EGU 2022 – 24/05/2022

Clément Haëck[1]
Marina Lévy[1], Laurent Bopp[2]

Quantification of the impacts of fronts on Phytoplankton in the Gulf-Stream extension from remote sensing data
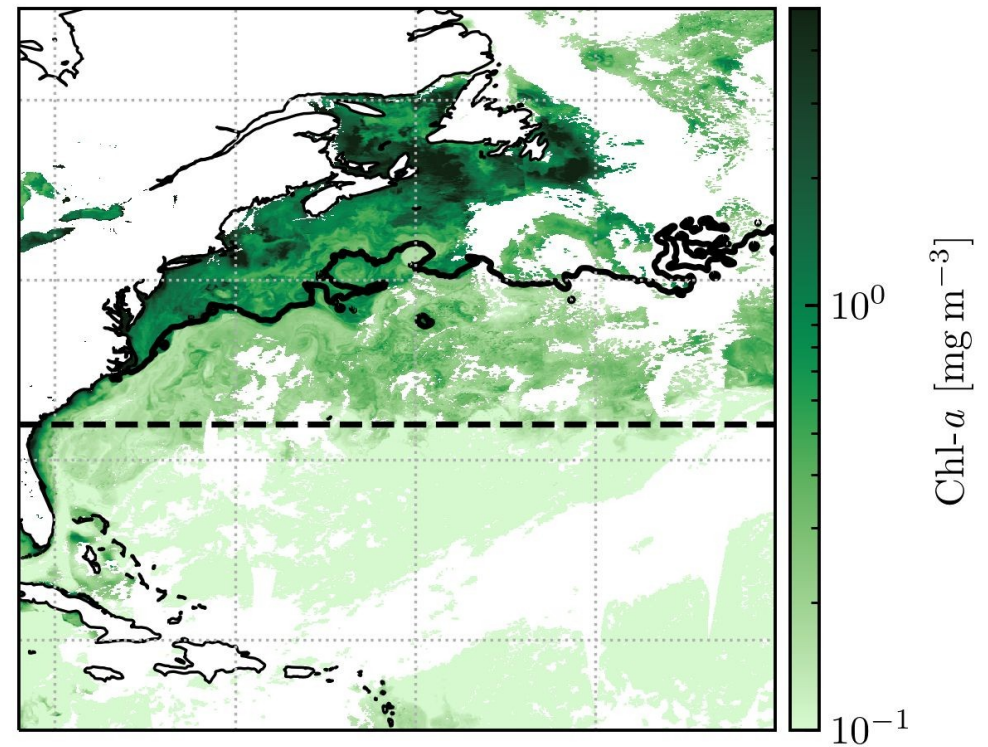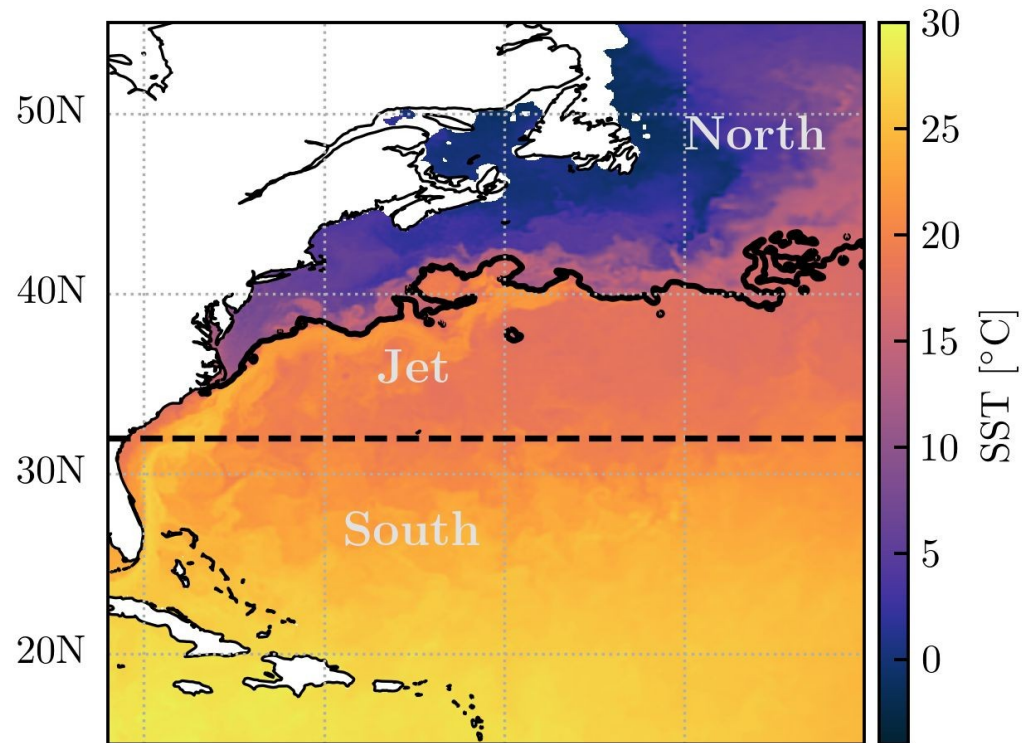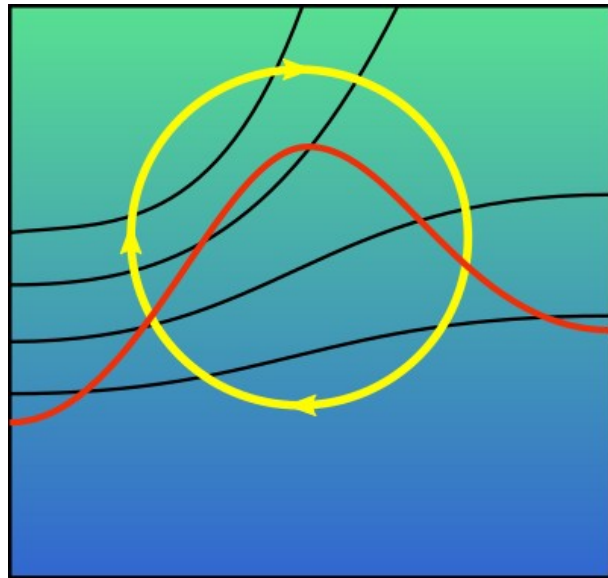
[1] LOCEAN, IPSL
[2] ENS, PSL

