Seagrasses actively modify their below-ground geochemical microenvironment: a microsensor study of Zostera muelleri

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Background

- Seagrass meadows constitute globally important marine ecosystems; supporting high marine biodiversity and protecting coastal areas from erosion.
- Over the past century, the worldwide extent of seagrass meadows have declined with an alarming rate, and in order to better manage these vital marine habitats for long-term preservation, new insight into the possible geochemical mechanisms behind these drawbacks is crucial.

![Seagrass diagram](image)

Results: Chemical microenvironment

- Oxid microshield & local pH enhancement provide protection against sediment-produced reduced phytoxins, such as H₂S.
- During water-column hypoxia, the oxid microzone around the meristematic tissue was significantly reduced, resulting in high levels of H₂S reaching the tissue surface and a concomitant decrease in the plants overall viability.

![Microsensor diagram](image)

Materials & Methods

- Electrochemical microsensors and planar optodes were used in combination with a custom-made split flow-chamber with artificial, transparent sediment, to investigate the below-ground chemical microenvironment of Zostera muelleri asp. capricorni under changing environmental conditions.

![Microsensor setup diagram](image)

Aim & Hypothesis

- Can seagrasses actively alter their below-ground geochemical microenvironment through the release of chemical compounds?

Materials & Methods

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2D O₂ microdistribution

- Actively growing roots leak O₂ from around the apical root meristem, thereby oxidizing the surrounding below-ground microenvironment, as they grow through the reduced sediments.

![O₂ microdistribution image](image)

Conclusion: Chemical defence mechanism revealed

- Seagrasses actively alter their below-ground geochemical microenvironment through the release of chemical compounds, such as O₂, and thereby accommodate their own growth.

![Seagrass diagram](image)

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