Contribution of filter-feeding gelatinous macrozooplankton to global marine biogeochemistry: a model study

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In collaboration with [3]Fabio Benedetti and [3]Meike Vogt

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JELLIES IN NEMO-PISCES

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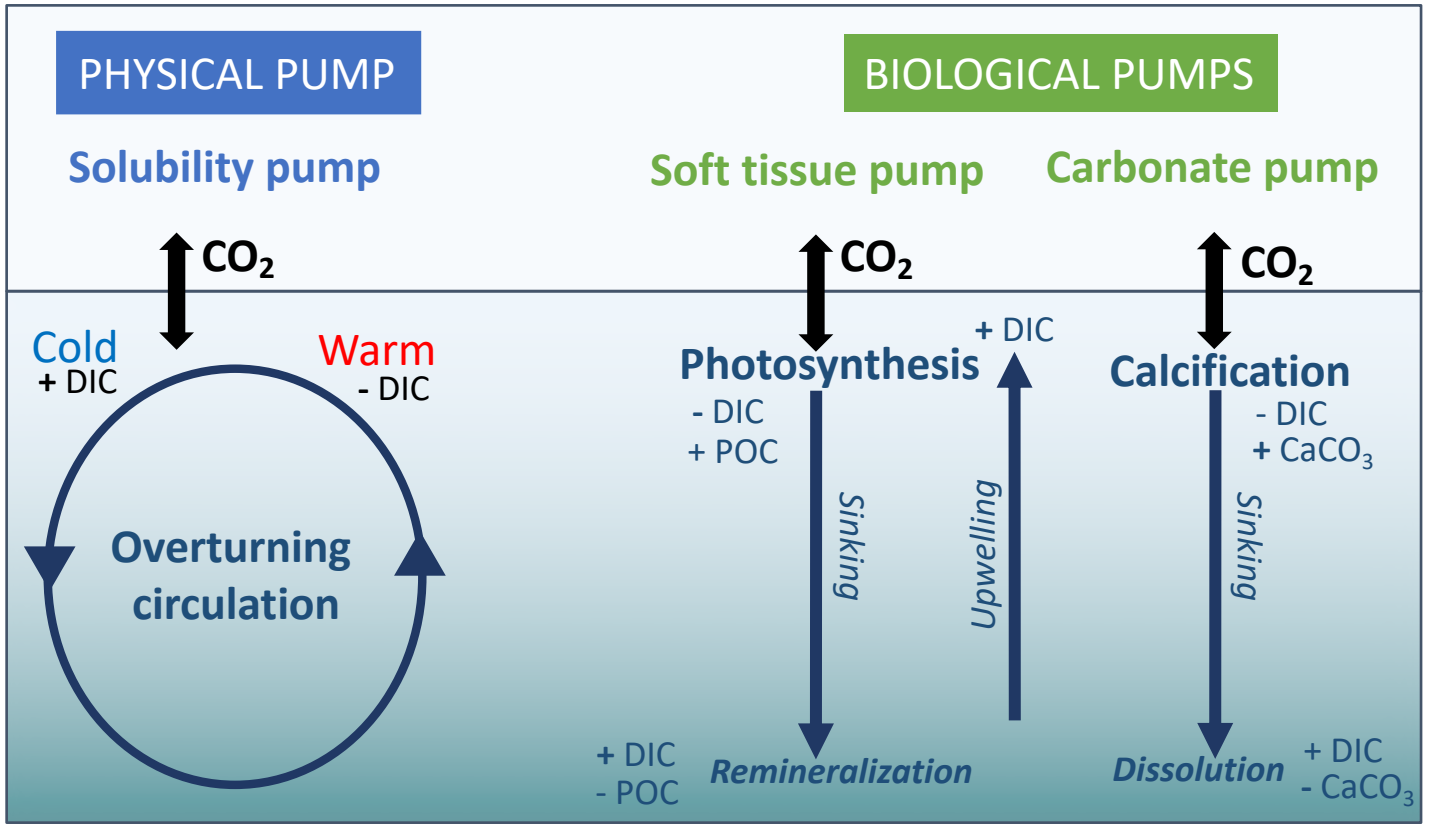
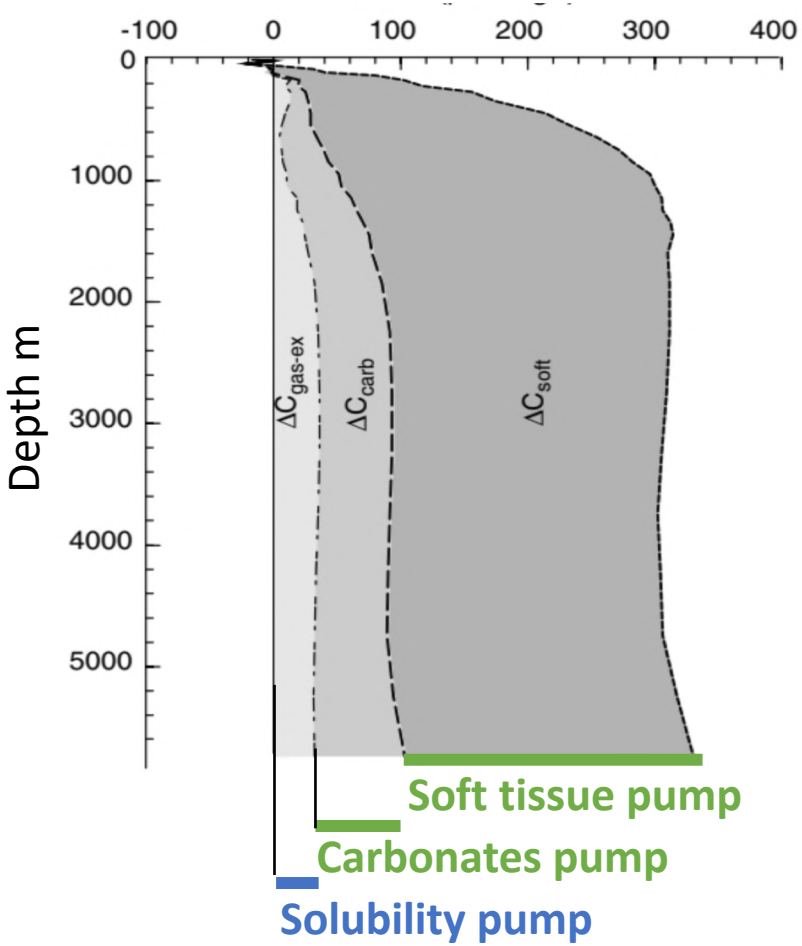
THE OCEAN CARBON PUMP(S)