Study region: Gulf-Stream extension

Introduction

Upwelling of nutrient
⇒ Chl-a increase

Quantified from remote sensing
by Liu & Levine (2016) in North
Pacific Subtropical Gyre

Reduced mixing
⇒ earlier bloom onset

Observed in situ by Mahadevan et al. (2012)
in the North Atlantic, but not quantified

— Isopycnals
→ Cross frontal circulation
— Mixed Layer Depth

Objectives

- Quantify how Chl responds to frontal dynamics in the Gulf-Stream region

- How this increase is conditionned by the fronts strength ?

- Can we detect an early bloom in fronts from satellite ?
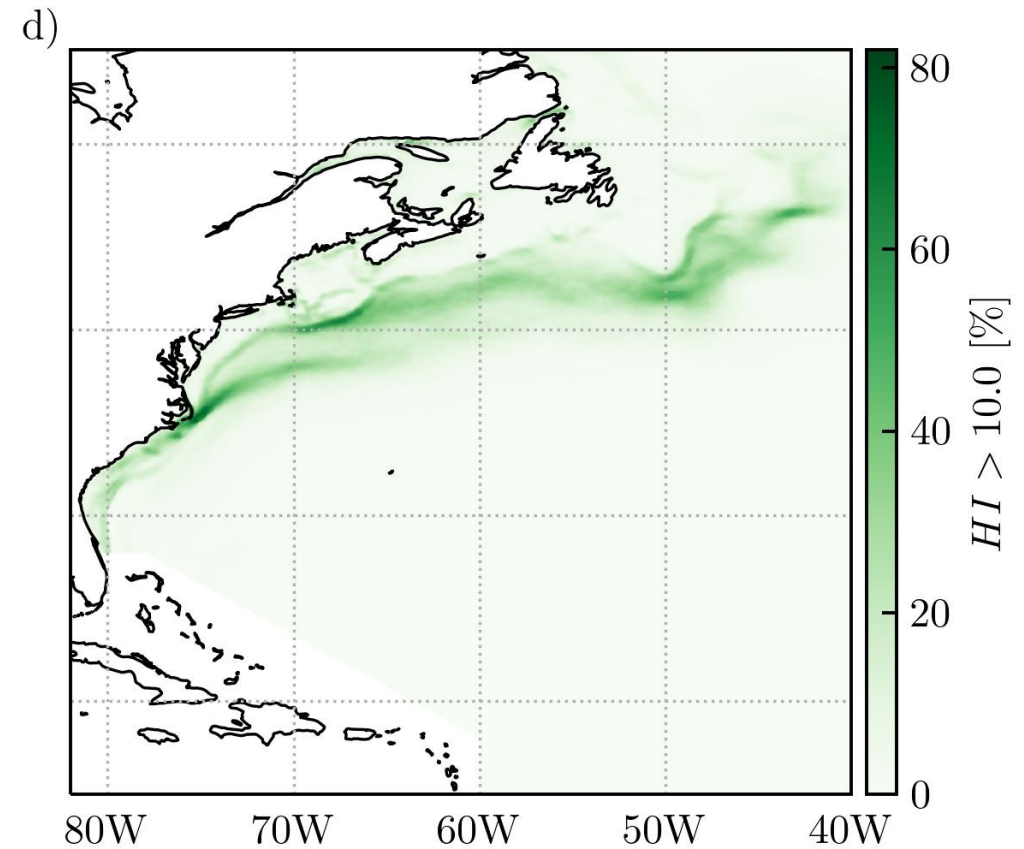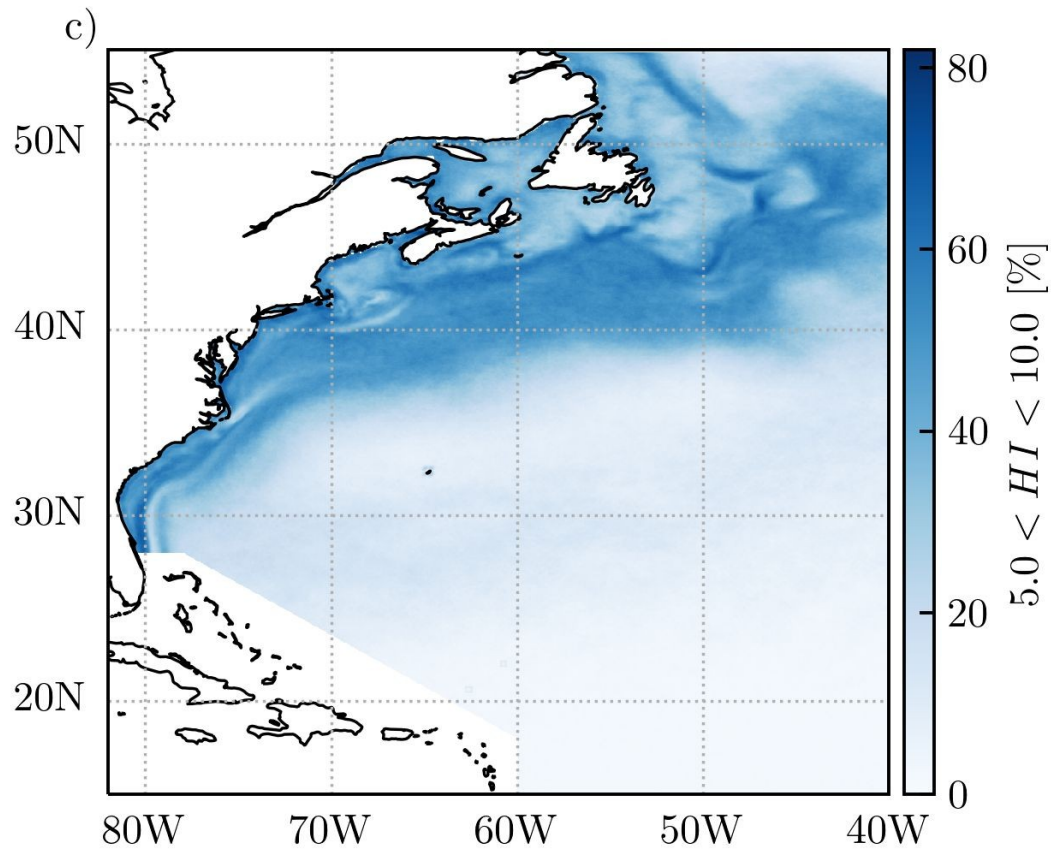
Method: Front detection

