# Typology of Plankton Communities seen by In Situ Imaging in the First 500 m of the Global Ocean

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Ocean Biogeography

- Vertical partitioning

Epipelagic
200 m
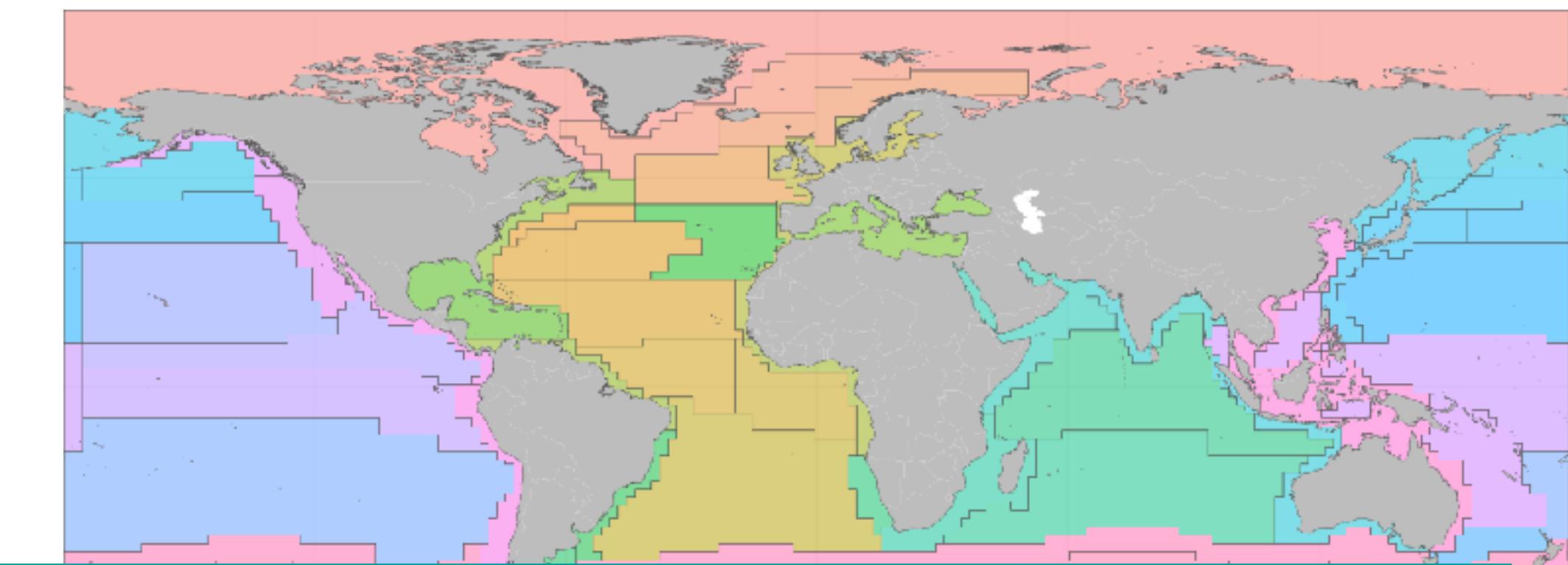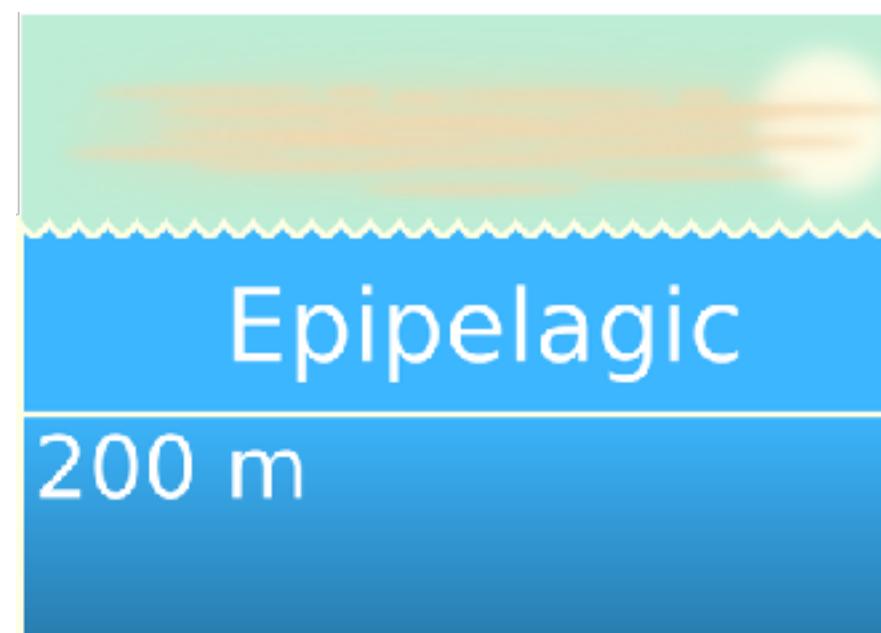
Which plankton groups dominate the community?

Which geographical partitioning is relevant to describe plankton?

- Mesopelagic provinces (Reygondeau et al. 2018)
- Latitudinal bands

Bathypelagic
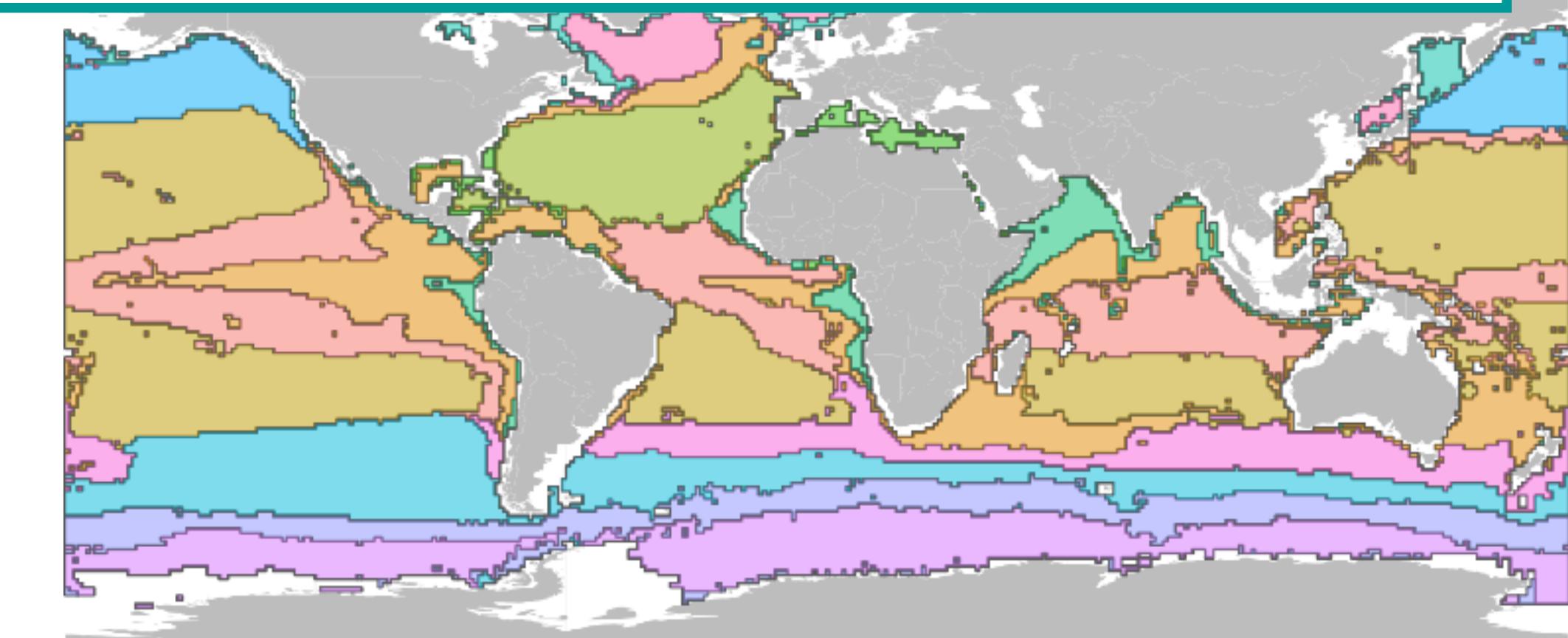
Reygondeau mesopelagic Provinces

