


WORKSHOP « SMALL-SCALE FISHERIES in the South »


June 25th-26th, 2018 – Brest, France




Spatial and Temporal variability of primary production in the north-west African upwelling: A modelling approach.

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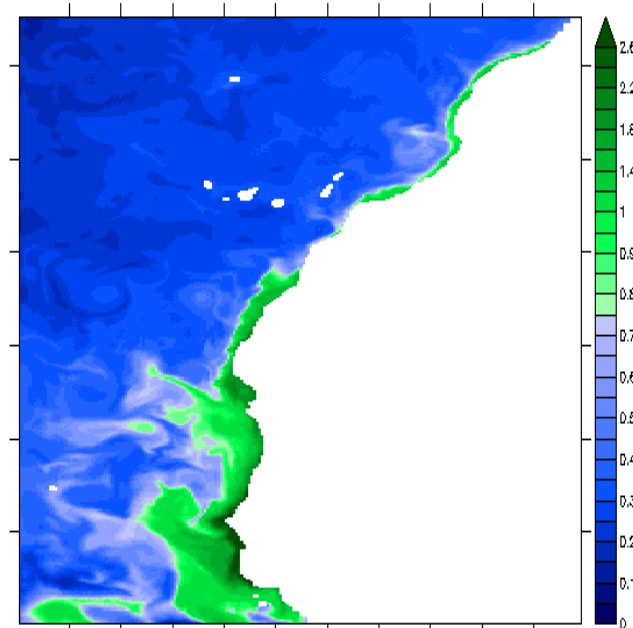
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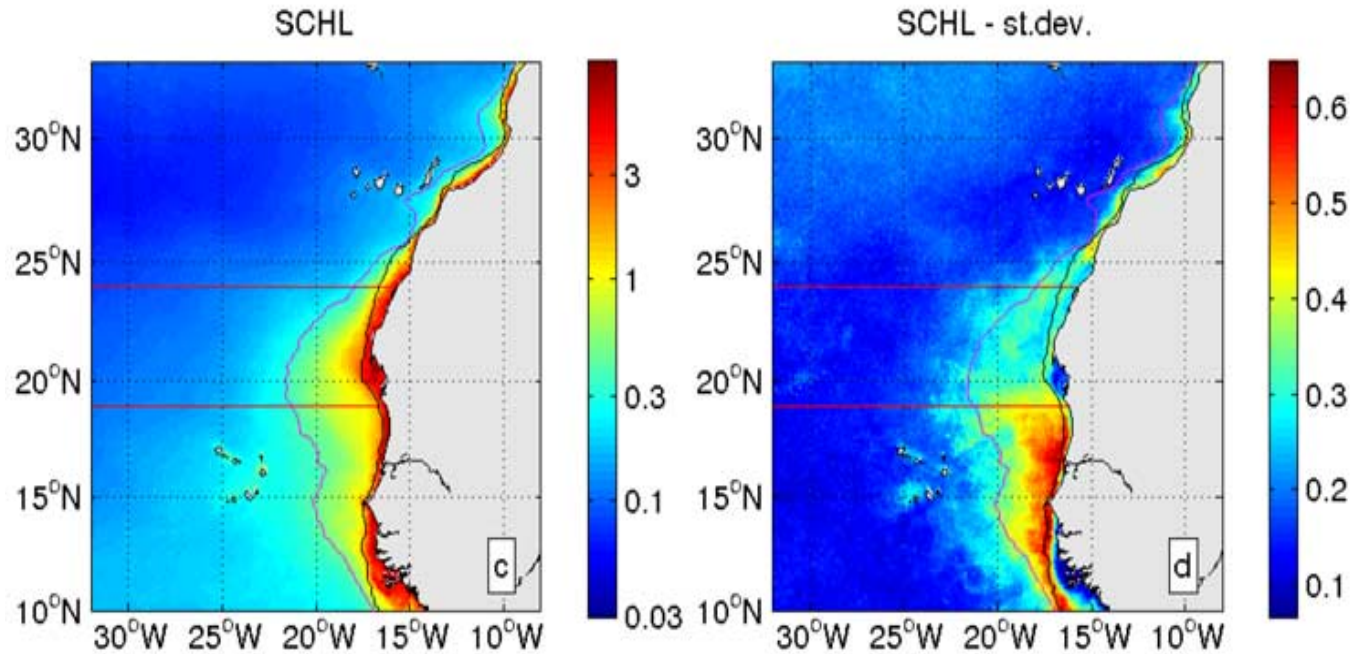
Our goal:

Understand, simulate (and predict) how the climate variability is impacting the primary producers in the North West African upwelling.