- Computation of an Heterogeneity Index
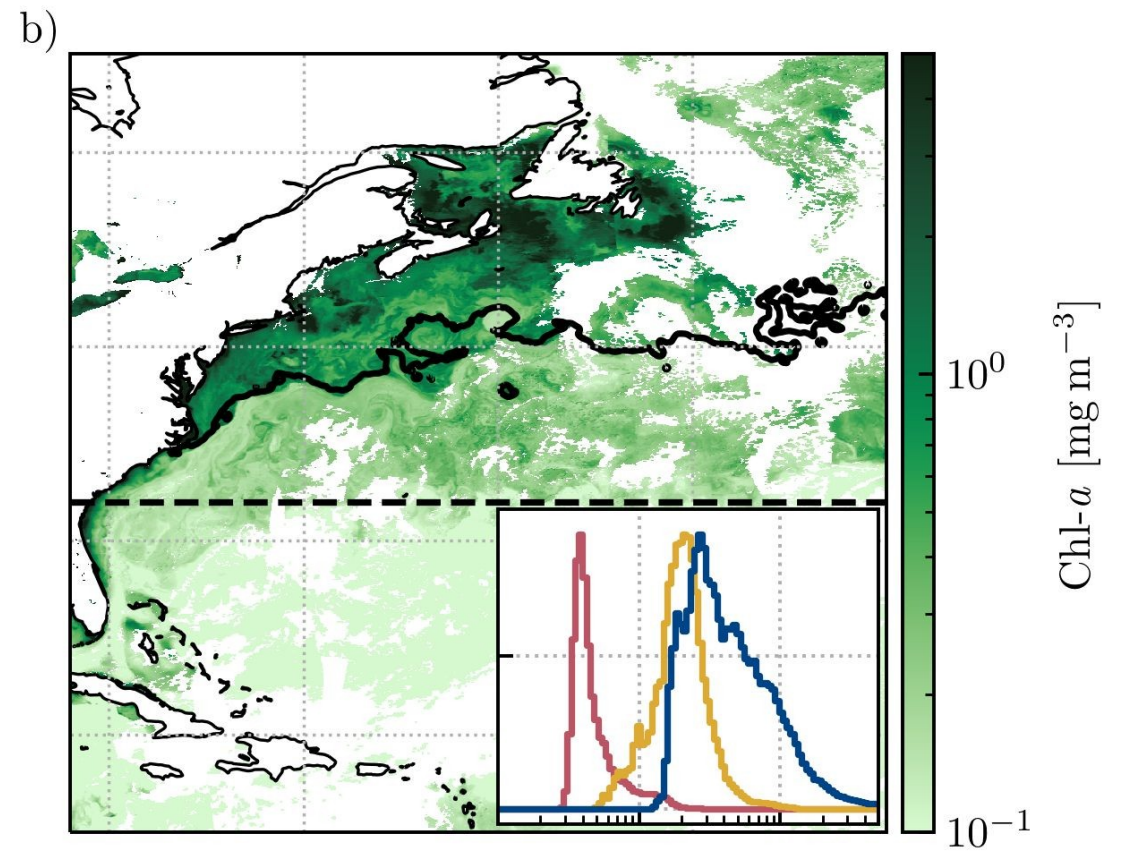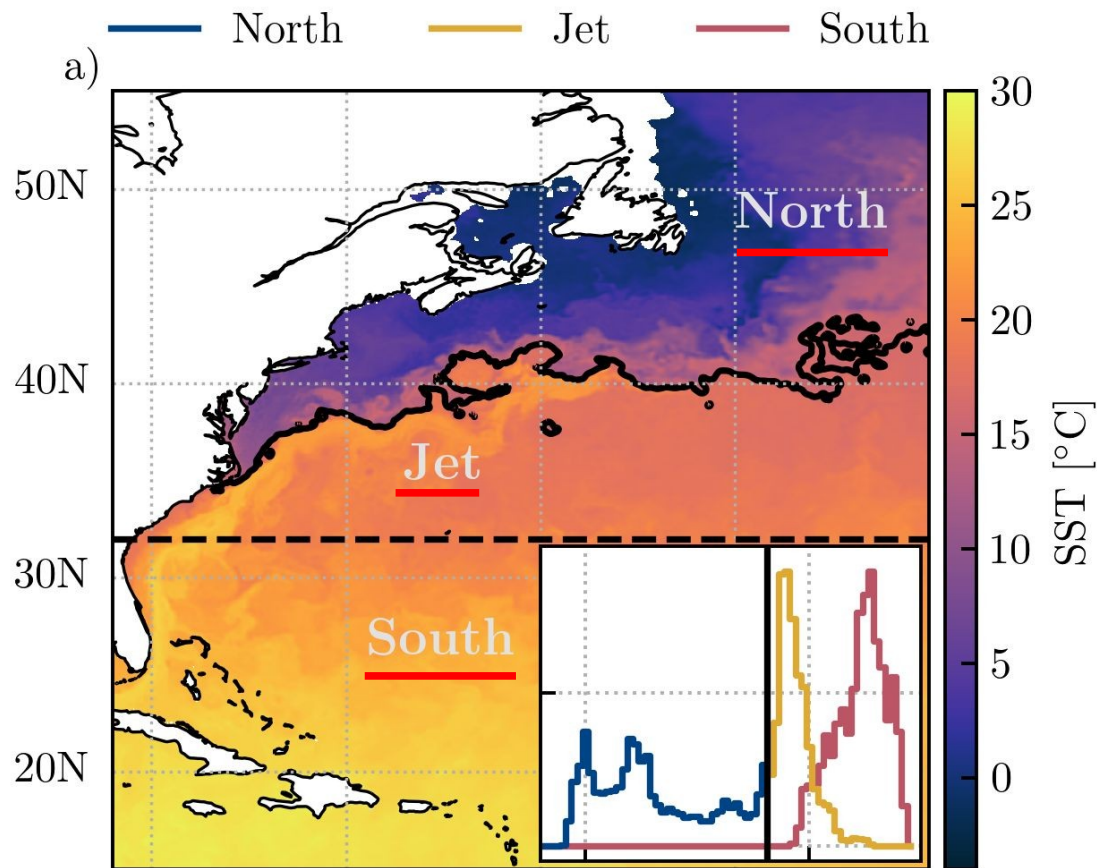 (adapted from Liu & Levine 2016)
