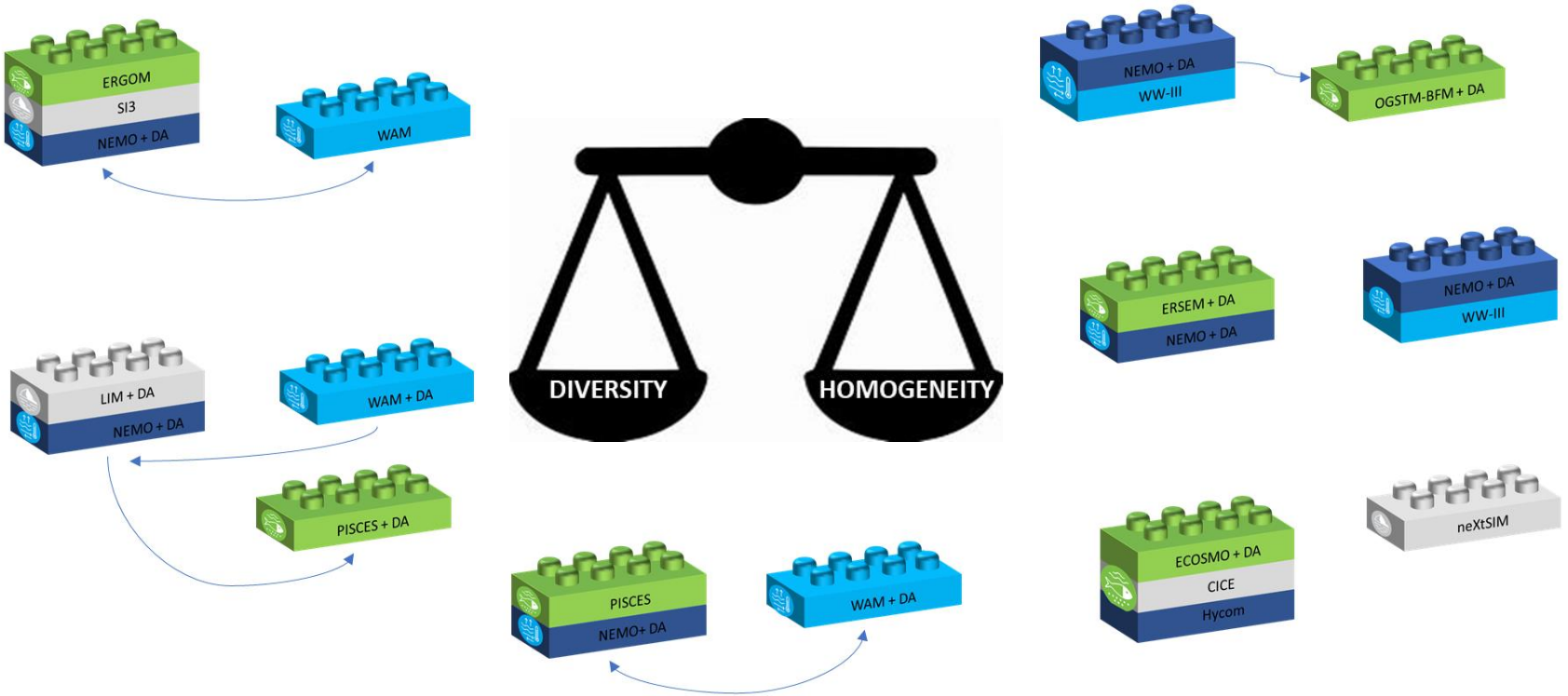
- Deterministic
- Daily cycle (twice a day)
- Lead time 10 days

Multi-Year:

- 1992 → 1 -2 years before present
- New time series every 3-5 years
- Timeseries regularly extended



What are the components of the MFCs ?



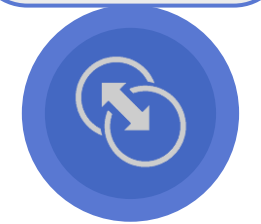
Evolution of the offer

ACCURACY

Model parameterization and processes
Data assimilation and observations

SEAMLESS

Boundaries from neighbouring MFCs
Forecast and **MY** system **similar**
Same **observations**



PORTFOLIO

New products/variables
Longer timeseries
Extension of forecast lead time

Improved accuracy

NEMO

ACCURACY

Model parameterization and processes
Data assimilation and observations

MODELS

- Parameterization
- Resolution
- Coupling
- Forcing

Vertical mixing - Re-mineralization and de-nitrification Gibraltar transport - Topographic wave drag coeff. – Bio-optical model

