FOLLOWING THE MEDITERRANEAN OUTFLOW WATER:

A CHARACTERIZATION OF COMMUNITY CONNECTIVITY DRIVEN BY WATER MASSES FROM THE ALBORAN SEA TO THE AZORES

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Mediterranean-Atlantic transition zone in ABYSS

1/ Water

- Influence of water masses on biotic compartment
- Exploratory! (opportunistic sampling)

- Do Mediterranean water masses harbour different biotic communities than Atlantic waters?
- Does the MOW keep a stable biotic signature throughout its journey to the Azores?

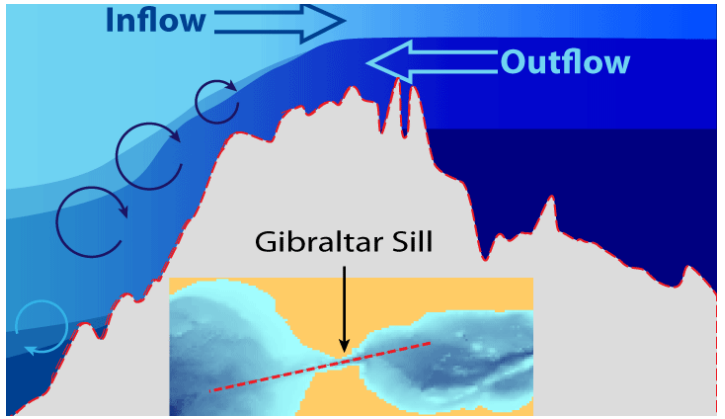
2/ Sediment

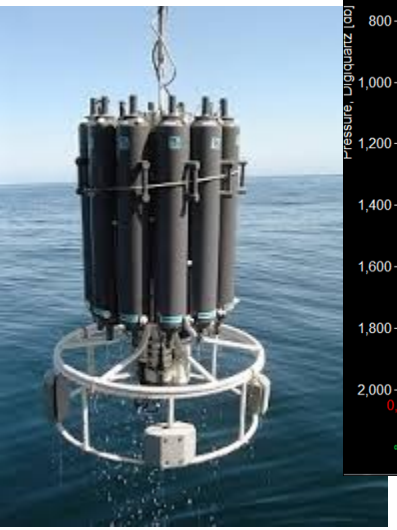
- Evaluation of benthic community changes across the Mediterranean-Atlantic transition zone

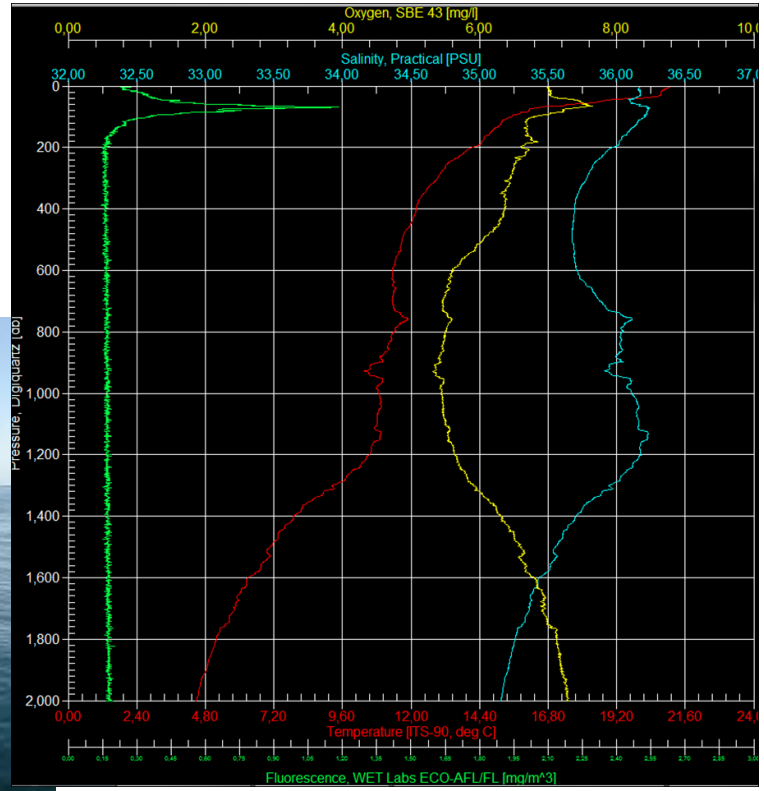
- Are changes primarily explained by depth zone or ocean basin ?
- Are these changes homogenous among sediment layers, or are deeper layers differently affected than upper layers?

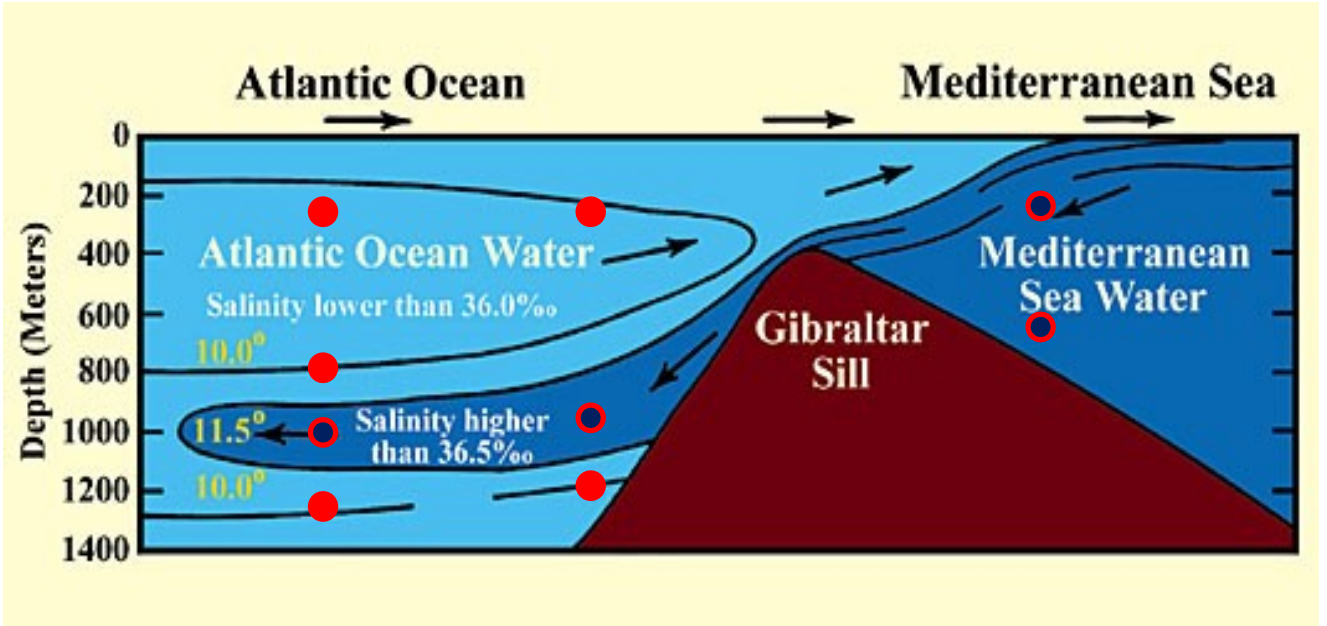
Water pilot study in ABYSS

- Following the Mediterranean Outflow Water (MOW) along an East-West gradient in the Mediterranean-Atlantic transition zone