Data

2800 samples distributed worldwide

Data

UVP

CTD

satellite

marine snow and bulk concentration

temperature, salinity, oxygen, chlorophyll a

clines, AOU, MLD, DCM, stratification, Z_{eu}

[Chl a]$_{surf}$, PAR, K_{dPAR}, BBP, POC, PIC
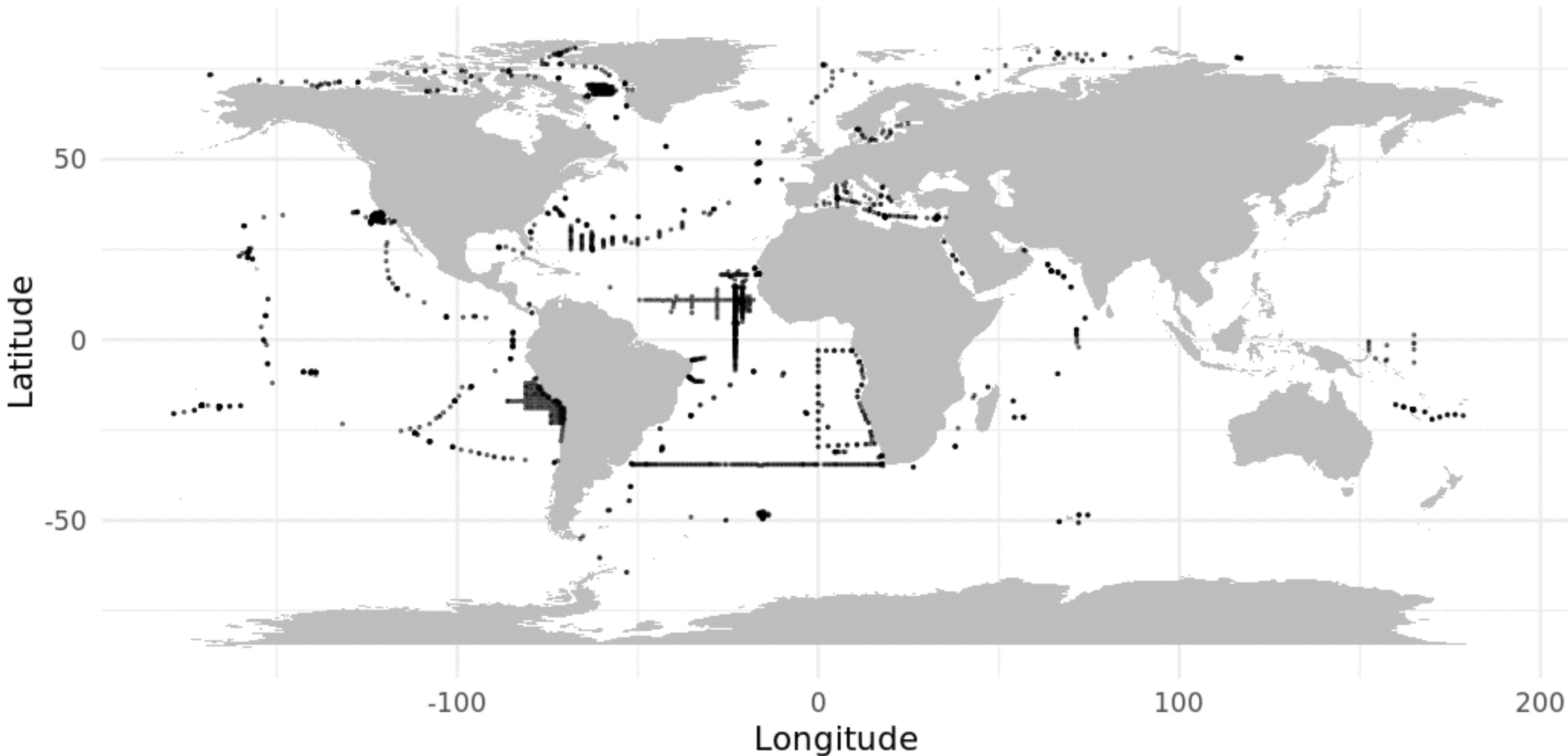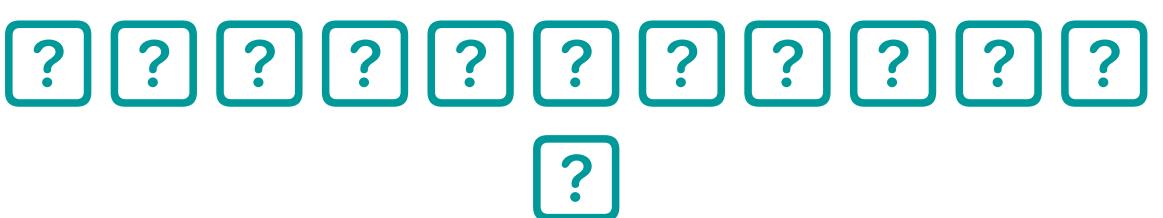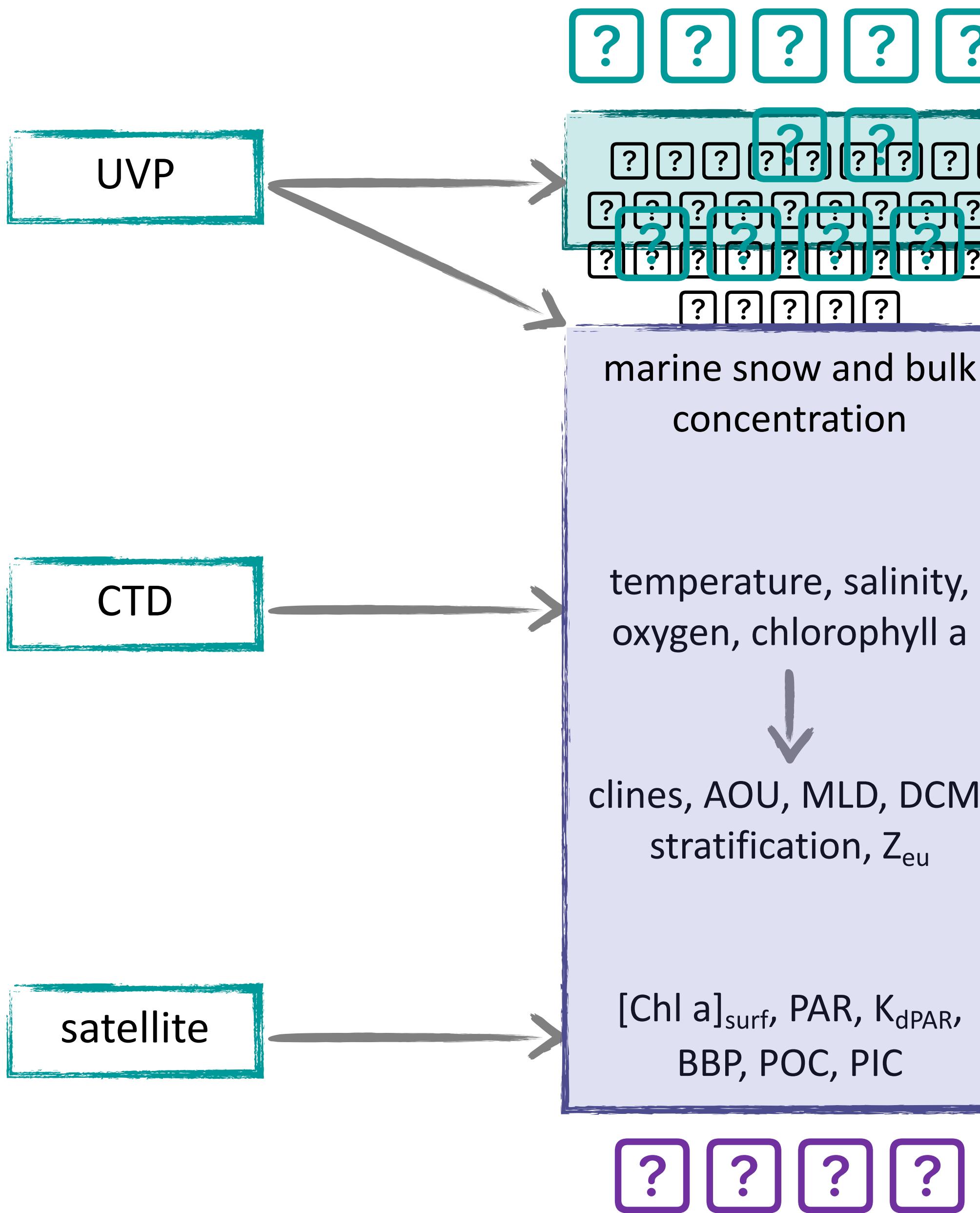
Lombard et al. 2019 (adapted)

