

Effects of saltwater intrusion into freshwater rewetted coastal fen on methane cycling microbial community



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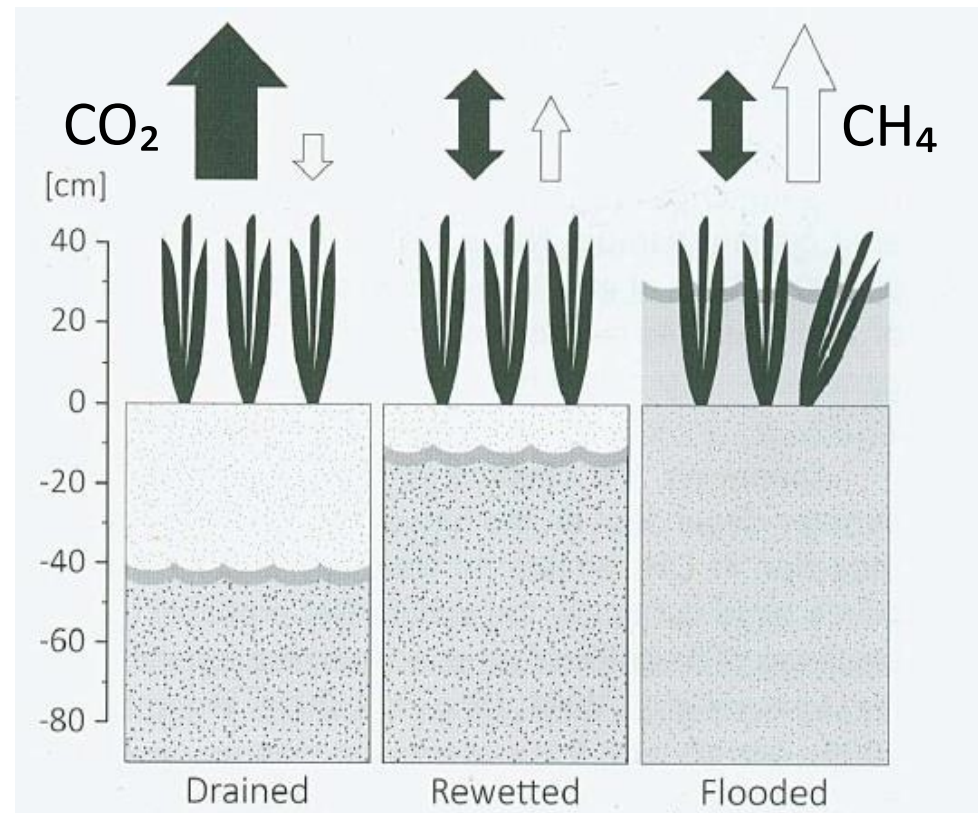


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Rewetting? Of course ! But where to start?

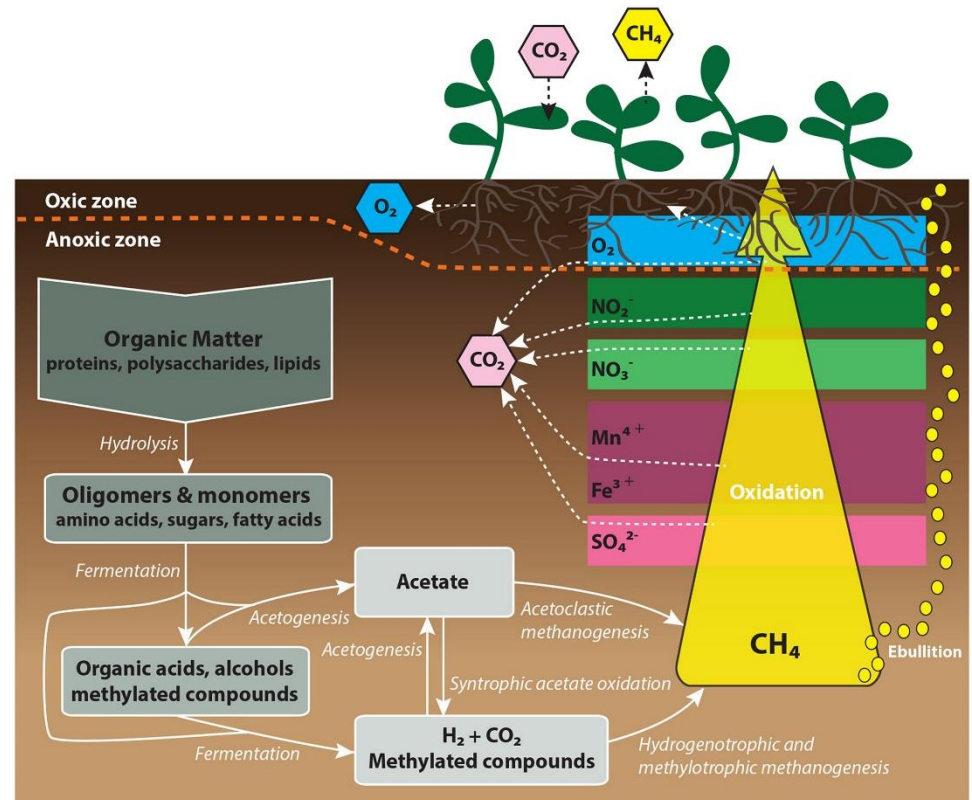
- Rewetting with freshwater often leads to high CH₄ emissions
- Sulfate-containing marine water could be used for coastal peatland rewetting