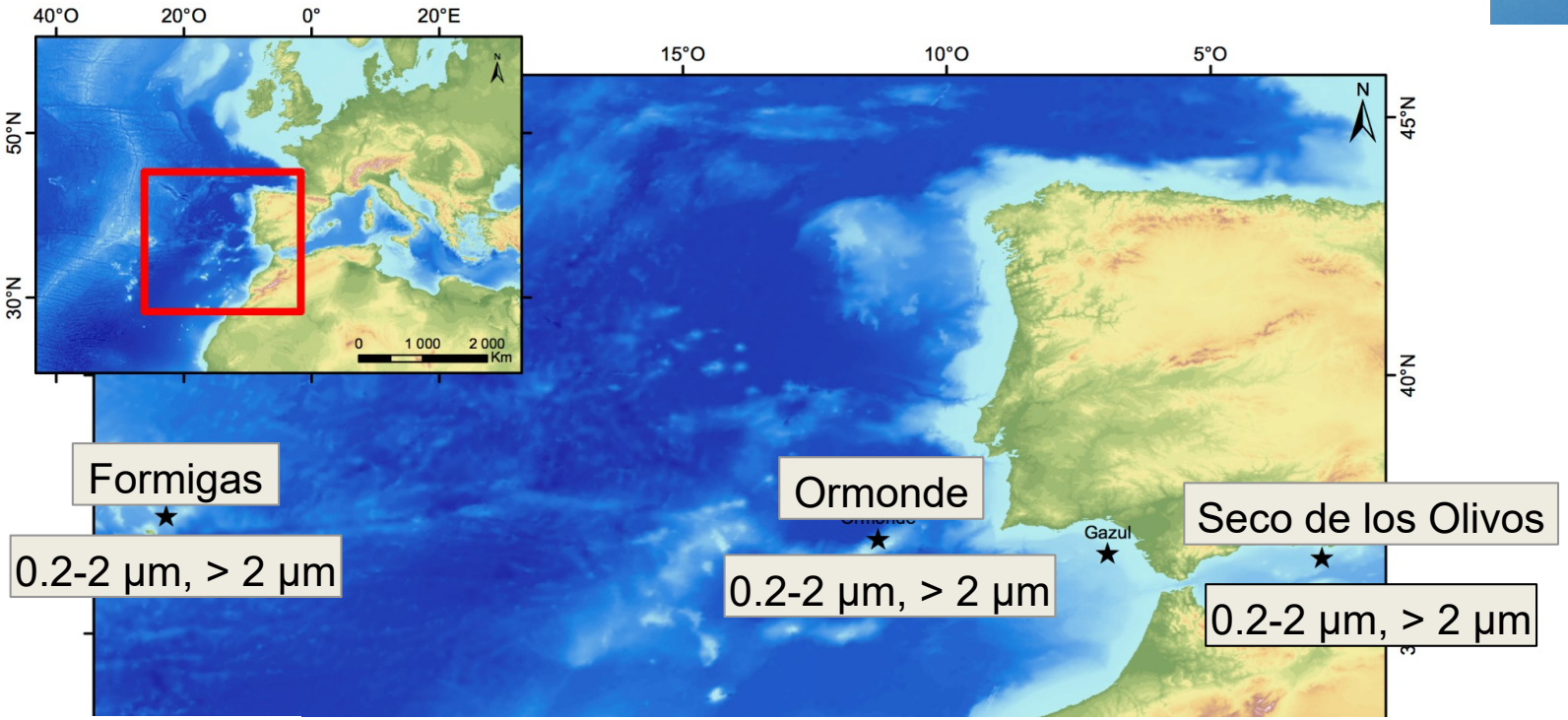


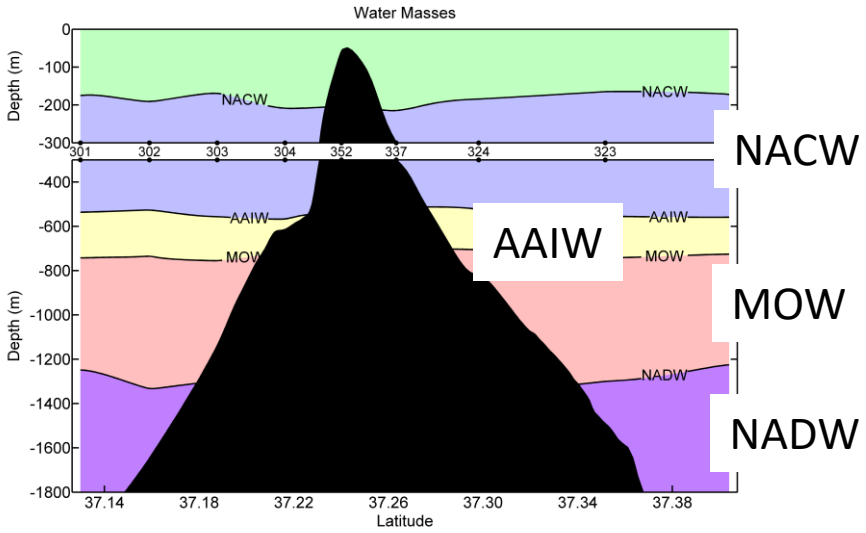


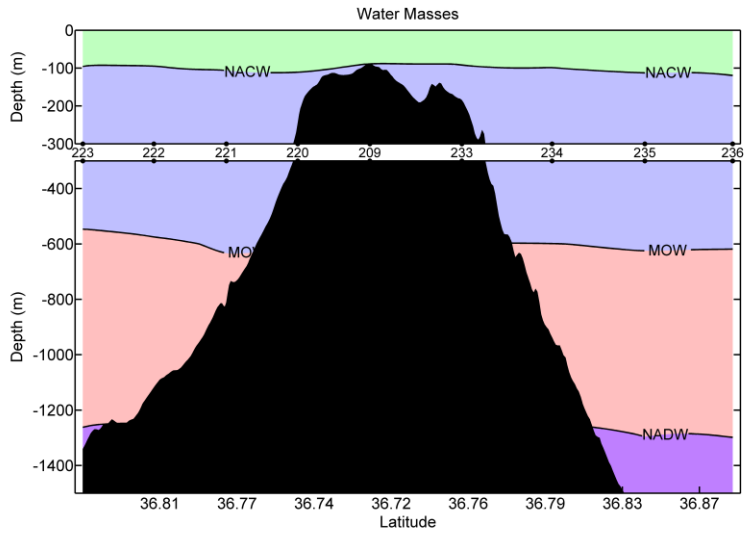
Sampling problem: only three 5L Niskin bottles at each site…
We had to pool the filters to allow sufficient yield for DNA extraction

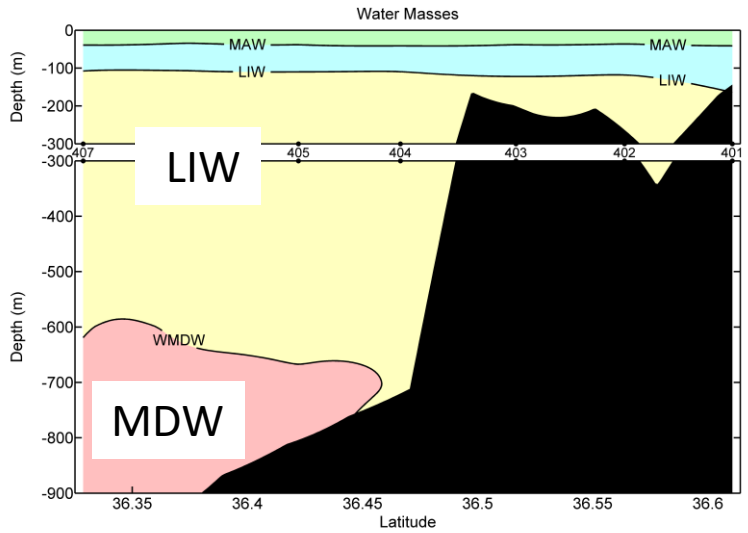
Water pilot study

- Two size fractions targeted at each site



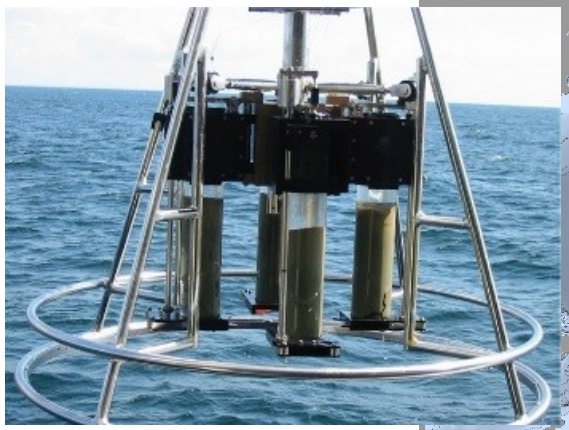


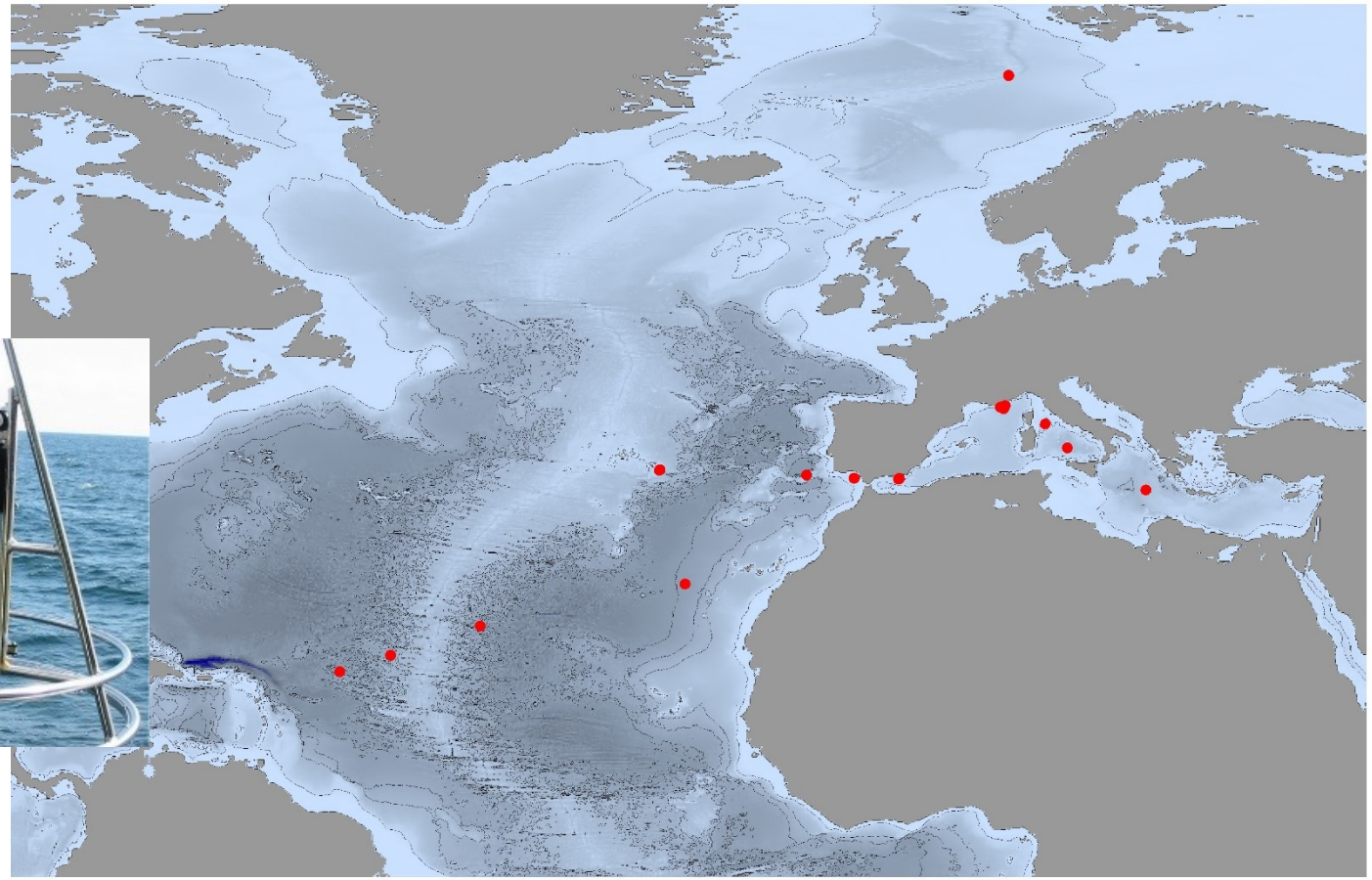




Sediment study

- 245 sediment samples covering the Atlantic-Mediterranean transition zone
- Triplicate sediment cores at each sampling site

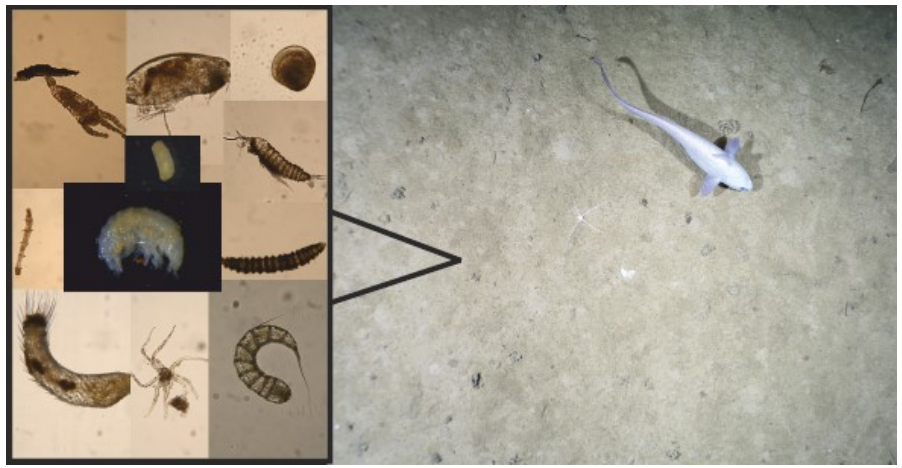


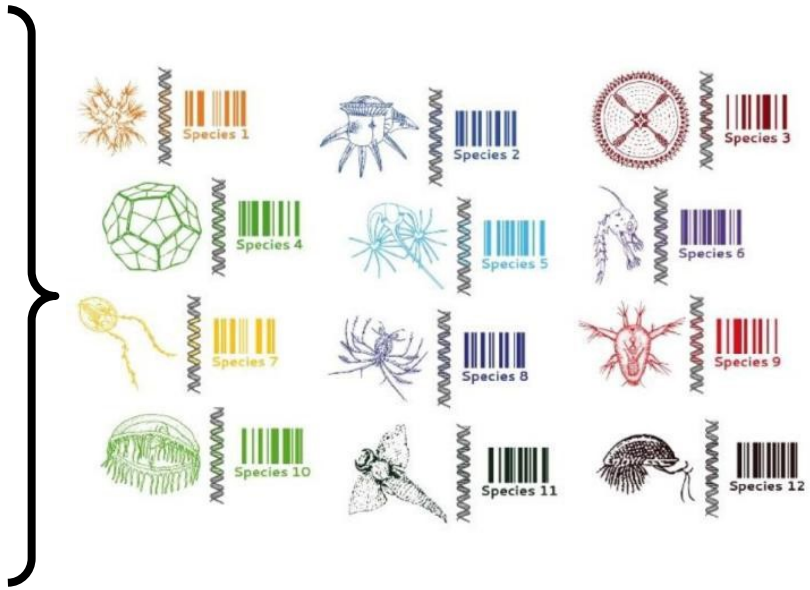


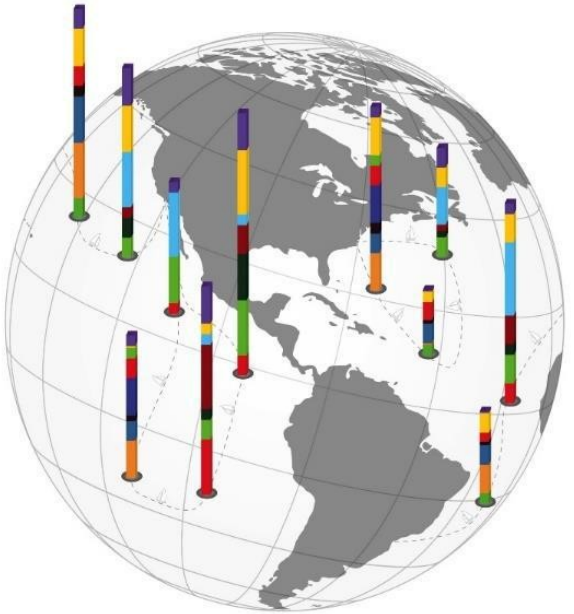
- DNA extraction from 10g of sediment using PowerMaxSoil kit

