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# A new version of the IBI near real time system for November 2020: what will be changed?

Guillaume Reffray<sup>1</sup>, Mounir Benkiran<sup>1</sup>, Bruno Levier<sup>1</sup>, Elodie Gutknecht<sup>1</sup>, Roland Aznar<sup>2-3</sup>, Karen Guihou<sup>2-3</sup> and Marcos Garcia-Sotillo<sup>3</sup>

<sup>1</sup> Mercator Ocean, Parc Technologique du Canal, 8-10 rue Hermes, 31520 Ramonville St-Agne, France

<sup>2</sup> Puertos del Estado, Av. Partenón, 10, 28042 Madrid, Spain

<sup>3</sup> Nologin, Avda. de Ranillas 1D, 50018 Zaragoza, Spain

- Mercator Ocean International
- NOLOGIN
- CESGA (Centro de Supercomputación de Galicia)
- Meteo France
- AEMET (Agencia Estatal de Meteorología)
- Marine Institute



CESGA



*Foras na Mhara*  
*Marine Institute*

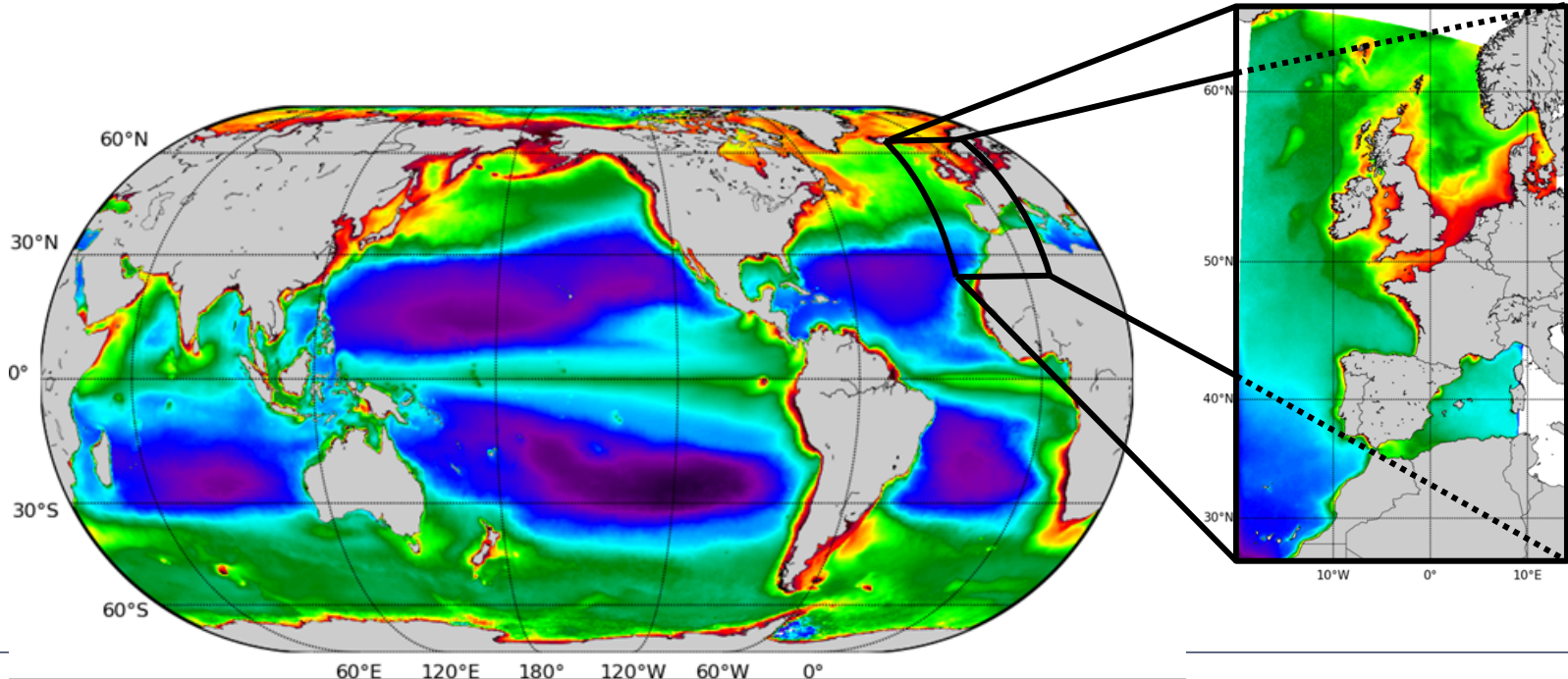


**METEO FRANCE**  
Toujours un temps d'avance