Jurasinski et al. 2016. Schweizerbart
Science Publishers

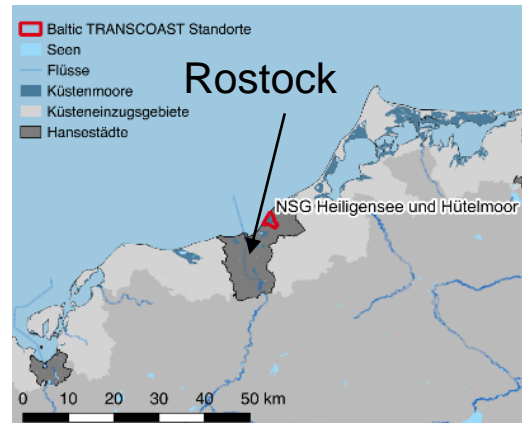
Sulfate-containing sea-water for coastal peatland rewetting

- Sulfate-reduction yields more energy compared to methanogenesis
- Competition for substrate between microorganisms
- Reduction of methane production and emissions?
- Colonialisation of anaerobic methane oxidizing archaea?



Dean et al. 2018. Reviews of Geophysics

Long-term observations in Hütelmoor

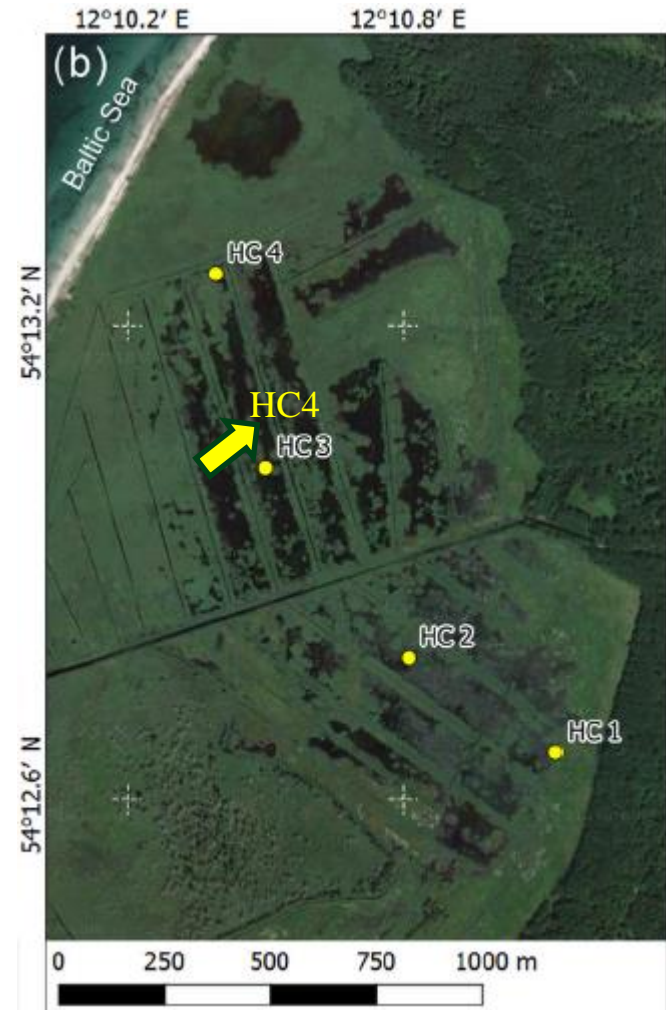


- Freshwater rewetted coastal fen showed sulfate is accumulated in deeper peat layers (Koebsch et al. 2019. Biogeosciences Discuss.)
- Spatial separation of methanogenesis and sulfate reduction leads to high CH₄ emissions (Jurasinski et al. 2018. Frontiers in Marine Science)
