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Climate of the Past Discussions

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

Anonymous Referee #4

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The manuscript by Scussolini and van Sebille introduces a rather novel use of foraminiferal d18O analyses (IFA) in order to illustrate the incorporation into the South Atlantic gyre of Agulhas rings and eddies shed from the Agulhas retroflection region during Termination II. The manuscript is well written, concise, and provides high quality data and appealing interpretations.

This paper was subjected to 3 reviews before my initial reading, which highlighted potential biases in the reliability/interpretation of the recorded IFA (in terms of density changes) at the MIS6/MIS5 transition. While trying to avoid repeating some of the main concerns put forward by the reviewers (some of the most important related to bioturbation being already answered by the authors), I will list here some additional comments:

The references put forward by the authors on the ecology of G. truncatulinoides (which motivated the use of this taxon for the IFA analyses) fall short of taking into account previous works by Loncaric et al. (Paleoceanography and Progress in Oceanography, both published in 2006) who conducted water column investigations of planktic foraminiferal distributions and fluxes within the area investigated by Scussolini et al.. Another paper by Loncaric (Geologica Croatia, 59/1, 2006) documented the distribution of G. truncatulinoides within an Agulhas ring between 50 and 300 m water depth with peak abundances close to 100 m water depth – so rather different from the 500 m wd proposed by Scussolini. This should be commented in the revised version.

Also the manuscript does not provide information on the choice to conduct the d18O analysis on the SINISTRAL form of G. truncatulinoides. I would guess that given its ecological preferences for warmer waters (eg. Niebler and Gersonde, 1998), the dextrally-coiled form would be more appropriate to investigate AgulhasâĂŤsource waters. The authors attribute the IFA d18O variance to density anomalies induced by Agulhas rings, and suggest that temperature is the driving parameter affecting these anomalies (low density). Minimum IFA d18O for a single sample within TII should therefore be related to the minimum density values inferred from the model in figure 1 at the 477 m depth level. Also, or alternatively, the range of IFA variance for a single sample within TII should correspond to the maximum density gradient between ring and no ring condition at the core site as illustrated in fig 1.

Finally, when comparing the IFA variance across TII with previously published records of Agulhas leakages, a key and more recent dataset is missing from Fig.3: Caley et al. (PNAS 109 n°18, 2012).

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