Inspired from Heinze et al. 1991

ΔDIC µmol kg^{-1} (Compared to an uniform ocean)



Adapted from Sarmiento and Gruber 2006

Note : DIC = Dissolved Organic Carbon, POC = Particulate Organic Carbon

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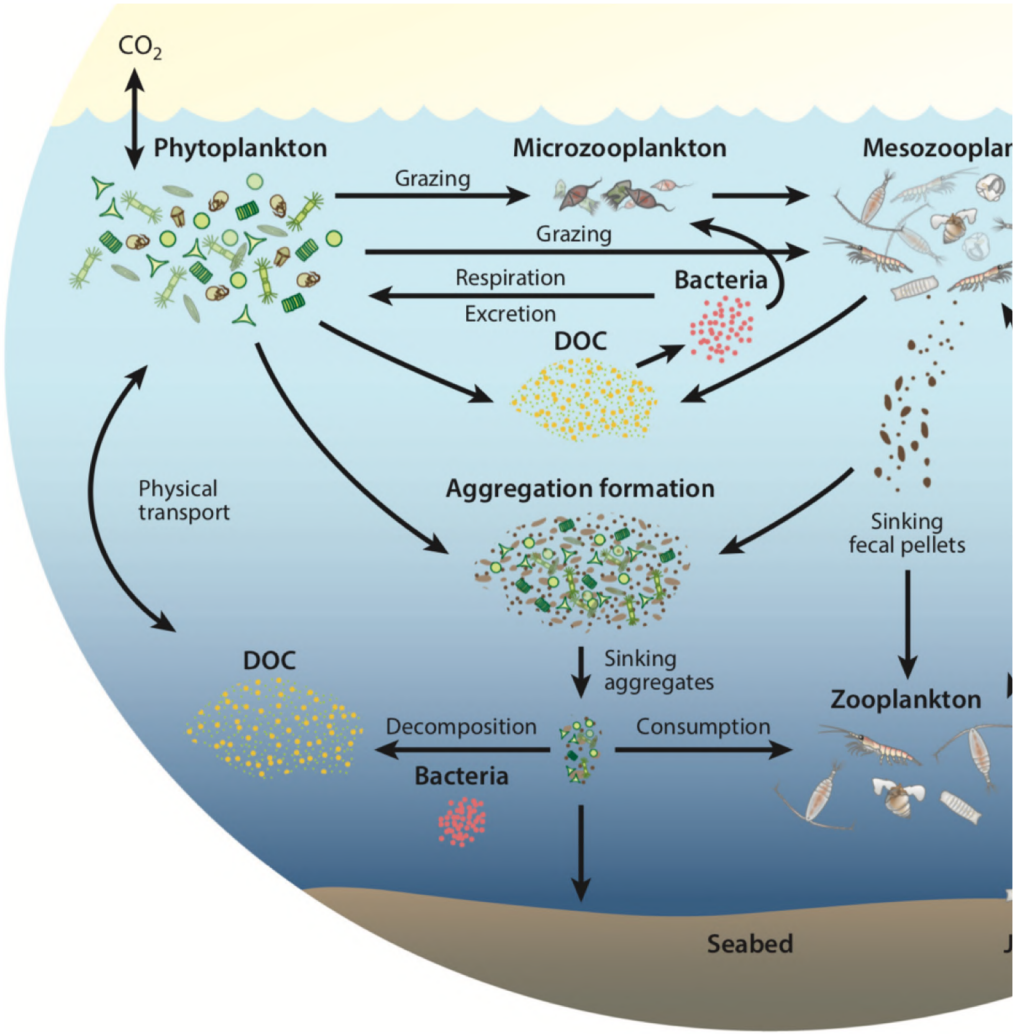
THE SOFT TISSUE CARBON PUMP