- Methanogenes show high and methanotrophs show low relative abundance (about 100x) (Wen et al. 2018. Biogeosciences)
- During drought in summer 2018 aerobic methanotrophic bacteria increased, but methanogenes did not decrease (Unger et al. in press)

Brackish-water intrusion 2019 into Hütelmoor

- Soil cores at 4 locations along salinity gradient
- Local gas fluxes using closed-chamber method
- Eddy-covariance fluxes on ecosystem level were measured continuously

Graphic adjusted from Wen et al. 2018



Picture by Cordula Gutekunst

Brackish-water intrusion 2019 into Hütelmoor

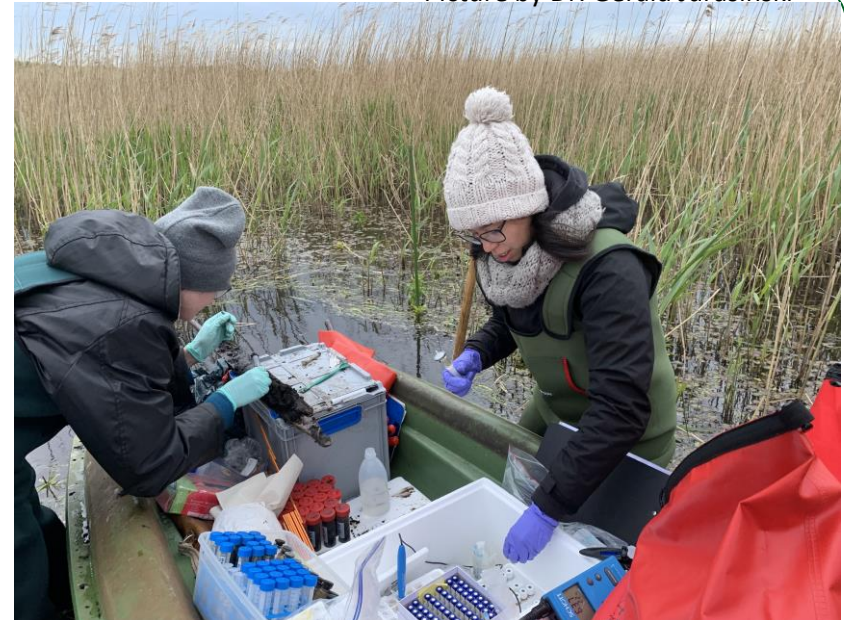
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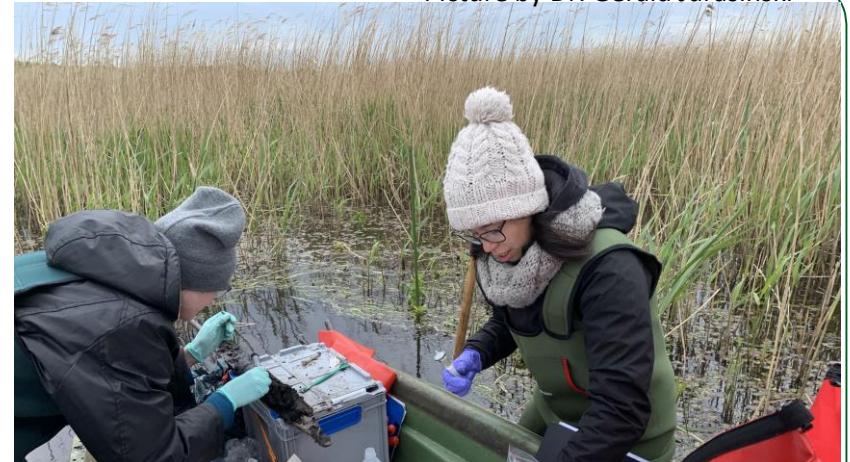
Picture by Dr. Gerald Jurasinski