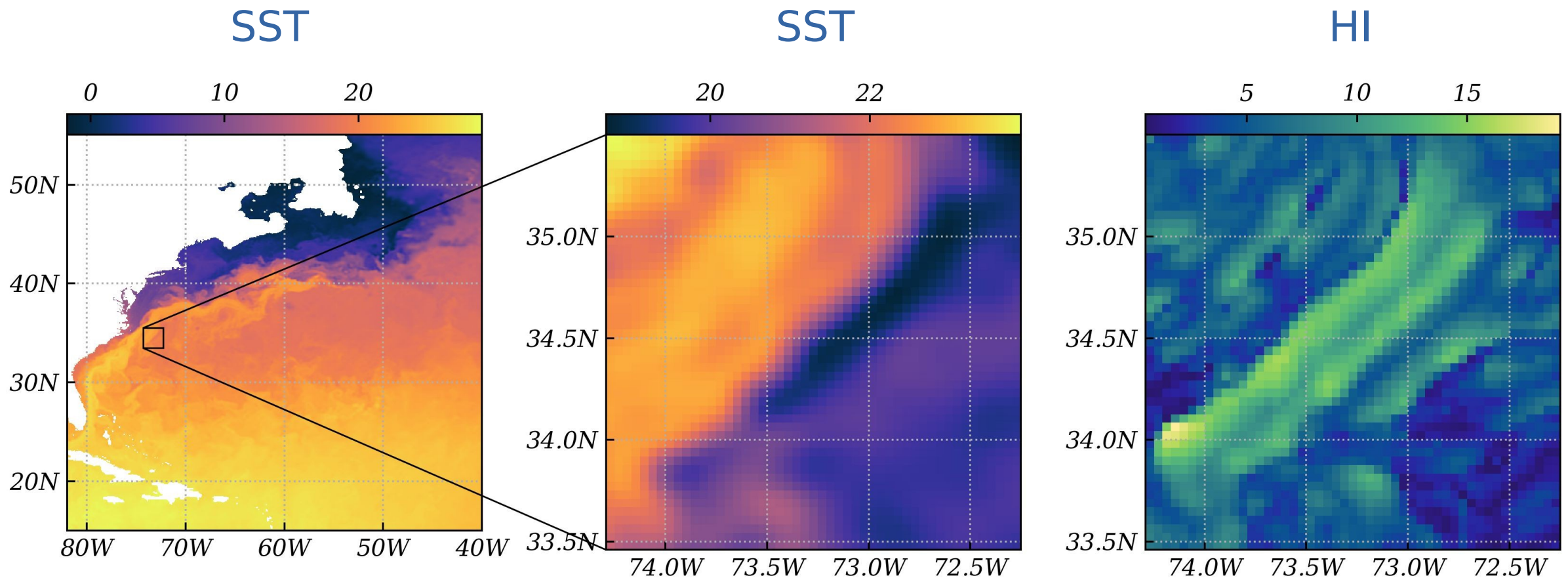
Results: Fronts presence probability
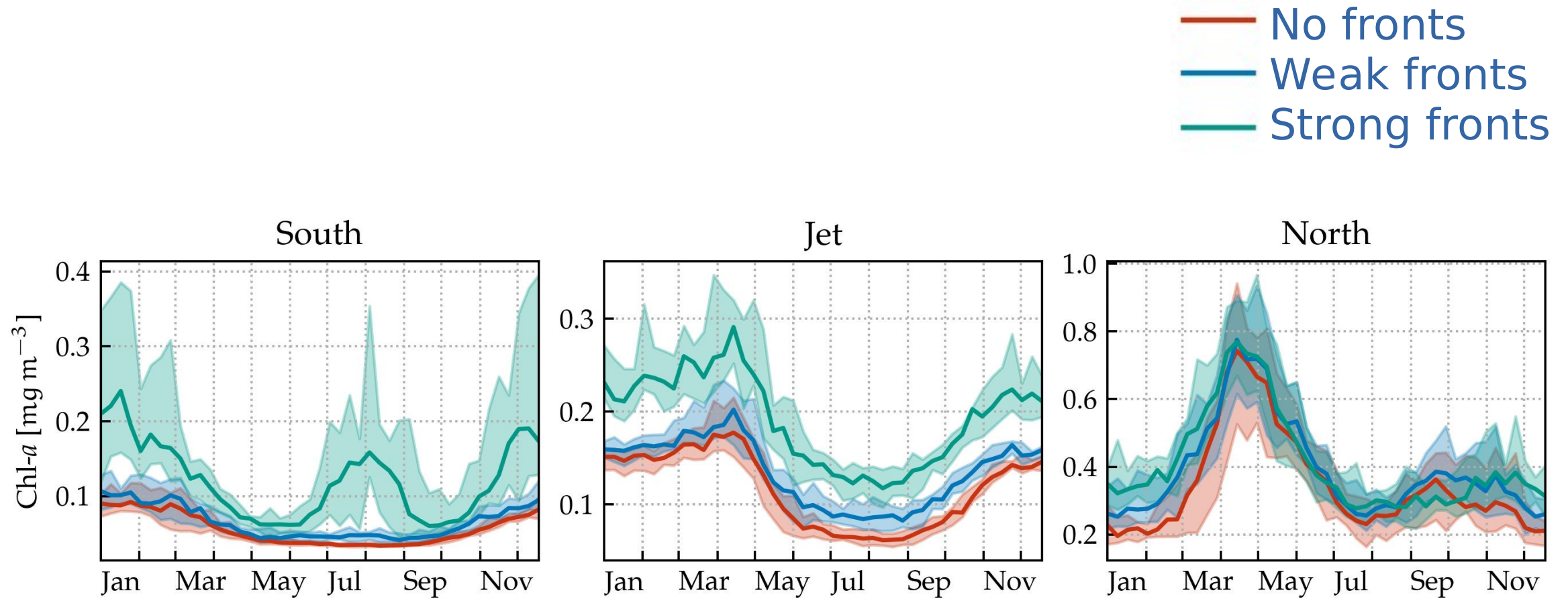
Weak fronts (medium HI)