Environmental DNA metabarcoding

- based on the evolutionary species concept
- description of biodiversity in a natural sample (community complex)

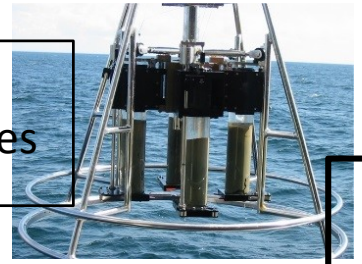






General eDNA workflow

Sample collection
+ environmental variables



Total nucleic acid extraction /purification

PCR amplification of barcode genes: rDNA, mtDNA

PCR products purification

Quality control of PCR products

Laboratory

NGS sequencing

Sequence analysis

Community analysis

Illumina HiSeq 2x250bp

Bioinformatics / Biostatistics

METAZOANS

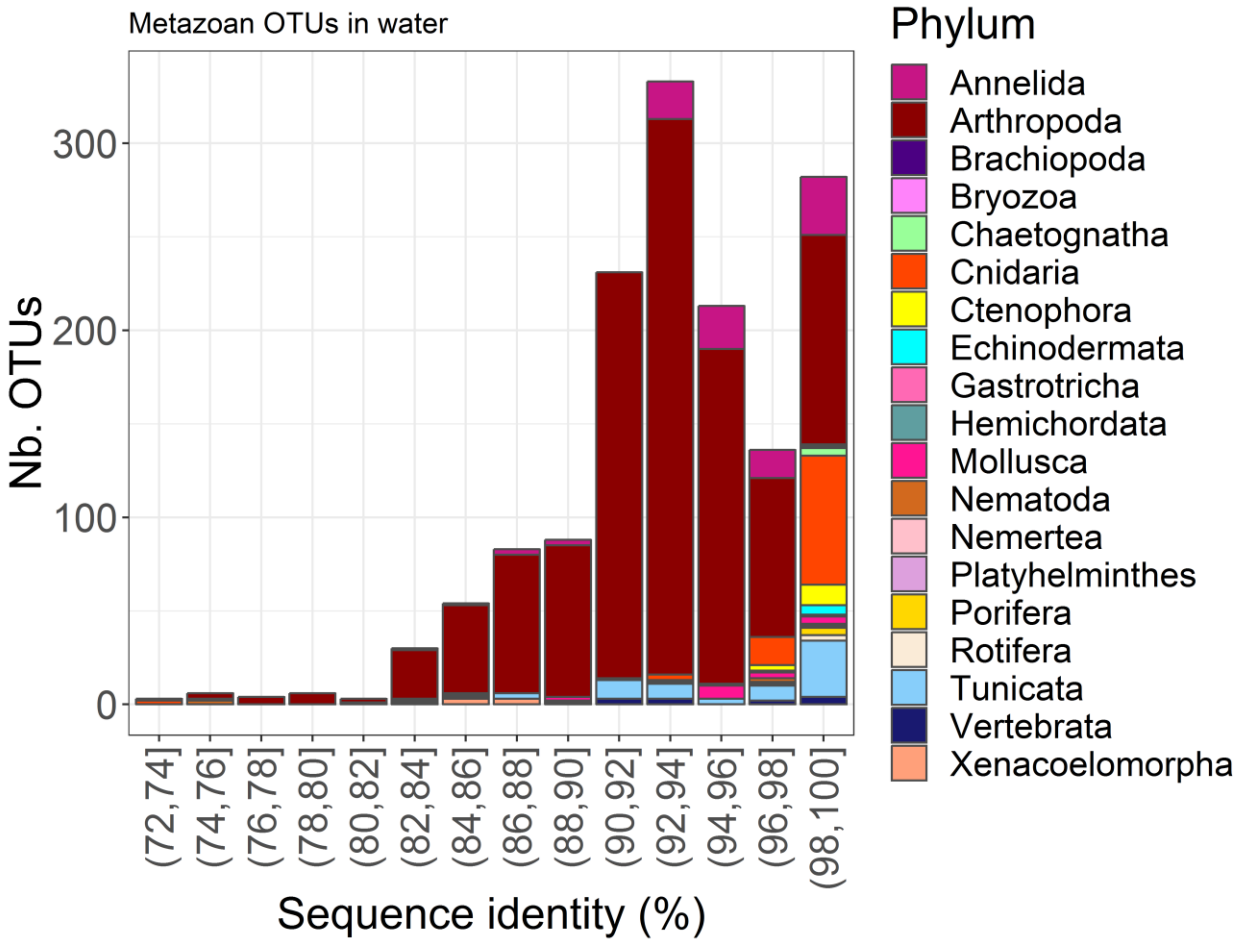
PRIMERS:

18S V1-V2

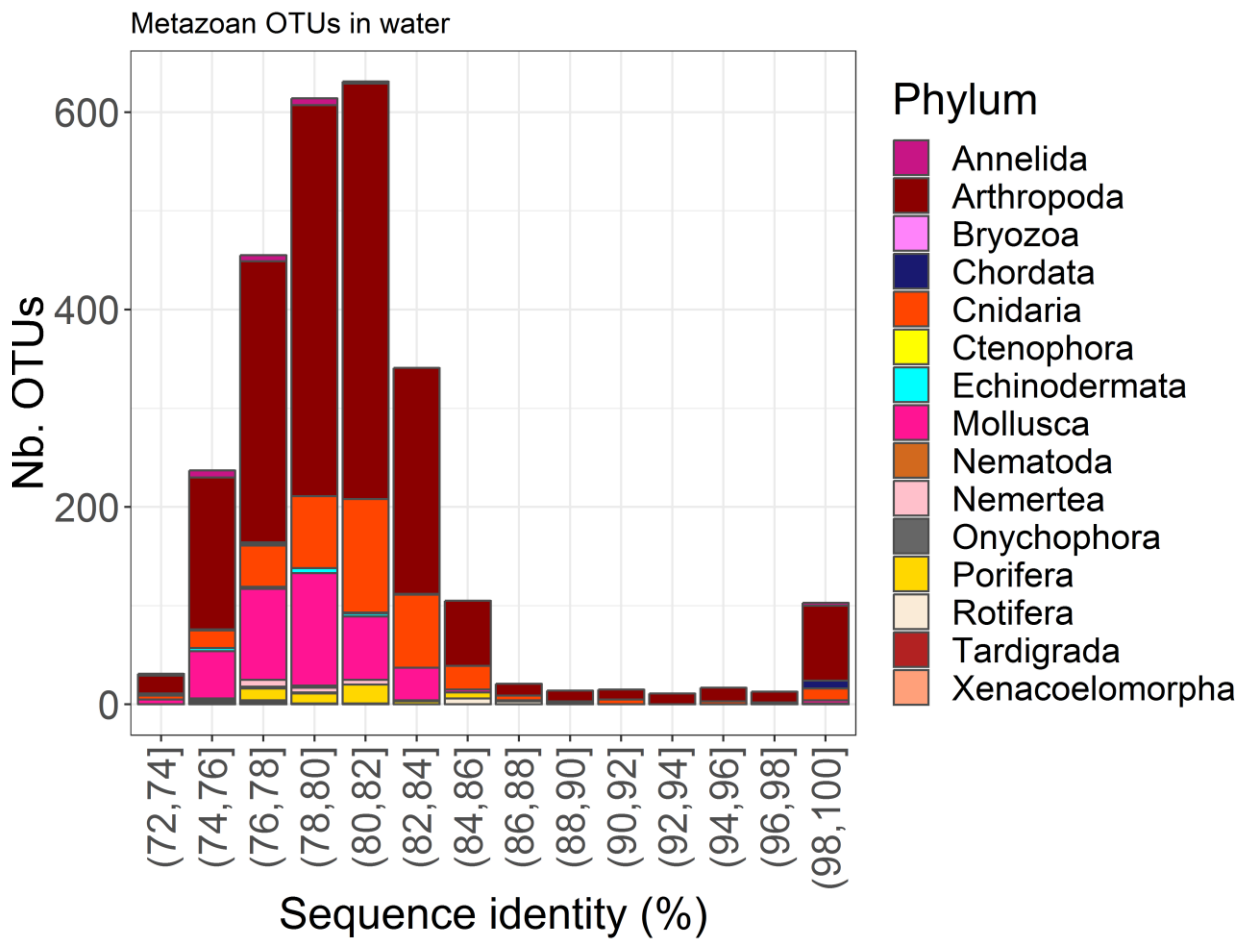
COI

Data overview for metazoans in the water column

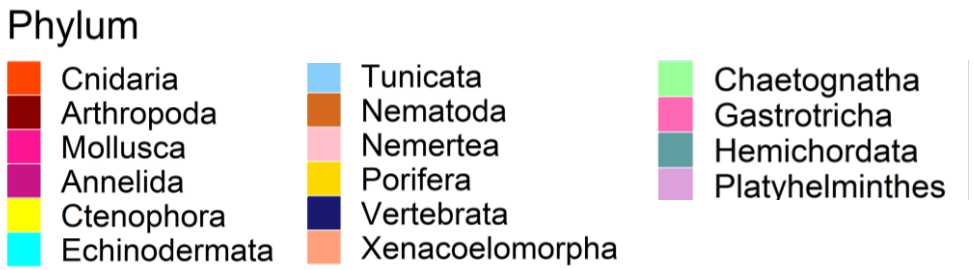
- 18S-V1 rDNA



- Mitochondrial COI

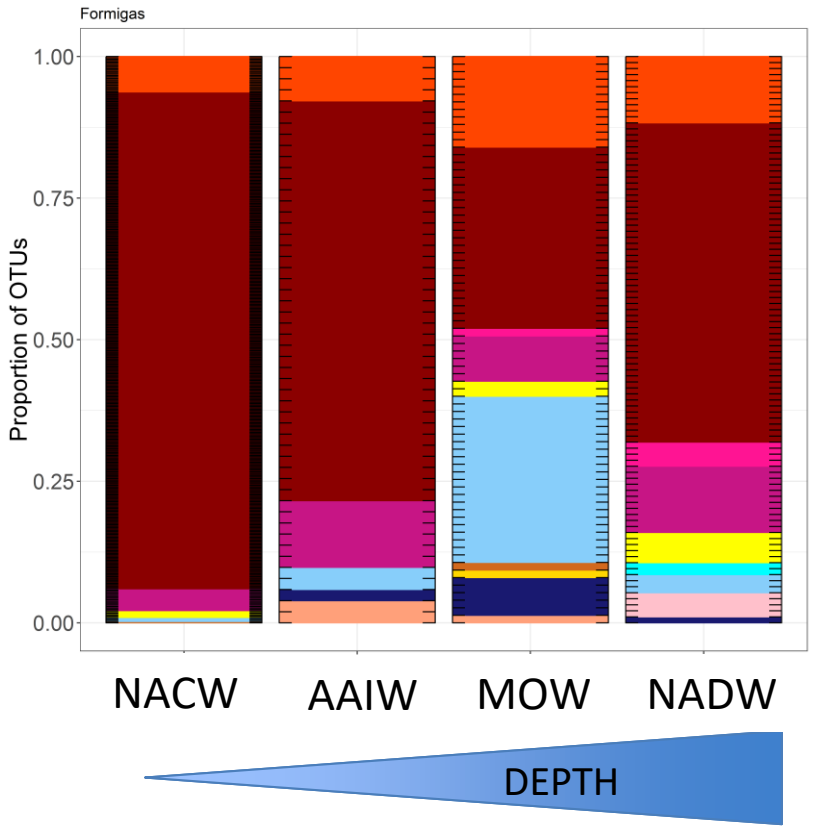


Taxonomic compositions, 18S-V1

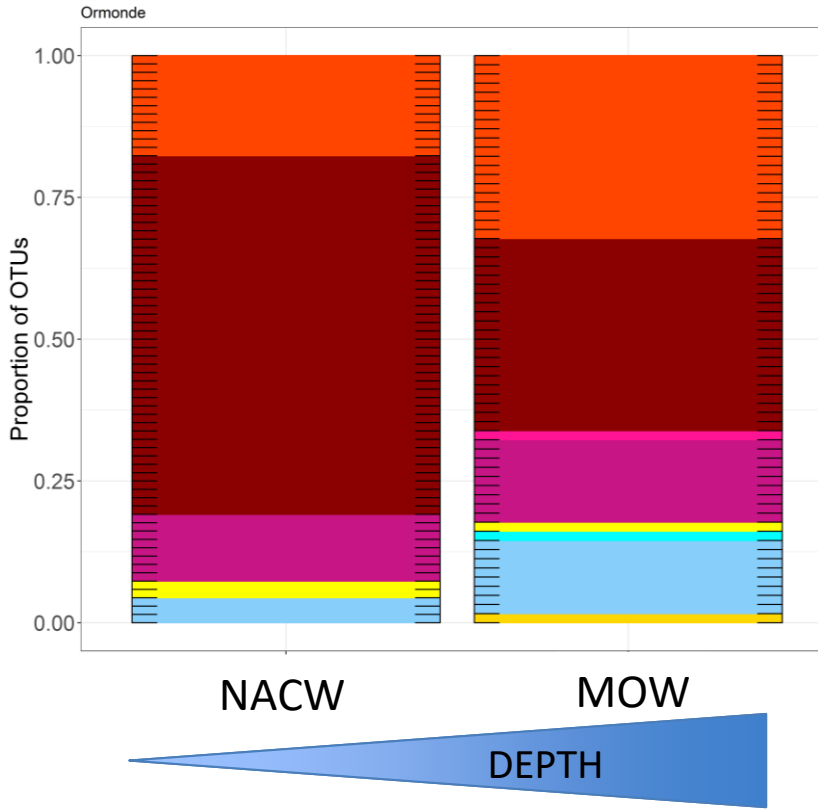


WEST **EAST**

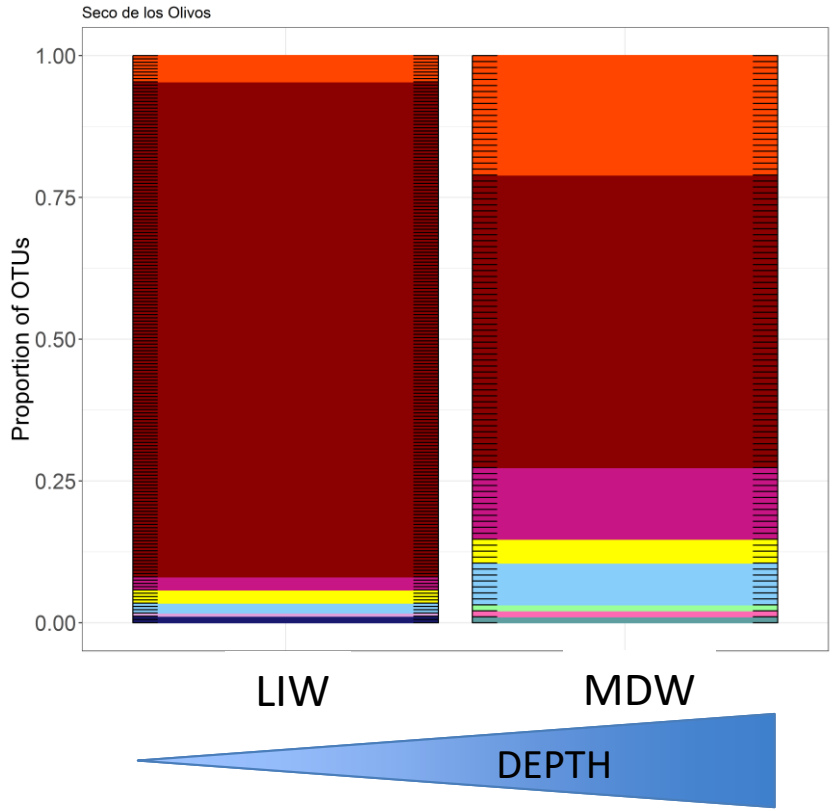
Azores



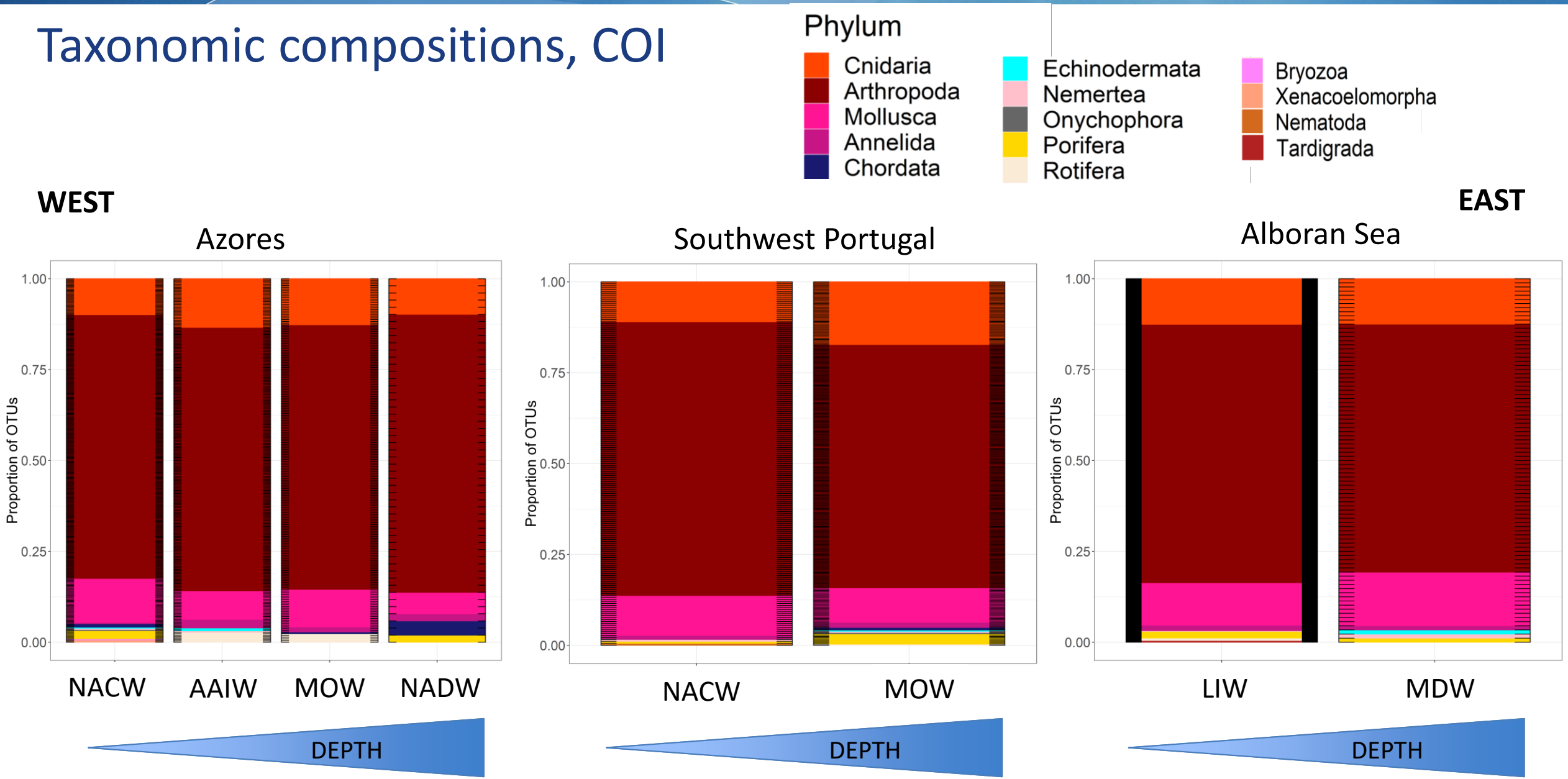
Southwest Portugal



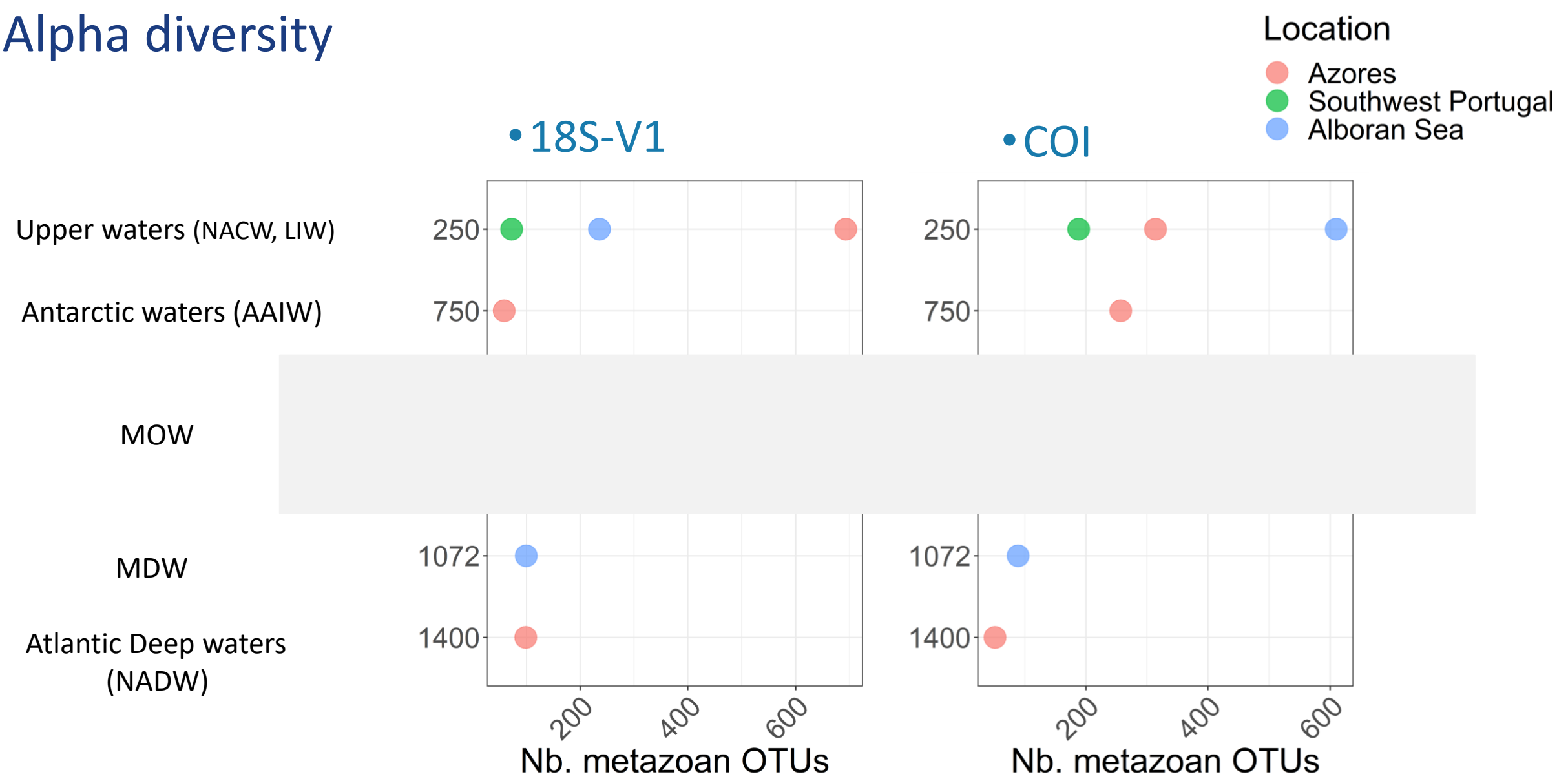