Steinberg and Landry 2016

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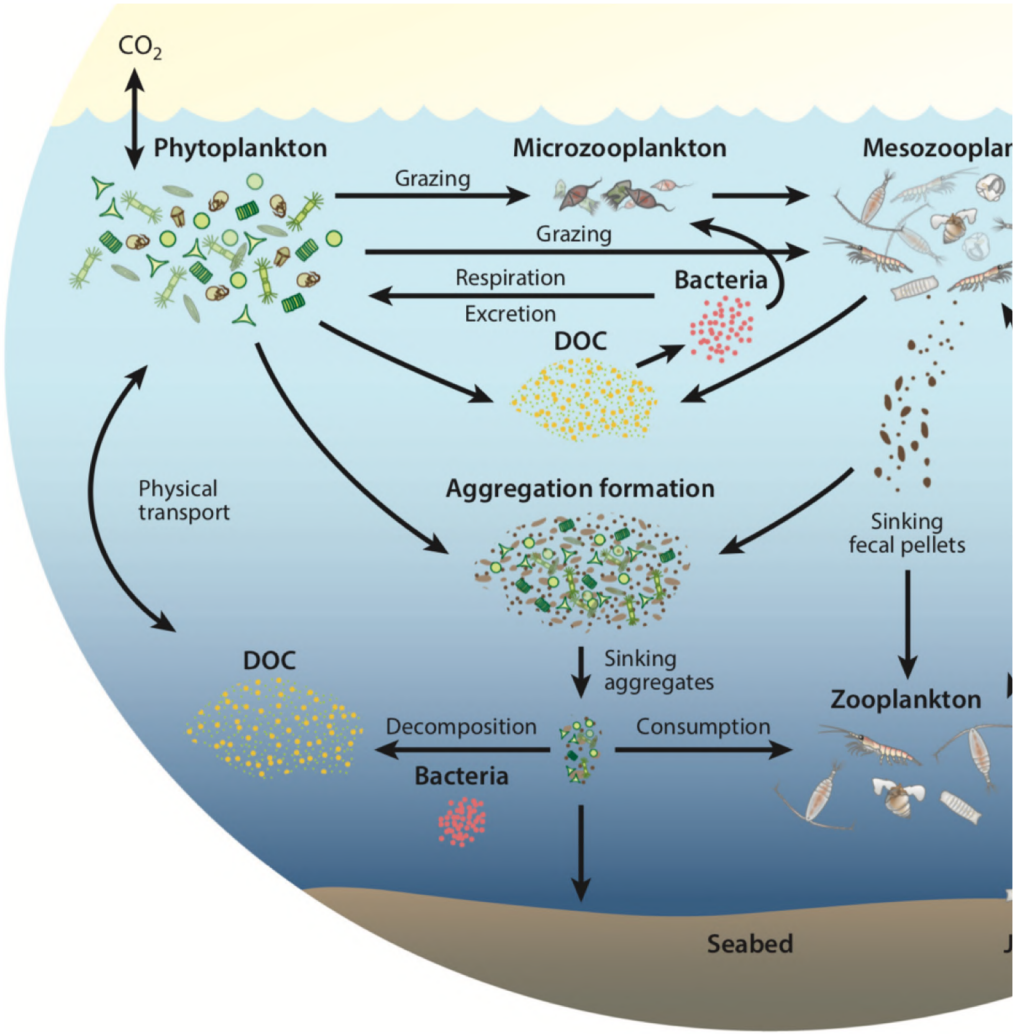
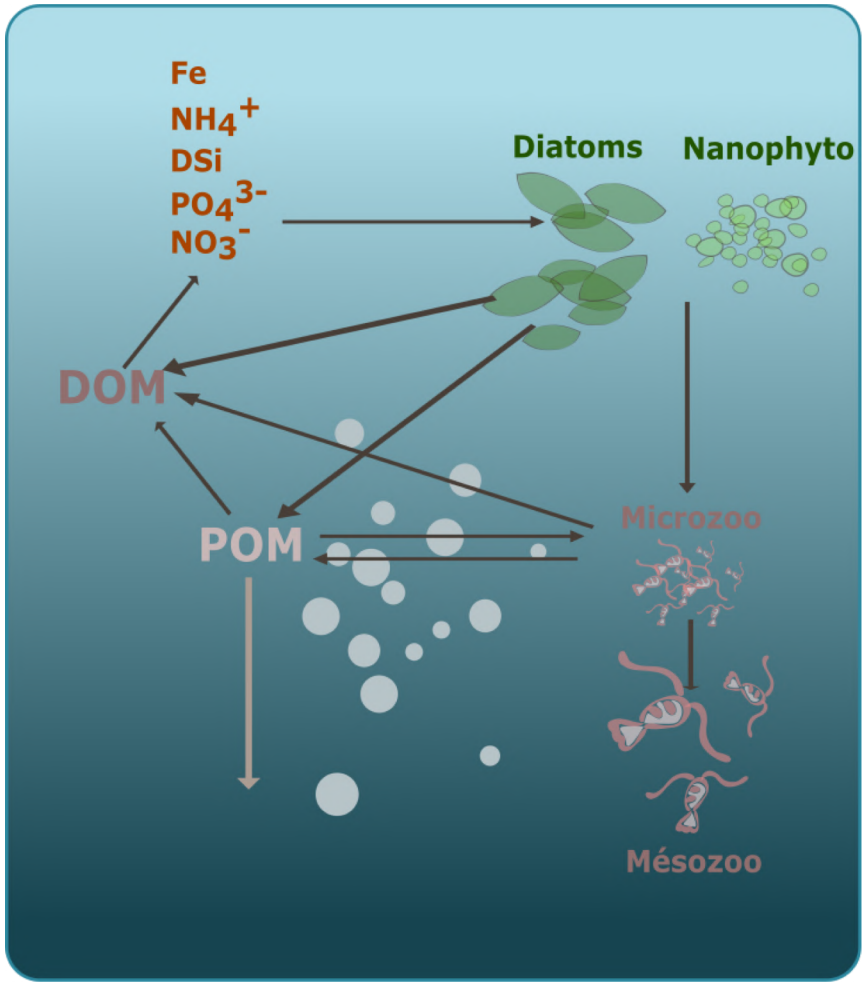