Relative role of : Biology? Physical Transport ? Other Processes involved ?

First step towards a robust projection of the effect of climate change on the halieutic resources.



Lathuilière et al. (2008)

Description of the variability of phytoplankton biomass

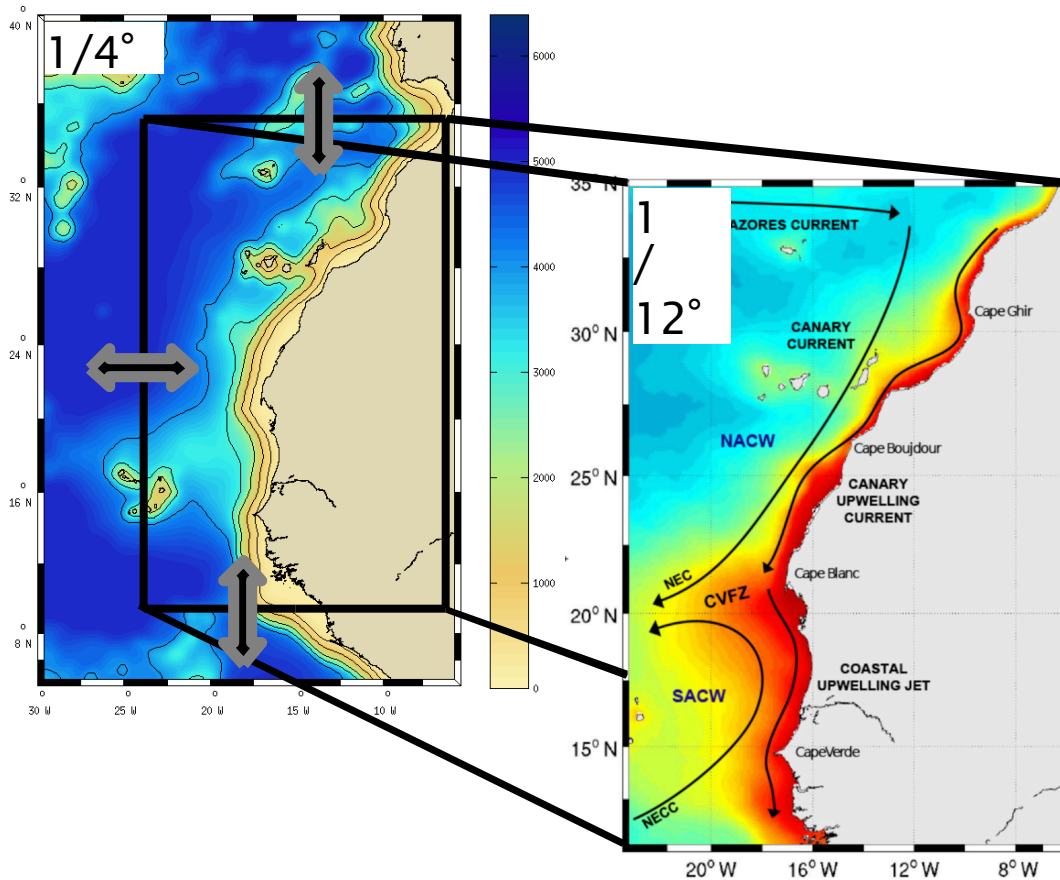
- Few studies (e.g. Lathuilière et al., 2008; Ohde and Siegel, 2010; Messié and Chavez, 2014)
- based on satellite data (Chl, T° , wind stress)

Role of : Biology? Physical Transport ? Other Processes involved ?

What are the relative importance of the processes driving the variability of the phytoplankton biomass ?