Alboran Sea



Taxonomic compositions, COI



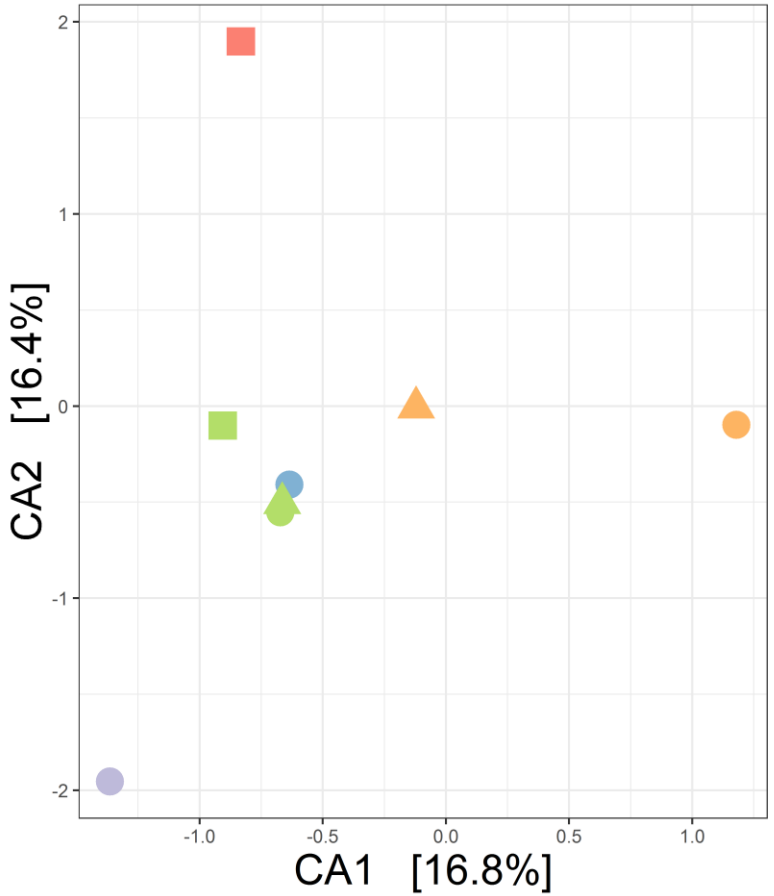
Alpha diversity



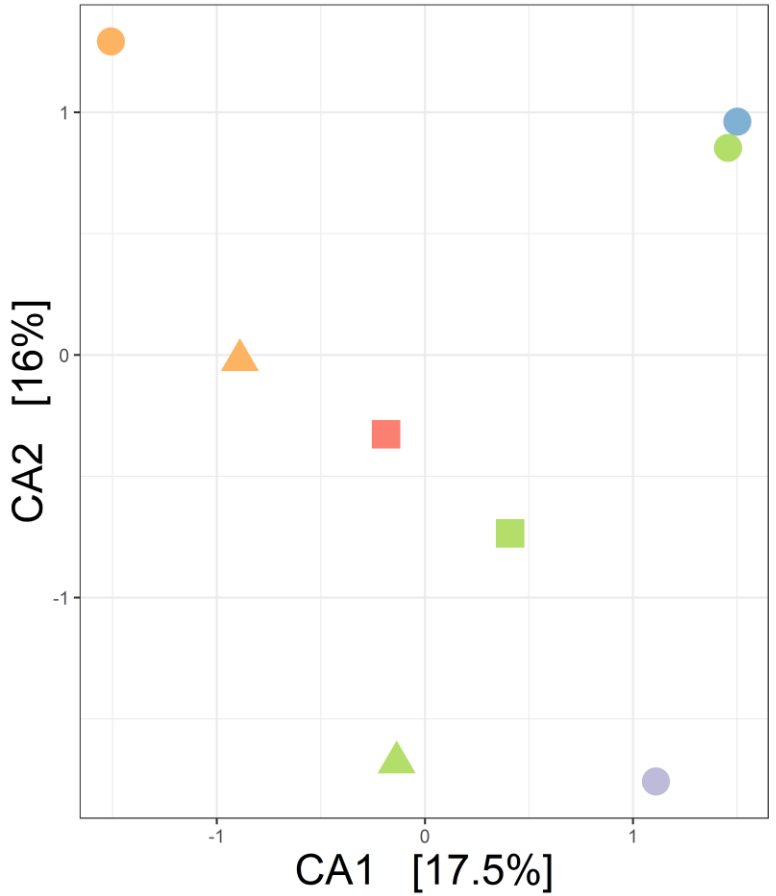
Beta diversity: influence of water masses on metazoan communities

- ~60% of variation in data explained by water mass
- Strong segregation surface vs deep
- Communities strongly vary with location

• 18S-V1



• COI



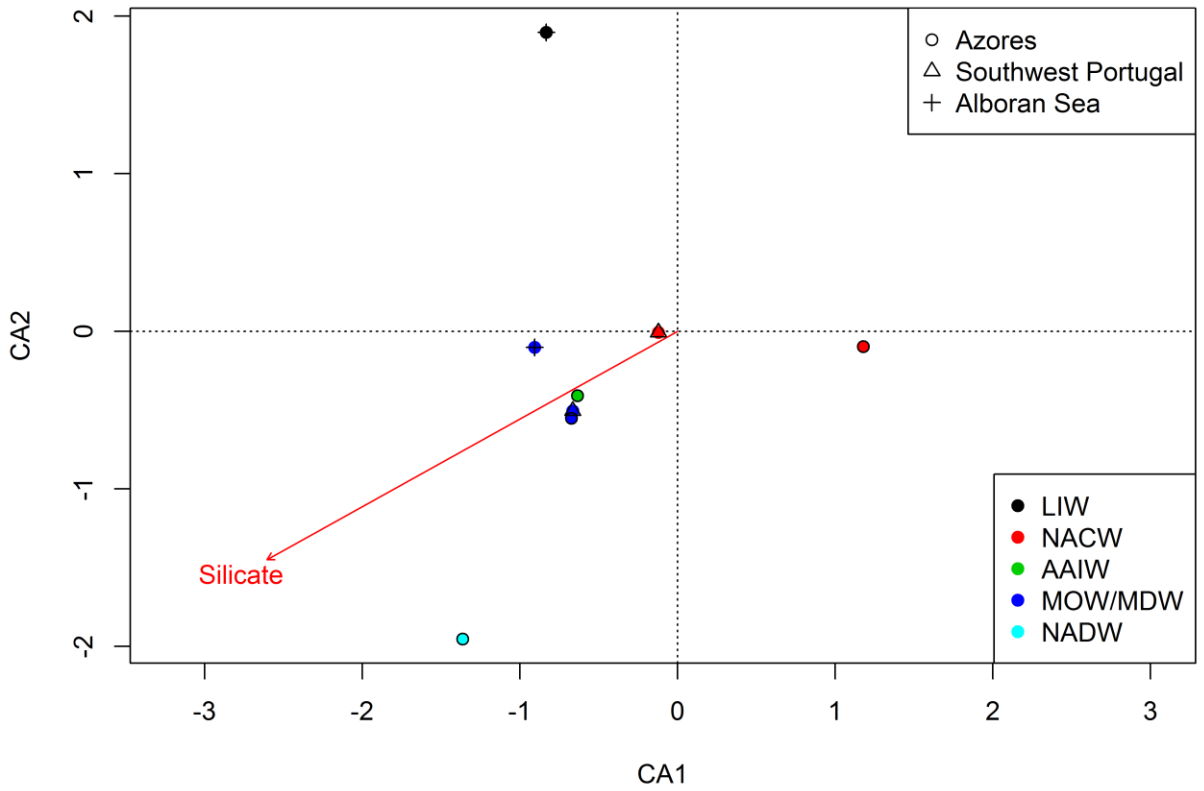
Location
Azores
Southwest Portugal
Alboran Sea

