Dear Torsten Bickert,

Thank you very much for your very positive and helpful review.

Please find here the reply to your comments:

Lines 125ff: Tremendous work that has been done to digitalize the older core photographs, and to correct them for uneven brightness. However, due to wall friction during core penetration, many sections show parabolic bent layers. Is that a problem, when splicing the images of different holes, which might be affected differently by friction? Furthermore, these images are compared to data sets, which have been measured just in the center of the split cores (e.g., magnetic susceptibility using a point sensor, reflectance photospectrometry). Is the offset to a core-wide integration of image data of any importance?

The parabolic bent layers can sometimes be seen in the core images but they have no effect on the correlation and splicing. In fact, the process of cutting the section images from the core box photo allows the user to exclude the outer edges of the section to mitigate the worst disturbance. Typically, a section image is about 110-115 pixels wide and we cut out the middle 100 pixels. Splicing is done using multiple data sets including those measured at the center of the cores. Generally, there is a small uncertainty involved in the exact position of data acquisition and image recording due to small variations in where the zero point for a measurement is. The core sections have end caps that due to expansion of sediment on the ship can be bulged a bit. The images are cut at the end caps in a straight line. Thus small offsets between data sets at each core are possible, which we estimate in the order of ±1cm, but this will have very minor effect on the correlation, splicing or tuning. There is further discussion of the limits of the depth calibration of the images in the section of the CODD User Guide describing the process.

Lines 140ff: For readers not that familiar with the splicing procedure, I would suggest to explain in more detail the criteria, how the "master record" is chosen out of the aligned holes. This is in particular important, to understand, why in a second step the sections outside the splice may be stretched and squeezed, instead of being implemented in the master record with their original length.

This is a very good comment, and we will add a few sentences explaining the splicing criteria in the revised version for clarification. We use the same criteria as typically used by the shipboard stratigraphic correlator for IODP expeditions. The spliced record is composed of core sections from adjacent holes so that coring gaps in one hole are filled with core intervals from an adjacent hole. The splice should contain no coring gaps, and an effort has been made to minimize inclusion of disturbed sections. The choice of tie points (and hence of a splice) is partly a subjective exercise. Normally we followed three rules: Where possible we avoided using the top and bottom ~0.5 m of cores, where disturbance resulting from drilling artifacts (even if not apparent in core logging data) is most likely. We attempted to incorporate those portions of the recovered core that were most representative of the overall stratigraphic section of the site. And we tried to minimize the number of tie points to simplify sampling.

Once the master record where the best quality cores are defined, all intervals outside the splice have to correlated to the master record. Typically these adjustments are in the order of cm to dm mostly due to coring induced compression or stretching of core intervals. In heavily sampled sites it is not uncommon for samples to be taken from core sections that are not part of the splice. The stretching operation ensures that those “off-splice” samples correspond as closely as possible to the same lithology as samples taken from splice sections.

Lines 215ff: Since the discrepancy between of the interval 1,80 to 1,90 Ma is the largest in the Pleistocene part of the LR04, you should maybe illustrate what might have been the problem for Lisiecki and Raymo (2005) in that interval by exhibiting the original records used (see also suggestions for Fig 10).

We modified Fig. 8 (attached) to better illustrate the mismatch by plotting the reference records used by *Lisiecki and Raymo (2005)* separately.

Lines 223ff: I fully agree that the tuning of the distinct cyclicity in lithology to orbital precession is robust and of good help as a control for oxygen isotope stratigraphy in the interval between 4.0 to 4.5 Ma. However, again I would prefer to see in separate figure, what might have been the problems of LR04 tuning in that interval, to better follow the arguments presented in the discussion (lines 236ff).

Figure 10 has been modified to include the LR04 reference records and is attached.

Fig 7 Abbreviations on 2. y-axes should be explained in the caption. Laskar 2005 => 2004?

We will correct this typo and add explanation of abbreviations in the revised version!

Fig 8 Since this figure contains the main results of the study, I would suggest to stretch the two graphs and present them on one page each in a portrait format. Furthermore, the offset of the individual d18O records should be raised to better get access their correlation. Larger data gaps (in particular in sites 927 and 929) should be left open.

Figure 8 Revised is now in landscape mode to stretch the data. Offsets have been increased. We haven’t made this into 2 figures as we feel there is sufficient detail in the redrafted figure.

Fig 10 I would reorganize this figure in a way that below the results of the Ceara Rise stack, you should probably present at the original data sets of the LR04 stack, to get behind the problem of the former stratigraphy within the interval 1.8 to 1.9 Ma. The lower graph should be moved into a separate figure, and maybe stretched to better present the details of the interval 4.0 to 5.0 Ma.