UVP

10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5}

ESD (µm)
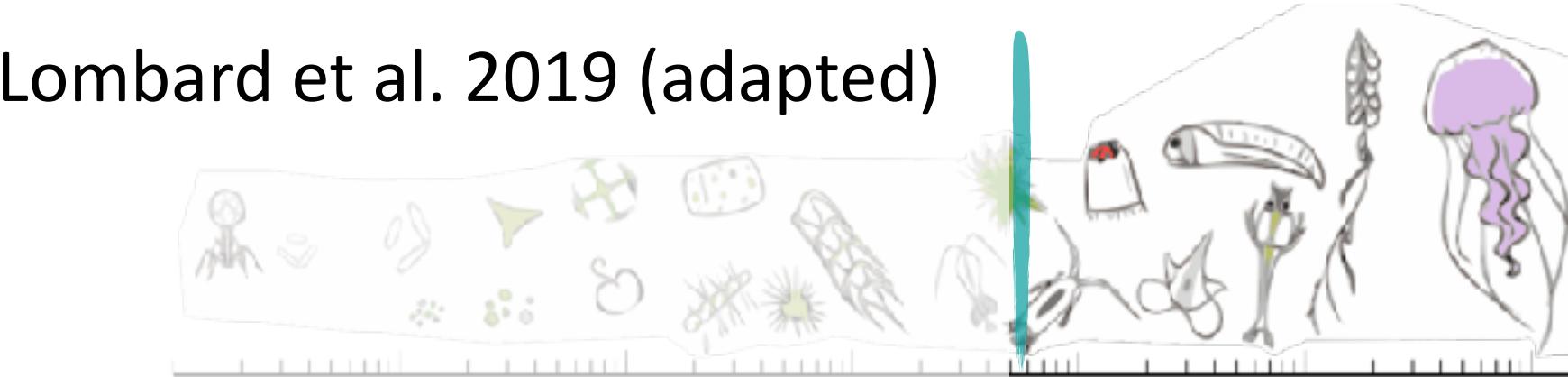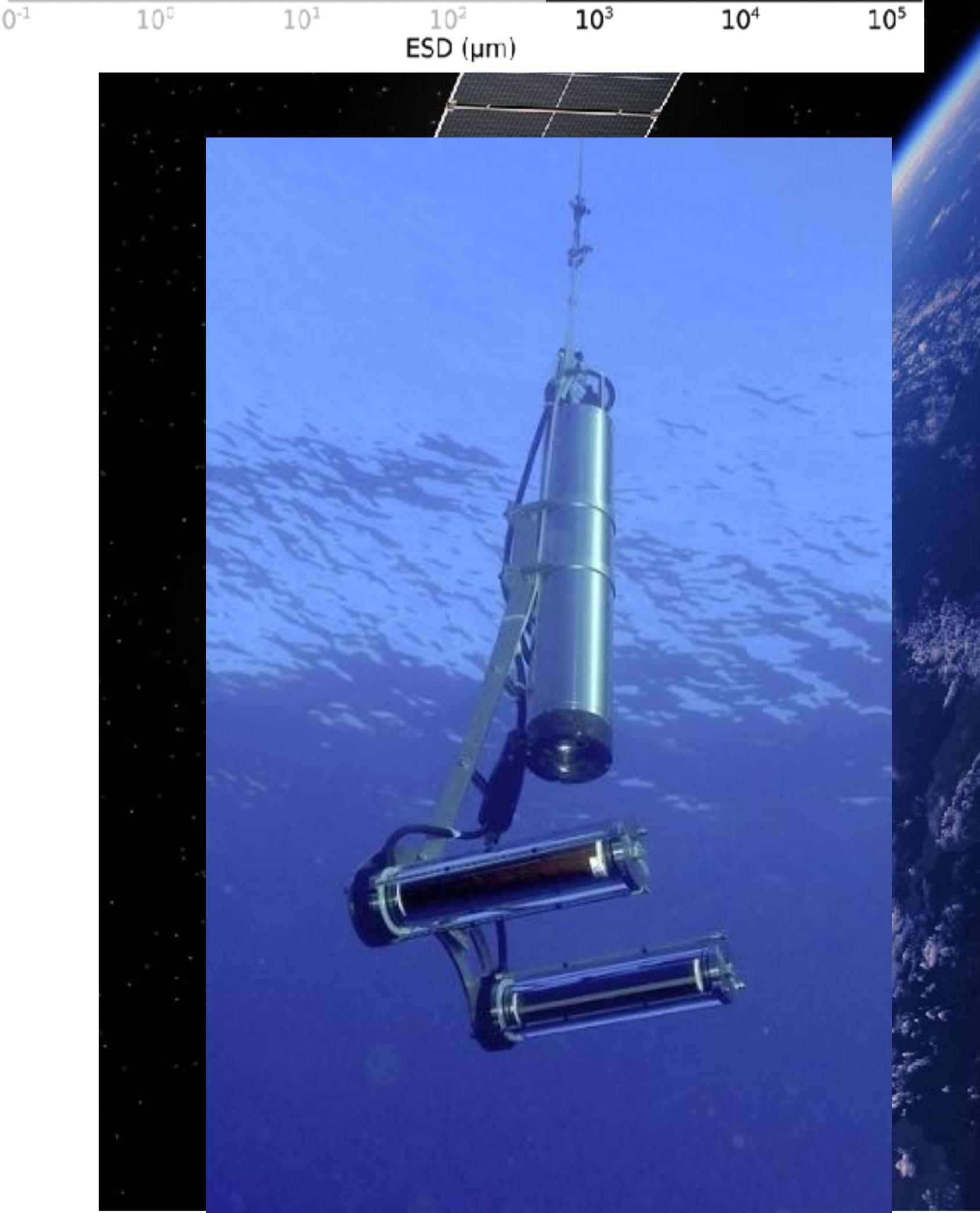
UVP deployment

Dynamic definition of epipelagic layer

Epipelagic layer

2795 profiles

Q1 = 49 m
med = 85 m
Q3 = 121 m
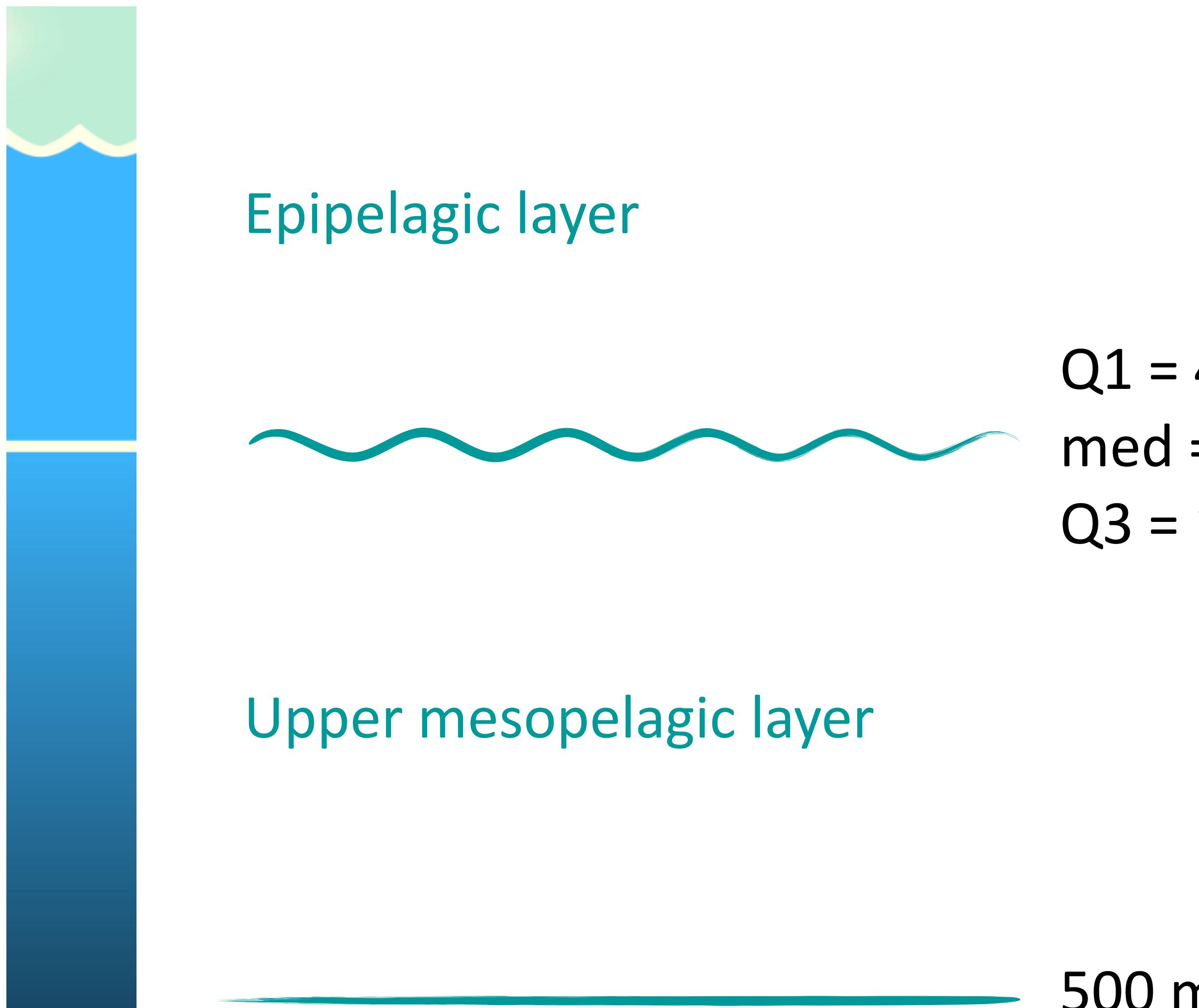
Max between pycnocline and Z_{eu} (Reygondeau et al. 2018)