## Model description

- **NEMO-PISCES 3.6**
- **Subset of Global ORCA grid: 1/36° (1.8 – 2 km)**
- **50 z-levels (with partial bottom cells)**
- **online coupling with PISCES**
- Runoff as 35 sources + climatology 2D
- **PHY Data Assimilation, NO BGC Data assim**
  - SAM2: SEEK filter
  - T/S bias correction
  - adaptive obs. error

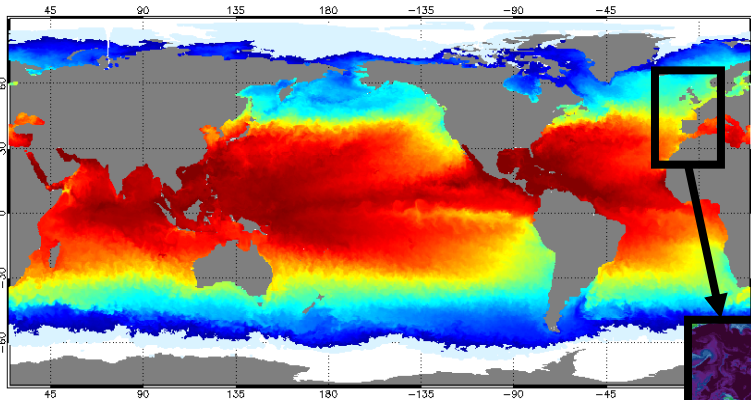
- Mom. Adv. in vector inv. form + EEN
- Quickest 3rd order advection for tracers
- $k-\varepsilon$  + Canuto A vertical mixing
- No implicit pressure gradient
- Split explicit free surface (ROMS rutgers like)
- Non linear free surface (key\_vvl)
- Surface atmospheric pressure gradient included
- 11 tidal harmonics at open boundaries + tidal potential
- 2 bands shortwave penetration with variable attenuation based on a merged SEAWIFS/IFREMER kpar climatology.



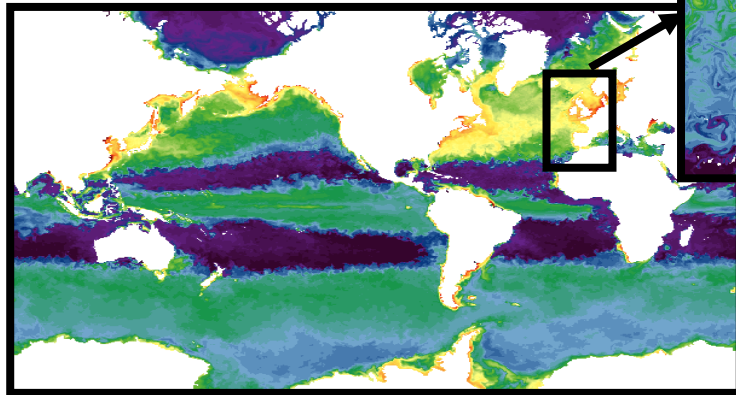
## CI & OBCs:

**Nested to CMEMS Global systems**

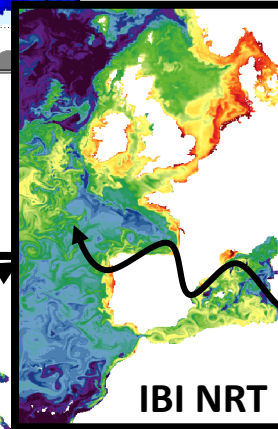
Physics  
Coarsening



**Daily CMEMS GLO forecasting system at 1/12° (PSY4)**

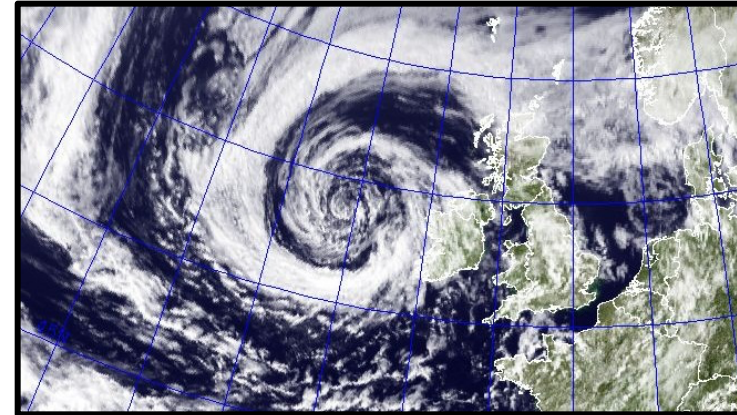


**Weekly CMEMS GLO forecasting system at 1/4° (BIOMER)**



**IBI NRT**

## Atmospheric forcings



**ECMWF (3h) + Core bulk formulae**

## Data assimilation

CMEMS data: along-track SLA, SST  
T, S in-situ profiles

## Current IBI NRT Forecasting System:

From 01/2010 up to 7-day forecast

→ Operated and distributed via CMEMS since April 2018

- ✓ **Current IBI NRT Forecasting System** → operated and distributed since April 2018  
7-year pre-operational qualification simulation (01/2010 – 12/2016)

## PHY:

- **Evaluation of physical variables**  
→ Pascual-Collar et al. ; Lorente et al. (2019; Ocean Sciences)

## BGC:

- **Evaluation of Ecosystem variables**  
→ Nutrients, O<sub>2</sub>, Chl-a, NPP distributed since April 2018  
→ Gutknecht et al. (2019; Ocean Sciences)

- ✓ **Preparation of the future system** → will be operated in Novembre 2020

7-year qualification simulation (01/2010 – 12/2016)  
→ first results very promising

## From current to future IBI36 model system

NEMO-PISCES 3.6 → up-to-date with the NEMO community

### PHY part

	Current IBI36	Next IBI36
<b>Tidal mixing parametrization</b>	no	Lavergne et al., 2015
<b>Advection scheme</b>	QUICKEST + ULTIMATE	QUICKEST + Zalezak (same as BGC)
<b>Solar penetration</b>	2 bands + climatology kpar	5 bands + monthly SSC
<b>Bulk formulae</b>	CORE	IFS + variable air density (new formalism)
<b>Diagnostics</b>	hbar	Enhanced hbar, hdyn, steric, volume of dense water formation
<b>Coarsened outputs</b>	/	Factor 3 to recover exactly the IBI12 grid
<b>IO server</b>	xios	xios2
<b>Data assimilation</b>		Adjustment: New settings to overcome identified weaknesses

### BGC part

	Current IBI36	Next IBI36
<b>CI and OBC</b>	Previous GLO-BIO-NRT (NEMO-PISCES 3.2)	New GLO-BIO-NRT (NEMO-PISCES 3.6, OC data assim + damping, CI: WOA2013, GLODAPv2)
<b>Permanent deposition in the sediments</b>	No deposition	Deposition is function of a bottom friction threshold
<b>River input</b>	Global News 2 + additional inputs (NO3, PO4) from EEA	Revised PO4 from EEA



## Current system:

2 bands scheme (Murtuggude et al, 2002; Morel 1988):

The solar flux  $Q_{sr}$  is split into 2 parts:

- 1 non penetrative part (Near IR)
- 1 penetrative part depending of a climatology of  $K_{par} = 1 / \eta_1$ .