Strong fronts (high HI)

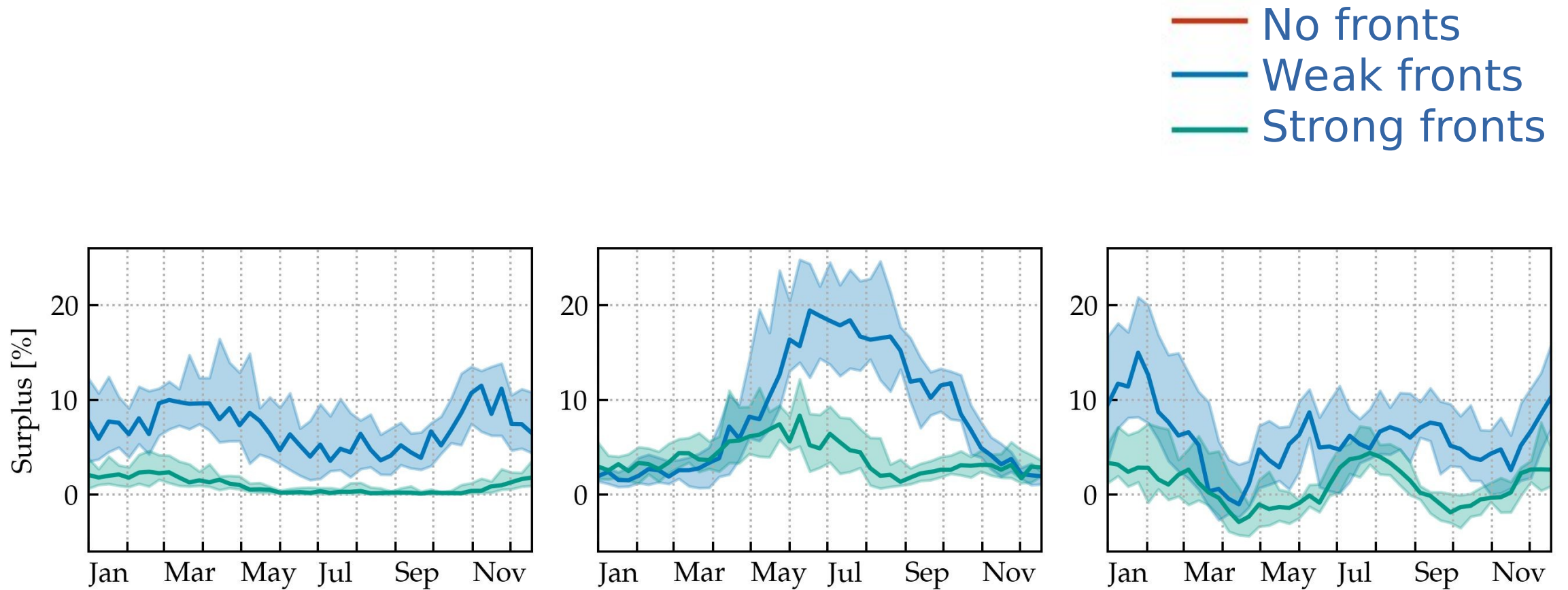# Method: separation into 3 regions

