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Climate of the Past Discussions

Interactive comment on "Sedproxy: a forward model for sediment archived climate proxies" *by* Andrew M. Dolman and Thomas Laepple

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The authors utilize our study (Scussolini et al., 2013) to illustrate one of the applications of their new model for marine sediment proxies. With the aim of suggesting improvements to this interesting manuscript, I bring to attention some relevant aspects of Dolman and Laepple's handling of that study.

First, Scussolini et al. (2013) analysed the planktic foraminifer Globorotalia truncatulinoides (sinistral coiling variety). This organism calcifies at depths beyond 400 or 600 m, according to the relevant literature and to Scussolini and Peeters (2013, Paleoceanography; doi: 10.1002/palo.20041; see also references therein), who compared values form core-top specimens to modern hydrography. At these depths, at the core site, there is hardly any seasonal variation in temperature and salinity. To assume 0.5 ‰ seasonal noise to mimic the del18O signal seems therefore inappropriate. I expect that this shouldn't change the position or magnitude of the peak in variability simulated by 'sedproxy', but it would be advisable to rectify the calculations to reflect this.

Second, Scussolini et al. (2013) report that they 'corrected the variance of foraminiferal del18O by subtracting that of external calcite standards measured in the same sequence', with the aspiration to clean their proxy from the spurious effect of measurement noise. It seems that Dolman and Laepple do not take this into account, as they 'assume a measurement noise of 0.1‰ del18O for the IFA and the bulk measurements'.

Third, Dolman and Laepple assumed 'a climate transition from 0.4 ‰ at 190 ka BP, to 2.6 ‰ at 90 ka BP'. The signal in core 64PE-174P13 goes from ca. 1.6 ‰ at 190 ka BP, to 1.3 ‰ at 90 ka BP (see fig. 2 in Scussolini et al. 2013). Where were the values of 0.4 and 2.6 ‰ taken from? In any case, this choice of such extended time frame is puzzling, as the sharp change in del18O occurs obviously across the glacial termination (ca. 140 to 125 ka BP). I would recommend that the authors take a more meaningful time frame. Also, they may consider using a more realistic representation of the transition in sea water isotopic values than the logistic function (taking inspiration from global del18O stacks, or a sea-level reconstruction?).

Further, assuming bioturbation reaching 10 cm from the top of the sediment will obviously produce a peak in variability in any record across a signal transition such as a glacial termination. While it is unrealistic to think that bioturbation is absent from core 64PE-174P13, Scussolini et al. (2013) advanced multiple lines of reasoning to exclude strong bioturbation in core 64PE-174P13, not least visible laminations in parts of the record (see also the author's response to referee #1, who raised specifically the point of bioturbation: https://www.clim-past-discuss.net/9/C511/2013/cpd-9-C511-2013.pdf). An additional argument against the role of bioturbation and in favor of an interpretation of the variability signal as proxy for Agulhas rings comes from Scussolini et al. (2015, Geology, doi: 10.1130/G36238.1). There, a tight coupling is shown between the Agulhas rings proxy with the ice-volume-corrected seawater del18O of G. truncatulinoides, a proxy for the high salinity anomalies that Agulhas rings seem to have introduced at the core location (see below a snapshot of the relevant figure in Scussolini et al. 2015, showing the two proxies). It is important to note that the two proxies are analytically independent of one another. It is not clear from the manuscript whether the authors have reasons to prefer the interpretation of the signal in terms of bioturbation.

As the authors admit, the choice of parameters here was 'partly arbitrary.' I explained four ways in which these choices seem needlessly arbitrary and indeed inadequate, and I suggested ways to improve these choices. One interesting application of 'sed-proxy' may in fact be that of revealing the bioturbation depth that would be sufficient to explain the variability peak shown for core 64PE-174P13, if the hypothesis of its ring-origin were to be rejected.

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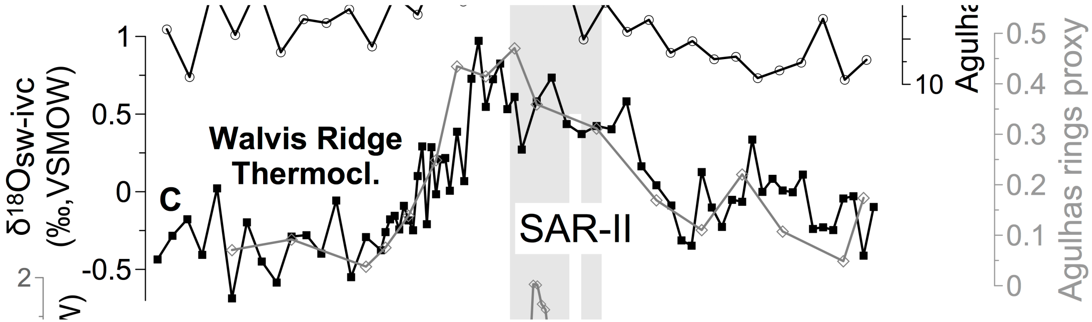

Fig. 1.

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