atlas

UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

Application of the Aquatic Eddy Co-variance on complex cold-water benthic habitats

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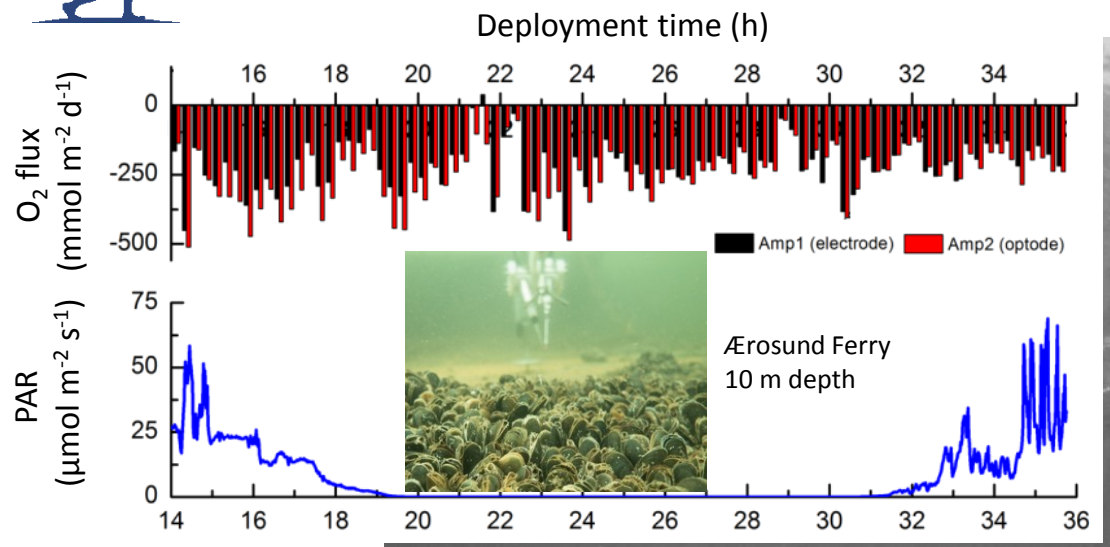
USD activities within ATLAS

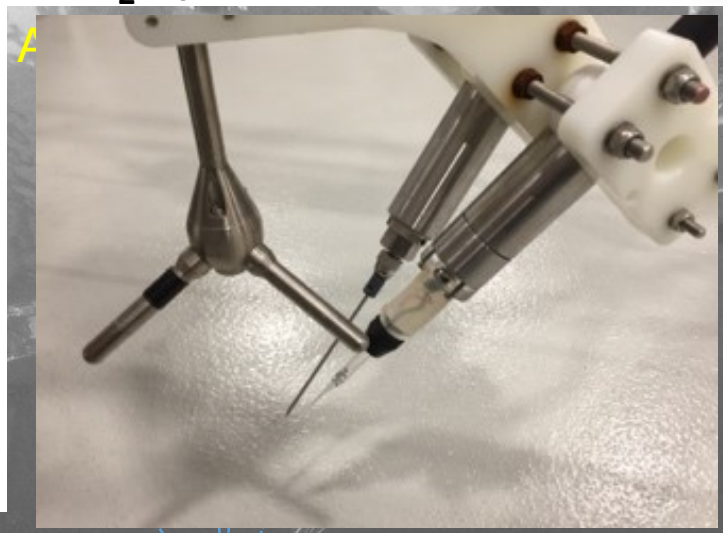
AEC upgrading & fine-tuning	Targeted field testing
Robustness & handling • Inclusion of O_2 optode sensors Setup optimization • e.g., for week-month long deployments Technique advancements • Elevator unit for in situ manipulation of the measurement area	Structurally-complex benthic communities • shallow cold-water mixed communities Epifauna-dominated hard substrates *(Doumer Island, Antarctic Peninsula)* • Complex coastal habitats e.g., blue mussel beds *(Tvärminne, Finland)* artificial reef *(Ærosund ferry, Denmark)*

