Towards the end-users

CMEMS OCEAN MULTI OBSERVATIONS TAC

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Main objectives of MULTIOBS TAC

Part of the CMEMS (Copernicus Marine Environment Monitoring Service, **http://marine.copernicus.eu/**): services and products for marine applications

MULTIOBS Thematic Assembly Center (TAC) :

➔ Products based on **Observations** (satellite & in-situ) and data **fusion techniques**

➔ Products covering the ocean **physics** and **BGC**

➔ **High level of service to the users**

➔ Provision of **qualified Global** Ocean **Multi Observation** Products

➔ Products for end-users → **modellers** (initialization, validation of models, data assimilation...)
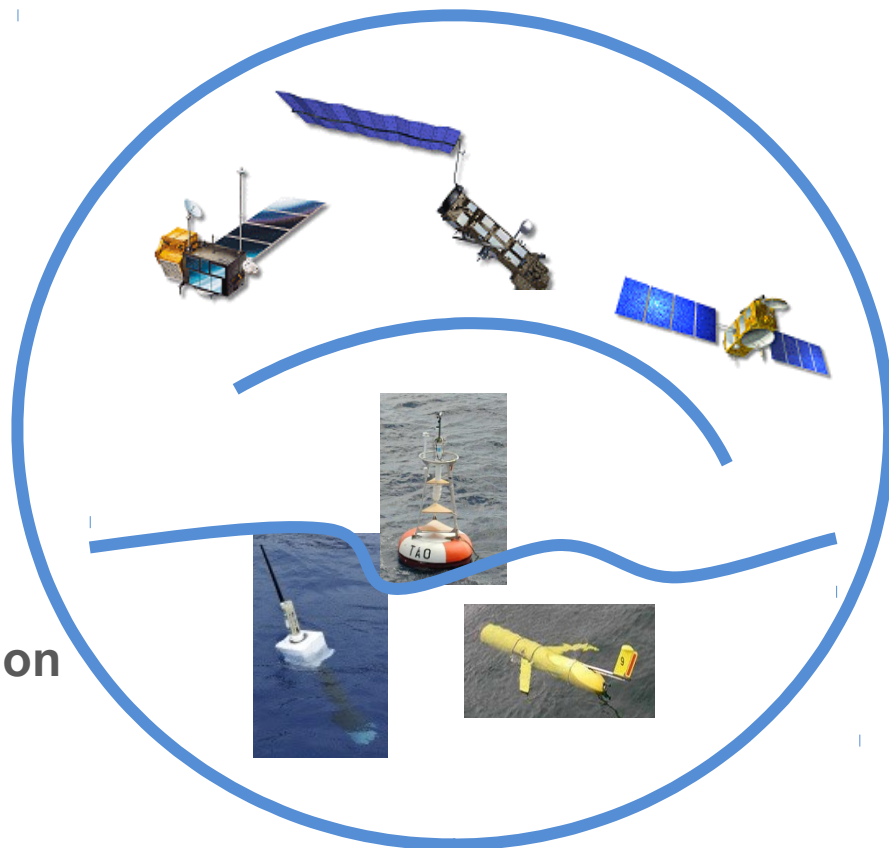
4D BGC products

➢ **Nutrient vertical profiles from BGC-Argo O$_2$ profiles**

➢ **Global 4D b$_{bp}$/POC and Chla product**

4D BGC products

> ### Nutrient vertical profiles from BGC-Argo O_2 profiles

- Based on a **neural-network method** trained on high quality nutrient data collected over the last 30 years (**GLODAPv2** database)

- **CANYON-B** (CArbonate system and Nutrients concentration from hYdrological properties and Oxygen using a Neural-network, Bittig et al. 2018, Sauzede et al. 2017)