water.mass
LIW
NACW
AAIW
MOW/MDW
NADW

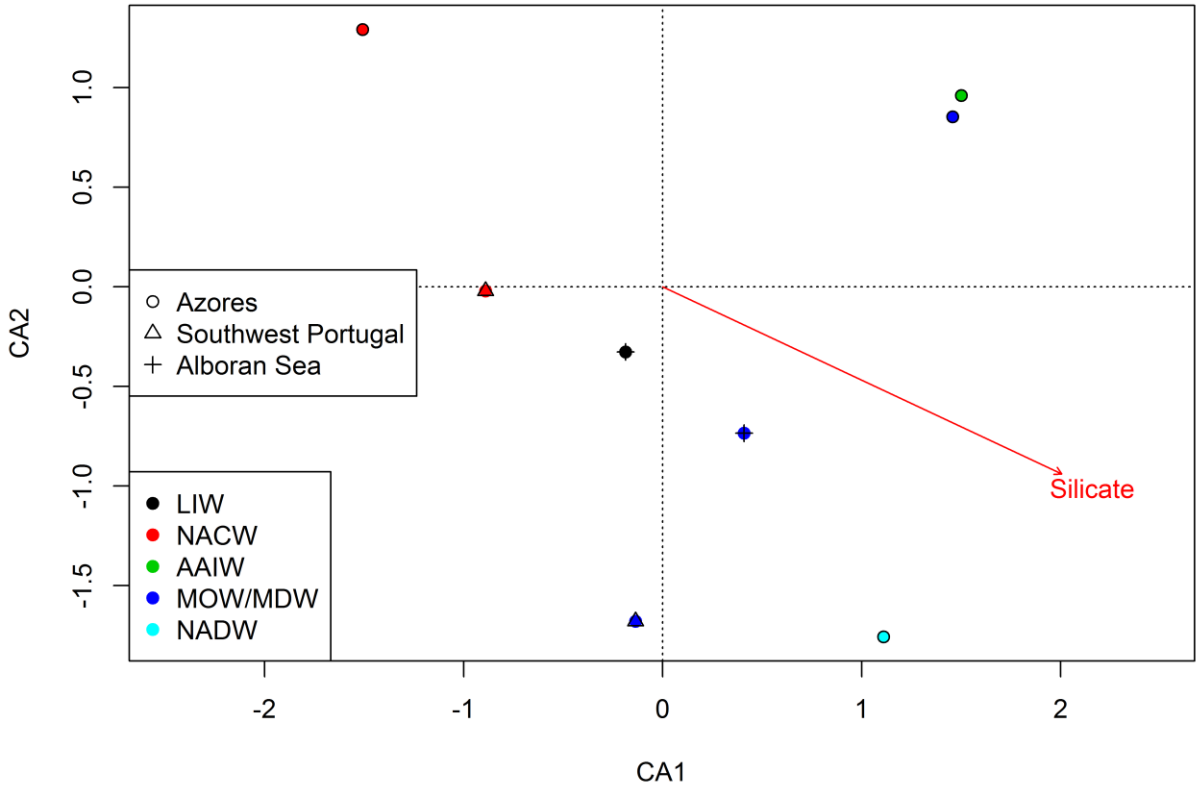
Surface
Antarctic
Deep

Beta diversity: influence of environmental variables

- 18S-V1



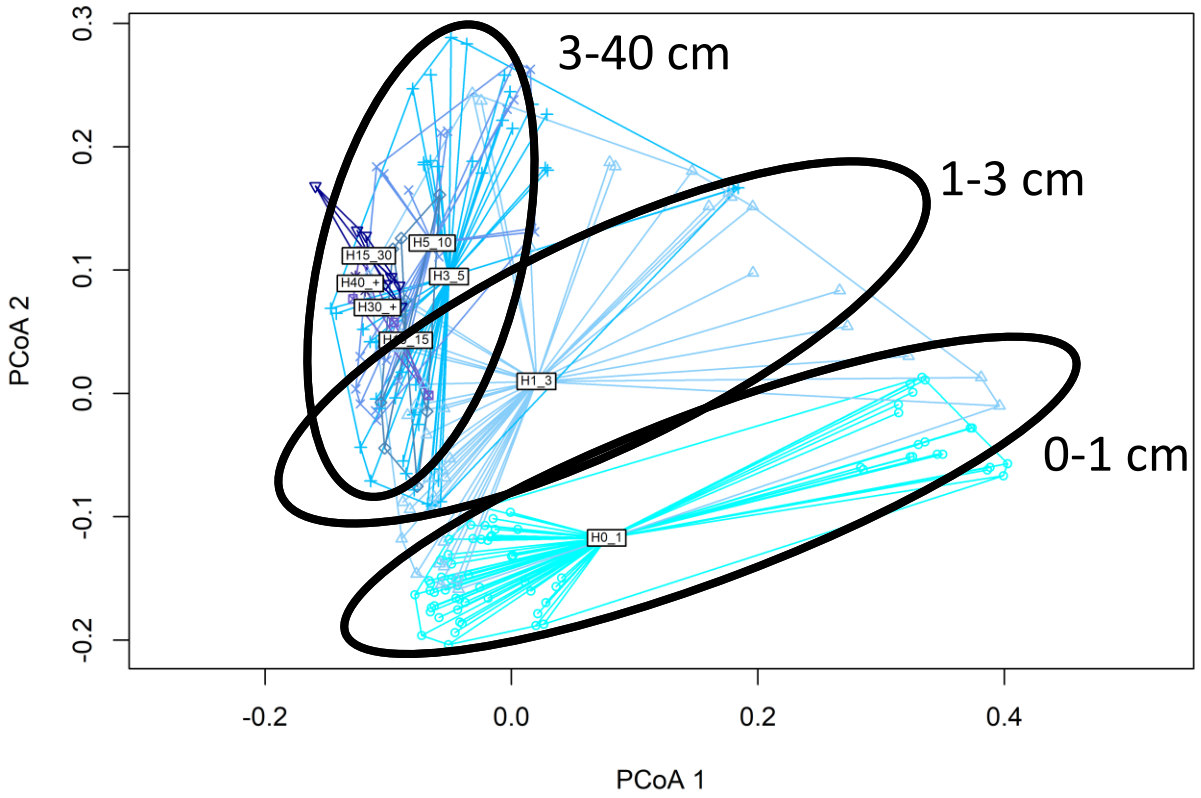
- COI



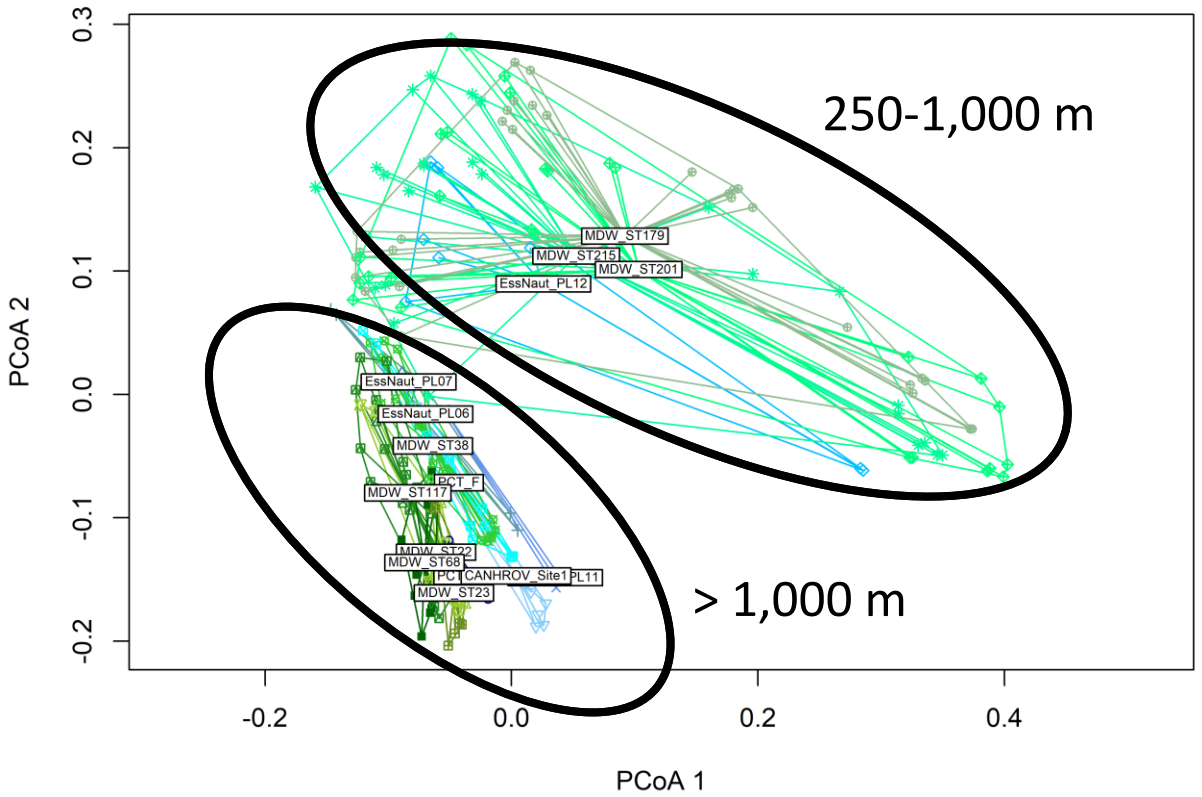
- Silicate concentration significantly correlated to community composition changes
- Silicate concentrations may explain the depth segregation

Metazoan communities: comparison of benthic communities (18S)

- segregation according to depth layer in sediment



- segregation according to depth region, not ocean basin

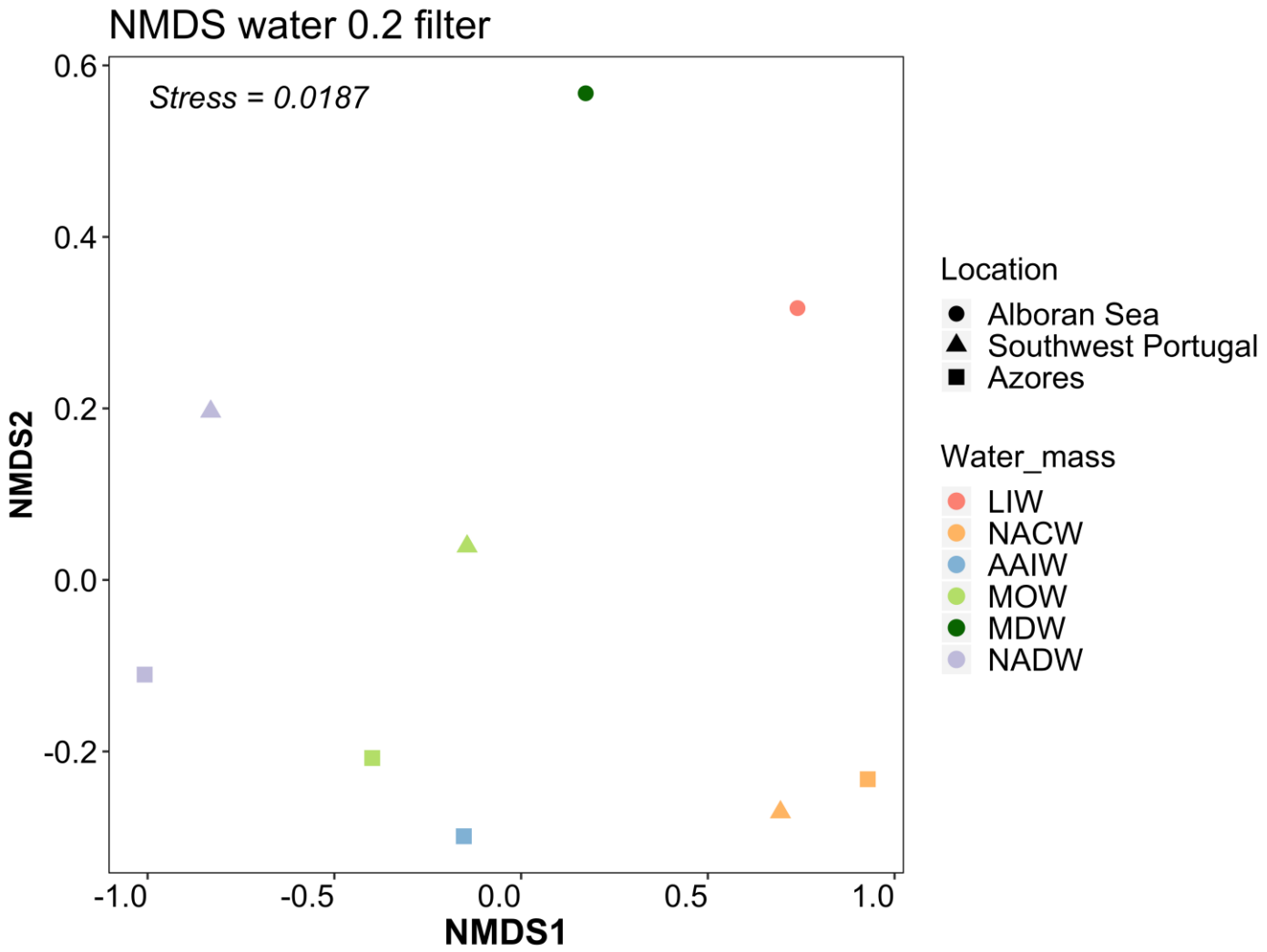


PROKARYOTES

PRIMERS:

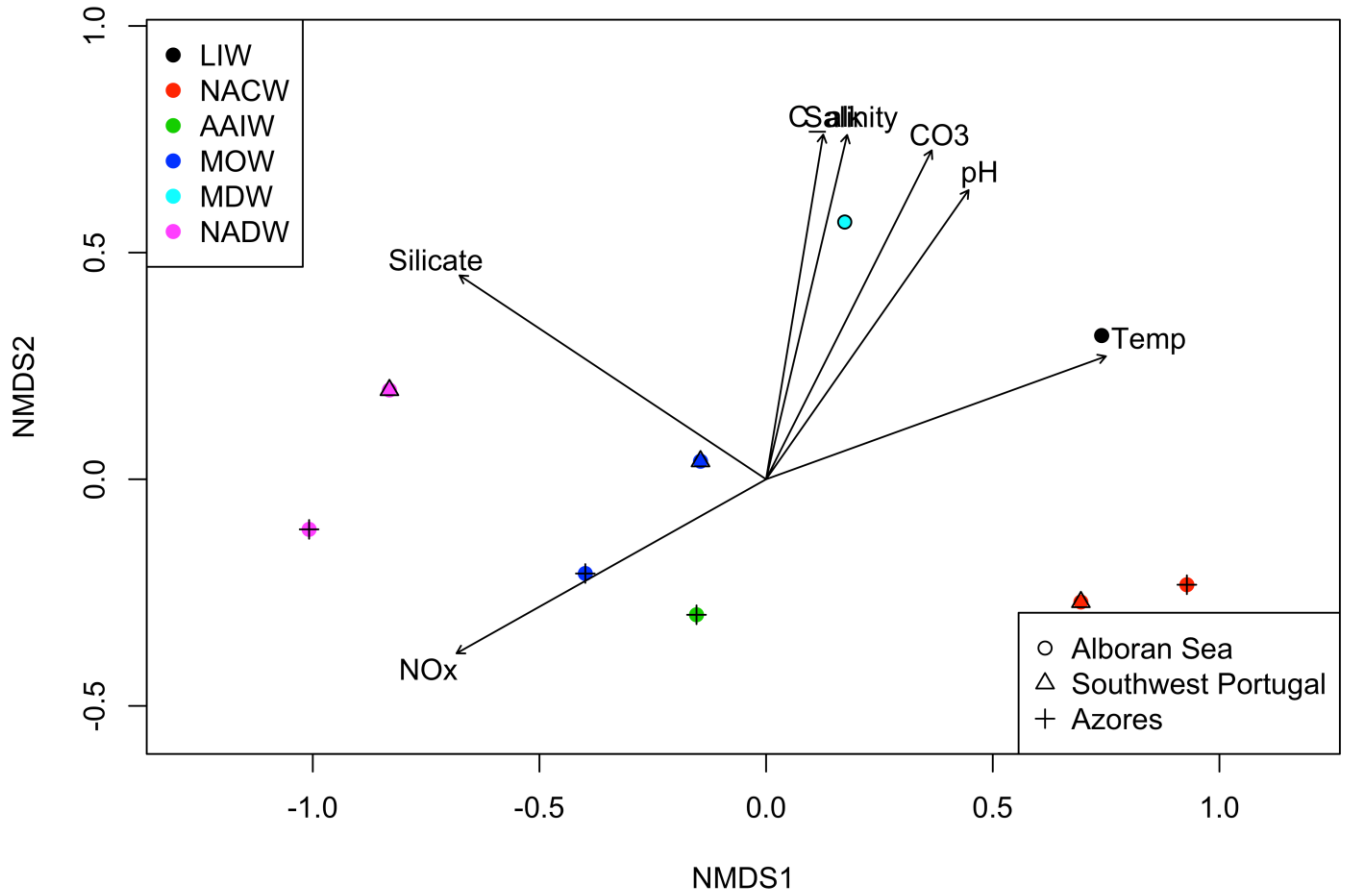
16S V4V5

Prokaryotic communities: comparison between water masses



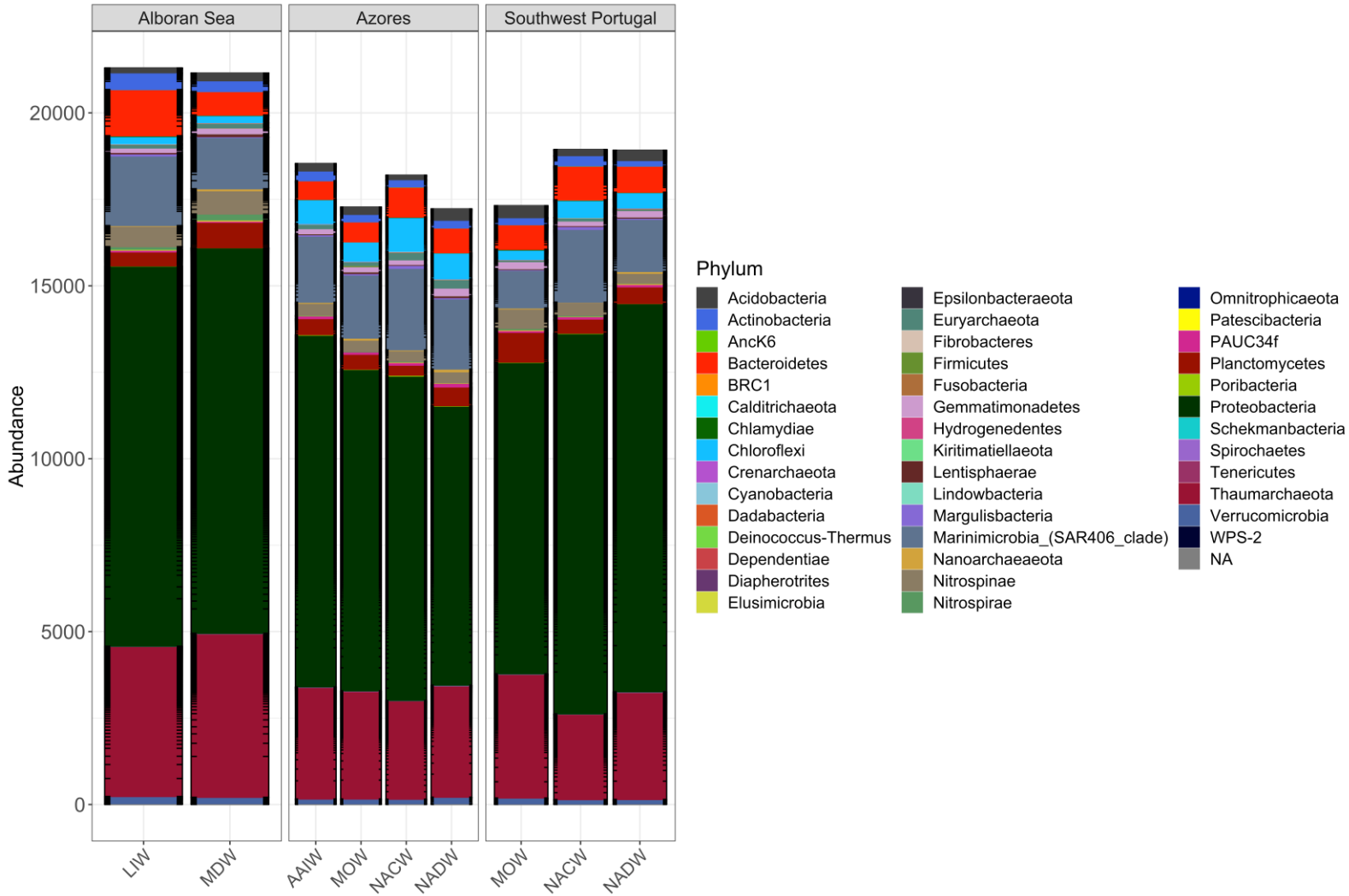
- Segregation of Mediterranean vs. Atlantic samples
- Segregation by depth and sampling location

Prokaryotic communities: comparison between water masses



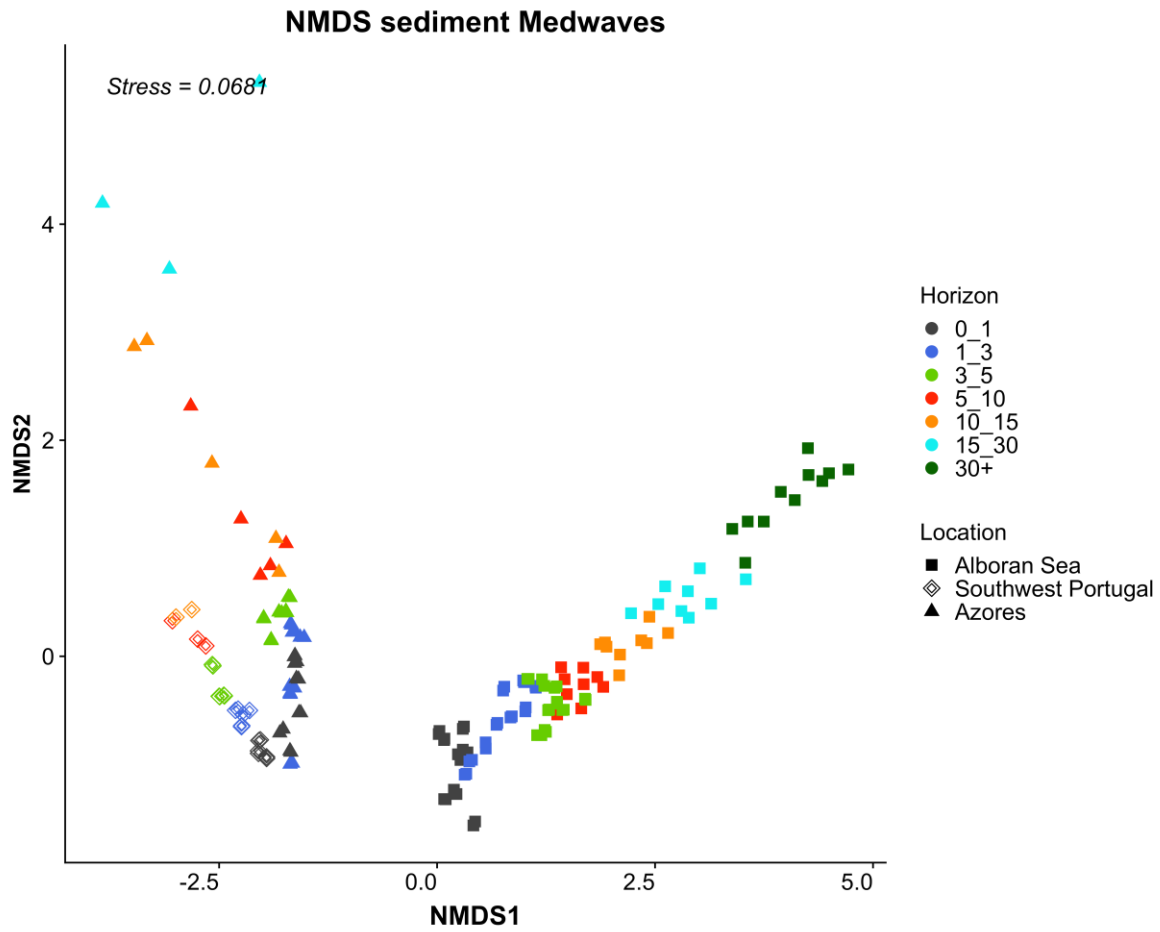
- Many physical-chemical parameters explain community structure
- Nitrates and silicates may best explain the depth segregation

Prokaryotic communities: comparison between water masses



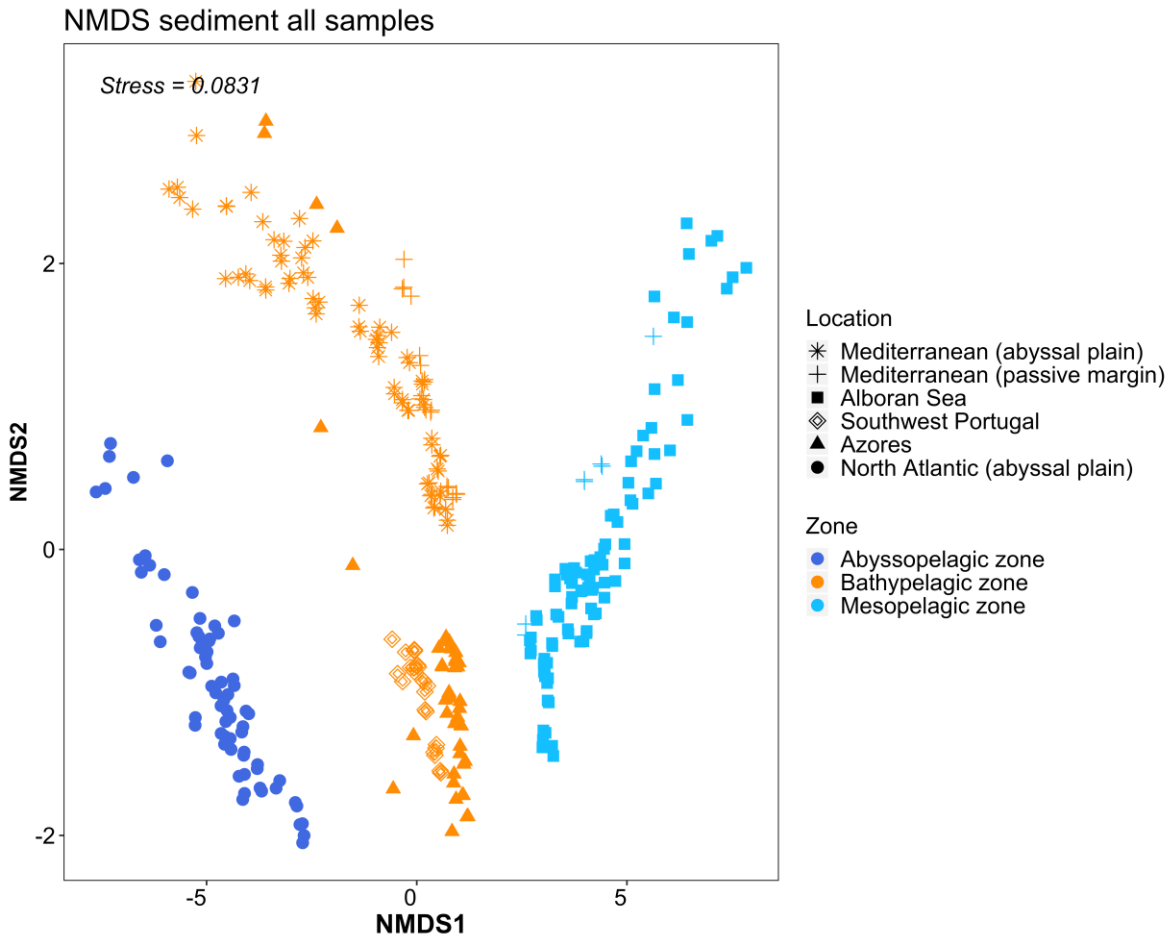
- No striking change in pattern at this scale

Prokaryotic communities: comparison of benthic communities



- Separation between Mediterranean and Atlantic communities
- Clear segregation according to depth layer in sediment

Prokaryotic communities: comparison of benthic communities



- Clear segregation by depth region

Perspectives

➢ Metazoans

- Benthic communities in the Mediterranean-Atlantic transition zone
- Coupling between pelagic and benthic communities?