Coupled dynamical-biogeochemical simulation (ROMS-PISCES)

- 2-way nesting
 - “Parent grid” (resolution $1/4^\circ$)
 - “Child grid” (resolution $1/12^\circ$)

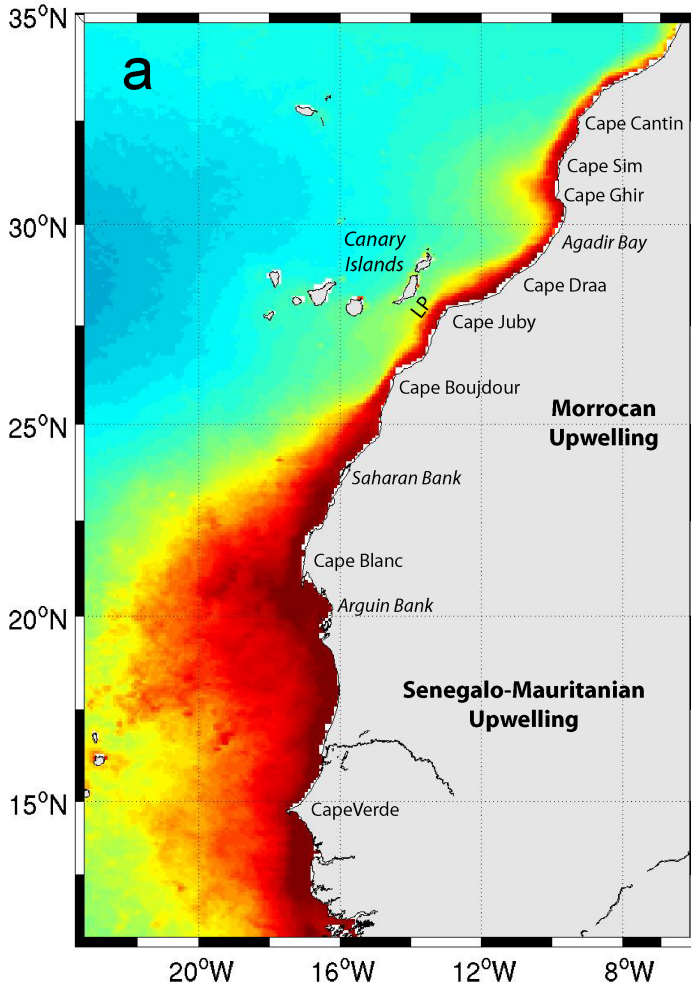
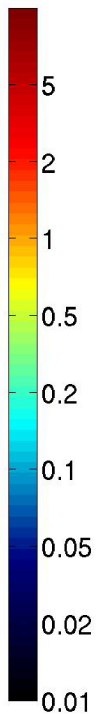


- Atmospheric forcing (6h) : CFSR (Climate Forecasting System Reanalysis)
- Bathymetry: GEBCO One Minute Grid
- Coupled with a biogeochemical model: PISCES

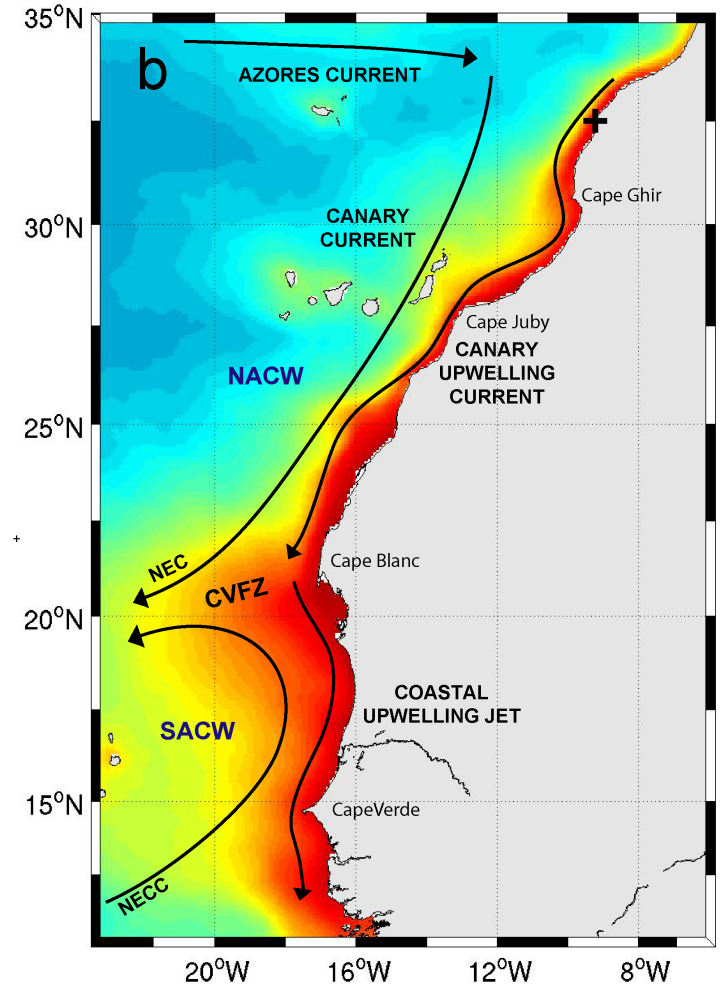
simulation cover the period: 1980-2009

SeaWiFS (1998-2009)