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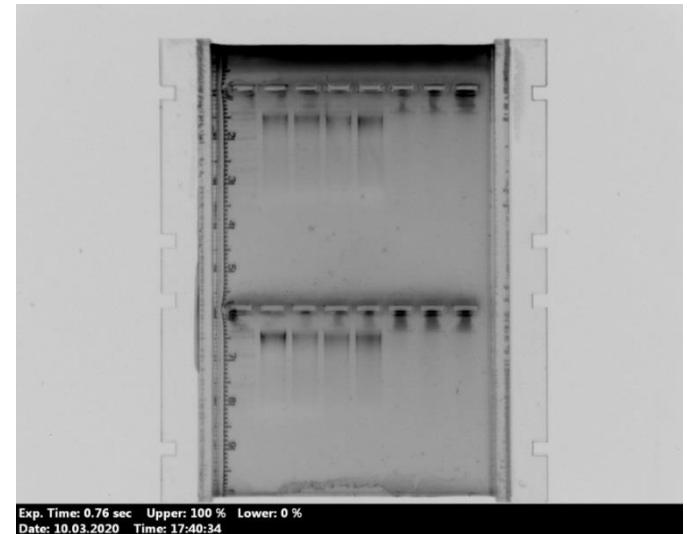
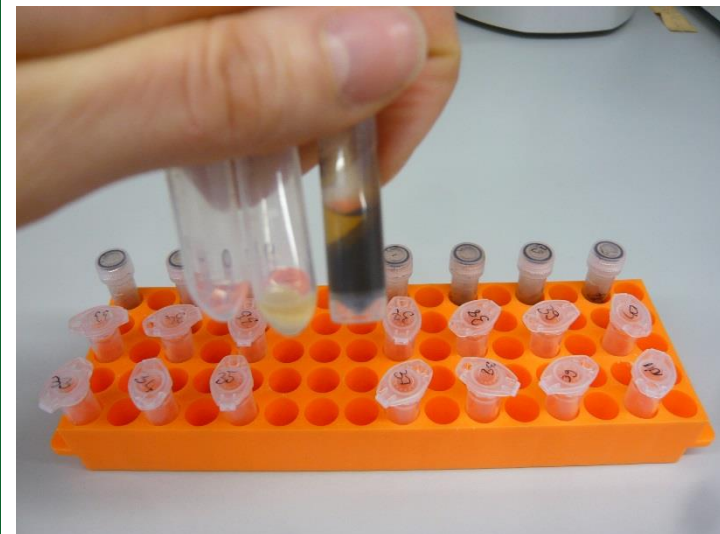
Picture by Dr. Gerald Jurasinski