Steinberg and Landry 2016

MODEL

PISCES-NEMO



Inspired from Aumont et al. 2015

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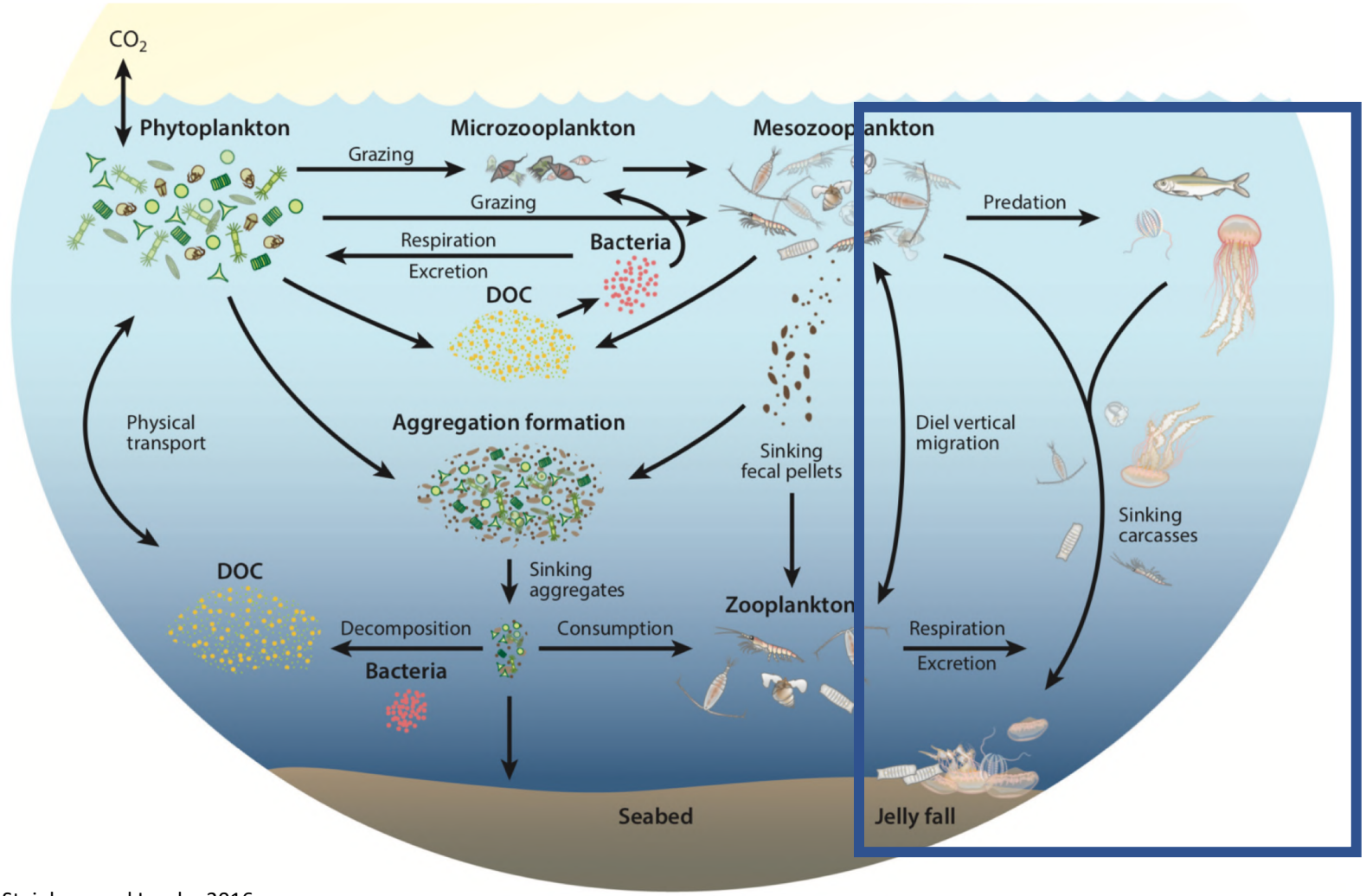
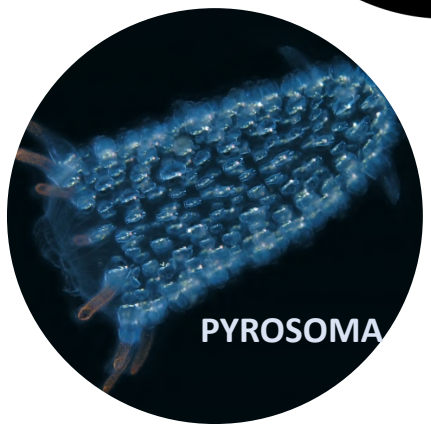
THE BIOLOGICAL GRAVITATIONNAL PUMP