Current solar penetration scheme for the IBI system:

$$I(z) = Q_{sr} \left[ R e^{-\frac{z}{n_0}} + (1 - R) e^{-\frac{z}{n_1}} \right]$$

with  $R = 0.57$

## Future system:

5 bands scheme: The solar flux  $Q_{sr}$  is split into 5 parts:

- 1 non penetrative part (Near InfraRed)
- 3 for the PAR (Lengaigne et al, 2007 as an efficient simplification of the 61-bands scheme of Morel, 1988)
- 1 for the Ultraviolet part

$$I(z) = Q_{sr} \left[ UV e^{-\frac{z}{z_{UV}}} + (1 - PAR - UV) e^{-\frac{z}{z_{NIR}}} + \frac{PAR}{3} e^{-\frac{z}{z_R}} + \frac{PAR}{3} e^{-\frac{z}{z_G}} + \frac{PAR}{3} e^{-\frac{z}{z_B}} \right]$$

with  $UV = 0.08$  and  $PAR = 0.47$

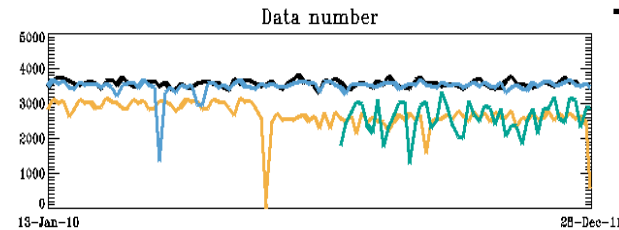
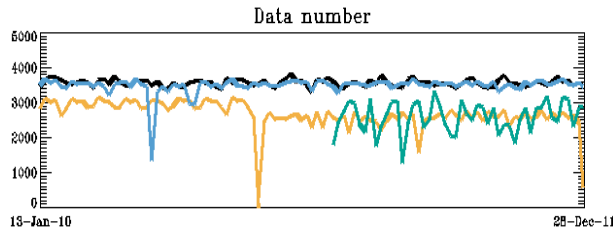
Monthly chlorophyll observations => interannual variability

## SLA

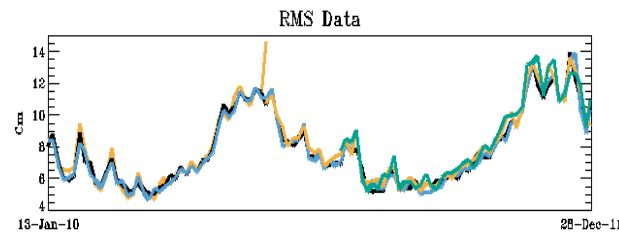
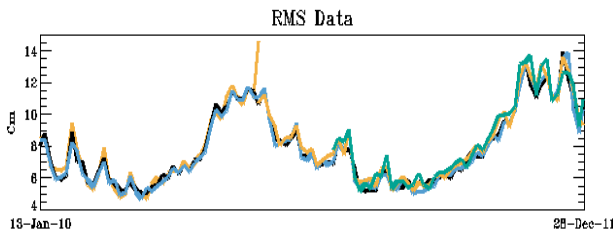
### Current system

### Future system

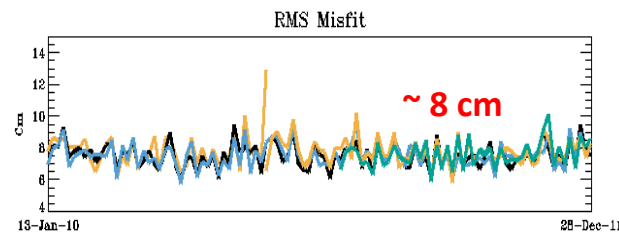
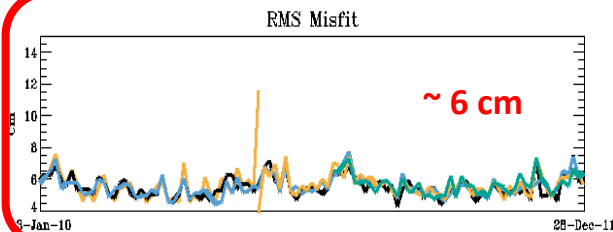
Data number