mgChl m^{-3}



Model (1998-2009)



Annual mean

Offshore Boxes

Coastal Boxes



Northern Saharan Bank : **NSB**



Southern Saharan Bank : **SSB**



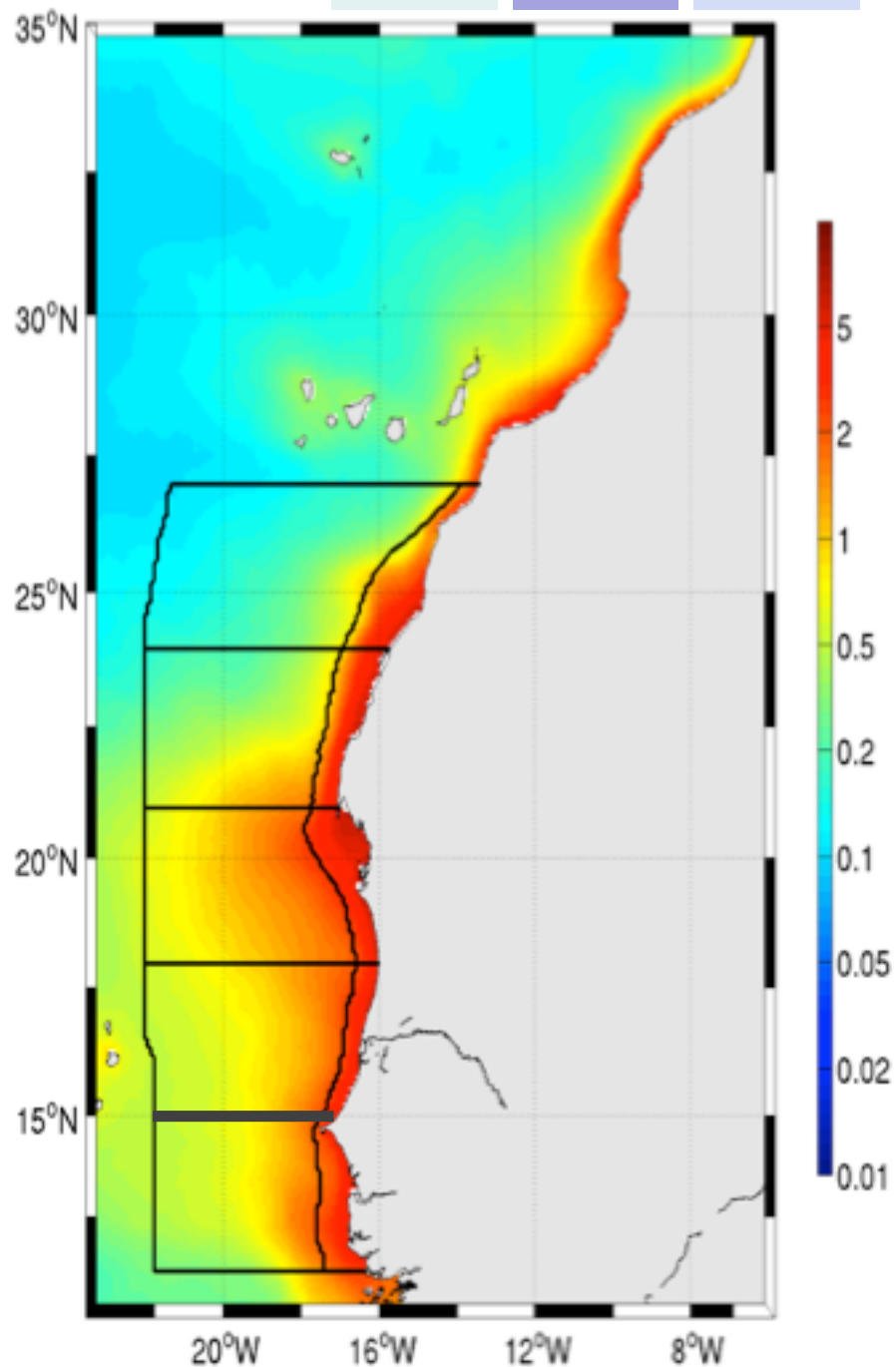
Cap Blanc region : **CB**



Senegalo-Mauritanian region : **SM**



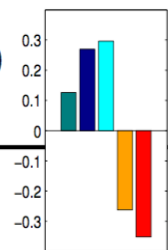
Southern Senegal region : **SS**



Annual mean

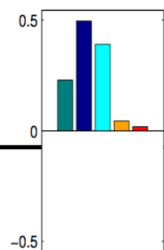
Coastal Boxes

Nitrate
($\text{molN m}^{-2} \text{s}^{-1}$)



(b) North