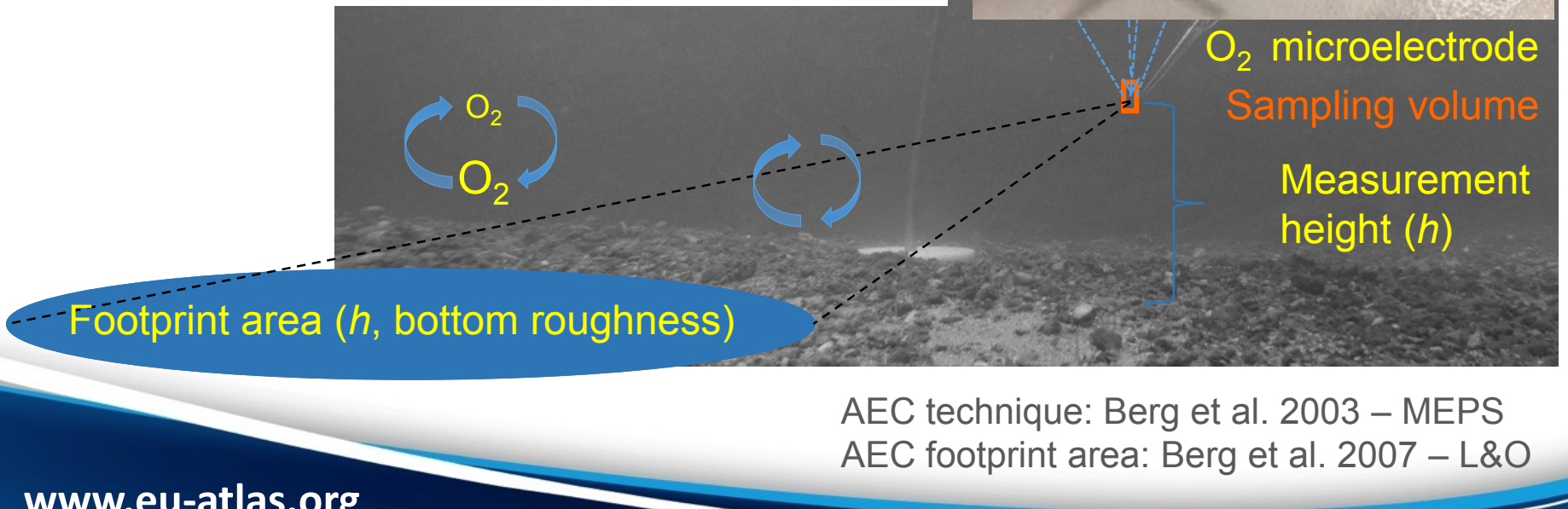
WP2 case study sites activities	
completed	planned
2017 – R/V Pelagia cruise **Rockall Bank** (Haas & Oreo mound)	2018 – Azores campaign **Condor seamount**