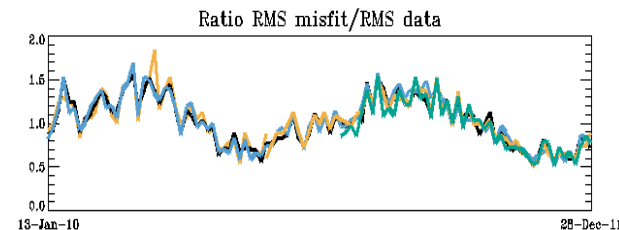
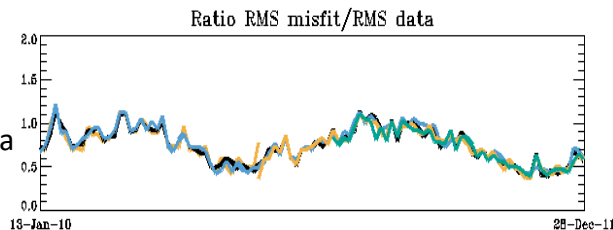
RMS data



RMS misfit



Ratio  
RMS misfit/RMS data



Only  
data  
→ identical

→ Degradation of the SLA solution (deactivation of SLA Data Assimilation on the shelf)

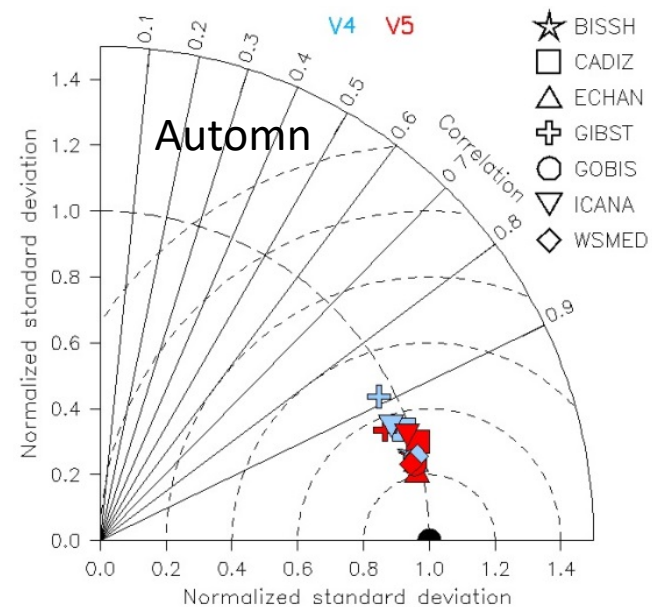
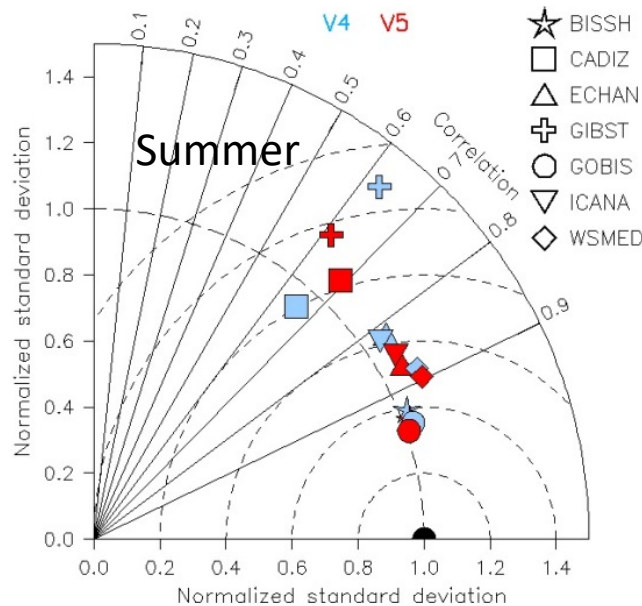
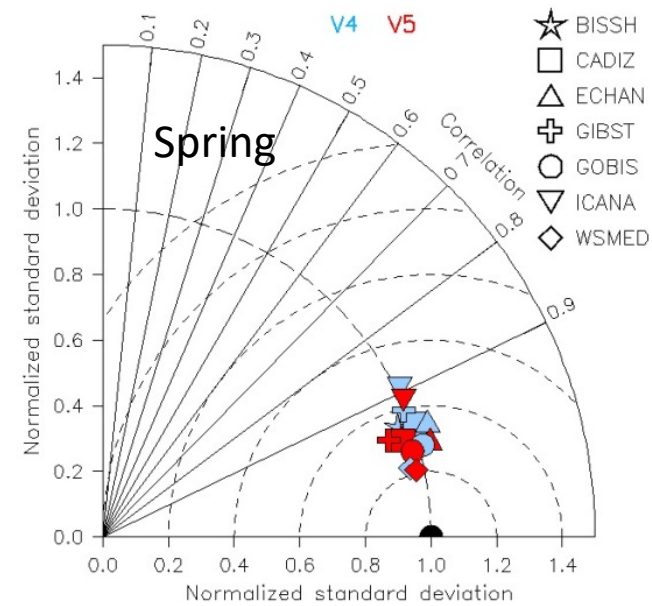
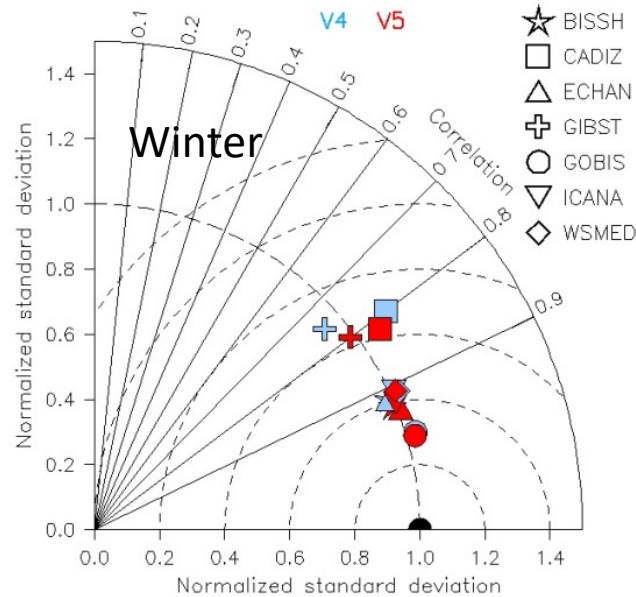
But nothing noticeable on the temperature and salinity  
from a statistically point of view (figures not shown here)