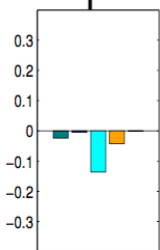
Phytoplankton
($\text{molC m}^{-2} \text{s}^{-1}$)



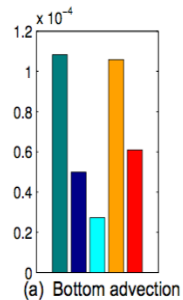
(f) North

Coastal boxes

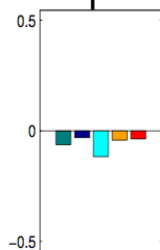
Coastal boxes



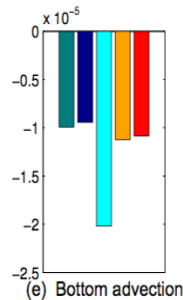
(c) West



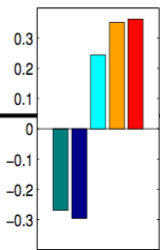
(a) Bottom advection



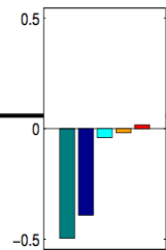
(g) West



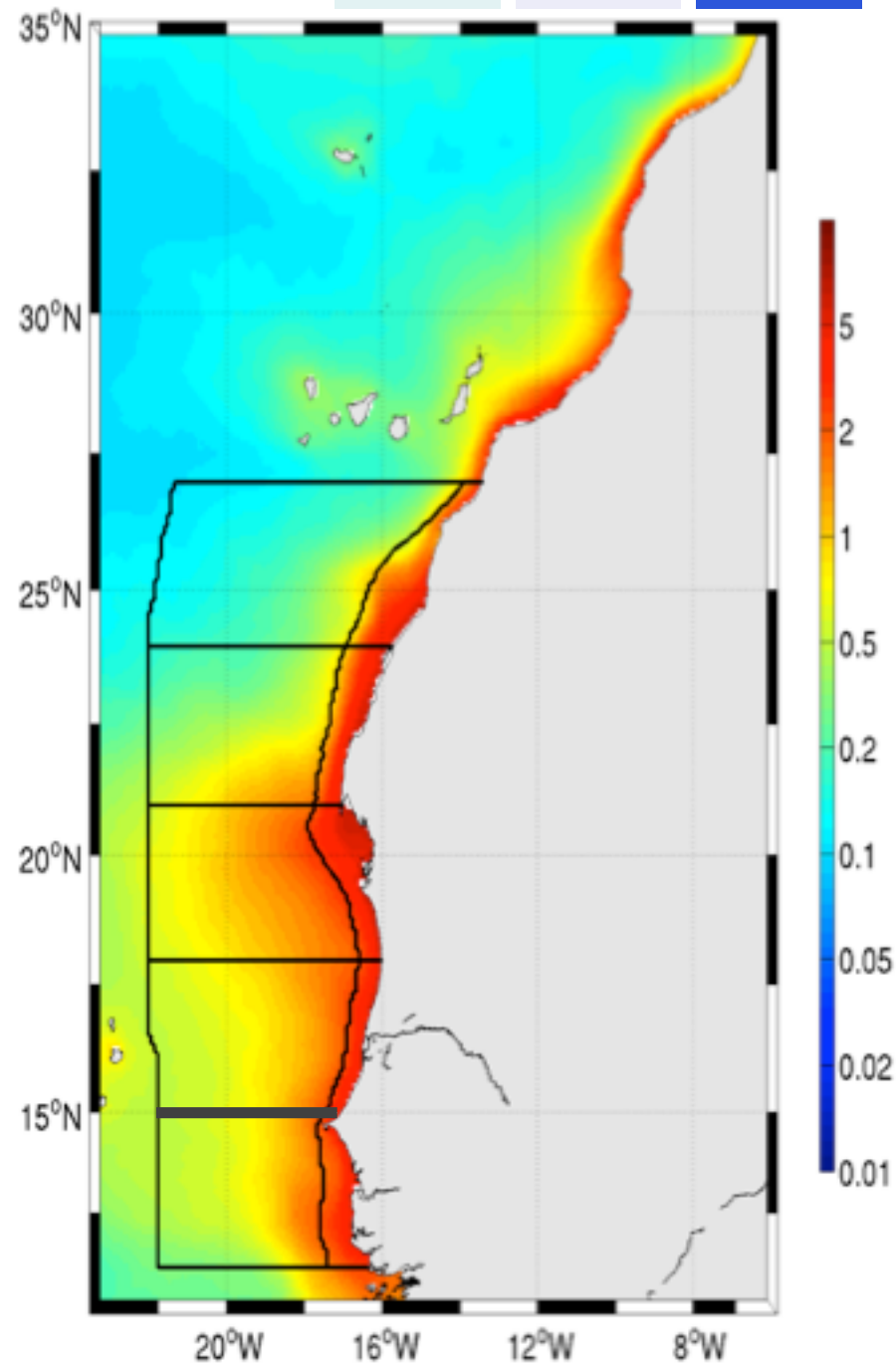
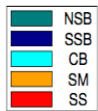
(e) Bottom advection



