

Biogeosciences Discuss., referee comment RC2
<https://doi.org/10.5194/bg-2021-204-RC2>, 2021
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Comment on bg-2021-204

Anonymous Referee #2

Referee comment on "The influence of lateral transport on sedimentary alkenone paleoproxy signals" by Blanca Ausín et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-204-RC2>, 2021

Review of 'The influence of lateral transport on sedimentary paleoproxy signals' by Ausín et al.

Ausín et al. report OC and alkenone contents as well as corresponding ^{14}C ages in grain-size fractions from several surface sediment samples from continental margin sites and compare these to ages of planktonic foraminifera and alkenone-based SST estimates. The SST estimates from the grain-size fractions in association with their ^{14}C ages are used to assess the influence of lateral transport on alkenone SST estimates in bulk samples. This new dataset has value as it presents SST estimates and ^{14}C ages of grain-size fractions to shed more light into the processes of grain-size specific lateral advection effects on proxy signals in sediment archives. I recommend publication after major revision.

Major comments:

Concept vs new findings: The concept of the influence of lateral transport on the age and SST estimates of alkenones is more than 20 years old (see Benthien & Müller, 2000 and diverse follow-up papers). Now this manuscript presents grain-size specific SST and ^{14}C data which support this concept and point to the fine silt fraction as being mainly responsible for the observed effects. My main concern with the Ausín et al. paper is the way this is presented. The history of this concept is described in the introduction but it nevertheless reads as if the whole concept is new and Ausín et al. are indeed the first to present the concept. I am referring to sentences like: "Our results demonstrate that selective association of alkenones with mineral surfaces and associated hydrodynamic mineral sorting processes can alter alkenone signals encoded in marine sediments (^{14}C age, content, and distribution) and confound corresponding proxy records (productivity and SST) in the spatial and temporal domain.". In this last sentence of the abstract, the first half of the sentence reads as if this was not known before. In contrast, this has been clear before and is just supported by the new data. The second half of the sentence, in contrast, is just an inference so far. It is logically to expect these effects but it is not actually demonstrated in the manuscript. Another example is the last sentence of the

conclusions: "Our results highlight the importance of considering the influence of hydrodynamic processes (e.g., lateral transport) on sedimentary alkenone signatures (amount, age, and temperature) and their relationship to surface waters overlying the depositional location.". Since the works from Mollenhauer, Ohkouchi and others from decades ago it is known that the influence of hydrodynamic sorting on organic paleo-signals in sediments has to be considered. Such sentences thus read like 'constructing a strawman' to oversell own findings. That said, I think the new grain-size specific data in itself carry enough value to be reported and the manuscript does not benefit from overselling and should be adjusted to be toned down.

Biological oceanography: Another point which seems to be wrong is the interpretation of alkenones being indicative for highest productivity in the Peruvian upwelling system used for explaining a warm bias (line 323 to line 325). This cannot be true as upwelling activity is driven by trade wind strength which is highest in austral winter leading to deep Ekman pumping which brings dissolved Si into the surface waters causing outcompeting of haptophytes by diatoms. The warm bias thus likely arises from the fact that alkenones are actually not produced during strongest upwelling, the latter associated with lowest SST.

Errors and precision: Please state what the analytical and propagated errors are of compound quantifications and SST estimates. For instance, in table 2 alkenone concentrations (C37:2 and C37:3 and combined) are reported to the last digit. Is this reasonable with a usual GC-FID error of at least 10% for long-chain alkenone quantification? How does this error propagate to the UK37'-SST estimates? I guess that with a good error handling many of the reported 'biases' will actually be within error and only a few significant offsets will remain. Also, error bars should be added to all plots showing SST estimates and, preferentially, also instrumental SST data.

Minor comments:

Generally, please replace 'warmer bias' by 'warm bias'

Line 3: Please check affiliations. Bruni and Eglinton are not in Salamanca.

Line 9: "...gaps remain on..." - consider wording

Line 29: Are alkenones really a large component of total OC of *Emiliania huxleyi*? Please check, I doubt this statement.

Line 106: "...in contrast with..." – consider wording 'contrast to'

Line 113: how was the grain-size fractionation done? Wet or dry sieving?

Line 201: I would presume that the statement that only SST estimates from SBB and SMB are comparable to atlas data is not true when considering errors. Avoid arguing with 'comparability' and argue with errors instead.

Line 204: I doubt that the statement of a general warm bias is actually true when considering uncertainties. Looks like only true for 2 out of 7 samples.

Line 208: The statement that FS overall shows the smallest temperature offsets with bulk is not true. Please look at the data from NAT. I do not understand the significance of the following statement on larger/smaller offsets. Consider removing.

Line 318-321: In upwelling areas coccolithophores are outcompeted by diatoms during strong upwelling. See major comment above.

Line 380: should read SMB

Tables:

Table 1: Namibian core – MC or BC?

Table 2: see comment on precision of data given.

Figures:

Figure 2: Please add comment in caption about sand fraction in BER

Figure 4: I do not see the significance of panel B, just another representation of the same data (also no reference to B in caption).

Figure 5: panel B: see comment on errors. I suspect that data from SBB, SMB, NAM and NAF are actually within error with instrumental SST. Preferentially add error bars to SST estimates and instrumental SST data.

Figure 6: captions for panel B and C are mixed up.

Figure 8: What is the significance of the solid regression line considering all data. Consider removing.