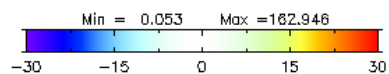
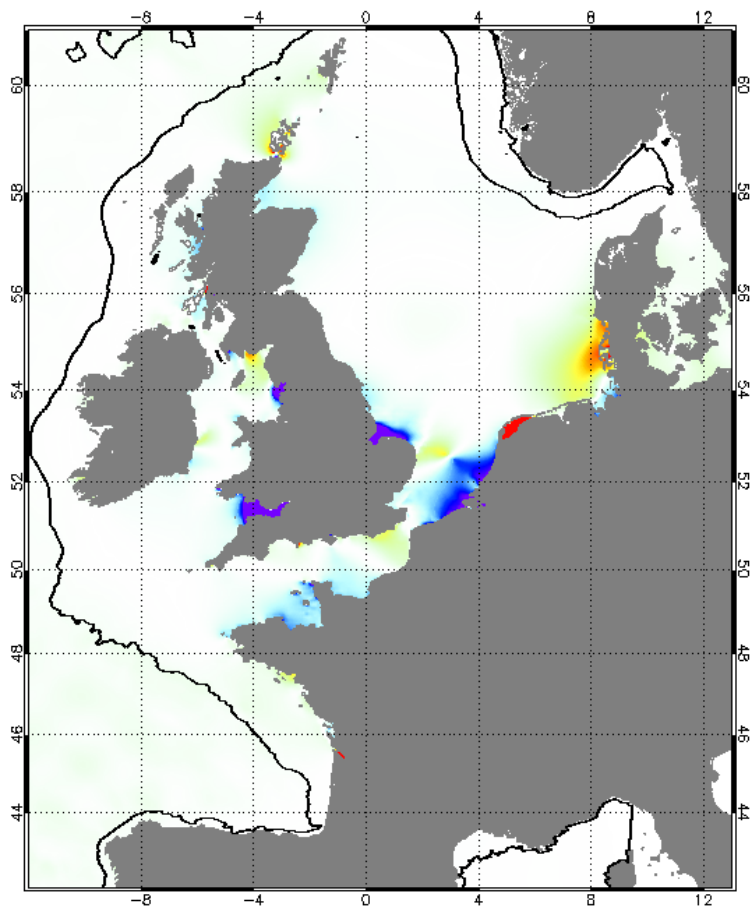
**SST L3S 2011**