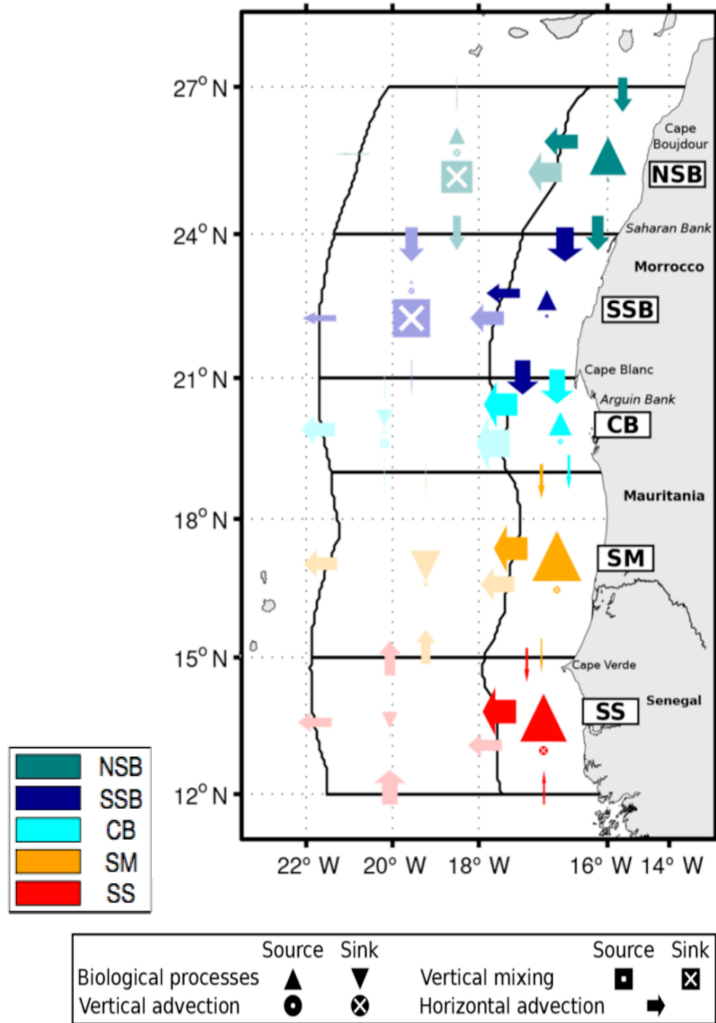
(d) South



(h) South



Phytoplankton



In coastal regions :