Steinberg and Landry 2016



Credits : Alexander Semenov, Nick Hodgood, Adhella Pinksky, Dave Fleetham

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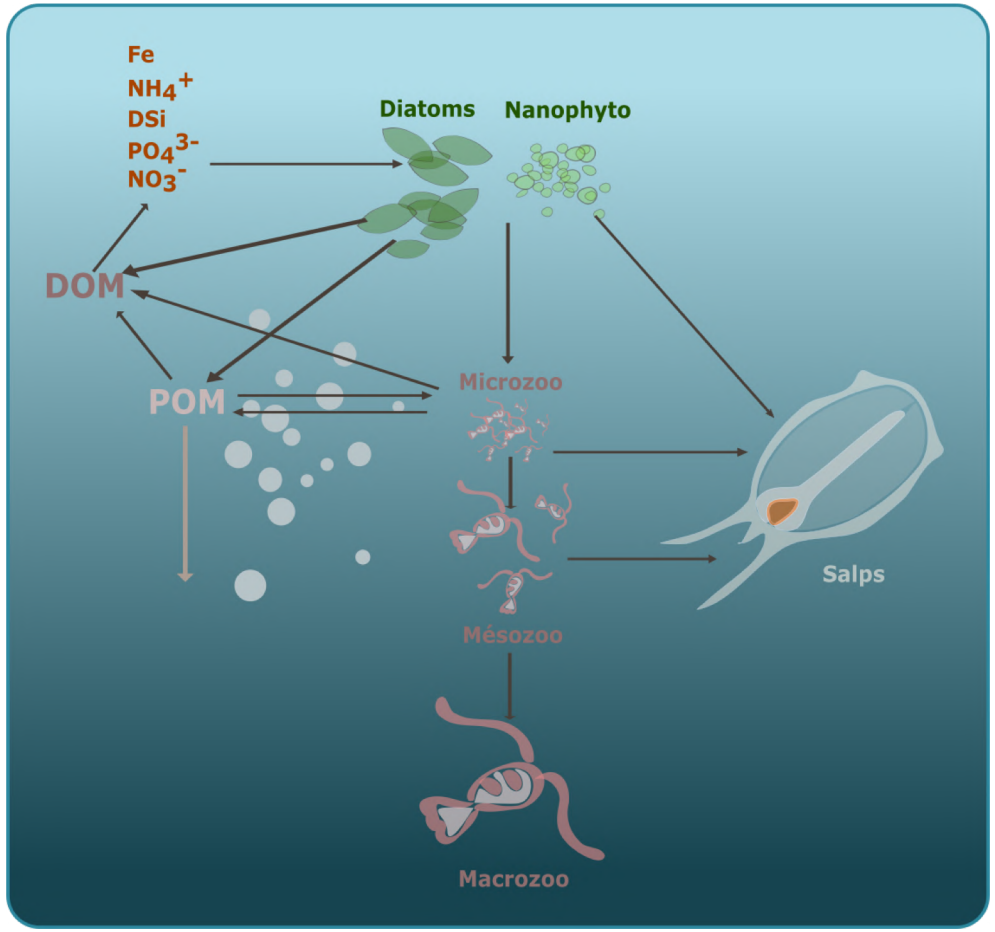
THE BIOGEOCHEMICAL MODEL : NEMO-PISCES-JELLIES

- Generic macrozooplankton
- Jellies (Pyrosomes, Doliolids and Salps)
  - Access to wide size range of preys
- **Explicit carcasses and fecal pellets**

Sinking speed (m/d)	FFGM	GM
CARCASSES	800[1]	300[2]
FECAL PELLETS	1000[1]	100[3]



[1] Henschke et al. 2016 [2] Allometric conversion of GOC [3] Small et al. 1979

Adapted from Clerc et al. (in prep.)