We agree with this suggestion and have redrafted the figure accordingly for the revised version.

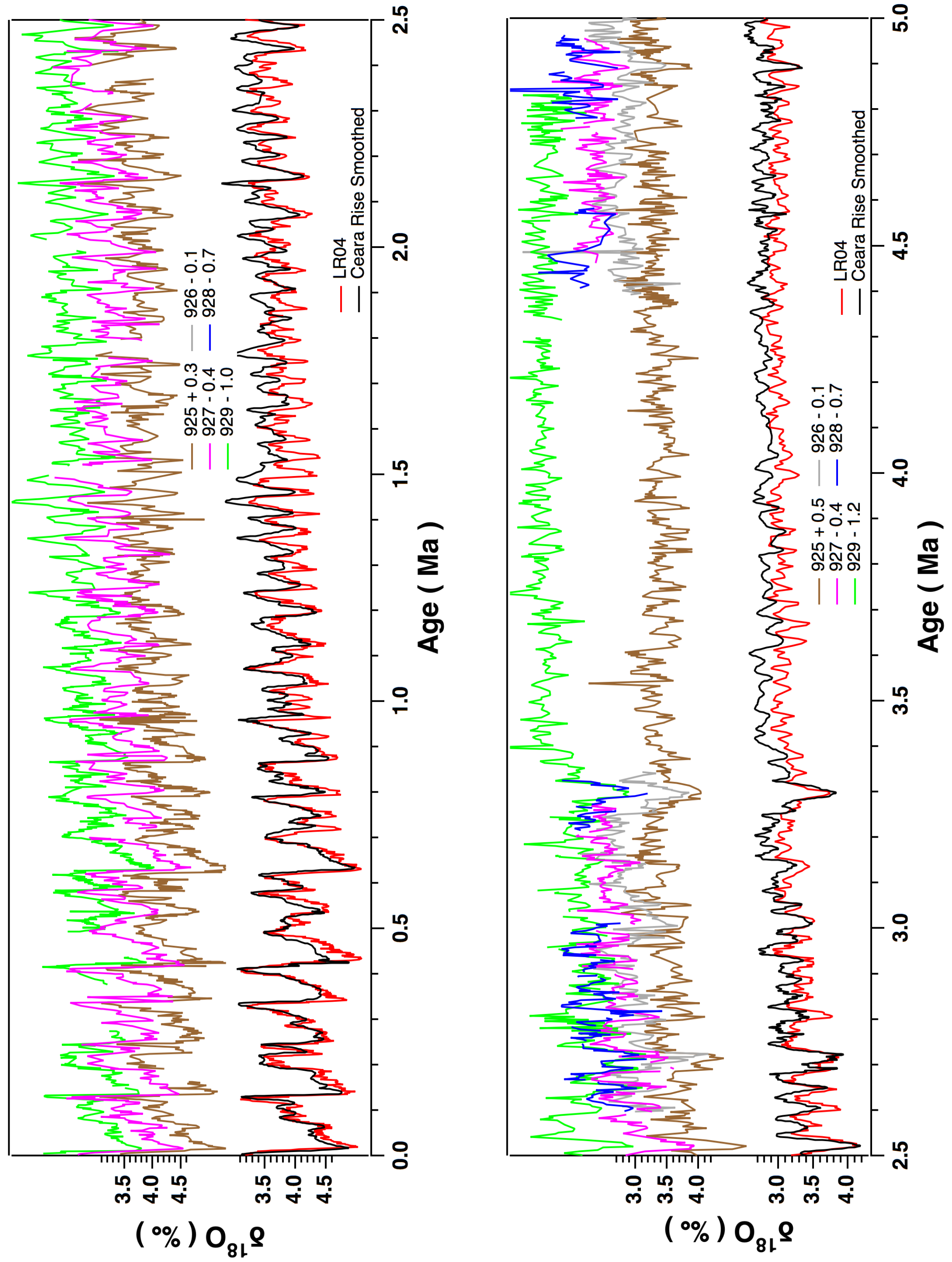

Figure 8 Revised: Benthic oxygen isotope data from all Ceara Rise sites compared with one another and a smoothed composite of all data compared to LR04. Top - 0 to 2.5 Ma, bottom 2.5 to 5 Ma. Note the $\delta^{18}O$ scale change between top and bottom plots. Individual site traces have been offset as indicated in the legend.

