

Interactive comment on “Migrating subtropical front and Agulhas Return Current affect the southwestern Indian Ocean during the late Quaternary” by D. K. Naik et al.

Anonymous Referee #2

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This paper investigates changes in the Agulhas return current over the late Quaternary. The Agulhas system is believed to be an important component of the global thermohaline circulation. Furthermore, changes in the Agulhas system before and after interglacials have been modelled to have impacts on the global climate by regulating and changing the strength of the Atlantic thermohaline circulation and therefore the amount of heat transfer from the southern to northern hemisphere. Because of this, there has been a push in recent years to try to understand changes of the Agulhas current over numerous glacial and interglacials. However, despite this effort, very little research has been conducted focusing on the Agulhas return current in the Indian Ocean. This article addresses changes in this system.

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Overall, the scientific importance of this paper is that it addresses changes in a major oceanic system that has not been previously studied but is thought to be an important part of the global climate system. The paper also demonstrates significant original thinking. However, before being published, a number of revisions are necessary to help clarify points raised in the article. Once these are addressed, I have no problem recommending this article for publication.

Main Correction

Another revision needs to be done with regards to making the article more accessible to general paleoclimate scientists. Right now the article is aimed and written for researchers with a background in foraminiferal studies. However, it needs to be aimed more towards a more general audience. A few edits and additions should make this possible. One good example of this is the section 6.1 comparing the paleo record to the modern distributions of foraminifera. I did not get a sense of why this section was important and why the differences could not just be explained by natural processes that effect the preservation of foraminifera on sea floor. Rewrite this section to make it clearer why it is important. Also the discussion of the possibility of dissolution effecting the Mg/Ca ratio is confusing and may benefit from streamlining the discussion to make it less wordy.

Other Corrections

The introductory paragraph spends a great deal of time discussing the Globigerina bulloides proxy but only briefly and confusingly talks about why the Authors decided to use the Neogloboquadrina pachyderma (dex.). The justifications for why pachyderma (dex) is an important climatic indicator are missing from the introduction. Also, the discussion of the advantages/disadvantages or motivations behind the use of the Mg/Ca temperature reconstruction is too late in the paper. While these are discussed later in the paper a sentence or two up front may help improve the flow of the paper.

The paper suggests that, because pachyderma (dex) is primarily deposited in the sum-

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mer months at the core site, the increased amounts are indicative of warmer temperatures. However, this needs to be clarified. It could be that the increased amount of pachyderma (dex) is only indicative of higher rates of productivity during the warmer months and not higher temperatures. This is especially the case because most studies I have seen associate N pachyderma (dex) with colder environments such as the polar fronts or an upwelling system. Therefore the authors need to make the link between the higher pachyderma (dex) and higher temperatures more explicit or change their analysis slightly to make the reasoning behind the conclusion clearer.

The authors need to look at some of the more recent papers about the northward movement of the STF, as there have been some recent changes in thinking about the interaction of the Agulhas current and STF. The conclusions in Bard and Rickaby (2009) are no longer assumed to be correct and may change some of the conclusions about the location of the STF.

The figure 4 need s some corrections to make it clearer. Figure 4 is hard to read due to the two data sets being placed on top of each other. Making figure 4 more like figure 3 would make the data easier to read.

Technical corrections

Sentence starting on line 5 is missing some words.

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