  → Profiles of concentration of nitrates (**NO_3^-**), phosphates (**PO_4^{3-}**) and silicates (**$Si(OH)_4$**)
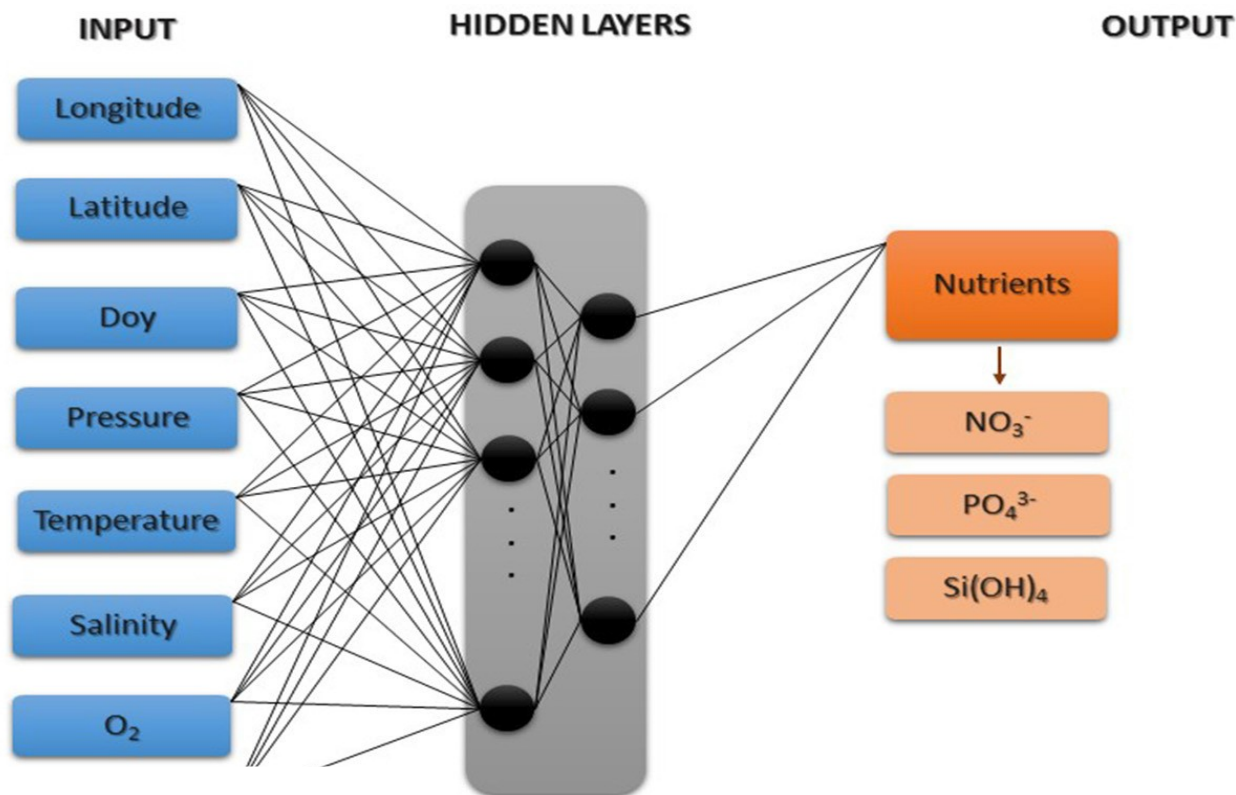
Global accuracies:
NO_3^- : 0.7 µmol kg^{-1}
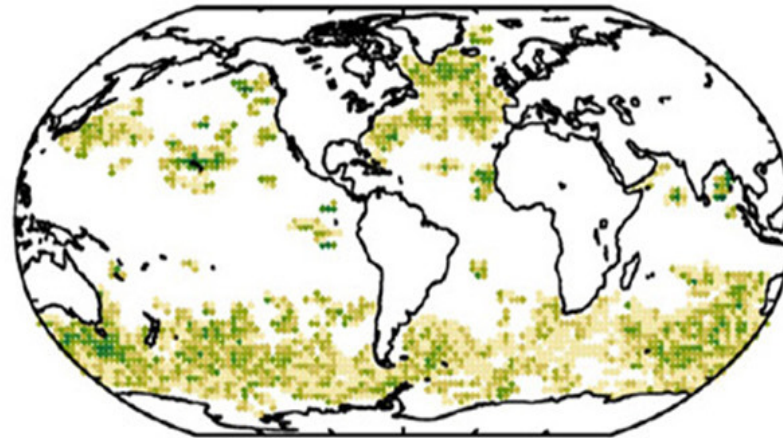PO_4^{3-} : 0.05 µmol kg^{-1}
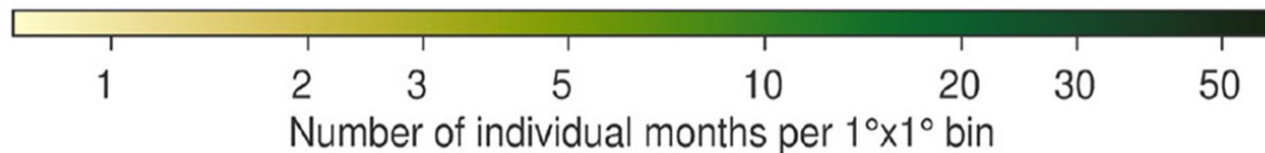$Si(OH)_4$: 2.3 µmol kg^{-1}