AEC technique



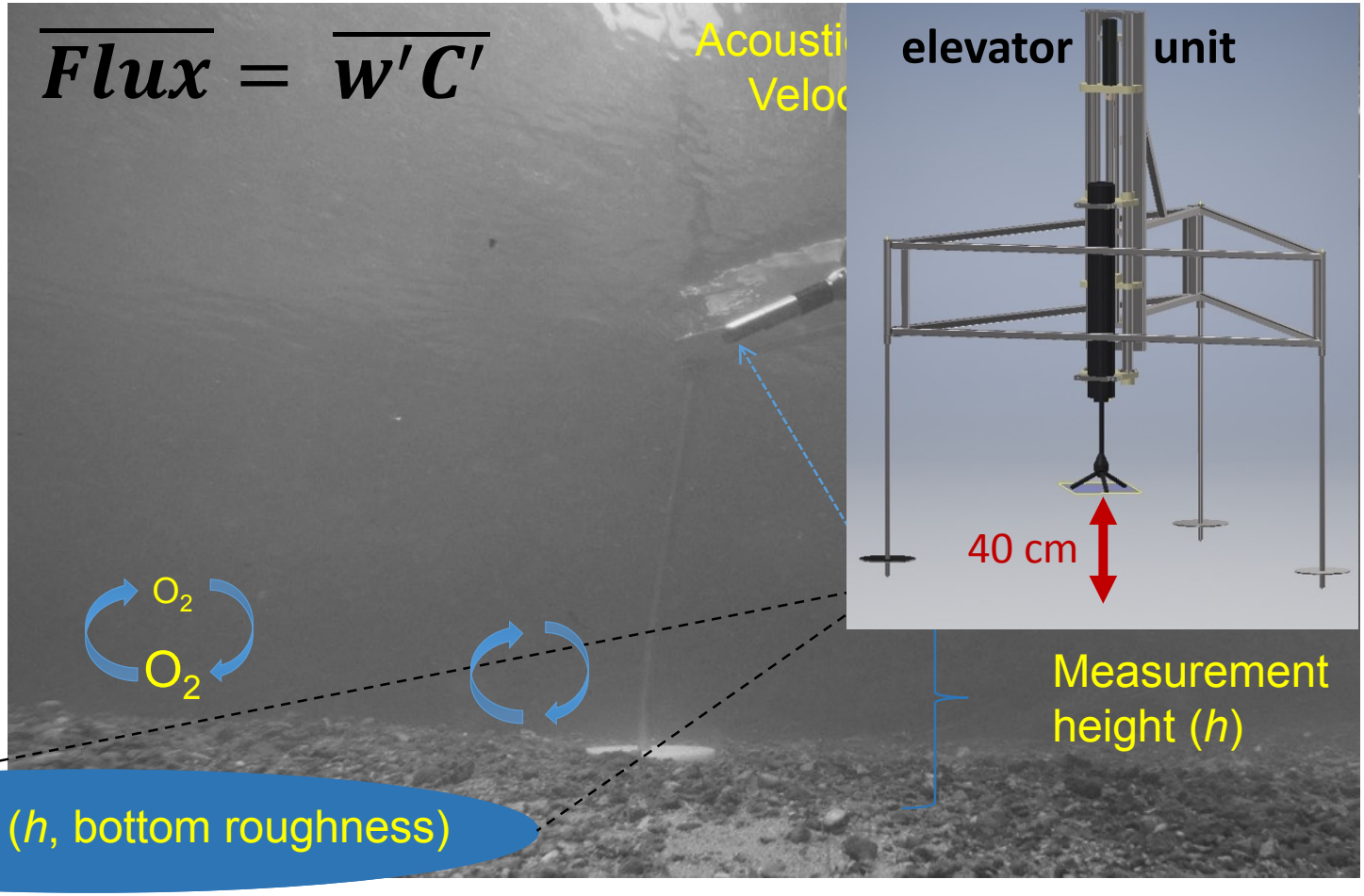
O_2 optode sensor addition





AEC technique: Berg et al. 2003 – MEPS
AEC footprint area: Berg et al. 2007 – L&O