Current system

Future system



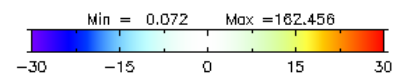
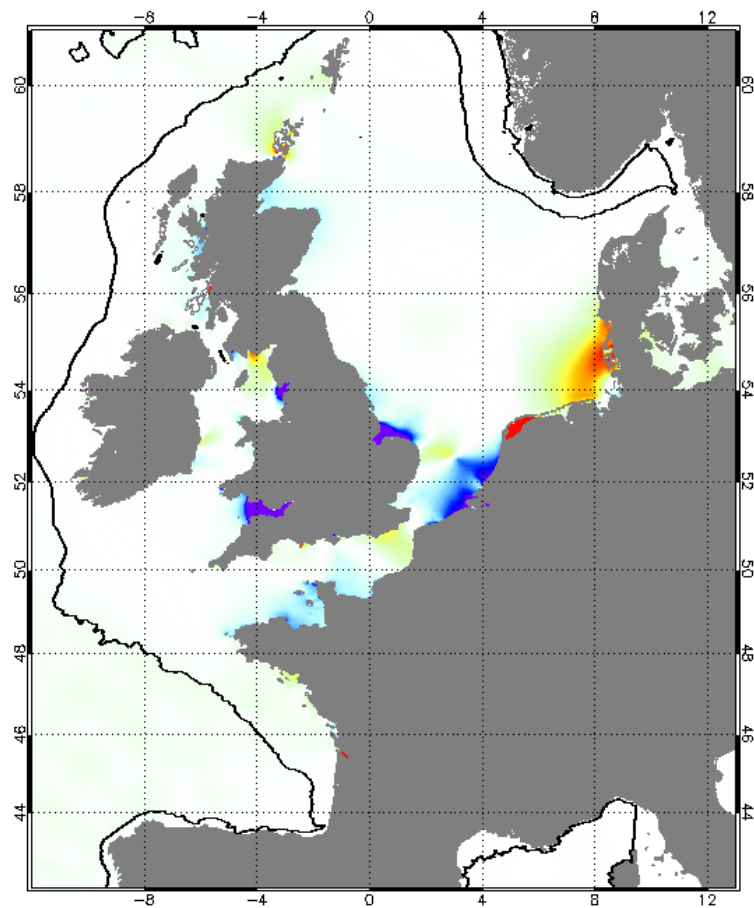
Amplitude: M2



avg: -0.076

**Current system**

Amplitude: M2



avg: -0.032

**Future system**

**The future system will be operational in November 2020**

**At the same time: R&D activities allow the IBI system to continue to evolve**

→ PHY Data assimilation:

Several issues highlighted, have to be investigated

Data assimilation method improvement

- Setting of the DA components dedicated to the specificities of IBI area
- Activate 4D analysis for SLA and SST
- Assimilation of higher resolution SST

Concerning the BGC component (assessment and perspectives), see the presentation of **Gutknecht et al.** in the same session OS 4.7 D2429 | EGU2020-5243

**“Modelling the marine ecosystem of IBI European waters for CMEMS operational applications”**

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