Dynamics of DOM and its influence on CO_2 and CH_4 production potentials in a northern peatland.

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Peatlands are sinks for CO_2 and source of CH_4 and store approximately 455 Gt of carbon equivalent to 1/3 of the global soil organic carbon. Carbon accumulates due to the saturated conditions, which slow the decompositoin rate. Dissolved organic matter plays a key role in the decomposition process since only a fraction of this is available for microbial utilisation. The fermentation of complex polysaccharides provides the substrate available for the metabolic pathway of most organisms. In anaerobic environments fermentors are the sole organisms that can hydrolise and utilise polymers and promote their breakdown into low molecular weight compounds. Extracellular enzymatic hydrolysis is often the rate limiting step. Water soluble carbohydrates are the most available substrate for microbial utilisation but are often overlooked in current studies.

Our study has shown that water soluble carbohydrates can play a potential role in the production of CO_2 and CH_4 in peatlands systems. Temperature has also been postulated to play a large role in controlling the balance between production and consumption of these substrates. The dynamics of both water soluble carbohydrates and DOM release are tightly coupled. The release dynamics may provide the link explaining the decoupling between DOM production following water table fluctuation events. Further, our results of incubation amendments have shown that the substrate limitation imposed on the production of CO_2 and CH_4 is spatially highly variable across a peatland gradient and that each of these settings is limited at different stages of decomposition.

Ecology and shell chemistry: a whole-fauna stable isotope study of Eemian sapropel S5

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Results are presented for a case study on planktonic foraminiferal (palaeo-)habitat preferences during the deposition of Eemian Mediterranean sapropel S5 (project with Sprovieri. M, Cane, T., Casford, J., Cooke, S., Hayes, A., Bouloubassi, I., Emeis, K., Jorissen, F., Schiebel, R. and Kroon, D.). Today, the study area is oligotrophic with well-ventilated deep water, in stark contrast with conditions during the formation of S5. We obtained very-high resolution (0.5 cm) foraminiferal abundance distributions, planktonic foraminiferal stable isotope ratios on all relatively continuous species, and Uk'37 SST values through S5 in NW Ionian core KS205, comparing results with similar data from ODP Holes 971A and 967C. The data are used to assess the interaction between hydrographic developments and foraminiferal habitats during S5. Affinity of the various species is considered to five potential water masses: (1) intermediate water; (2) winter mixed layer; (3) summer subthermocline (Ssth); (4) summer mixed layer; (5) fresh-water diluted toplayer/lenses. Reconstructions are validated with a _^{18}O box-model that represents a seasonal mixed-layer distinction within the model of Rohling (1999). Excellent agreement is found between model results and the analytical series. Below, we summarise our S5 palaeo-habitat conclusions for the species analysed, in comparison with their modern habitats. The presentation will also discuss palaeosalinity implications.

	Present-day Mediterranean Habitat (1)	Reconstructed S5 Habitat
G. ruber (white)	Upper 50 m (summer), to upper 100 m (winter)	Summer ml + lenses
G. ruber (pink)	Very shallow (~20 m), peaks above summer thermocline	Spring ?
G. sacculifer	Together with trilobus types	Summer ml
G. sacc (tril.)	Summer ml (20-50 m)	Summer ml
O. universa	Summer mixed layer	Summer ml
G. glutinata	Rare. Winter, to 200 m	Spring
G. bulloides	Winter and early spring	Spring
G.siphonifera	Winter ml, peak 100-200 m	Winter ml
N. pachyd. (dextral)	Year-round, 50-200 m; link with density gradients (2)	Ssth / Intermed.
G. scitula	Mesopelagic, at ~ 100 m	Ssth / Intermed
G. inflata	Winter. Annual at fronts (2)	Winter ml (3)

(1). Pujol and Vergnaud-Grazzini (1995); (2) see also Rohling et al. (1995); (3) Derived in ways similar to those described here from the post-glacial record in SE Aegean core LC21.

References

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