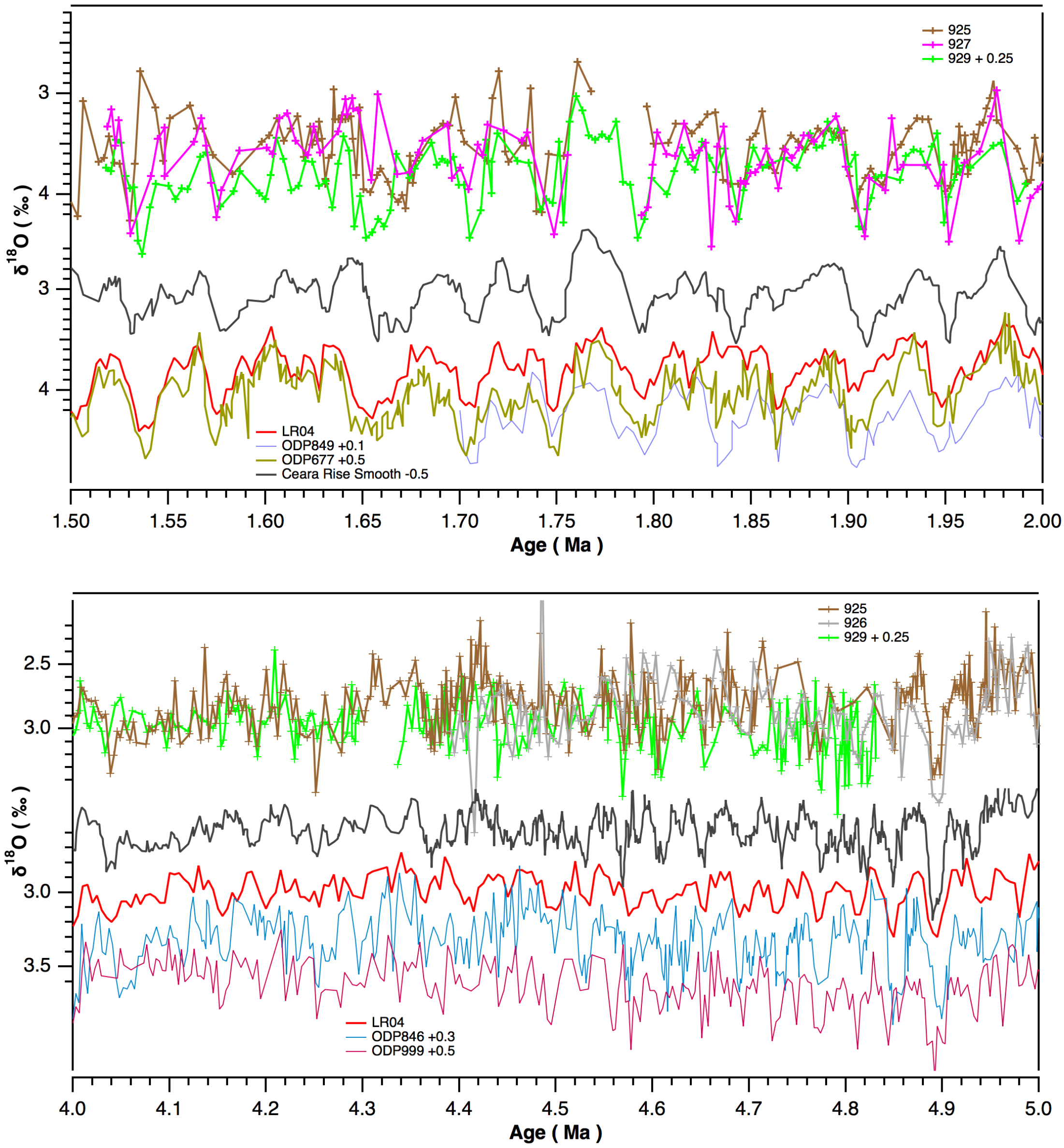

Figure 10 Revised (will be Figure 9 in the revised version after moving Fig. 9 to the supplement): Detail from Figure 8 comparing individual holes to one another and a smoothed composite to LR04. Below the LR04 stack the initial alignment target records from the LR04 stacks are plotted. For the 1.5 to 2.0 Ma interval these are the records from ODP 677 and 849, for the interval 4.0 to 5.0 ma these are the records from ODP 846 and 999. Some records have been shifted as indicated in the figure for better comparison of the data with each other. Note the differences between LR04 and the Ceara Rise average at 1.80 - 1.85 Ma although the initial alignment targets are more similar to the Ceara Rise smooth. Also note the difference between 4.0 and 4.5 Ma. The 999 record is from a single hole and the splice of the 846 record might be erroneous. The age model for the Ceara Rise is very robust in this interval (see. Fig. 11) pointing to potential inconsistencies in the age model construction of the 846 and 999 records.