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Interactive comment on "Paleo Agulhas rings enter the subtropical gyre during the penultimate deglaciation" *by* P. Scussolini and E. van Sebille

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We are very grateful to the reviewer for the comments provided, as well as for the appreciation of our work and the kind words. We therefore proceed to carefully address all the important points mentioned in the review.

We acknowledge that our explanation of the choice of this species has been indeed spare, and we recognize the relevance of the work of Lončarić et al. (2006; 2007), and we therefore insert a mention to Loncaric et al. (2006), which expressly deals with the depth habitat of G. truncatulinoides in our core region. In Lončarić (2006, Geologica Croatica) it is reported indeed of a shallow (100 m) peak abundance of G. truncatulinoides sin. caught in plankton tows within a ring, but from his Figure 7 it is also visible that the abundance of this species in a ring is much limited compared to the environ-

ment outside rings. Our claim in the manuscript is not that some of the individuals we analyse are carried within a ring, which we deem a very rare circumstance, but mostly that the autochthonous stock is influenced by changes in hydrography brought about by rings. Further, in Lončarić et al. (2006) it is reported that the calcification of both coiling types extends to 400 m, and that the base of the productive zone for the left-coiling variety in winter, the season of highest standing stock, was at $\sim$440 m, much closer to our estimate. Further, their apparent calcification depth, estimated from δ18O values, is well constrained at $\sim$330-350 m. On the other hand, we prefer to rely on our own first-hand estimation of habitat depth, following a procedure that is widely applied, i.e., comparing δ18O values from specimen in the core top to the δ18O at equilibrium calculated from modern hydrography (Word Ocean Atlas, 2009). This is shown in detail in Scussolini and Peeters (in second revision in Paleoceanography), and yields an apparent calcification depth of $\sim$500 m ($\pm$ 50 m). Since other researchers, such as Erez and Honjo (1981) reported depths as far as 600 m, or beyond (Hemleben et al., 1985) in the Atlantic Ocean, we consider our estimation realistic. We found therefore fit, as implied by the reviewer, to mention these estimations in the Methods.

The choice of which morphotype to select was dictated in the first place by G. truncatulinoides sinistral's stable abundance across the record, not replicated by the dextral morphotype, which is probably a reflection of the deep thermocline in this region, coherently with what found by Lohmann and Schweitzer (1990). As the reviewer points out, sinistral is commonly associated with waters colder than dextral but, as mentioned above, our aim is not to trace the Agulhas leakage warm waters, as rather that of capturing the disturbance of those water bodies of Agulhas origin on the local oceanography. In this sense, rather than the provenance of the species, the requisites were its constant abundance in the record, testifying for its endemicity (and also necessary to perform a sufficient number of single measurements), and its reasonably defined deep/thermocline depth habitat. We add a specification to this in the Methods.

Finally, concerning the inclusion of the dataset of Caley et al. (2012), we initially omitted it because of concerns regarding the validity of the interpretation of the increased presence of G. menardii in the South Atlantic during deglaciations (see the four reasons formulated against the hypothesis of a control of this phenomenon by reseeding via the Agulhas, in Sexton and Norris, 2011). But, taking into account the reviewer's remark, because we do not consider the conceptual dispute settled, and for the sake of completion and of diversity of evidence, we include this record in our revised Fig. 2B (and map in Fig. 1) and we deal with it in the Discussion.

Additional references

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