4D BGC products

➢ **Nutrient vertical profiles from BGC-Argo O$_2$ profiles**

→ Profiles of concentration of nitrates (**NO$_3$$^-$**), phosphates (**PO$_4$$^{3-}$**) and silicates (**Si(OH)$_4$**) + associated errors of estimation from calibrated Argo profiles (P/T/S/O$_2$)

Calibrated Argo-O$_2$ Floats

Number of individual months per 1°x1° bin

Bittig et al., 2018

~30,000 D profiles

→ Available in **march 2019** from the CMEMS website http://marine.copernicus.eu/

4D BGC products

- ➢ **Global 4D b_{bp}/POC and Chla product**
  - ▪ Based on a **neural-network method** trained on high quality b_{bp} and fluorescence/Chla data collected from **BGC-Argo** floats
    → **SOCA** (Satellite Ocean-Color merged with Argo, Sauzede et al., 2016) : SOCA-BBP, SOCA-CHL + satellite derived product of b_{bp} and Chla + Argo P/T/S + date

To extend surface **bio-optical properties to depth from ocean color data**
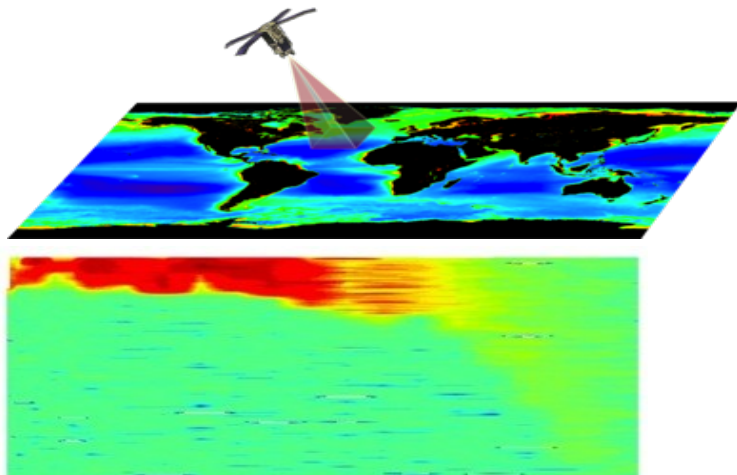
Physical state of the water column (from CTD profiles):
- • Influences nutrient and light availability for phytoplankton growth
- • Available at high spatio-temporal frequency with Argo data