➢ Prokaryotes

- Archaeal data
- Oligotyping : high resolution taxonomic analysis of most abundant members of the communities

Thank you for listening!

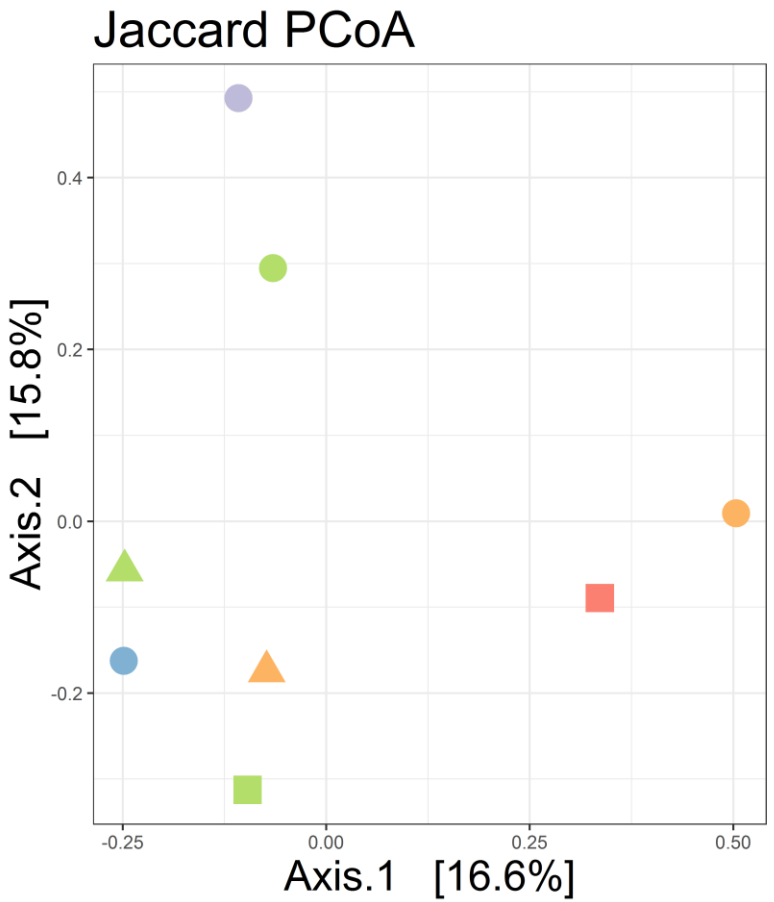
Acknowledgements

- Pourquoi Pas les Abysses? Team & Ifremer Bioinformatics group
- Ifremer
- Génoscope (Julie Poulain and Patrick Wincker)
- Researchers and crew of the MEDWAVES cruise (ATLAS H2020 project)

Beta diversity: PCoA on Jaccard distances

- Significant effect of water mass on community structure
- Strong segregation surface vs deep
- MOW always intermediate, but strong variations with location

• 18S-V1



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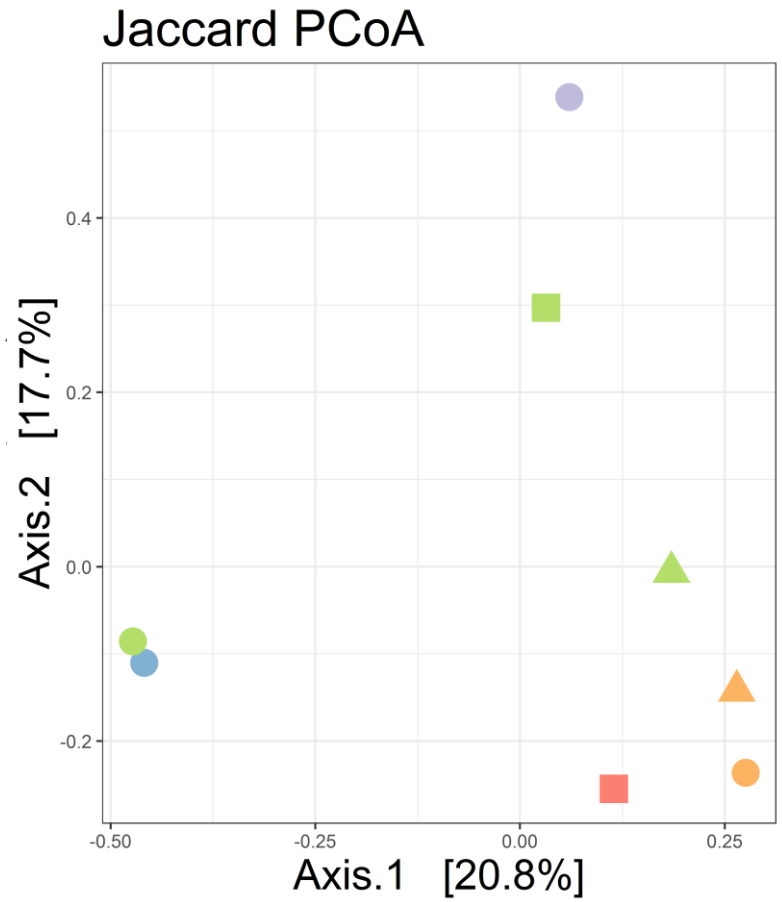
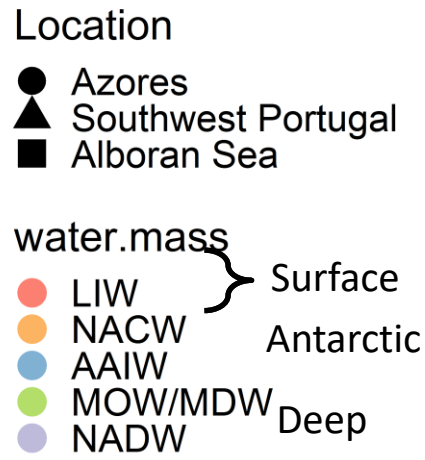
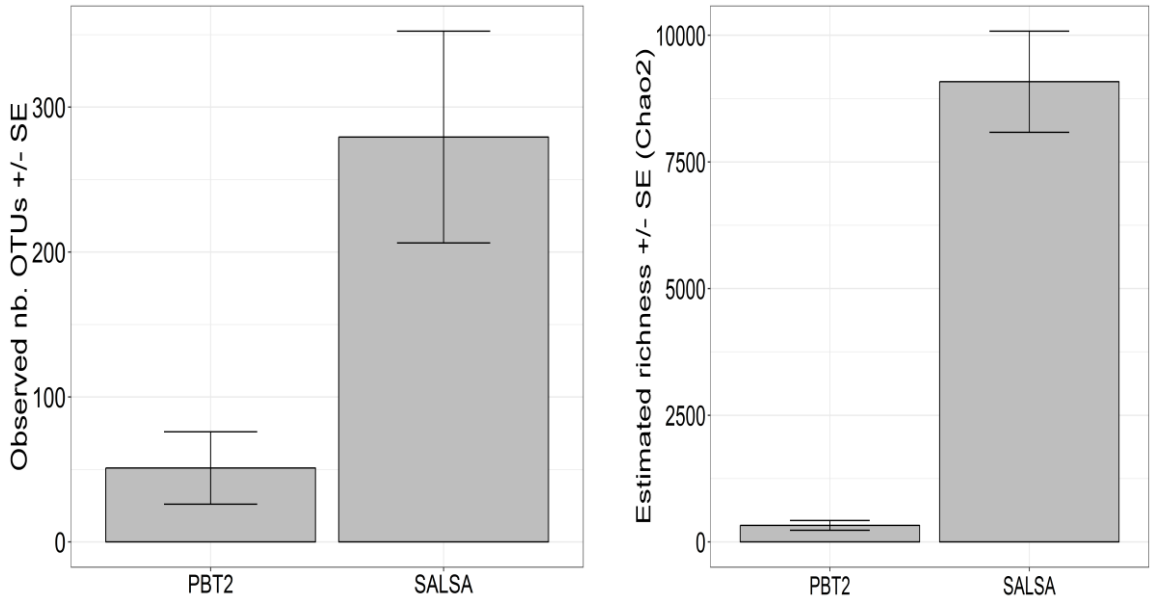




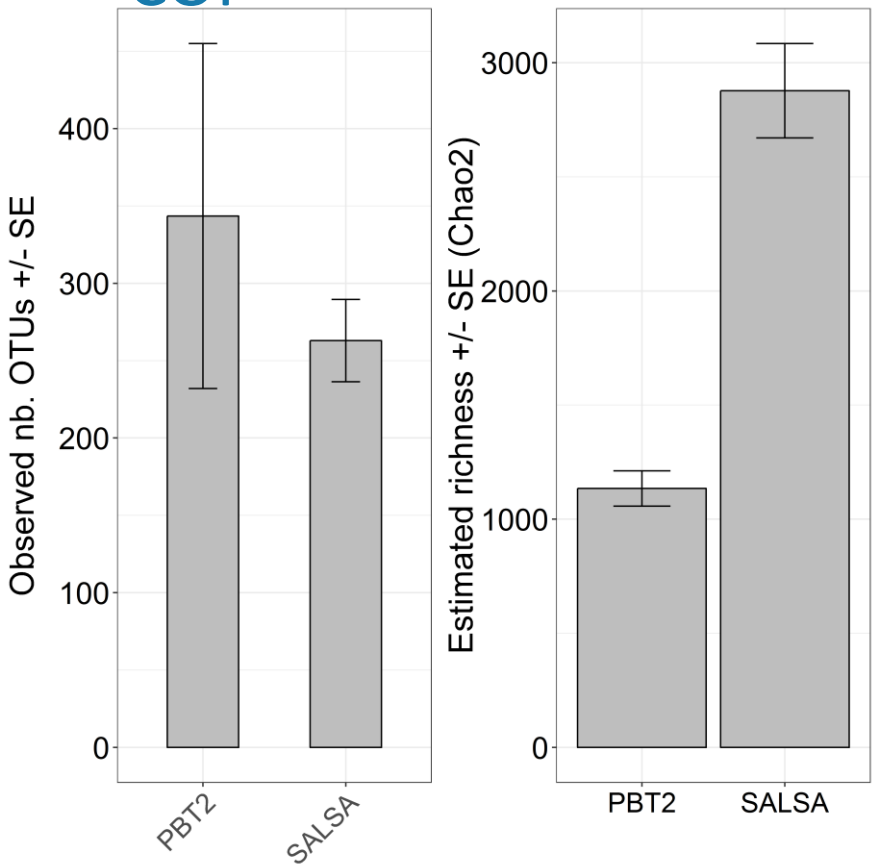
Water pilot study: sampling methods in EssNaut

- 18S-V1



- 12 phyla detected in PBT2, 21 phyla in SALSA
- Similar taxonomic composition for main phyla

- COI



- 12 phyla detected in PBT2, 13 phyla in SALSA
- Similar taxonomic composition