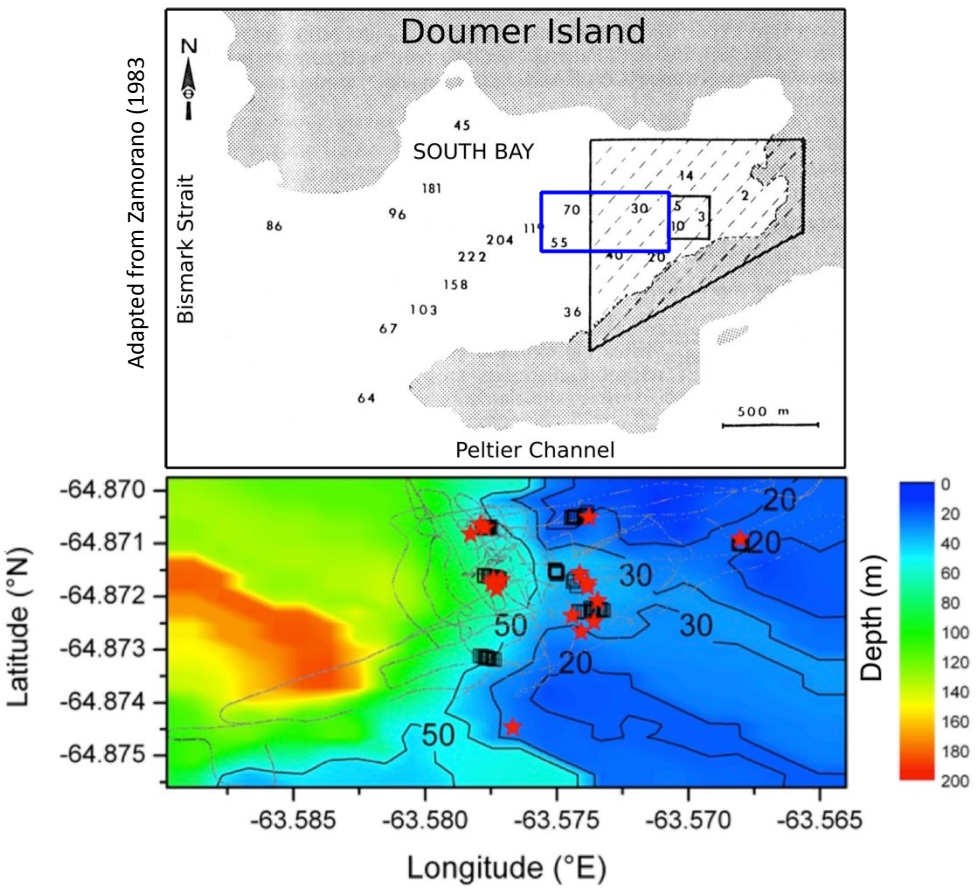
AEC technique

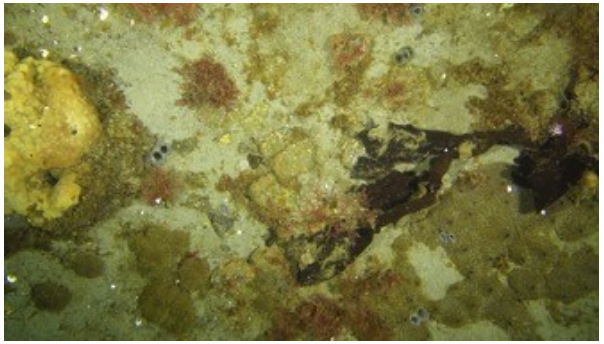


AEC technique: Berg et al. 2003 – MEPS
AEC footprint area: Berg et al. 2007 – L&O

Doumer Island (WAP)

Assessment and characterization of benthic metabolism of complex epifauna-dominated communities on hard substrates





35 m

62 m

- **Bathymetric mapping** of Zamorano (1983)
- □ **Benthic imaging & Biodiversity surveys**
- ★ Quantify benthic metabolism with **Aquatic Eddy Co-variance**

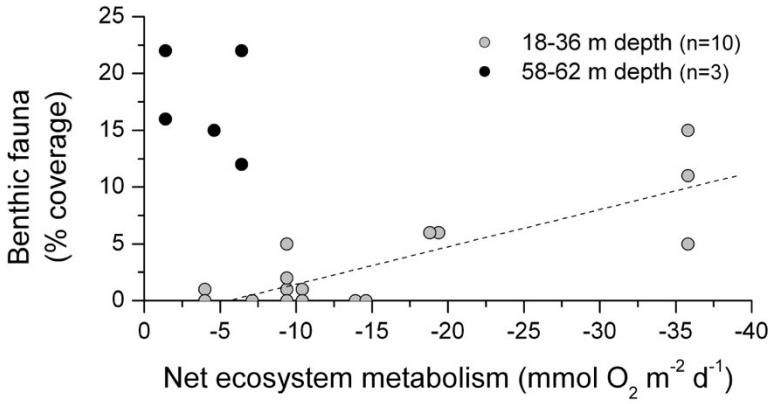
Doumer Island (WAP)

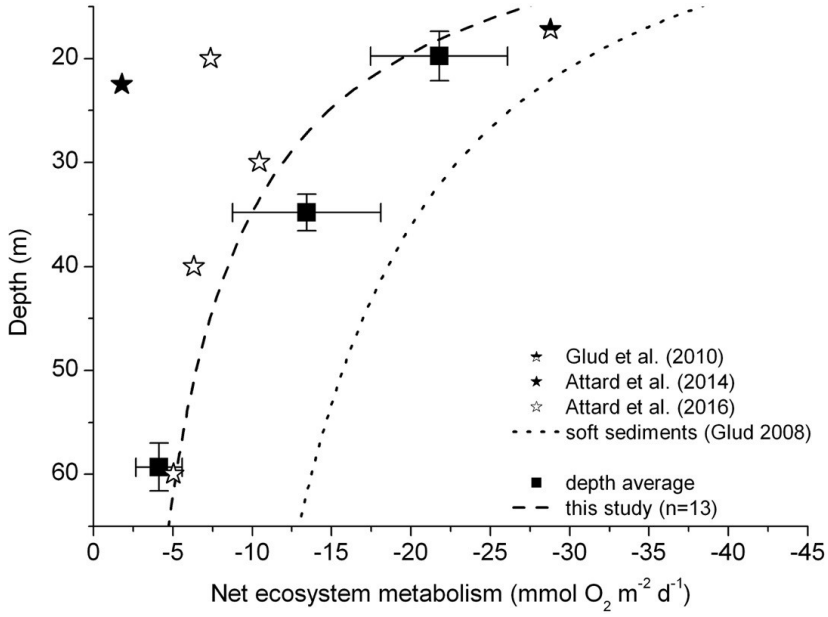
13 AEC sites (545 h of measurements) | 10 imaging transects (total 80 images)