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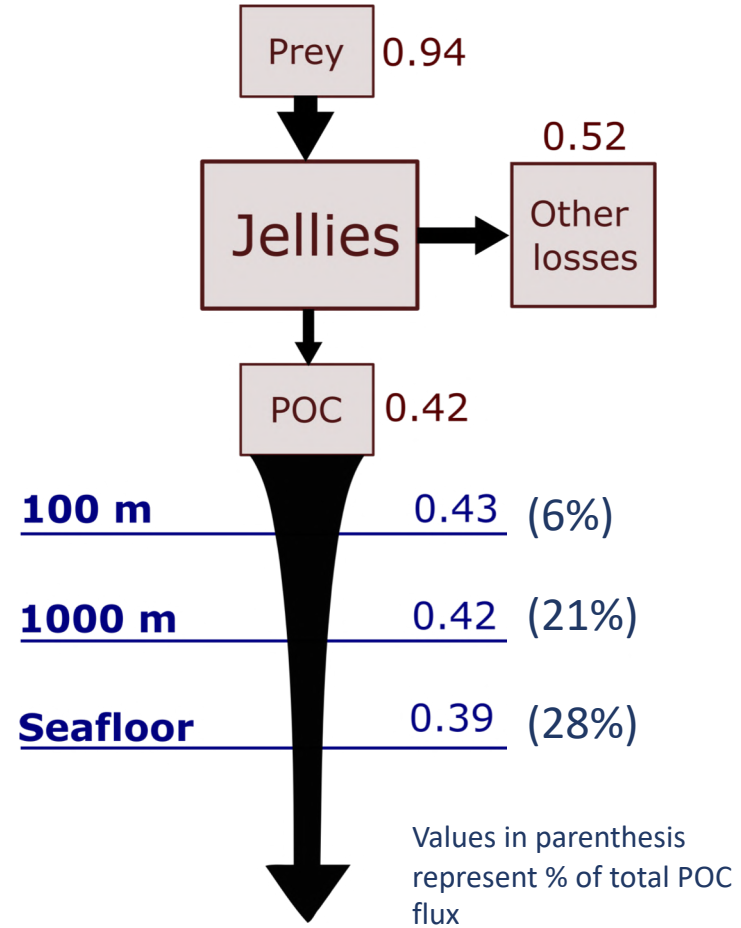
JELLIES-DRIVEN PARTICULATE ORGANIC CARBON

Jellies-driven global carbon fluxes (in PgC yr^{-1})



Adapted from Clerc et al. (in prep.)

- ❖ High export ratio (45% of the grazed matter exported at 100m)
- ❖ High transfer efficiency (close to 1) due to fast sinking speed
- ➢ **High importance in carbon export, relative importance increasing with depth**

Reminder : Jellies = Pyrosomes, Doliolids and Salps
POC = Particulate Organic Carbon