Upper mesopelagic layer

1863 profiles

500 m

Description of plankton communities

Layer-wise

Plankton concentrations

Hellinger's transformation

Community level

PCA

Relationship among organisms and with environment

HAC

Broad plankton communities types

Map

Communities geographical distribution

```
ev <- spe.h.pca$CA$eig
evplot(ev)
# PCA biplots
cleanplot.pca(spe.h.pca, ahead=0)

# The species do not form clear groups
# variables. However, see how the speci
# along the site sequence.
# On the scaling 1 biplot, observe that
# strongly to axes 1 and 2. Are these s
# completely the same as those identifi
# groups in Section 4.10.3?
```

Plankton organisms seen by UVP

Average concentration over 0-500 m for all profiles

700 000 living organisms

Trichodesmium   Copepoda   Phaeodaria   Rhizaria_others
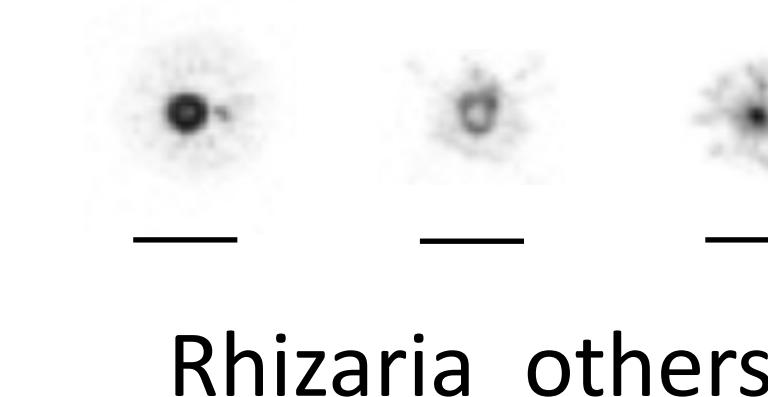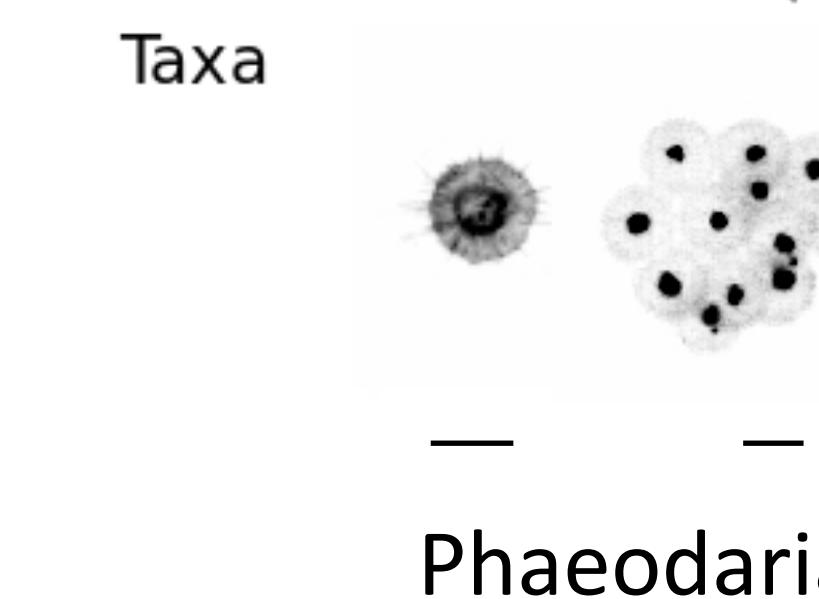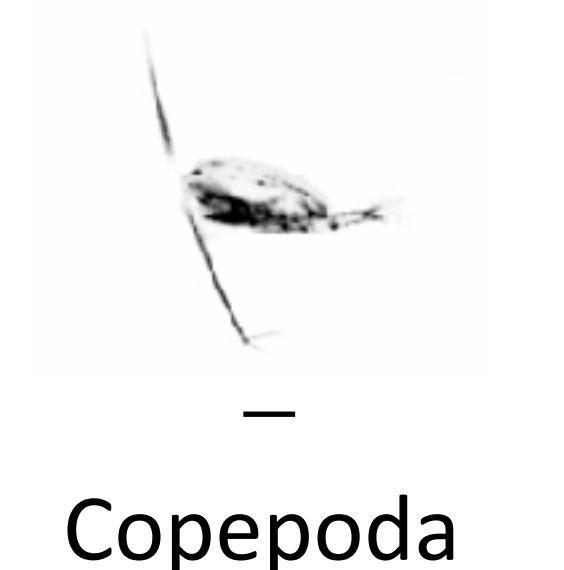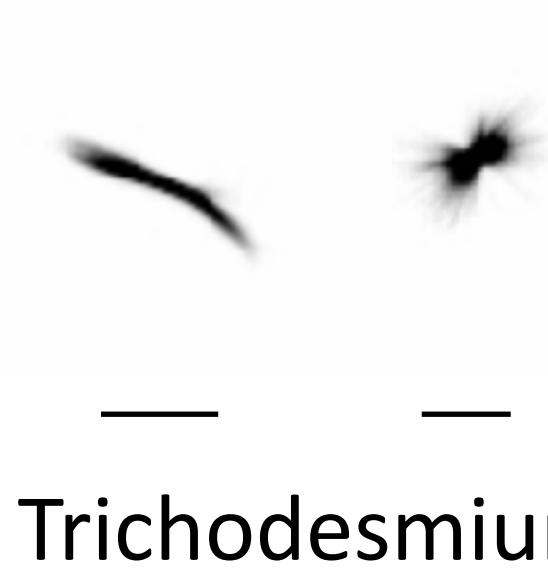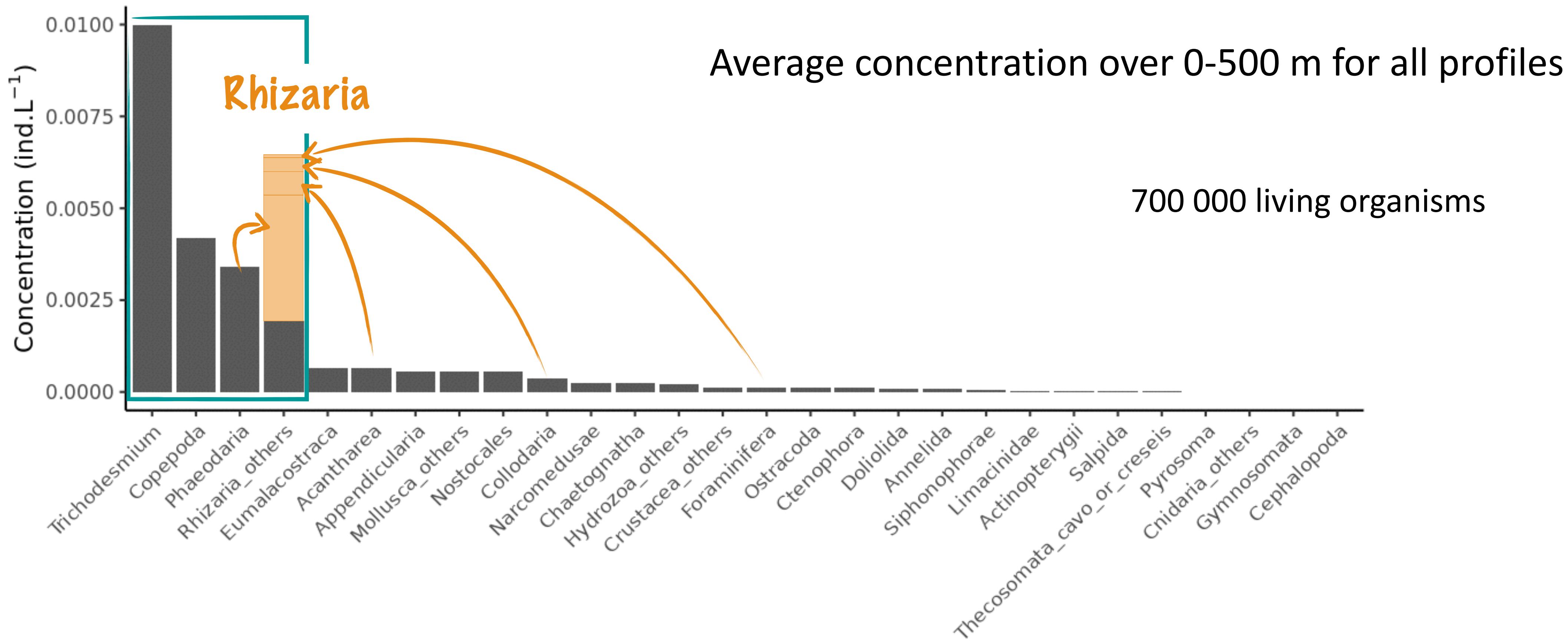
Description of plankton communities — epipelagic layer
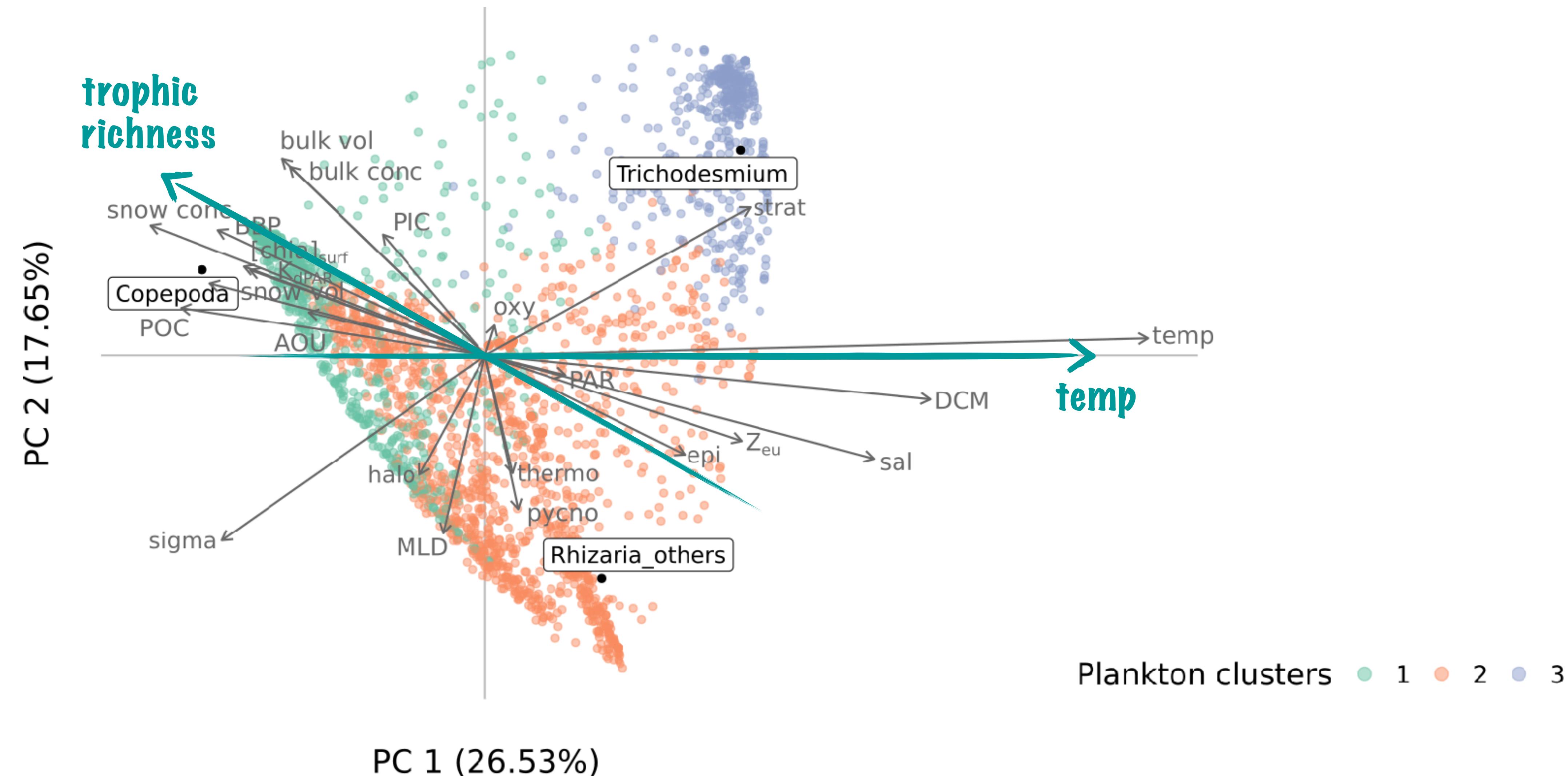