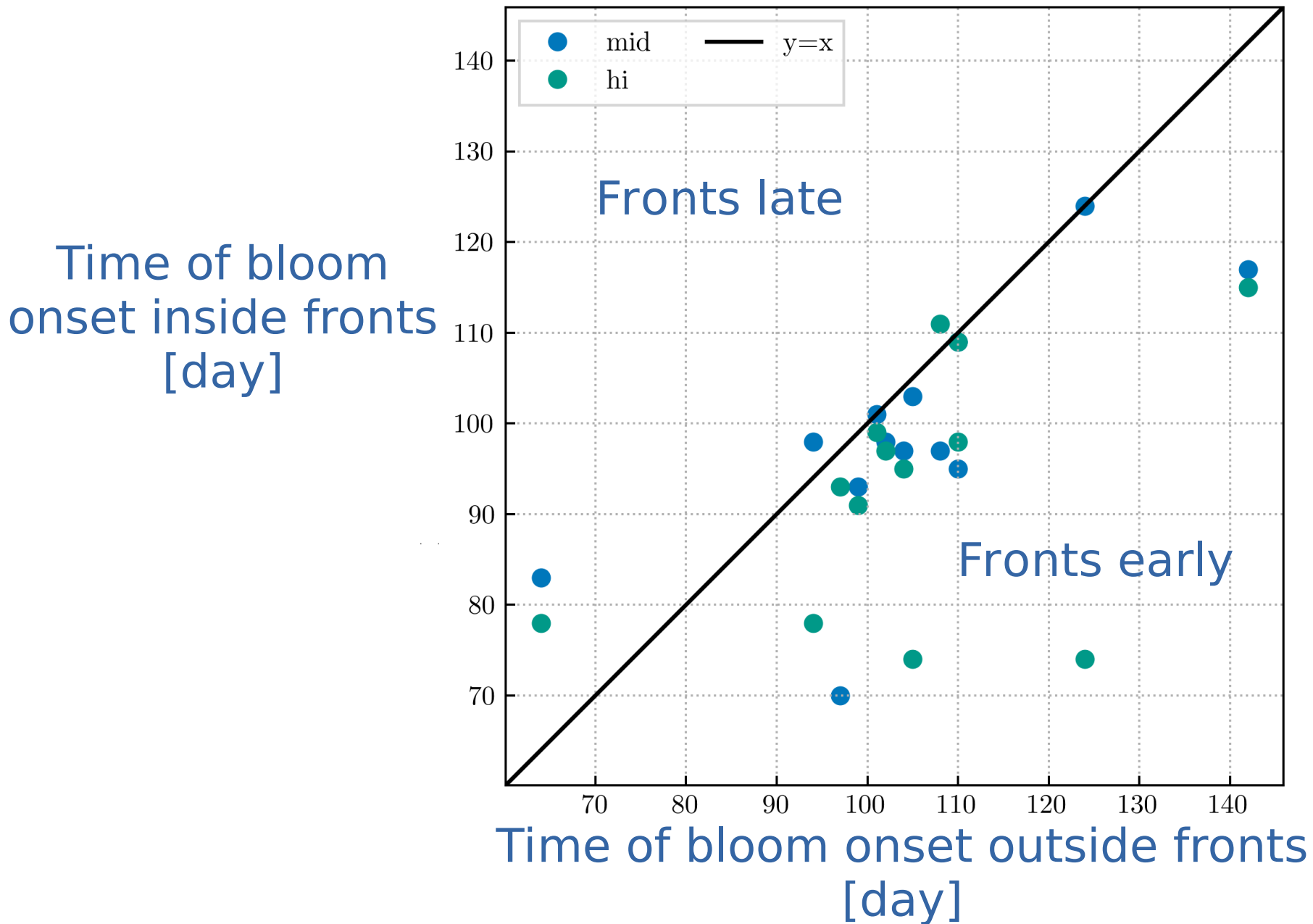# Results: climatology (over 13 years)
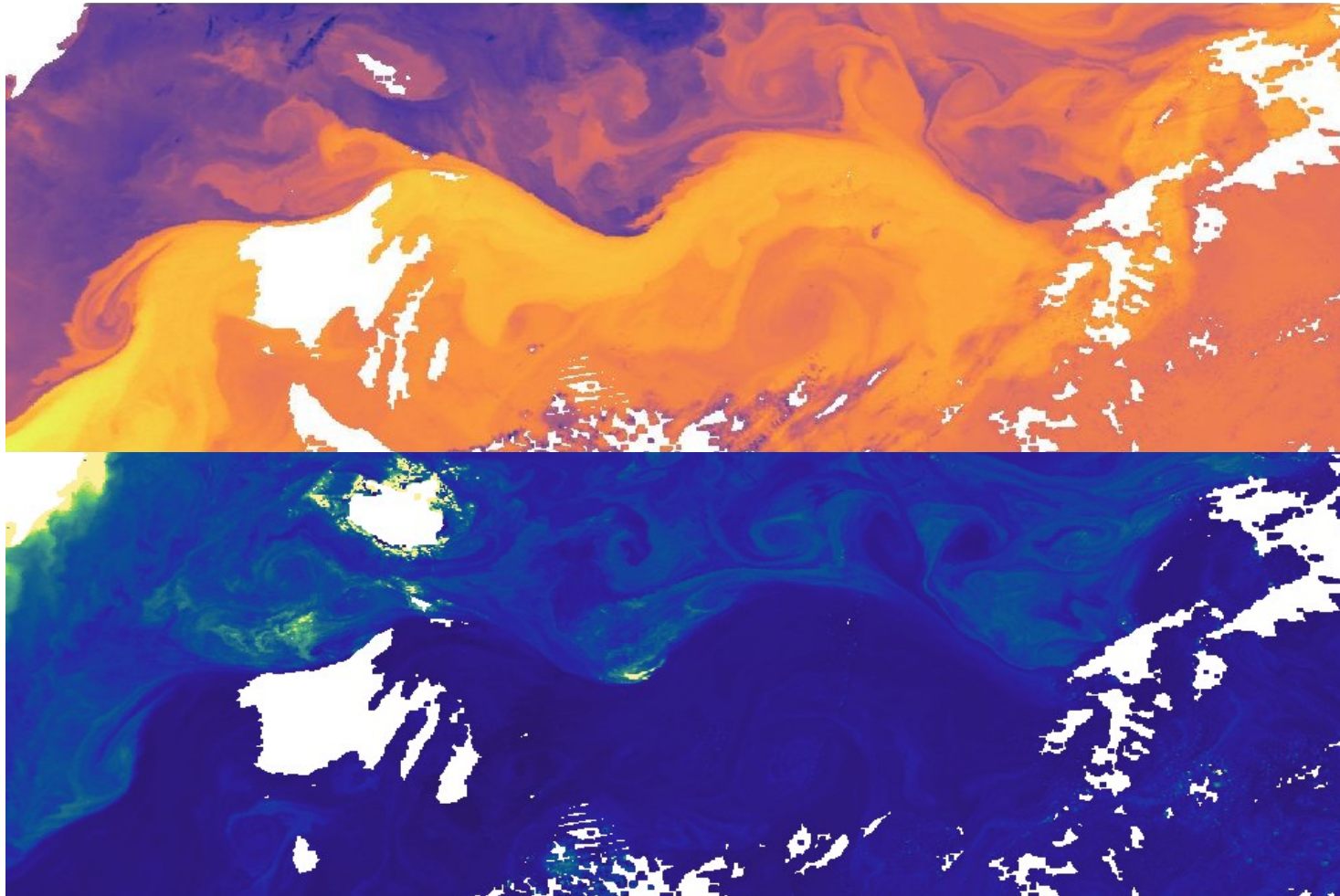