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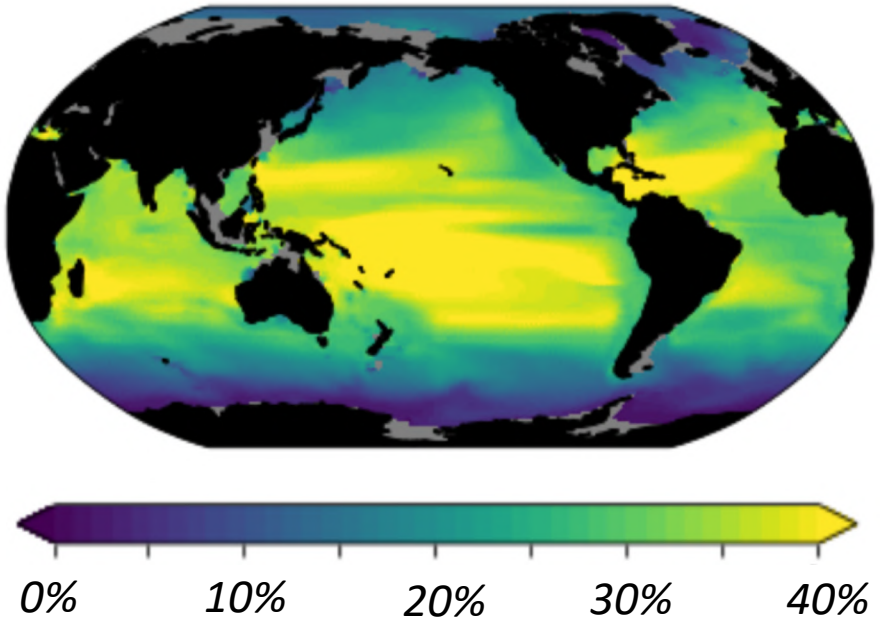
JELLIES-DRIVEN PARTICULATE ORGANIC CARBON

Jellies-mediated POC flux at 1000m



Values in parenthesis represent total POC flux

Adapted from Clerc et al. (in prep.)

- ❖ High export ratio (45% of the grazed matter exported at 100m)
- ❖ High transfer efficiency (close to 1) due to fast sinking speed
- ➢ **High importance in carbon export, relative importance increasing with depth**
- ➢ **Higher importance in low productive areas**

Reminder : Jellies = Pyrosomes, Doliolids and Salps
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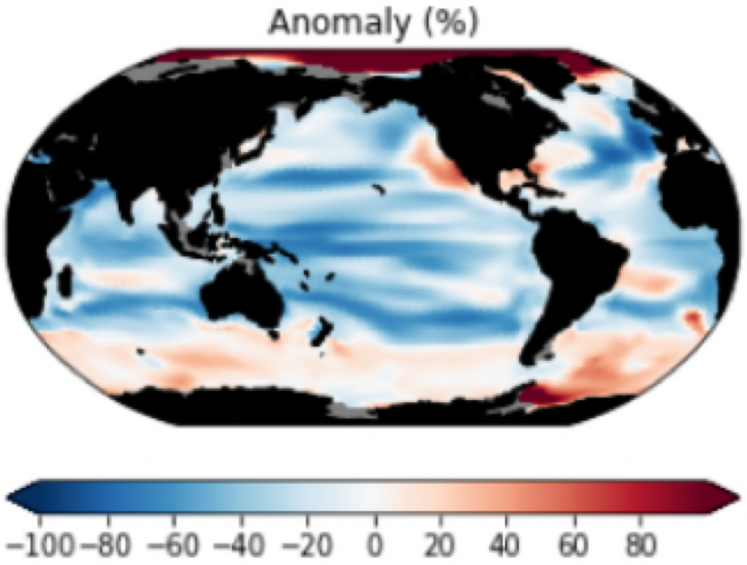
CONCLUSION & PERSPECTIVES

- Main conclusions:
  - Jellies plays a important role in the **Biological Gravitationnal Pump**, in particular at depth
  - **Efficient carbon export** and high **transfer efficiency**
  - **High uncertainty** of those estimates (rough parameterization): **scarcity and patchiness** of gelatinous zooplankton data.
- **How would climate change affect jellies role ?**

Jellies-driven POC export at 1000m anomaly (%) (2081-2100 vs 1851-1870)



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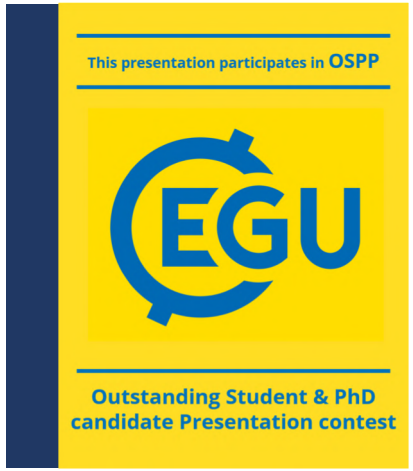
THANKS FOR YOUR ATTENTION !



The abstract QR Code

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