Projection of epipelagic stations on first two PCA axes, with taxonomic classes and environmental variables.

Description of plankton communities — epipelagic layer

copepods

rhizarians

trichodesmiums

Plankton clusters ● 1 ● 2 ● 3

Map of epipelagic plankton clusters
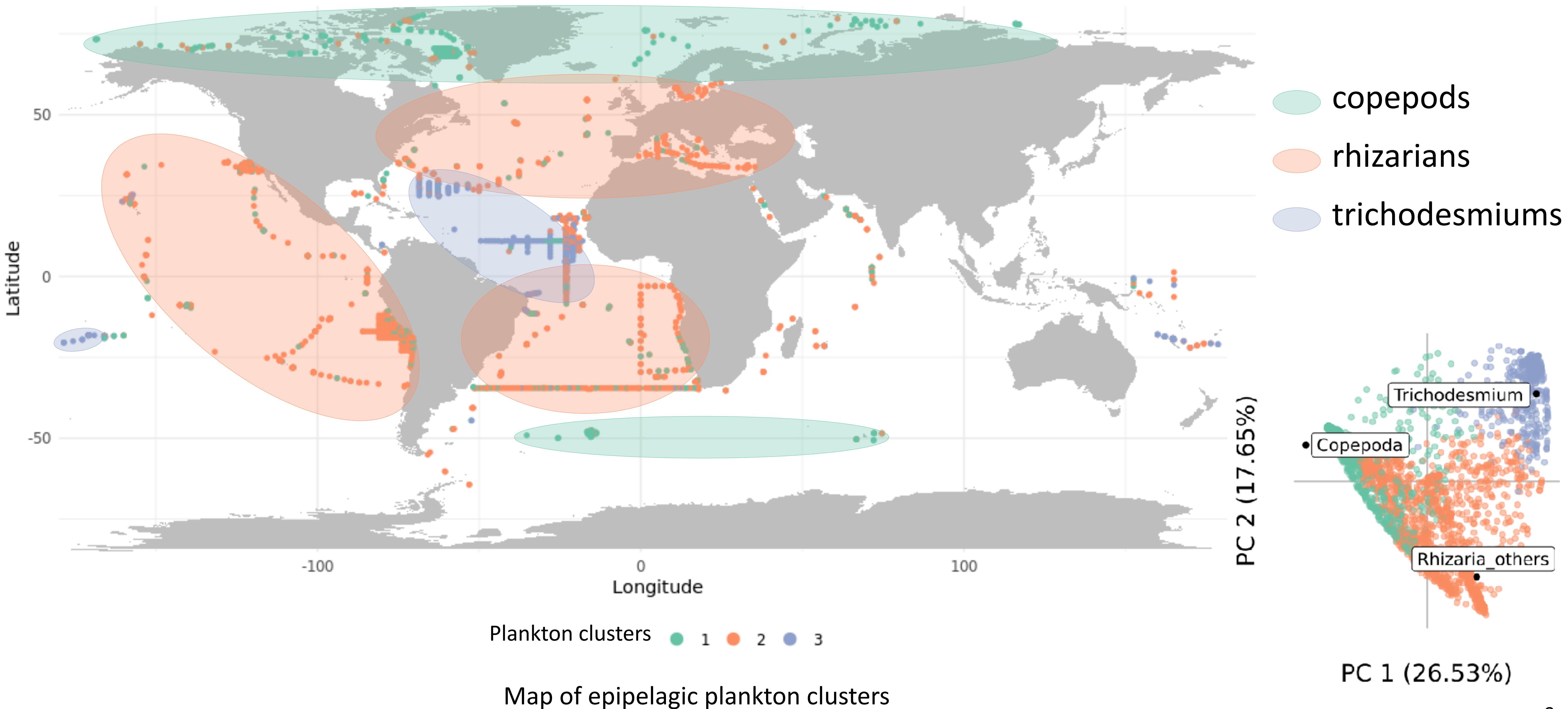
Description of plankton communities — upper mesopelagic layer
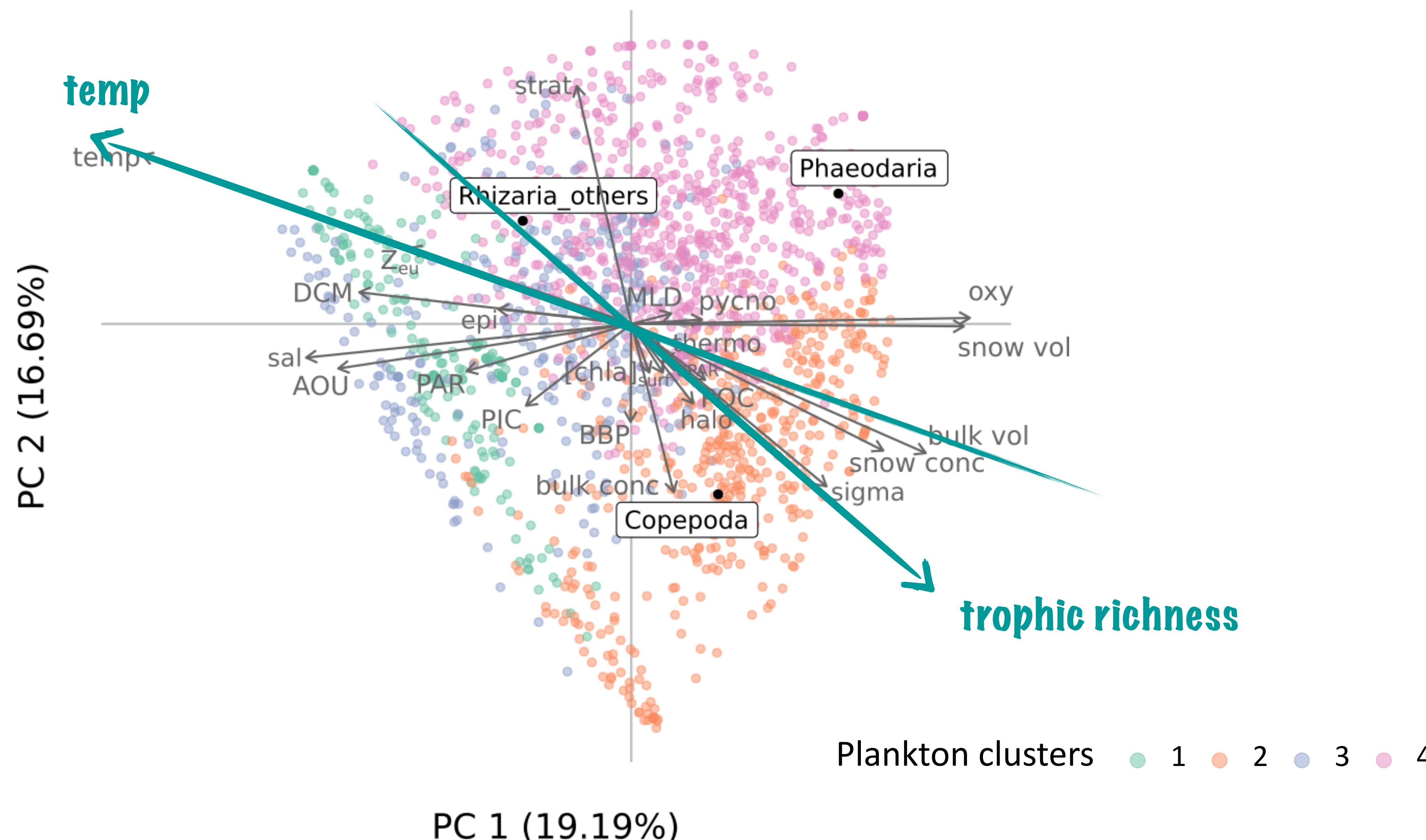
Projection of mesopelagic stations on first two PCA axes, with taxonomic classes and environmental variables.

Comparison among regionalisations

Layer-wise

Quantify the part of variance explained by:

- local and immediate environment from in-situ data

- latitudinal bands

- climatology-based regions

- a maximal model

- a null model

Same approach to test seasonal and circadian cycles effects
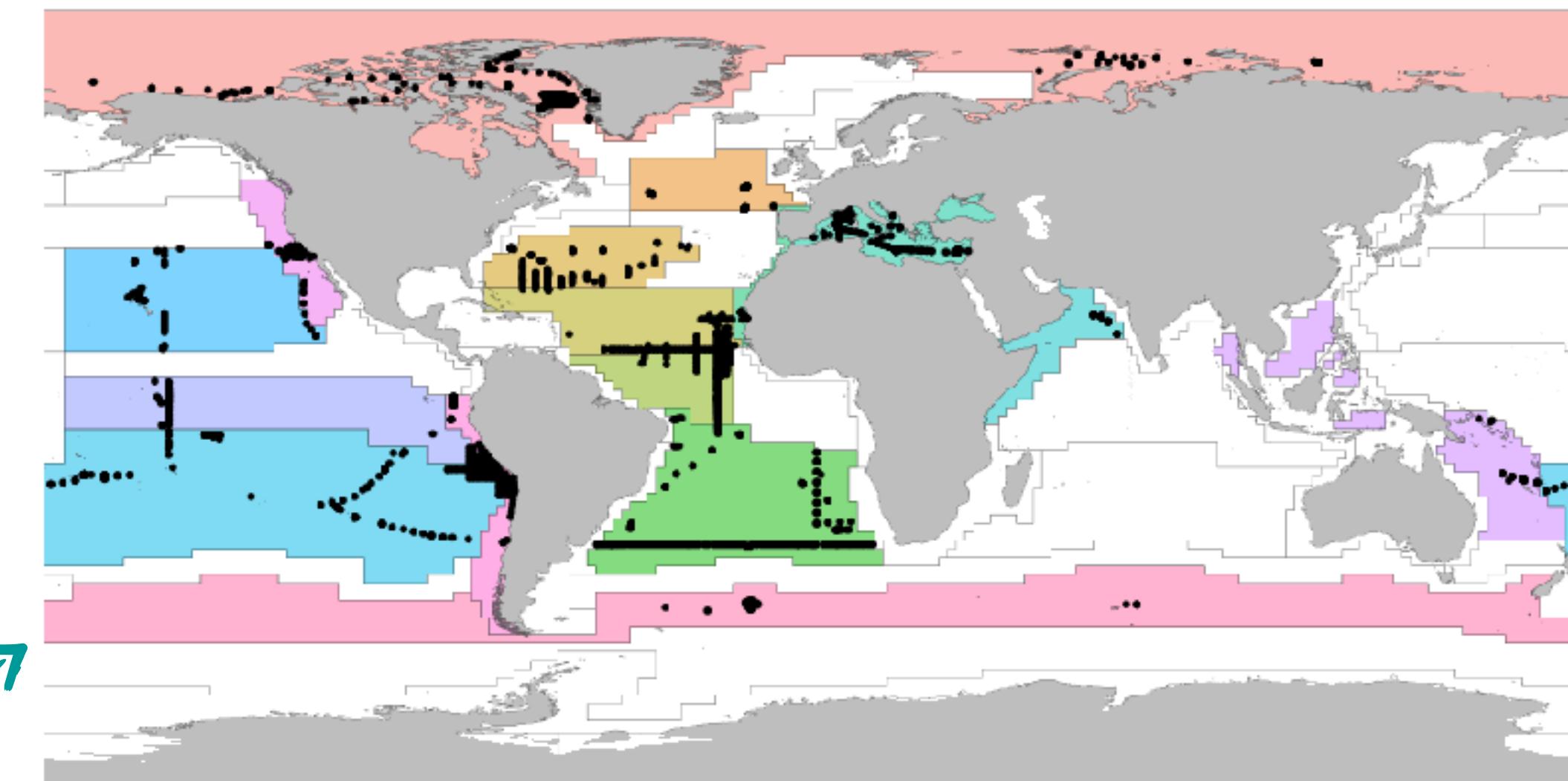
Longhurst provinces (epipelagic layer)

Mesopelagic provinces (Reygondeau et al. 2018)