- Assessment of benthic metabolism for WAP communities on hard substrates

→ Validation of the AEC approach

- Habitat biodiversity
  (bathymetry, light availability, ice scouring)



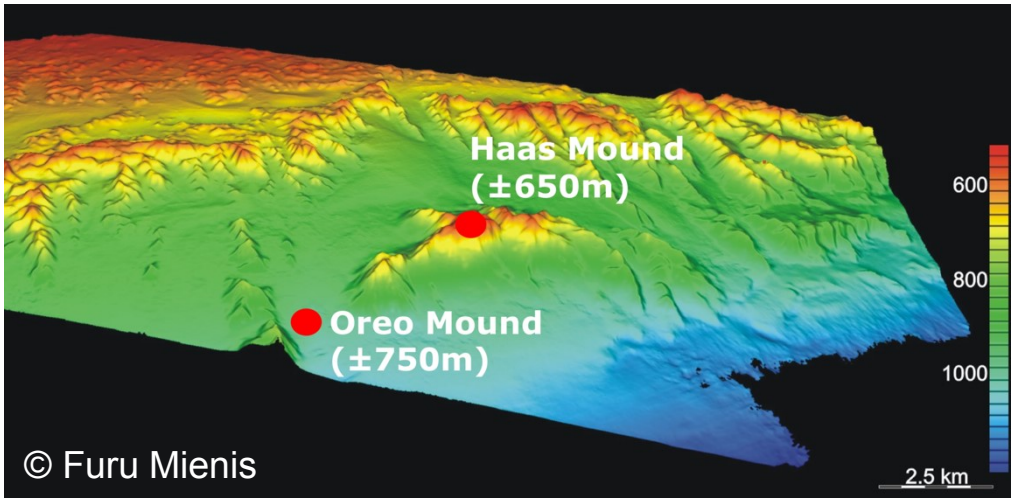


Rovelli et al. (in progr.)

NEM = NEP – |ER|

Functional upscaling of C turnover will require a more complex statistical approach than traditional parametrizations

