

Interactive comment on “Salinity changes in the Agulhas leakage area recorded by stable hydrogen isotopes of C₃₇ alkenones during Termination I and II” by S. Kasper et al.

Anonymous Referee #1

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Review of CP-2013-71 "Salinity changes in the Agulhas leakage area recorded by stable hydrogen isotopes of C₃₇ alkenones during Termination I and II" by Kasper, et al.

Kasper et al. analyze organic temperature proxies, i.e., UK37 and TEX86, from 2 sediment cores off South Africa covering the last 2 glacial terminations. In addition, they measure hydrogen isotope compositions of long-chain alkenones to infer paleosalinity changes. The manuscript consists of 2 parts, one on the temperature proxies and one on the reconstructed salinity changes. The data are discussed in the framework of published data from these cores, such as Mg/Ca and 18O data from planktonic foraminifera, and data from other cores in the vicinity.

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Recommendation: Major revision

General remarks: While the presented data are certainly valuable in aiming at an improved understanding of investigated paleoceanographic proxies, I have some difficulties with the discussion of the data and interpretations in this manuscript. Specifically, the discrepancy between the points raised in the introduction and the actual conclusions is unsatisfying. While reading the introduction suggests that new data on the behavior of the Agulhas leakage during glacial terminations will be presented the manuscript fails short in achieving any new paleoceanographic insights. The work presented in this manuscript builds on an earlier study of Martinez-Mendez et al. (2010) of these sediment cores. As was noted in that paper already, the foraminiferal-based proxies are in disagreement with alkenone-based SST records from neighboring cores. Kasper et al. now show that the same deviating signals are seen even in the same sediments. What more have we learned? The authors speculate about depth habitats, seasonal production, lateral advection and/or other, second order effects which may cause the observed discrepancies. Such speculations, however, were already done by Martinez-Mendez et al. (2010) and no further insights are added now. This might be the reason for absence of any mentioning of SST in the title of the manuscript. As about half of the current manuscript is, however, about SST proxies, the title does not reflect the content.

In contrast to the somewhat disappointing discussion of the SST data, I find the application of the hydrogen isotope analyses on alkenones for estimating salinity changes interesting. At least to my knowledge, this is the first application of this new proxy in such open ocean settings away from freshwater influences. Despite that also in this case the authors arrive at similar estimates of salinity changes as Martinez-Mendez et al. (2010) and no new paleoceanographic perspectives are added, the observations are highly encouraging for further application and development of the organic salinity proxy. I am, however, a bit lost in the understanding of Table 3 which seems to be important as summary of the salinity estimates. I understand that only the first column

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in that table actually contains own data and all other data are calculated from other sources. It remains however, unclear to me how the authors arrive at those data and what can be seen from the comparison. This should be explained in more detail.

The main paleoceanographic findings of this study are thus that different SST proxies show different signals, which remain mechanistically unexplained, and that the new data completely agree with an earlier concept by Peeters et al. (2004) and others. The authors unfortunately do not go further in explaining how the data would fit into it. Looking at Fig. 1, I see that the cores are located downstream from Cape Valve and that elevated SSTs are only found in the subtropical Indian Ocean. I see how colder glacial conditions would fit with decreased Agulhas leakage. However, I do not understand where the elevated salinities in the glacial should come from. Compared to today, elevated salinities are not found anywhere in the region and if subtropical fronts would have been closer to Cape Town, salinities would even be expected to be lower, right? Maybe I miss a point here. Are the elevated salinities indicative of decreased river discharge (which river?) or enhanced evaporation? I miss any conceptual explanation.

My general recommendation would thus be to significantly revise the manuscript and focus on the hydrogen isotope signals for estimating paleo-salinity, explain the concept behind, the inherent assumptions and applied calculations in more detail and come up with a conceptual climatic explanation for the observed changes. Thus, I suggest restricting the manuscript to the point that is mentioned in its current title. I would recommend to leave the organic SST data out as those remain yet unexplained and do not add further insights to our current understanding of those proxies. I think that a more focused manuscript including a more detailed explanation and climatic interpretation would make a better contribution with higher impact.

Specific comments:

The H3 factor reported in the methods (10-14) seems to be unusually high and variable. The H3 factor should be below 10 and only vary by 0.1 from day to day. Can the authors

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be sure that the dD data can be trusted having such high and variable H3 factor?

Referencing in table captions is a bit odd. The citations for the calibrations (Kim et al., 2010; Prah1 & Wakeham, 1987) should be in the method section only and not in the table captions which seems to suggest that those data are derived from those papers.

The authors speak about a shift of 14 and 13 per mill in dD of alkenones throughout the text; however, Table 3 lists a shift of 14 per mill for both terminations. Which is right?

Are the 2 decimals significant for D/H listed in Table 3?

There is no error propagation from the alkenone D/H data towards the intervals summary in Table 3. Are the other data reported in that table (18O and dD of ice and dD of sea water) without error?

Interactive comment on Clim. Past Discuss., 9, 3209, 2013.

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