Sauzède et al. (2016), A neural network-based method for merging ocean color and Argo data to extend surface bio-optical properties to depth: Retrieval of the particulate backscattering coefficient, J. Geophys. Res. Oceans, 121, doi:10.1002/2015JC011408.c
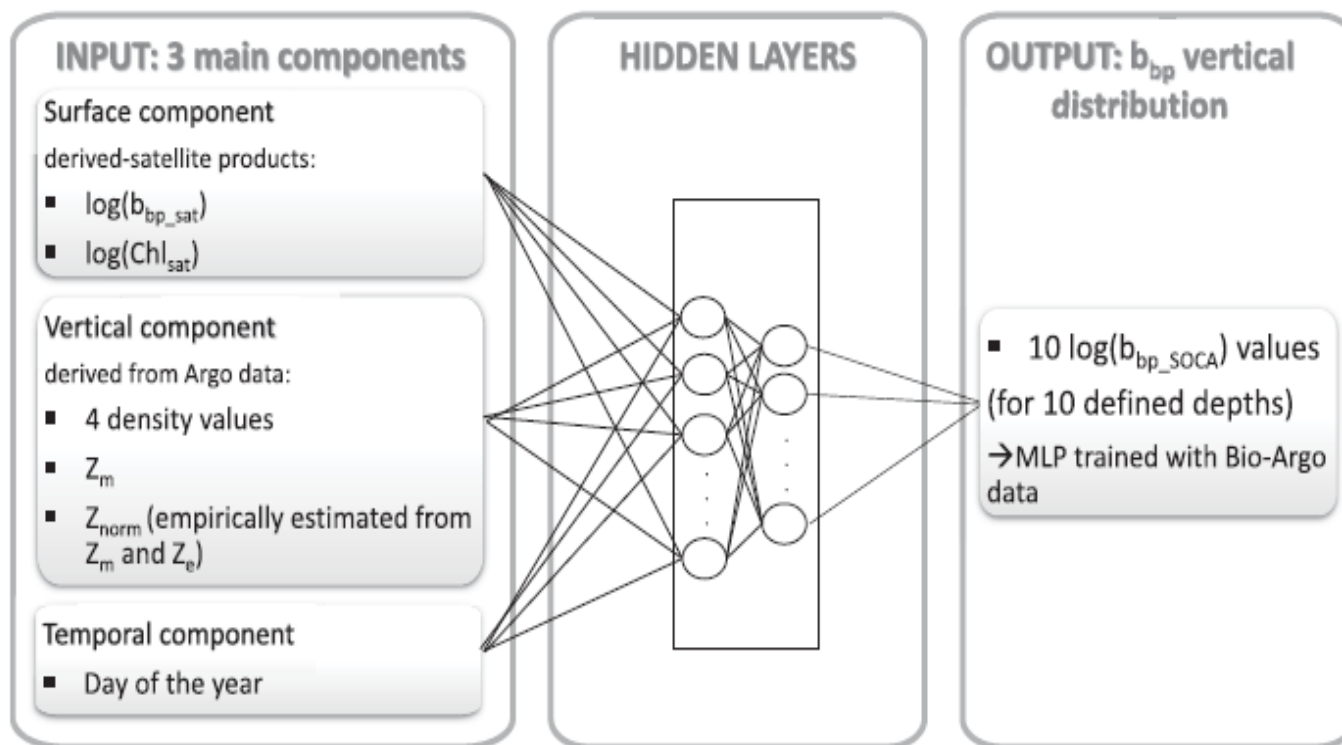
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- ➔ 3D weekly/monthly **b_{bp}/POC** and **Chla**

Satellite data

Argo data

Doy

INPUT: 3 main components

Surface component
derived-satellite products:
- ■ $\log(b_{bp\_sat})$
- ■ $\log(Chl_{sat})$

Vertical component
derived from Argo data:
- ■ 4 density values
- ■ Z_m
- ■ Z_{norm} (empirically estimated from Z_m and Z_e)

Temporal component
- ■ Day of the year

HIDDEN LAYERS

OUTPUT: b_{bp} vertical distribution

- ■ 10 $\log(b_{bp\_SOCA})$ values (for 10 defined depths)
- →MLP trained with Bio-Argo data

Global error:
~20 % on b_{bp}
~50 % on Chla

> **Global 4D b_{bp}/POC and Chla product**
> → 3D weekly/monthly **b_{bp}/POC** and **Chla**

4D global climatologies of b_{bp}

Surface ocean color climatologies

+
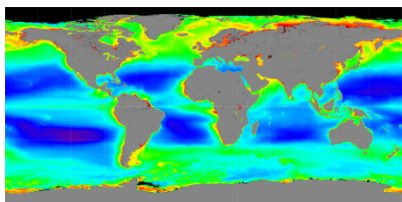
Argo T/S climatology
(Roemmich and Gilson ,2009)