WP2 case study site Rockall Bank



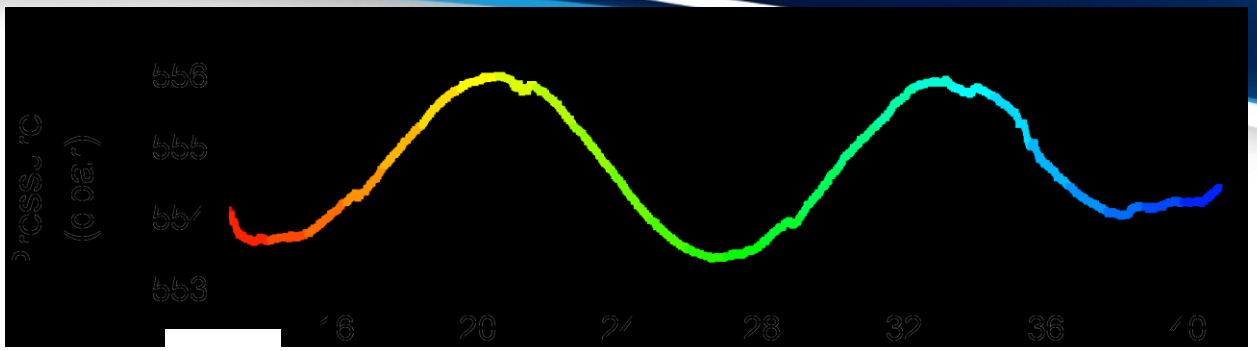
NIOZ ALBEX Lander

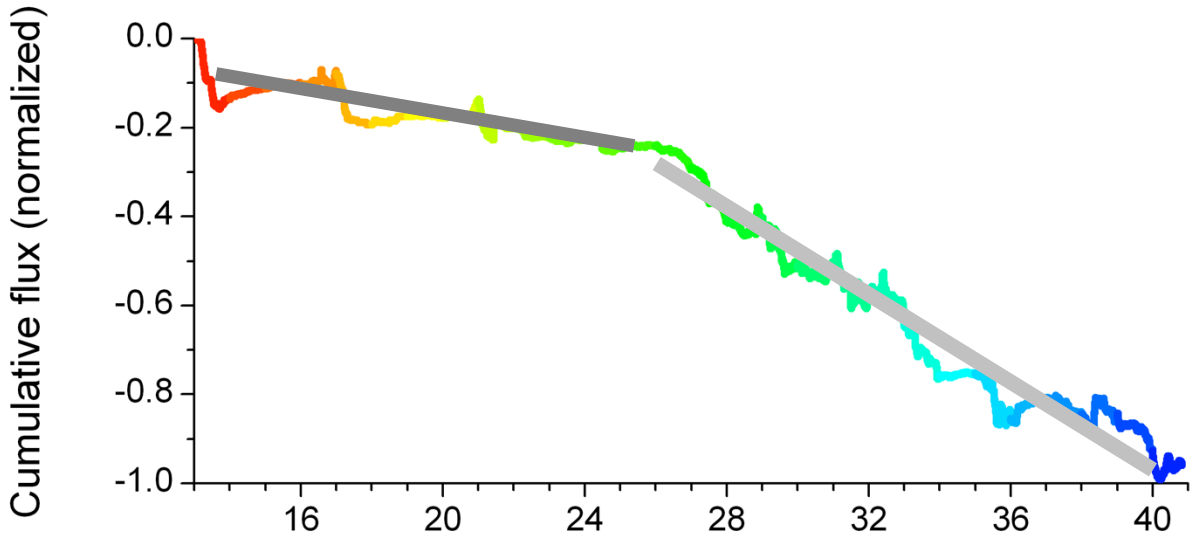
Lander-based AEC deployments during the R/V Pelagia 420 cruise (2017)

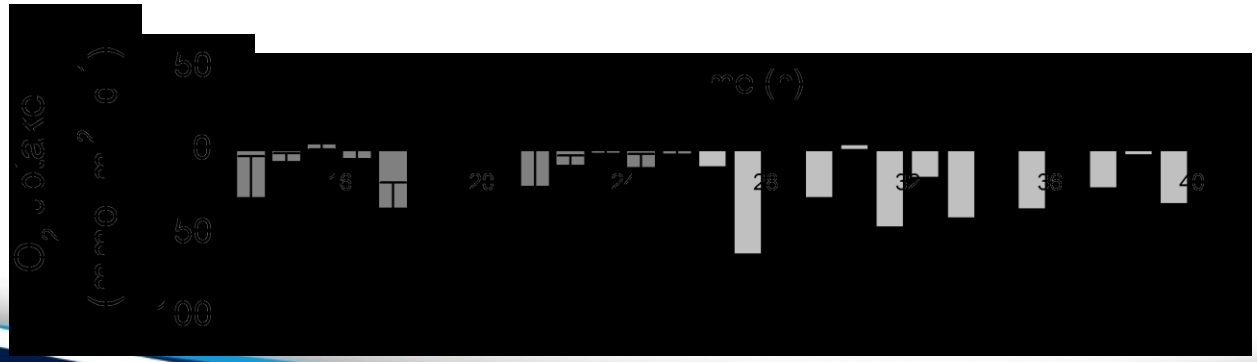
Quantify O_2 uptake by dominant mound CWC communities

