

## ***Interactive comment on “Revisiting the Ceara Rise, equatorial Atlantic Ocean: isotope stratigraphy of ODP Leg 154” by Roy Wilkens et al.***

### **C. Zeeden (Referee)**

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Dear Authors,

With great interest I have read your manuscript entitled ‘Revisiting the Ceara Rise, equatorial Atlantic Ocean: isotope stratigraphy of ODP Leg 154’. In this manuscript you describe the CODD software package, which supplements the commercially available IGOR software system, and use this software to splice all ODL Leg 154 Sites for the last 5 million years. In addition, you extract color (Lab) information from ‘old style’ ODP core images and correct these for the light source. Finally you align all available d18O data of the Ceara Rise record to the Site 926 splice and create a smoothed composite record, and compare this Ceara Rise composite to the LR04 benthic isotope stack (Lisiecki and Raymo, 2005).

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The compilation of an equatorial Atlantic benthic isotope stack, its comparison to the established LR04 stack, and the at least in some intervals higher quality of the new stack is a substantial advance in paleceanography and paleoclimate research. The limitation to the last 5 Ma may go into the manuscript title.

The overall quality of your manuscript is without doubt high, figures are explaining the content in detail and are showing your data handling coming to the final dataset. Your manuscript clearly is a substantial contribution to Paleoceanographic data; your compilation of the Ceara Rise isotope stack is important for the wide readership of *Climte of the Past*, and relevant for a wide paleocimatic and wide paleoceanographic community. Generally, you describe the data handling in detail, and tie points used are supplied in Supplementary Materials, which make your approach reproducible. You use established methods of data generation, splicing and tuning to come to the age model and data set for the Ceara Rise isotope record. You consider earlier and similar work in an appropriate way. More specific points are given below. Figures supplement the text in a logical way, and Supplementary Materials provide additional data.

Generally I think clarifying following points would be beneficial for your manuscript

You provide a final dataset which is smoothed. Also because not all software that you use is open source, I would suggest to consider also providing the full isotope dataset on the spliced record. This will facilitate other researchers to determine uncertainty, and provides the option to use other smoothing methods. In addition, I suggest to supply the magnetic susceptibility record of the splice to allow for a detailed investigation of the tuning. Could you also comment on the possibility of using this record for alternative age models?

Generally, you make reference to the original tuning of the record (Bickert et al., 1997; Tiedemann and Franz, 1997) and the well-known phase relationship. In my opinion repeating their approach in several more sentences here would be beneficial for many readers.

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Chapter 2.2.: If I understand this correct, you do not correct the ODP files for horizontal differences in colour? This is not necessarily a problem here, but should be clarified. In addition, this would imply that ca. 9/10 m cycles in colour may be related to this effect – please mention this.

Similar experiments of extracting data and correcting for the light source have been made by (Nederbragt and Thurow, 2001, 2005) and I suggest to give reference their work here.

In lines 269/269 you mention that a more robust age model will be helpful, if I understand this correct. This stands in contrast to previous suggestions of a known phase relationship. In my opinion a clarification, and an estimation of age model accuracy would be helpful for a wide readership, also to assess similarity of pattern, age and age uncertainty reported by (Lisiecki and Raymo, 2005).

You use quite some figures, some of which may not be very relevant for a wide readership. I suggest considering to move few figures to supplements.

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In addition, I would like to mention several minor points at specific places:

Line 33: I suggest to add a sentence on the value of the Ceara Rise record of ODP Leg 154

Lines 43(ff): ‘synchrony’: I would rather suggest to use semi-synchrony or a similar expression

Line 56f: ‘that may have shifted’ – I suggest to express more clear that their reference age may have shifted due to the availability of new records

Line 49: Splicing is commonly used in ocean drilling, but not limited to ‘Ocean’ – I suggest to remove ‘ocean’ here.

Line 50: cyle → cycle

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Line 97ff: please explain all abbreviations to include the wide range of readers of Climate of the Past

Line 126: Probably you mean units of lightness – please clarify the meaning of numbers here a bit clearer.

In chapter 2.3. you discuss core disturbance, I also regard (Ruddiman et al., 1987) a good reference here – please decide yourself to include this or not.

In chapter 2.3. you refer to Fig. 3a, but not 3b and 3c – this may be useful in the manuscript text.

Line 179: ... to a common depth scale?

Line 194: include 'for the last 5 Ma'?

Line 251f: Here it may be stated that high eccentricity intervals may be expected to lead to such patterns – but this is not necessary, please decide yourself.

297: Reference – there seems to be an issue with special characters.

Figures: Adding 'Site' to Site numbers may be helpful for non-(I)ODP involved readers

Fig 6: you use 'ka' in the heading and 'kyr' in the text

Fig. 7: Labelling of x-axes may be added.

Fig. 9: The crosses seem integer numbers, while the legend suggests a smooth transition of colours

Line 405: 'ans' should read 'and'?

Line 406: 'darl' should read 'dark'?

Fig. 12: isotope data seem to miss an axes and/or labelling.

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## References:

Bickert, T., Curry, W.B., Wefer, G., 1997. Late Pliocene to Holocene (2.6-0 Ma) western equatorial Atlantic deep-water circulation: Inferences from benthic stable isotopes, in: Proceedings of the Ocean Drilling Program. Scientific Results. Ocean Drilling Program, pp. 239–253.

Lisiecki, L.E., Raymo, M.E., 2005. A Pliocene-Pleistocene stack of 57 globally distributed benthic  $\delta^{18}\text{O}$  records. *Paleoceanography* 20, PA1003. doi:10.1029/2004PA001071

Nederbragt, A.J., Thurow, J.W., 2005. Digital Sediment Colour Analysis as a Method to Obtain High Resolution Climate Proxy Records, in: Francus, P. (Ed.), *Image Analysis, Sediments and Paleoenvironments, Developments in Paleoenvironmental Research*. Springer Netherlands, pp. 105–124.

Nederbragt, A.J., Thurow, J.W., 2001. A 6000 yr varve record of Holocene climate in Saanich Inlet, British Columbia, from digital sediment colour analysis of ODP Leg 169S cores. *Mar. Geol.* 174, 95–110. doi:10.1016/S0025-3227(00)00144-4

Ruddiman, W.F., Cameron, D., Clement, B.M., 1987. Sediment Disturbance and Correlation of Offset Holes Drilled with the Hydraulic Piston Corer - Leg 94. Initial Rep. Deep Sea Drill. Proj. 94, 615–634.

Tiedemann, R., Franz, S.O., 1997. Deep water circulation, chemistry, and terrigenous sediment supply in the equatorial Atlantic during the Pliocene, 3.3-2.6 Ma and 5-4.5 Ma. in: Proceedings of the Ocean Drilling Program. Scientific Results. Ocean Drilling Program, pp. 299–318.

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