Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-373-RC2, 2019

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Better molecular preservation of organic matter in an oxic than in a sulphidic depositional environment: evidence from of *Thalassiphora pelagica* (Dinoflagellata, Eocene) cysts" *by* Gerard J. M. Versteegh et al.

Jakob Vinther (Referee)

jakob.vinther@bristol.ac.uk

Received and published: 15 December 2019

The authors identify that samples in euxinic conditions have undergone substantial kerogenisation, while samples in 'oxic' settings have not.

Their argument that the oxic conditions are better seems apparently good on these premises. I would like to stress, though, that I am not certain about the premise of good preservation and also what constitute oxic environments.

I have two key issues:

Printer-friendly version

Discussion paper

1. Kerogenisation is not necessarily bad organic preservation. This may be a way to quench many labile organic molecules into larger macromolecules. What they mean is that the cysts have been overprinted by kerogenisation. This is not bad organic preservation per se, but not good if you want to look at the original composition of a microfossil.

2. When the authors call the other deposit oxic I am not sure that this has been proven and in fact, I doubt it is fully oxic throughout. While it may be on the surface, almost all sediments switch to anoxic conditions quickly in the subsurface. Dinoflagellates are robust and survive initial oxic decay under almost any circumstances contrary to most other tissues. This is the reason why exceptional Konservat Lagrstättens are notoriously anoxic environments. But, this does not mean that oxic environments may not preserve extremely stable and recalcitrant biomolecules such as dinoflagellates and pollen as it will switch to anoxic conditions a few centimeters below the sediment-water interface.

In conclusion. I would like the authors to nuance in their abstract, title and throughout the distinction between kerogenisation and in situ polymerisation with respect to preservation without it. Finally, I don't think that the dichotomy between 'euxinic' and 'oxic' is true given that sediments quickly become anoxic soon after deposition and dinoflagellates would survive the initial oxic conditions that would have been existing in the subsurface.

Therefore, I would focus on the nature of kerogenisation and how this complicates investigation of original biosignatures endogenous to a microfossil. Describe and discuss kerogenisation and therefore how an investigation of tissues in euxinic settings need to evaluate degrees of kerogenisation before doing other chemical analyses, such as isotope composition or more superficial chemical analyses, such as FTIR, RAMAN, TOF SIMS or similar, as they would characterise a mixed bag of molecules. This, I think, would make for an interesting comparison and a study I would find useful.

Printer-friendly version

Discussion paper

Best wishes Jakob

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-373, 2019.

Printer-friendly version

Discussion paper