Comparison among regionalisations

Epipelagic layer

$R^2_{adj} = 56.1\%$

Upper mesopelagic layer

$R^2_{adj} = 42.6\%$
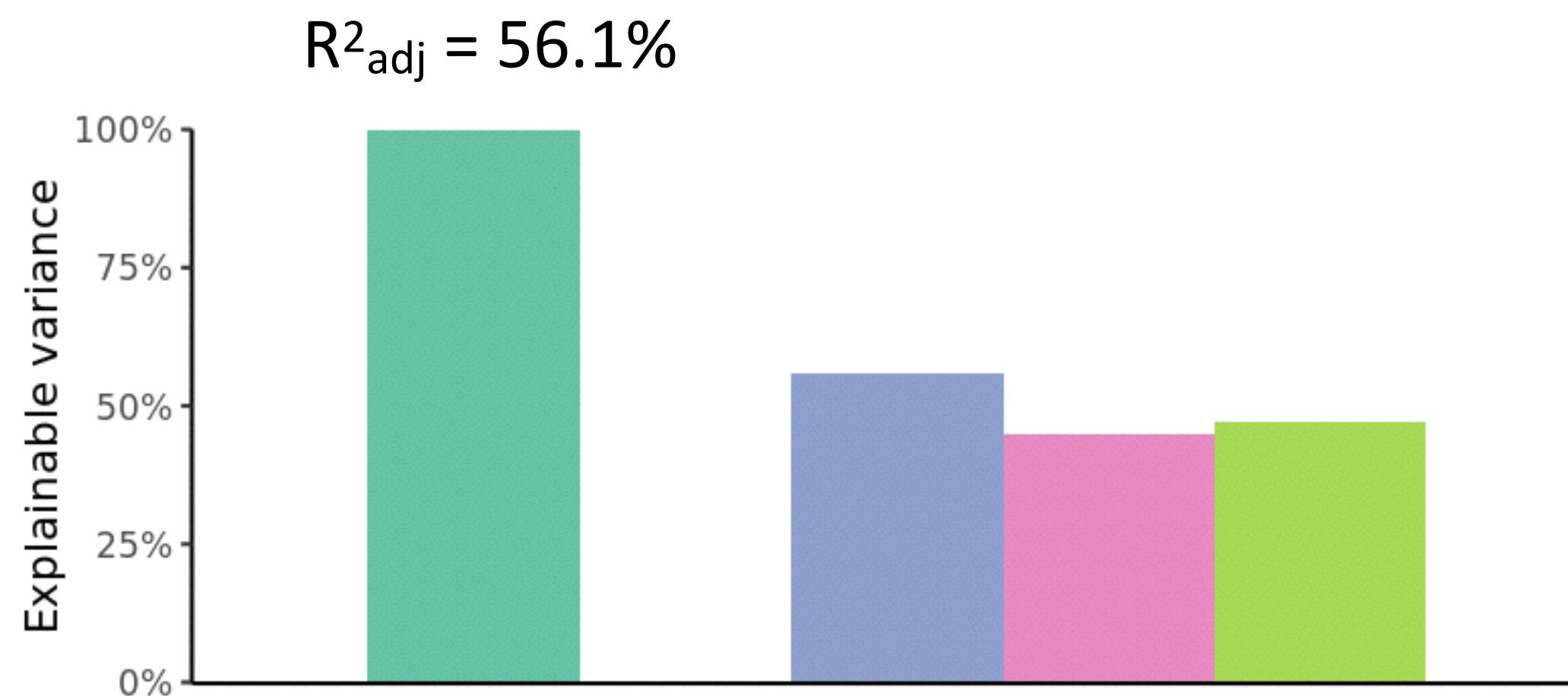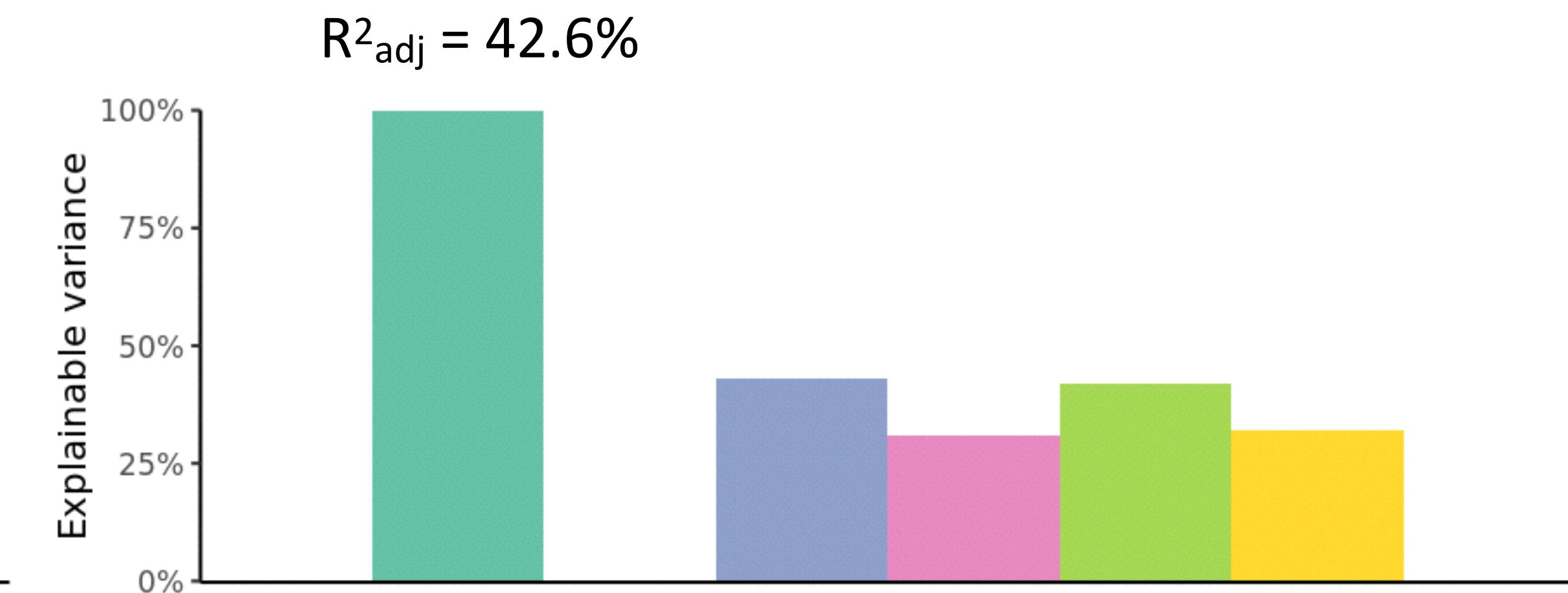
Part of plankton data variance explained by each partitioning.

Legend	
Maximal model	Null model
Longhurst Provinces	Latitudinal bands
Local environment	Mesopelagic provinces