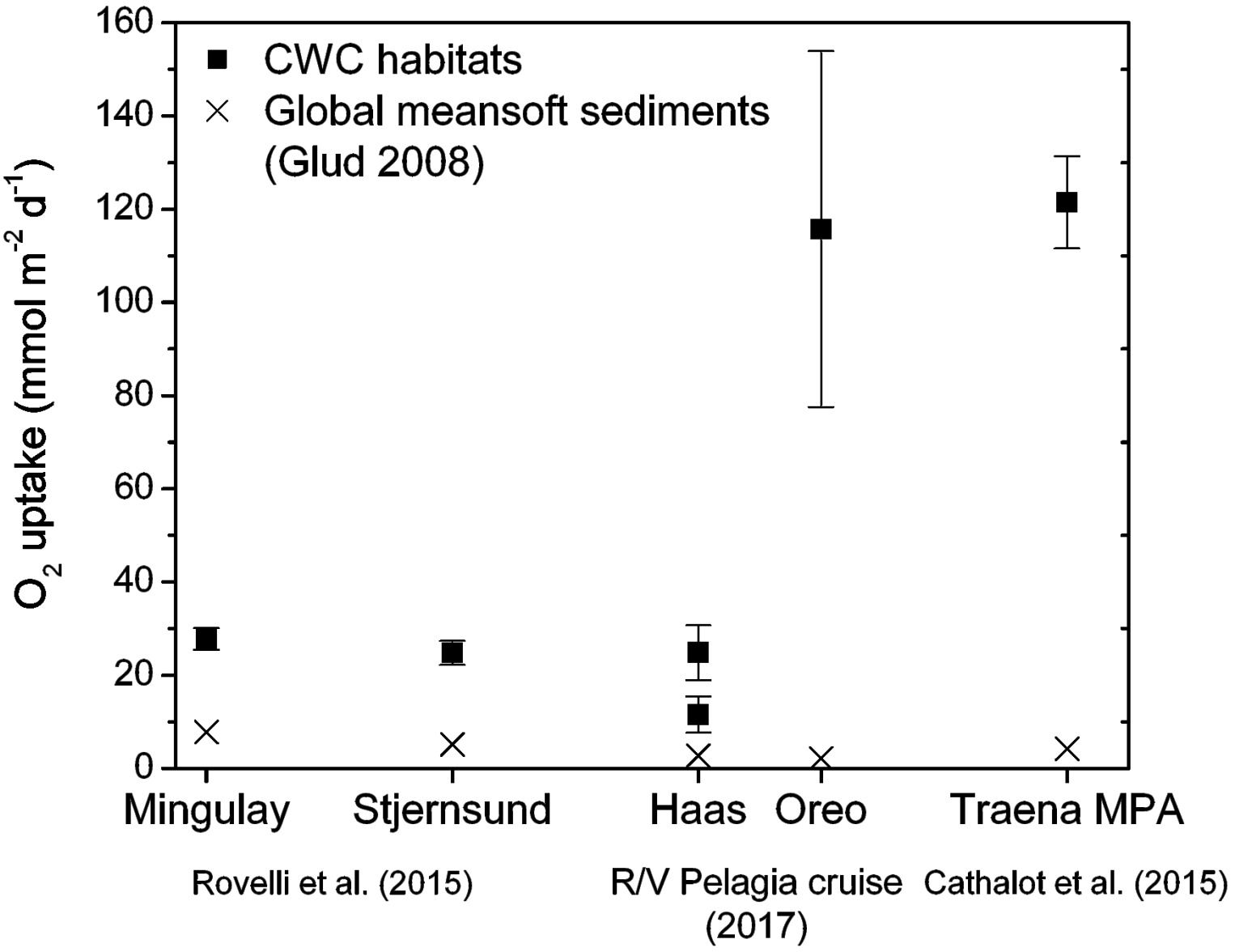
Coral rubble habitats	Live CWC habitats	Reference site
Haas Mound summit	Haas Mound flank Oreo Mound summit	Bank

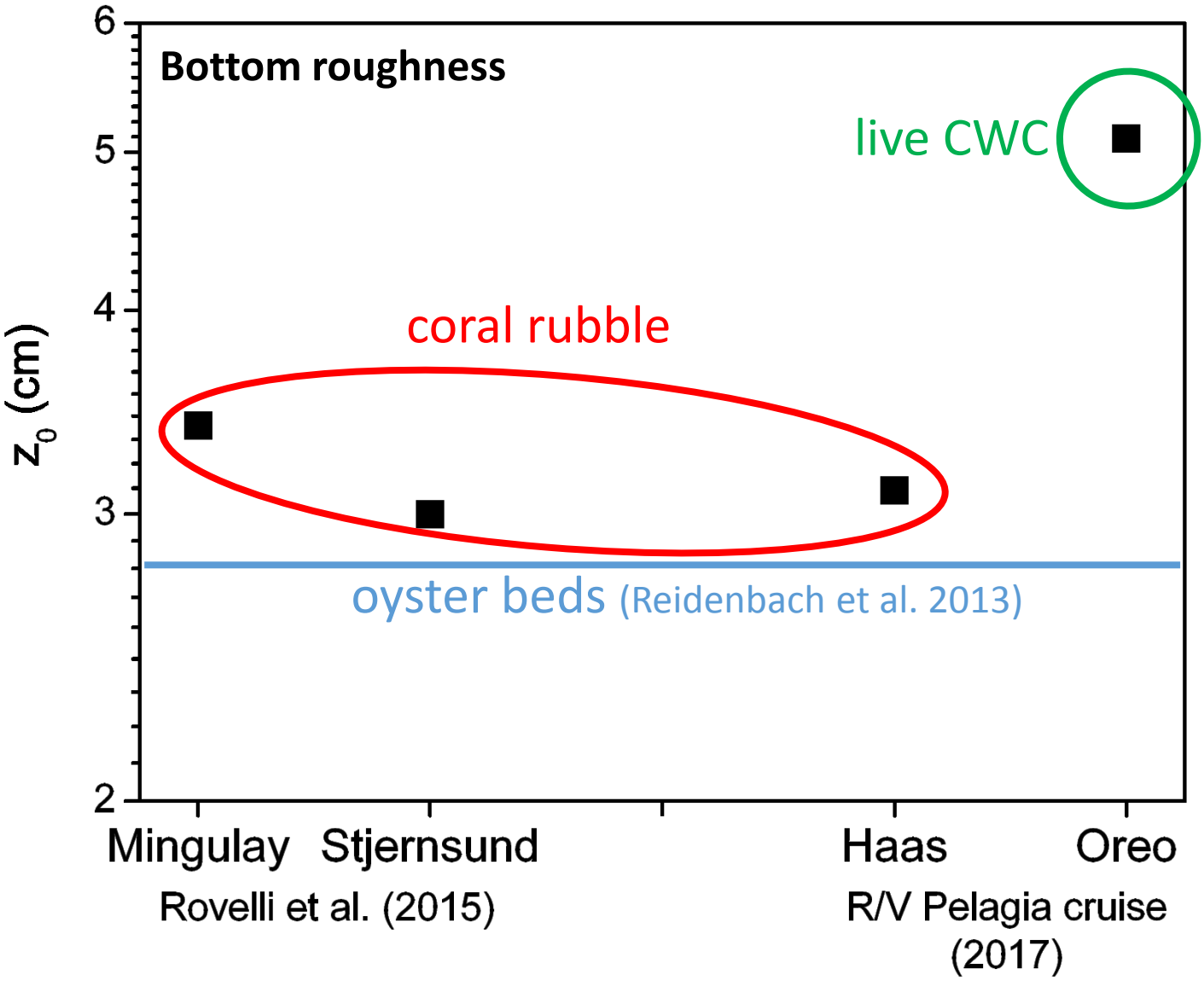
Haas Mound (536 m)