Laboratory analysis: Sequencing and qPCR

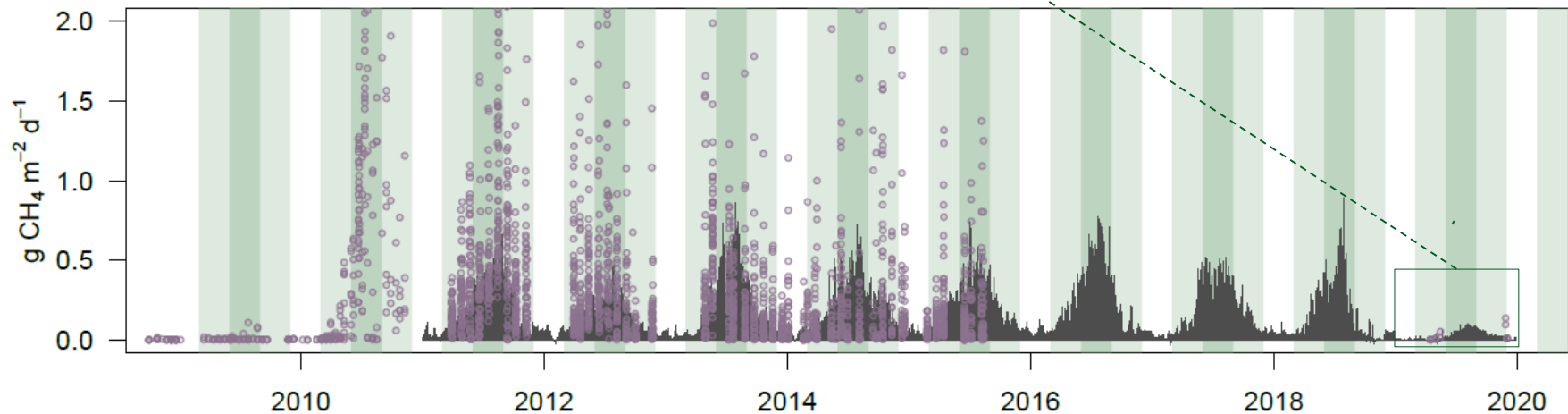
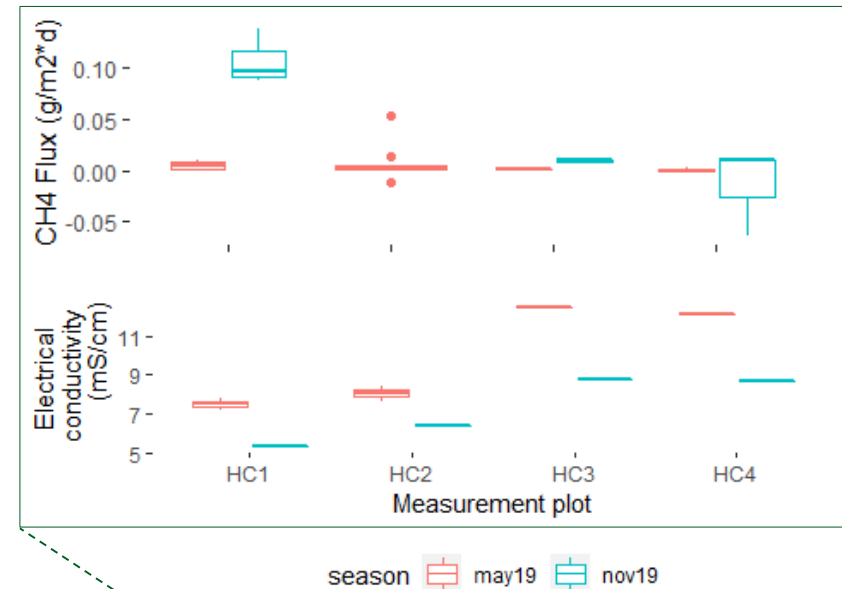
- High-throughput sequencing and quantitative polymerase chain reaction of DNA and cDNA
- Total and active target genes (*16S rRNA*, *mcrA*, *pmoA*, *dsrB*) of bacteria and archaea