Plankton communities structure

Regional scale

trophic richness

temp

	Copepoda	Trichodesmium	Rhizaria
Epipelagic			

|	Copepoda	Phaeodaria	Rhizaria
upper Mesopelagic			

Stronger structure
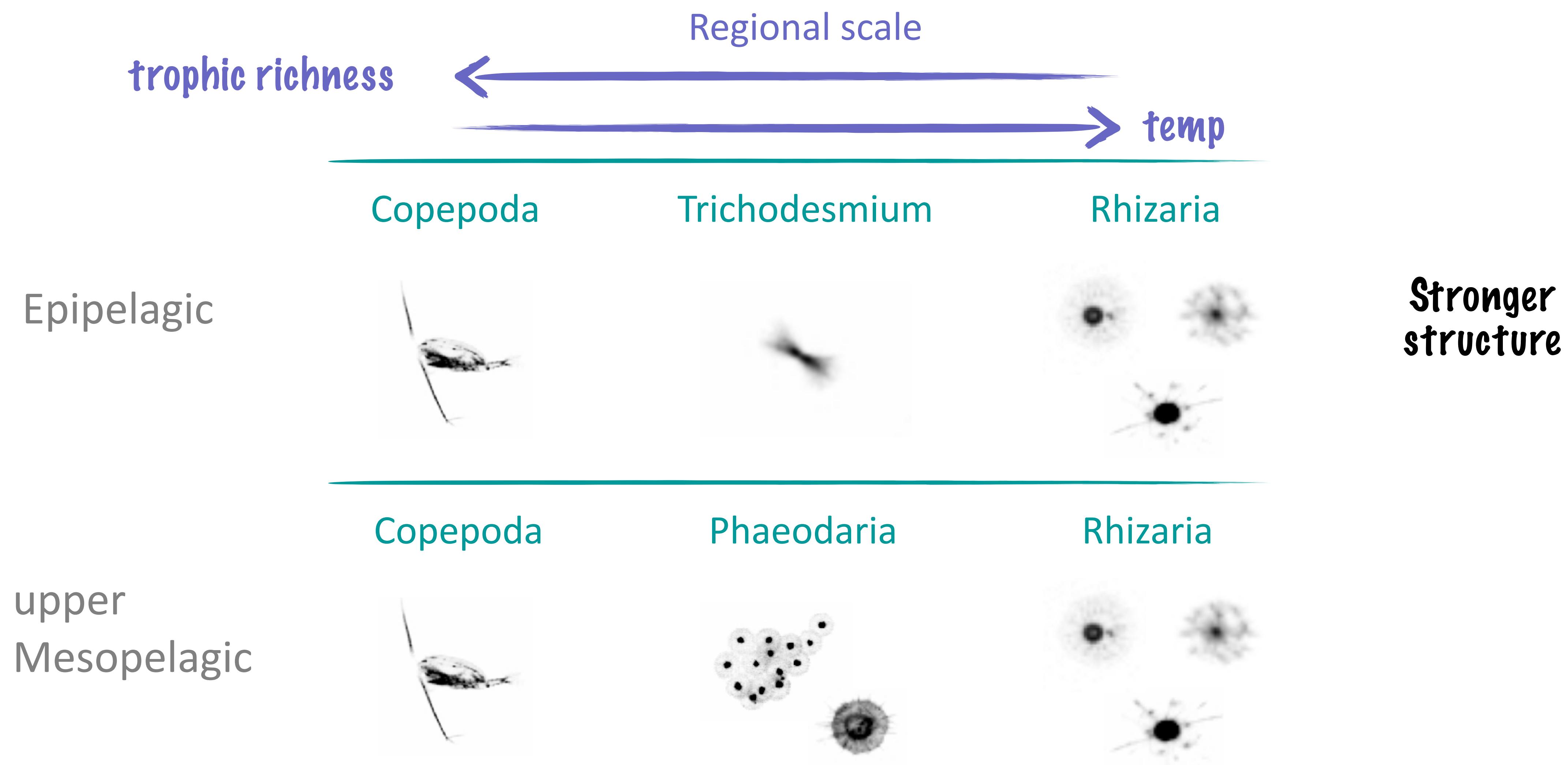
Next steps

- Improve data spatial and temporal resolution
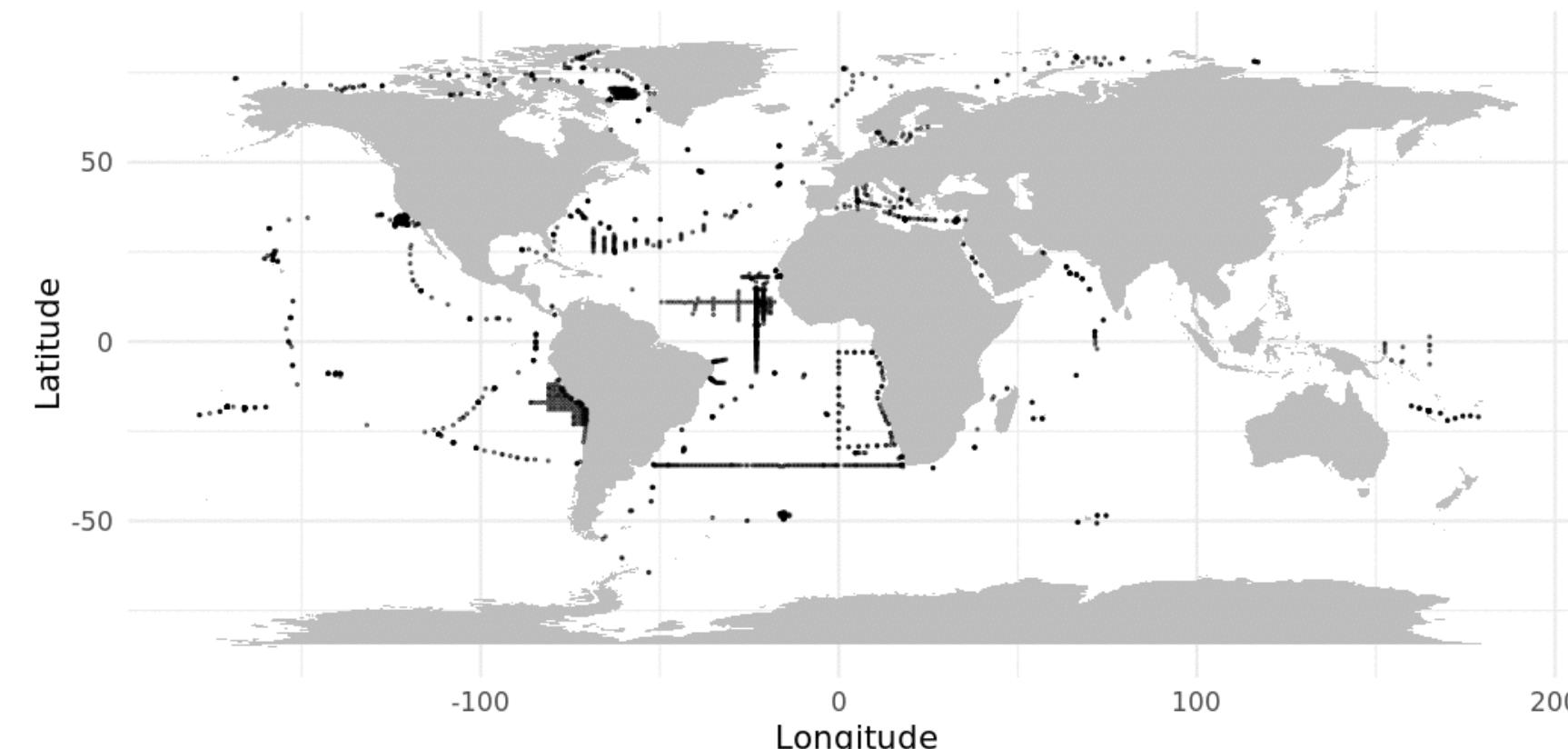
See Marc Picheral's presentation on Wednesday at 8:30

UVP6

- Extrapolation of plankton communities distribution and biomass
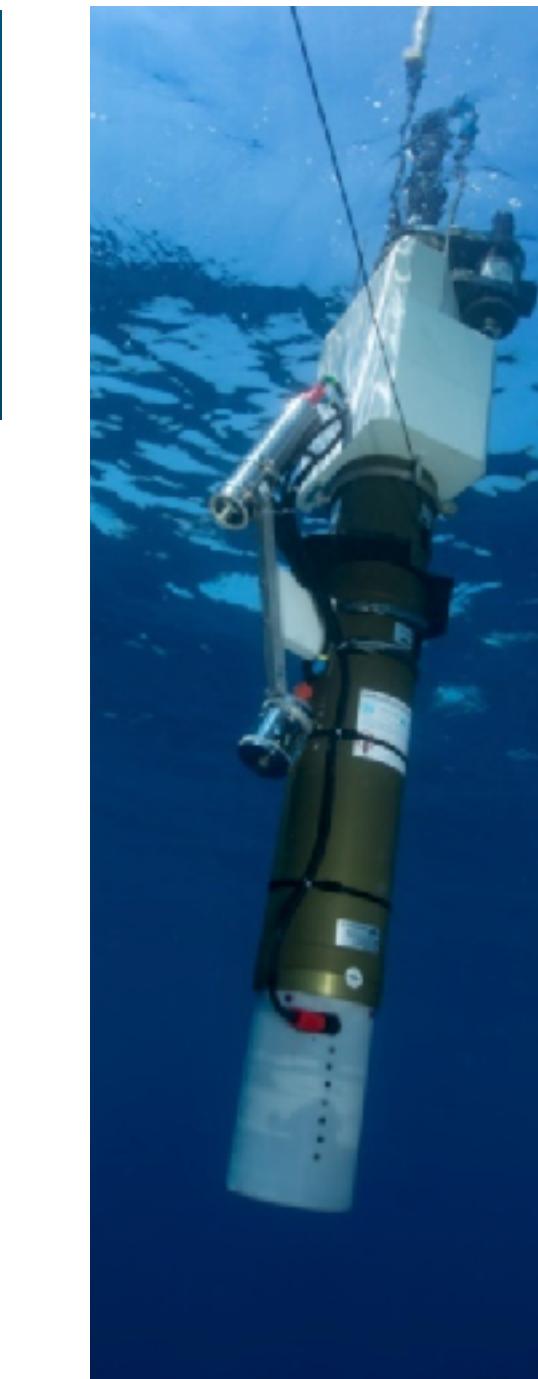
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