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***Interactive comment on* “The effect of meter-scale lateral oxygen gradients at the sediment-water interface on selected organic matter based alteration, productivity and temperature proxies” by K. A. Bogus et al.**

Anonymous Referee #2

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This paper describes a number of molecular proxies indicative of oxidation, export production and temperature as induced by differences in bottom water oxidation at sediment water interfaces in the Arabian Sea. Generally the MS is well-written, however, I have some comments that need some

The authors relate their results and changes in proxies mainly to differences in bottom water oxygen. In his review Cowie (2009, in Progress in Oceanography) states: “Sedimentary organic matter distributions across the Arabian Sea have served to fuel an ongoing debate over the controlling environmental factors. Recent studies have illustrated

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that factors including the supply of reactive organic matter, oxygen exposure, digestion and mixing by the benthos, sorptive preservation, and sediment dilution, winnowing and downslope transport, all interact in a complex fashion and with varied impact to determine distributions of sedimentary organic matter across the different margins of this basin.” Particularly the OMZ transect may suffer from other factors as well: the oxic sediment is far more off shore than the anoxic and suboxic ones. Although the terrestrial OM input may be small, the sediments near Pakistan may be influenced by different (possibly terrestrial) mineralogies. Oxic sediments exhibit deeper bioturbation and oxygen penetration. Although < 1 cm top sediments were used, bioturbated ones are mixtures of young and older material (several 100s of years), and therefore they experience much longer oxygen exposure times than less/no bioturbated anoxic sediments. Thus, how rapid are the changes observed and are they of similar periods of time? In other words, the authors should discuss other factors than oxygen as well.

How was the quantification of the 1,15-C30/C32-diols and -keto-ols conducted? They often co-elute, which fragment ions did the authors use? For the C30 compounds the situation is even more complex: also 1,13 and 1,14 diols and their keto-ols co-elute with the 1,15 members, of which the keto-ols are difficult to distinguish from each other and have typical ions 326 (1,15-keto-ol), 327 (1,14-diol), 328 (1,15-keto-ol) that interfere each other through their isotopic mass fragments. Why were not always the C32 ones quantified? Do the authors also see trends in DOXI for the 1,14 and 1,13-diols/keto-ols.

Alkenones are very abundant in Arabian Sea sediments, did they suffer from selective oxidation?

For the GDGT data: it would be useful to add the BIT indices as indicator of the terrestrial OM contributions.

Supplement: I would prefer to express concentration per gram TOC instead of per gram sediment as that reflects better preservation/degradation. These TOC concentrations should be added to (e.g.) Table 1 as well.

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