CWC habitats
Global meansoft sediments (Glud 2008)
O2 uptake (mmol m-2 d-1)
0
20
40
60
80
100
120
140
160
Mingulay
Stjernsund
Haas
Oreo
Traena MPA
Rovelli et al. (2015)
R/V Pelagia cruise (2017)
Cathalot et al. (2015)


Bottom roughness
live CWC
coral rubble
oyster beds (Reidenbach et al. 2013)
z_0 (cm)
6
5
4
3
2
Mingulay
Stjernsund
Haas
Oreo
Rovelli et al. (2015)
R/V Pelagia cruise (2017)

Rockall Bank - Summary

✓ O_2 uptake the two CWC communities at the summit of two different mounds (tot. 40 h of AEC measurements)

✗ Assessment of community metabolism variability along the mounds

Summit heterogeneity community, flank live CWC habitats, replicates

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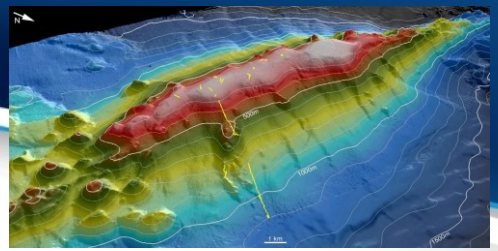
- Increased confidence on the typical magnitude of carbon turnover by CWC communities
- Reference key bottom roughness parameters (e.g. z_0) for the AEC footprint assessments

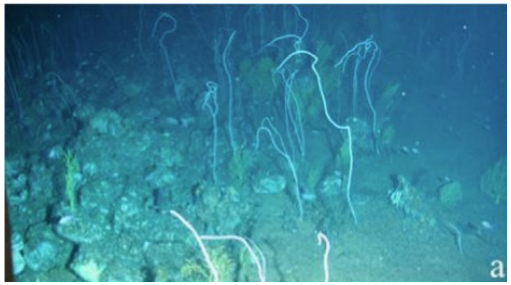
→ upcoming USD and WP2 effort in the Azores (Condor Seamount)

Condor Seamount (Azores)



Investigate O_2 short-term dynamics and quantify O_2 uptake rates by benthic communities from distinct habitats on the Condor seamount summit.

→ Tethered deployments (U-mooring) measurements

Hard substrate CWC habitat	transitional habitat	Unconsolidated sediment
		
6 x 24h & 2x 3day measurements		2x 24h measurements REF

Images from Porteiro et al. (2013)

→ Detailed insight on the carbon turnover at the seamount summit
→ Quantification of drivers responsible for the transport/supply of organic C

Thank You!

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