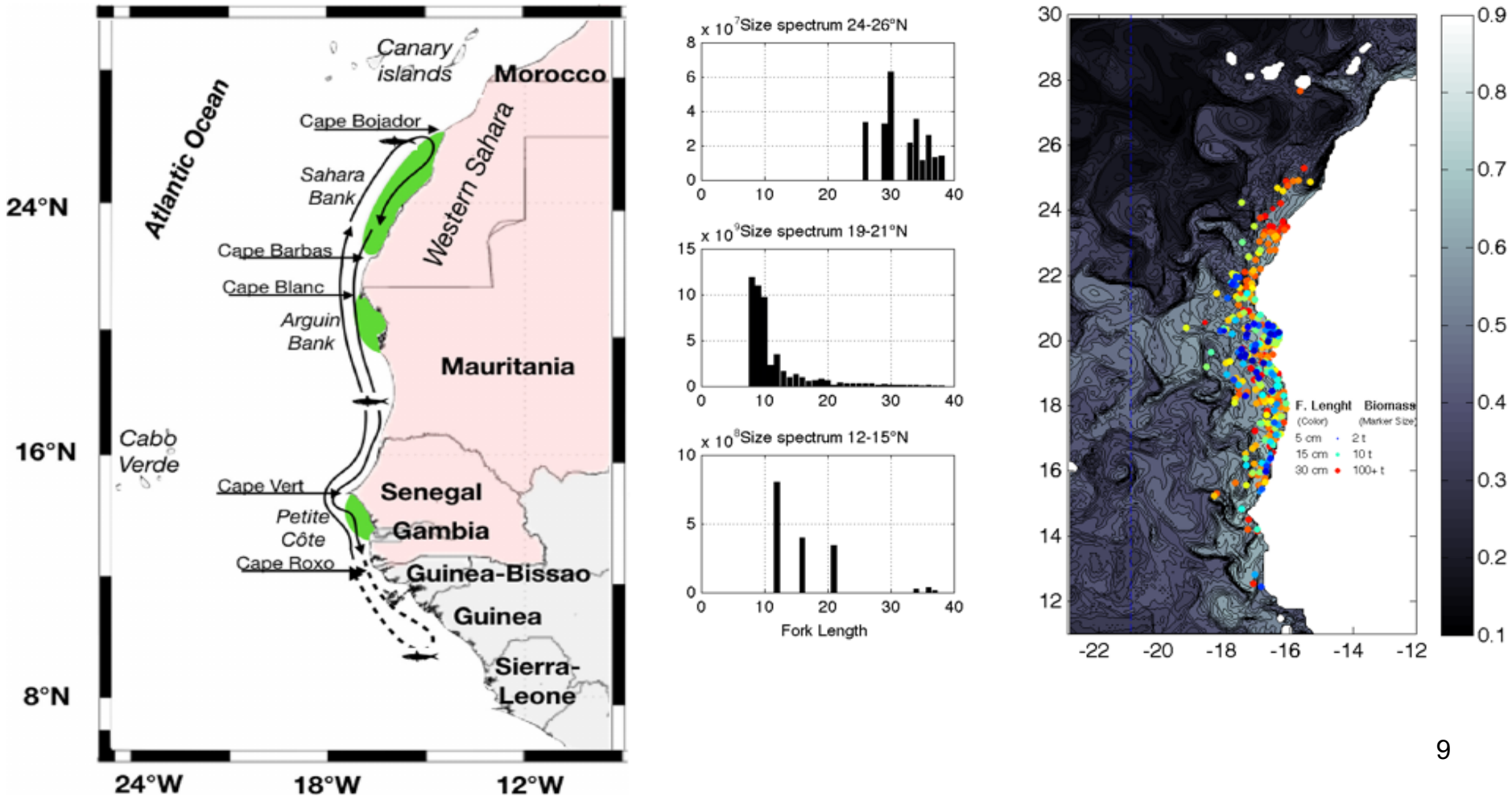
- Local growth is the dominant source of phytoplankton in the southern part of the upwelling.
- Southward meridional transport of phytoplankton mainly happen north of Cape Blanc

Offshore extension:

- High extension south of cape Blanc not driven by nutrient supply due to Ekman pumping.
- Lateral transport of Phytoplankton is the dominant process.

Using our model outputs : The « Evol-Deb » experiment (Brochier et al., 2018)

Understanding SPF distributions



Thank You !