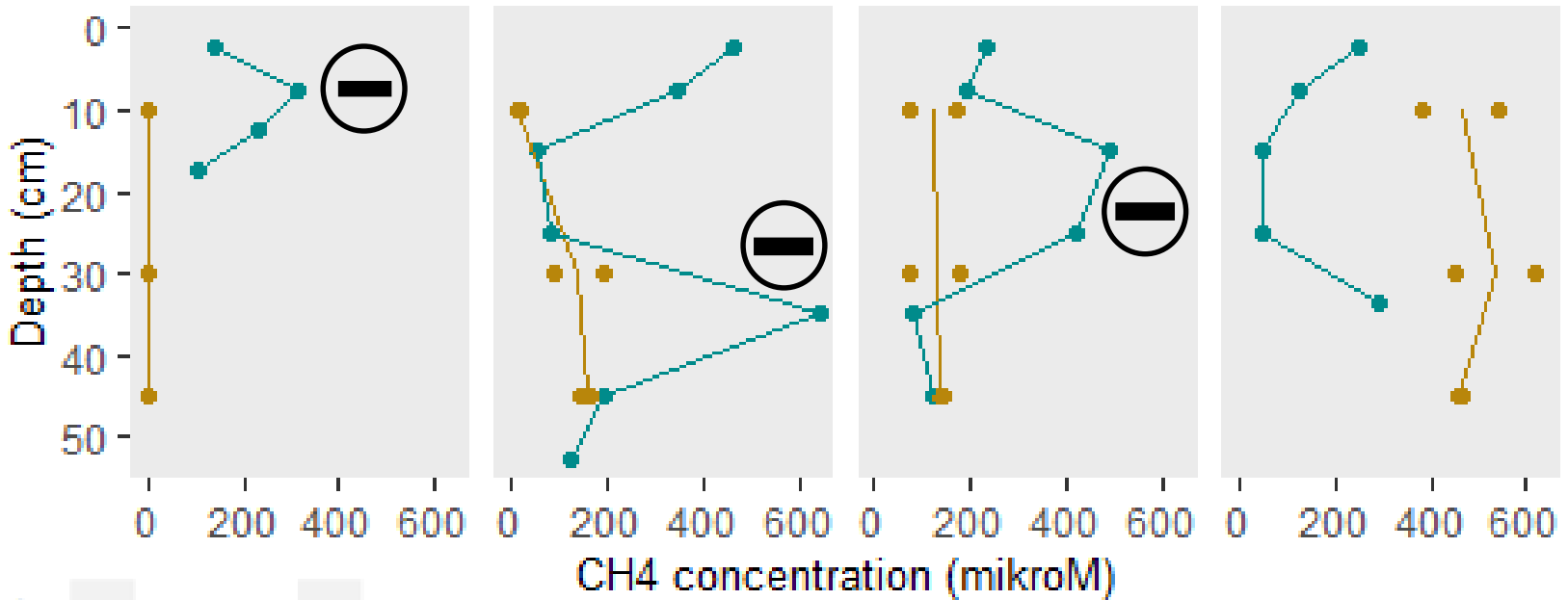
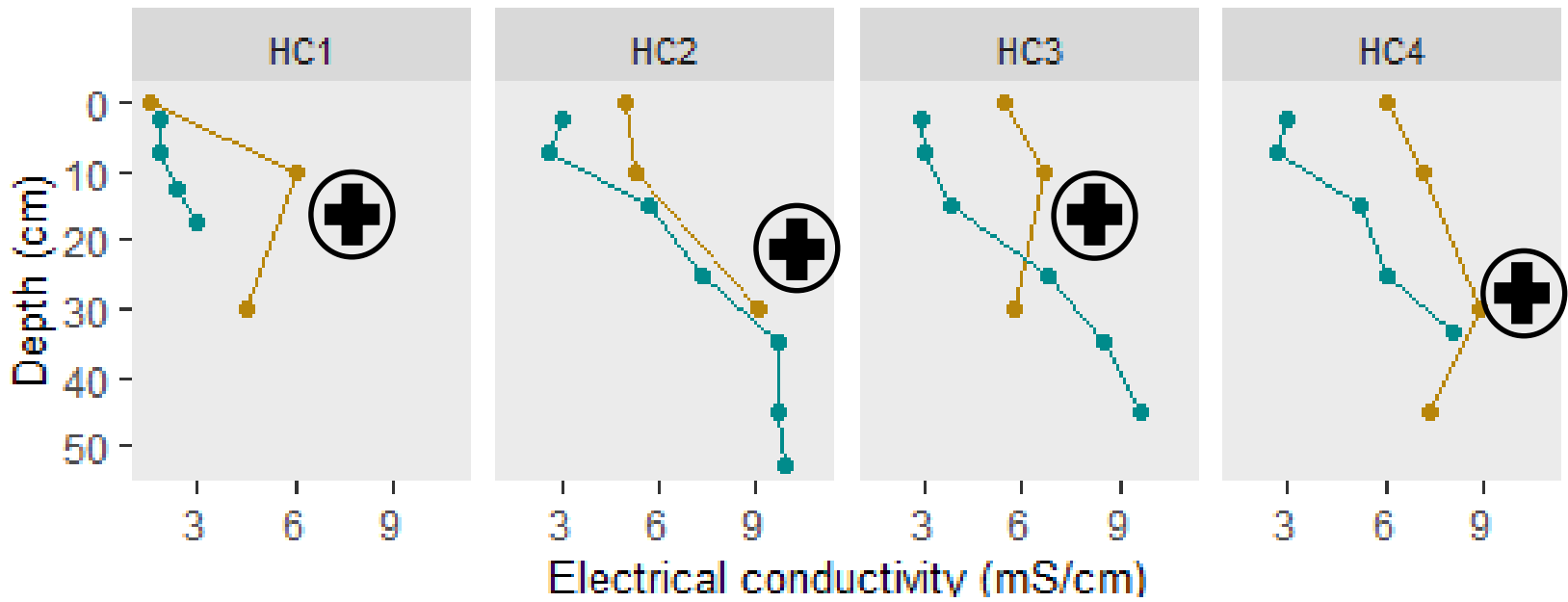
Pictures by Cordula Gutekunst