SOCA-BBP

At 25 m
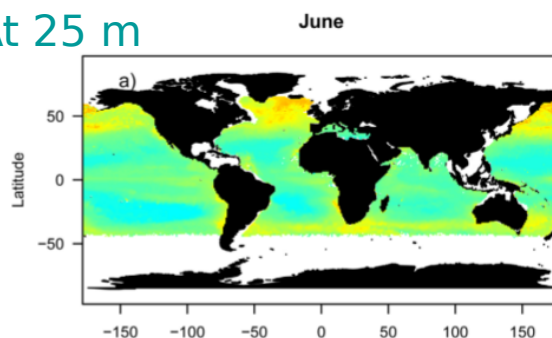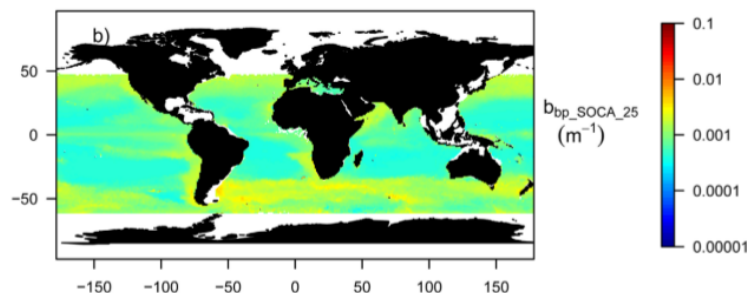
At 50 m
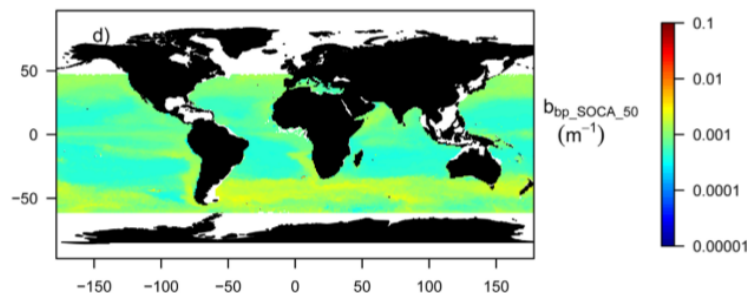
At 100 m

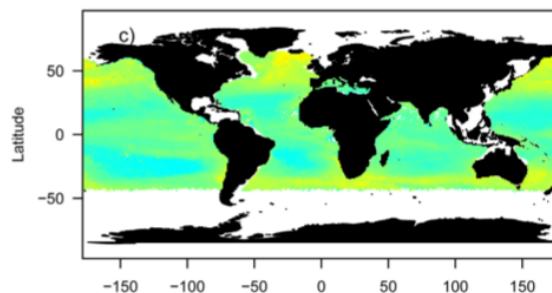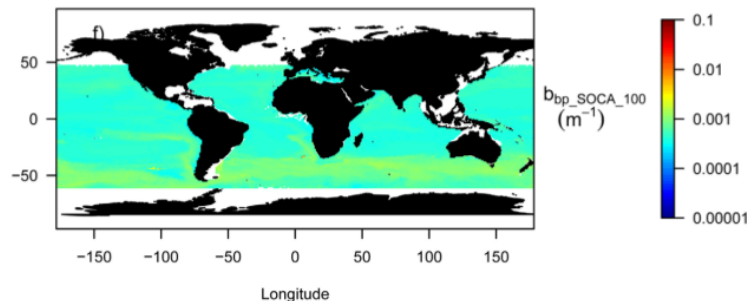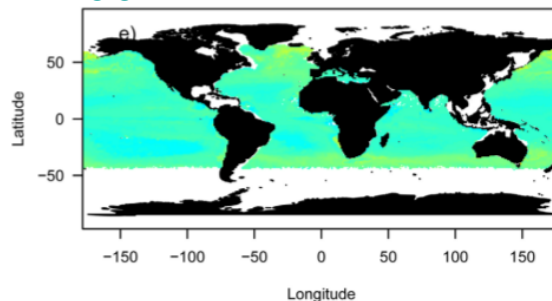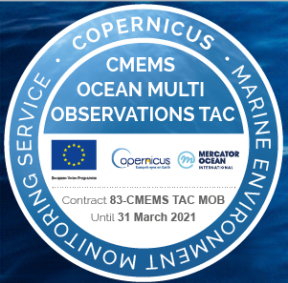# 4D BGC products

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  ➔ 3D weekly/monthly **b_{bp}/POC** and **Chla**

➔ Available soon from the CMEMS website
http://marine.copernicus.eu/

- 3-years monthly global database of b_{bp} transformed in POC from SOCA-BBP
- 3-years monthly global database of Chl from ANNs (SOCA-CHL)