Increased resolution in Arctic, IBI, Black sea

More wave-ocean coupling terms - More PHY-BGC feedbacks

Improved river forcing (EFAS) - Lateral boundaries

DATA ASSIM

- Observations
- Scheme
- Cycle

Ice Charts – Bio ARGO - Sentinel 6 – Wave spectra – BGC profiles

4D scheme - Improved background covariance and EOF – barotropic model SLA assimilation – bias correction optimization

Higher frequency cycle - Shorter assimilation window

Nesting –lateral boundaries

SEAMLESS

Boundaries from neighbouring MFCs **Forecast** and **MY** system **similar** Same **observations**

Forecasting systems

	2021			2024		
	PHY	WAV	BGC	PHY	WAV	BGC
Arctic	CLIM					
Baltic			CLIM			
Black Sea	CLIM	N/A	CLIM		N/A	CLIM
IBI						
Med Sea			CLIM			
NW Shelf	Met Office	Met Office	CLIM			

Reducing the differences: Reanalysis ↔ Forecast

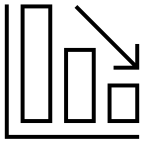
- **Resolution**
- Model
- DA
- Forcing

SEAMLESS

Boundaries from neighbouring MFCs **Forecast** and **MY** system **similar**
Same **observations**

Multi Year: reanalysis

Reduced gap between the end of the timeseries and present
- RAN-interim (only 3 MFCs in 2021, almost all in 2024)
- 2022: first interim M-1
- 2022: Increased frequency of RAN timeseries extension
- Reanalysis production → operational



Increased time period of WAVE reanalysis
- 2022: 2 regions from 1980
- 2024: GLO + all regionals from 1980
  - 2 regions from 1950

PORTFOLIO

New products/variables
Longer timeseries
Extension of forecast lead time

New variables:

BLUE OCEAN
physical

- Vertical velocities 2022
- Maximum wave 2023
- Daily de-tided SSH and currents 2023
- Error maps of SST 2023
- Climatologies for wave 2023

WHITE OCEAN
Sea Ice

- Increased number of variables
- Albedo, Ice classification and Sea Ice Speed 2022

PORTFOLIO

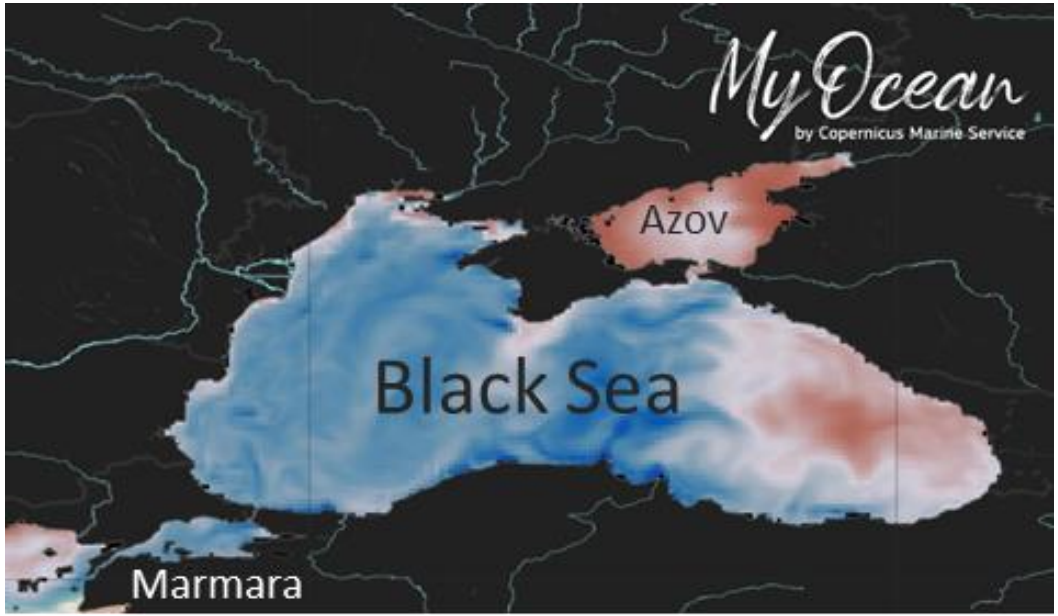
New products/variables
Longer timeseries
Extension of forecast lead time

GREEN OCEAN
biogeochemical

- Across MFCS: increased harmonization
- E.g. Light attenuation coefficient will be delivered by all the MFCs by 2024, in 2021 only by 2.

Extended geographical domain:

- **Marmara sea 2023**
- **Azov sea 2024**



PORTFOLIO

New products/variables
Longer timeseries
Extension of forecast lead time

Copernicus
Marine Service

Continuous improvement of all the components
→ **delivery of better and more products**

- **Conclusion**

Increased the harmonization across MFCs
→ **ease of use for users**