Enveloppes correspond to interannual variability

Results: Chl surplus

Result: Bloom onset timing
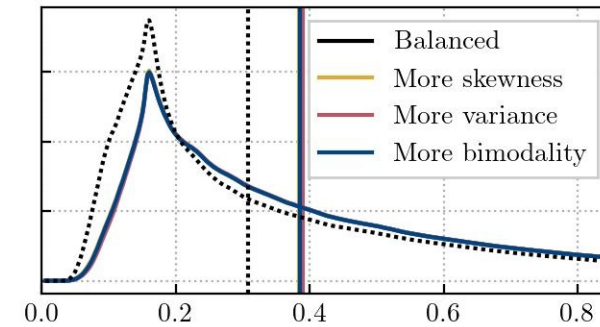
Thank you for your attention !

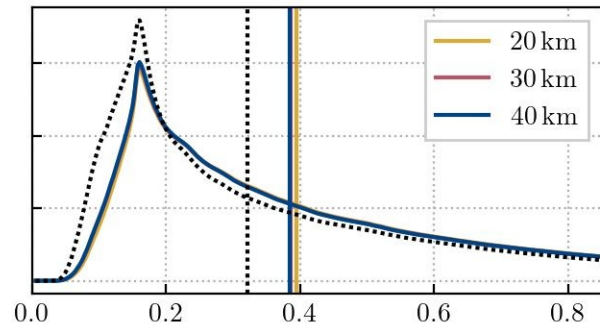# Sensitivity test of parameters
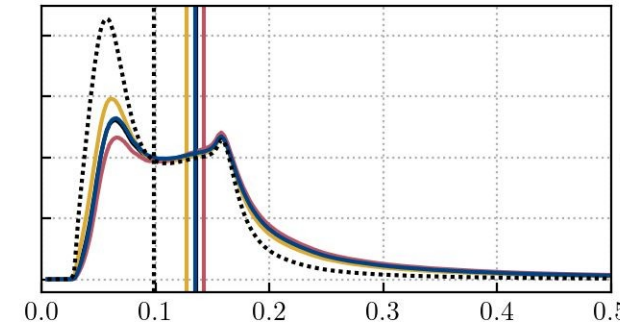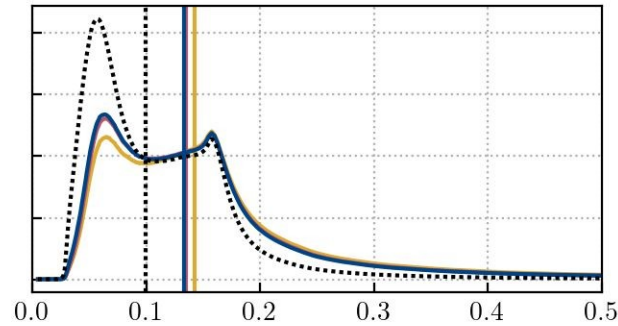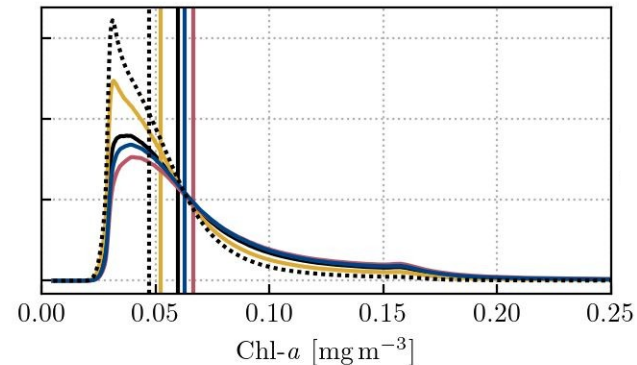
Distribution of Chl-a with HI
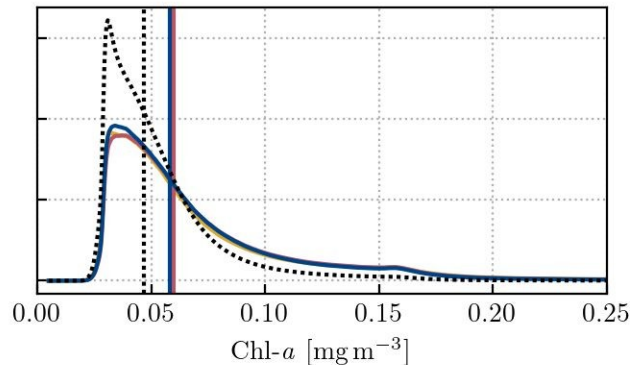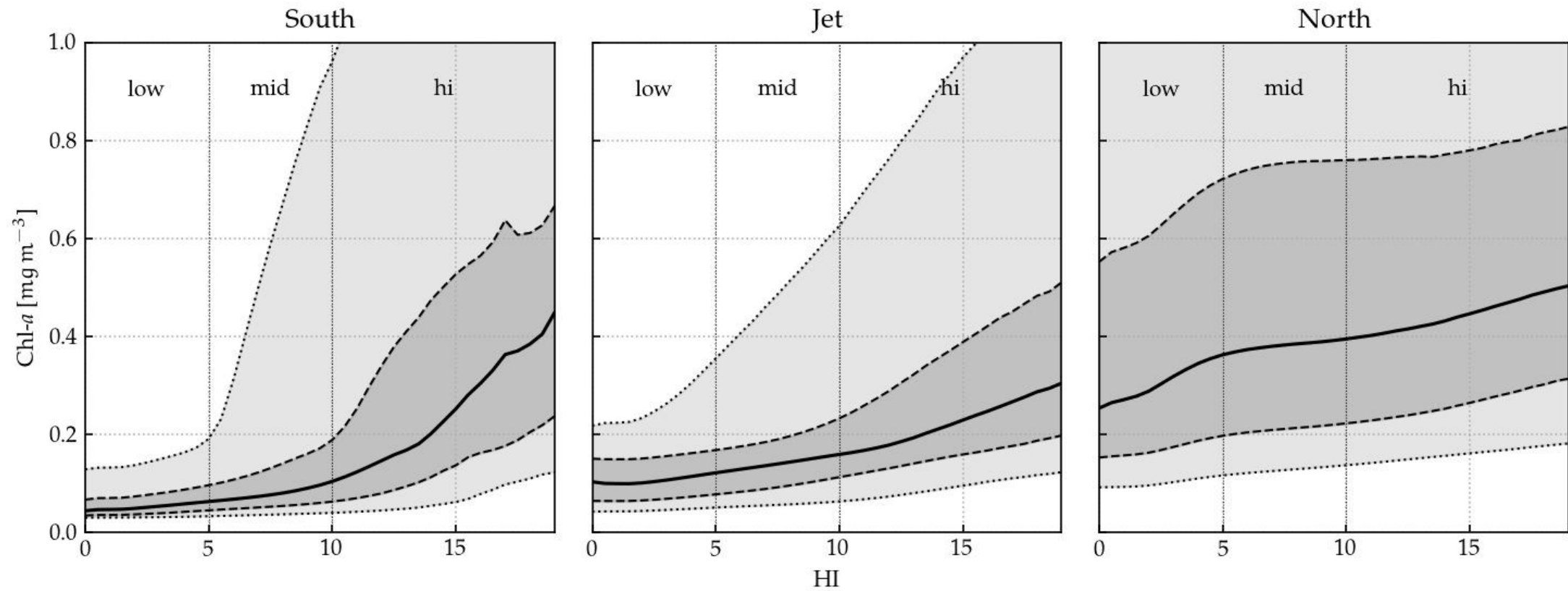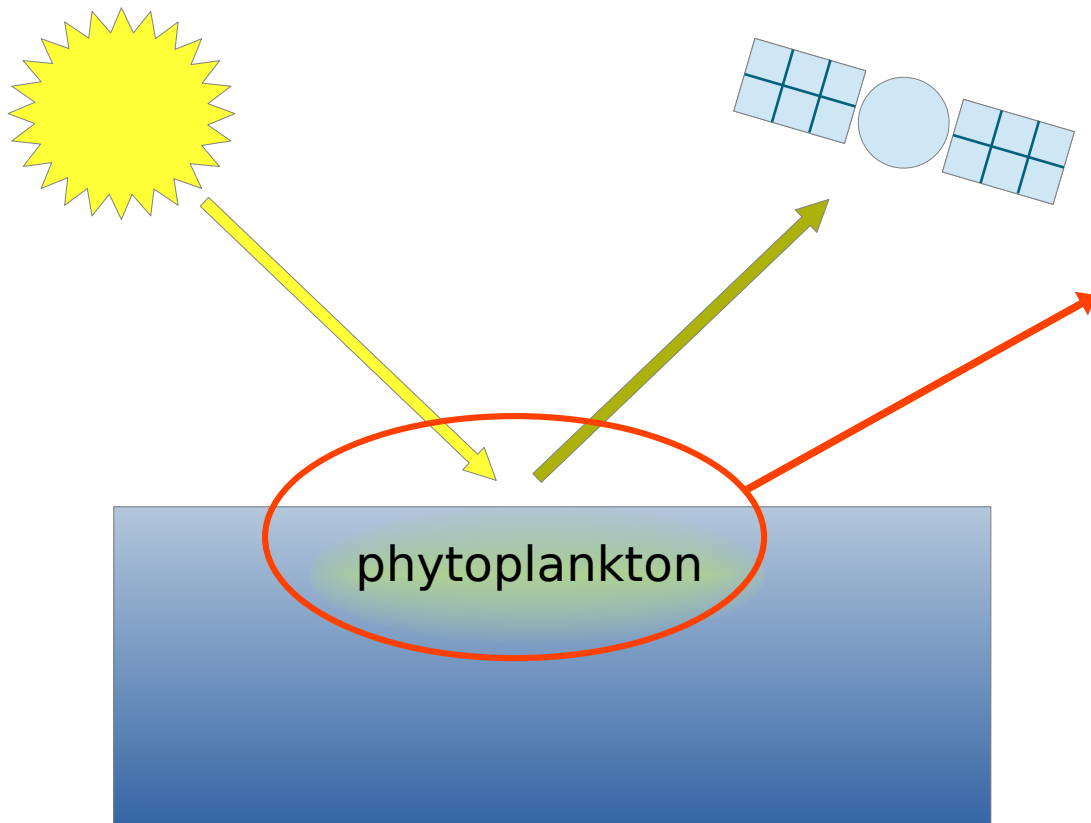
Data

- MODIS L2 regridded data
  - 1km, single sensor

- ESA SST CCI and C3S reprocessed sea surface temperature analyses
  - 4km, L4

- ACRI-ST Copernicus-GlobColour Chlorophyll-a
  - 4km, L3

Synoptic data of Phytoplankton composition

phytoplankton

Correlations captured by SOMs
(Self-Organizing Maps)

- Trained on:
  - Satellite: Nrrs, Chl-a, SST
  - In-situ: Pigment concentration (HPLC data)

El Hourany (2019)