

Interactive comment on “Productivity patterns and N-fixation associated with Pliocene-Holocene sapropels: paleoceanographic and paleoecological significance” by D. Gallego-Torres et al.

Anonymous Referee #2

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This paper documents changes in nutrient proxies across 35 sapropels in a E-W transect of the eastern Mediterranean adding new results to the already extensive literature on paleoproductivity proxies. The results are interesting but the paper needs a significant amount of work before it can be published. One of the main issues is that many of the interpretations provided in the paper e.g. the dominance of N-fixers as an explanation for low delta 15N in sapropels, the fact that Ba concentrations are a better indicator for the presence of sapropels etc. are not new, and have been discussed extensively in other papers, so that the discussion of these parameters could be written

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in a much more concise way, without lengthy discussions of alternatives. This would make the paper more readable. The authors should rather focus on the lateral patterns of the sapropels of different age and discuss the differences or similarities. A second problem is the poor figures, which need to be improved. The axis labels are too small, the scale for nitrogen isotopes in figures 4 and 5 should be changed in order to show more clearly the variations: a scale from -5 to 10 is too large. The same is true for the TOC scale on Fig 4. It would be better to make a separate Figure for each sapropels group, rather than for 4. The naming of the sapropels layers is confusing. If they are cited in the text by the i-cycle number, then this should also be put in the figure, so that the reader does not have to look in the table all the time when reading the discussion. It would also be useful to use the normal sapropel nomenclature S1, S2 in the figures, not only in the text, where appropriate, so that the reader familiar with the Mediterranean can easily relate the sapropels discussed here to other publications. It is also somewhat confusing that the delta 13C is plotted in reverse, with negative values on the right side. This should be changed or at least mentioned in the figure caption. The discussion is in general somewhat difficult to follow, if streamlined then the paper should be easier to follow. Also the discussion of the conversion of sedimentation rates to mass accumulation rates should be improved: On page 4479 the authors conclude that the different length of sapropels duration depicted in figures 2 and 4 is due to “However, we are inclined to believe that this pattern results from differences in sedimentation rates inasmuch as the paleoceanographic conditions that favored increased productivity were approximately stable and concordant across the basin” I agree with the authors, that a difference in onset of high productivity of a few thousand years within the Eastern Mediterranean is very unlikely, but this means that the age models they used to plot the figures are wrong, with the consequence that the accumulation rates discussed and plotted are incorrect. This point needs to be resolved..

Additional specific comments Page 4471, line 20 delta13C values are higher or lower, not smaller or bigger Page 4474, line 5-10: This is not quite correct, Lehmann et al,

C2014

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2002 actually show a decrease in delta 15N upon anoxic diagenesis and the same effect was discussed e.g. in Sachs and Repeta, 1999. It is generally considered that oxic diagenesis, not anoxic or suboxic, increases delta 15N of OM.

Page 4477 line 21-27 This sentence is confusing, do the authors mean that the productivity decreased but organic carbon accumulation continued due to anoxic conditions or that Barite was removed because of sulfate reduction, and thus this would be a diagenetic artefact? This is also important for the discussion of Figure 9, as a low Ba-Bio accumulation rate, if the Ba was diagenetically removed would not imply that high preservation is more important than productivity to produce a sapropel. This needs to be clarified. Incidentally, for figure 9 it would be better to plot Ba accumulation rate vs TOC accumulation rate, rather than %TOC, so to have a direct comparison of the two. Figure 7, figure caption “very high correlation” not “very high correlation rate”

Summarizing, I thin this paper contains a nice dataset, which has to be much better valorized by rewriting the paper more to the point and by providing better figures where the patterns can be seen much better.

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