Gas fluxes and surface water

- Methane fluxes decreased in 2019 after the brackish-water intrusion
- Not clear, whether legacy effect of drought 2018 is main cause



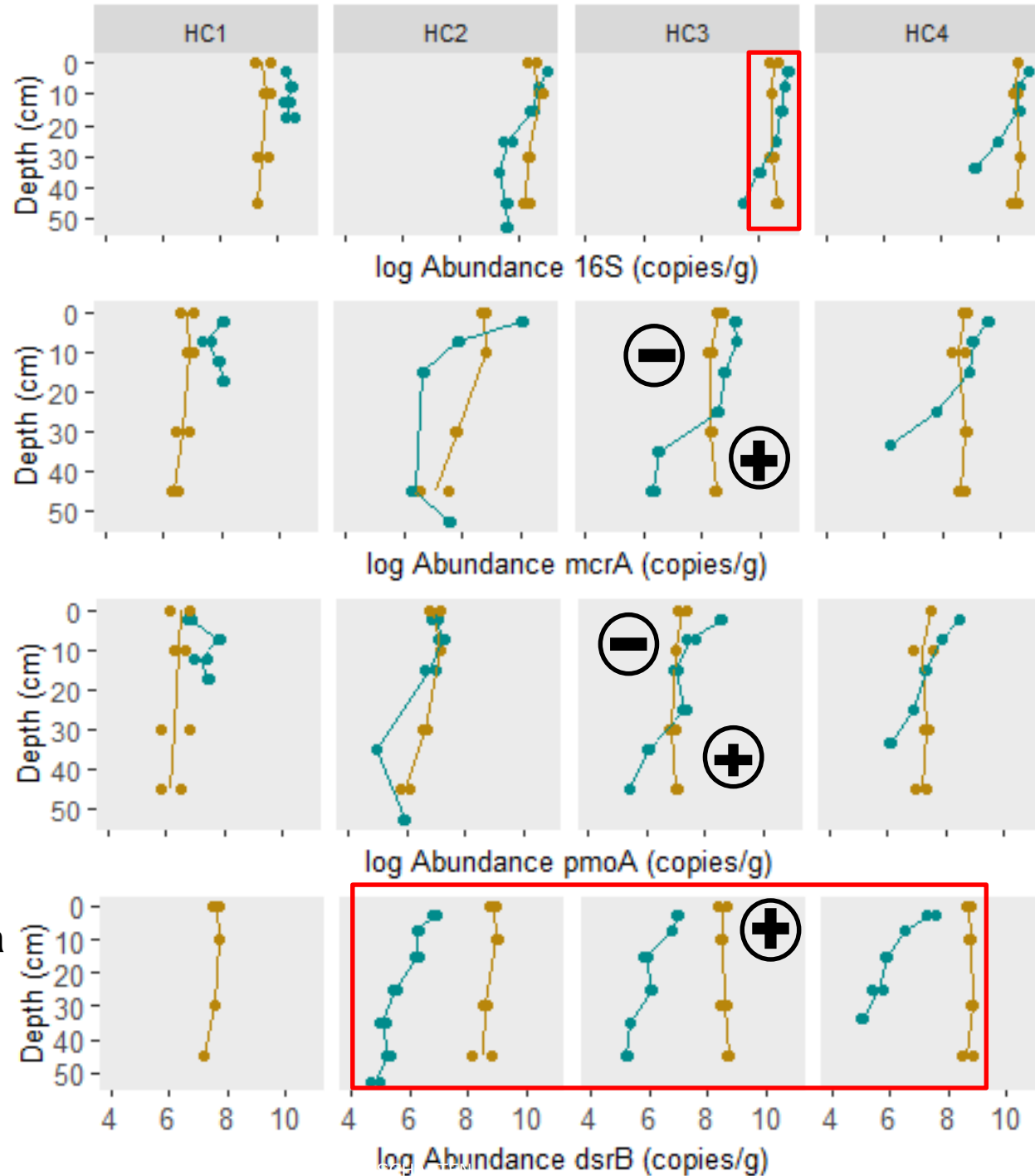


Date oct2014 nov2019

Microbial abundances

- Homogeneity throughout depth profiles increased
- Methanogens only decreased in deeper peat layers
- Sulfate-reducing bacteria increased clearly

Date  oct2014  nov2019



Thank you
for your
attention!



References

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