Supplemental material to: The carbon cycle during the Mid Pleistocene Transition: The Southern Ocean Decoupling Hypothesis

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Appendix A Forcing BICYCLE with LR04

To overcome the problem of synchronisation deficits between various paleo records and because ice core records are so far not extended further back in time than 800 kyr BP, we developed an approach, which is solely based on the LR04 benthic δ^{18}O stack, to force our BICYCLE model over the last 2 Myr. This approach consists of three steps:

1. Calculate correlations and regressions functions between LR04 and six different climate records which were used in our earlier applications covering the last 740 kyr (Köhler and Fischer, 2006). For this purpose we relied on the available record length and did not restrict the correlation to the previous application period. Details are summarised in Table 1 (main text). Paleo records and regressions used here are plotted in Figs. A1–A6.

2. Decide which and how various climate variables (boundary conditions) of the model depend on the calculated regressions for the approach based on LR04 only (scenarios S_LR04) and substitute them for the 2 Myr application. Because of the poor r^2 between LR04 and planktic δ^{18}O from ODP677, and because this latter record was available over the whole 2 Myr time period, and its highly synchronisation with LR04, we refrained from substituting this record (which is used as proxy for equatorial SST) at all (Table 3, main text).

3. If necessary (due to inconsistencies or other studies) revise one or more of the substituted climate variables to be used in alternative scenarios (Table 3, main text).

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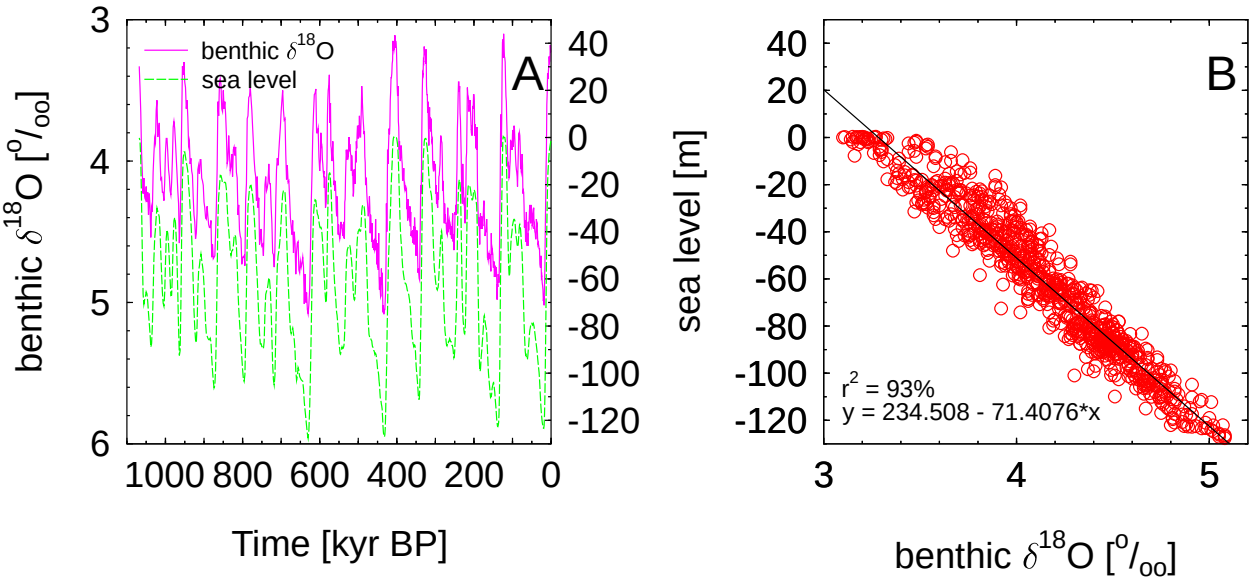

Fig. A1. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with sea level reconstruction of Bintanja et al. (2005). Note the reversed scale of the benthic δ^{18}O stack in A.

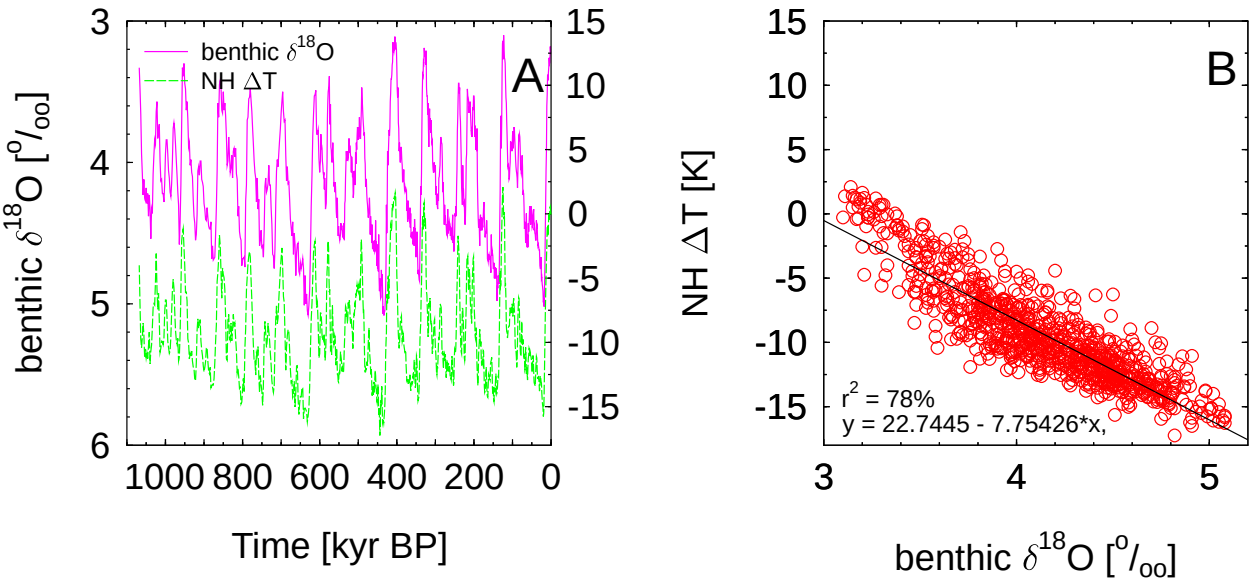

Fig. A2. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with the reconstruction of of temperature changes in the northern hemisphere (Bintanja et al., 2005). Note the reversed scale of the benthic δ^{18}O stack in A.

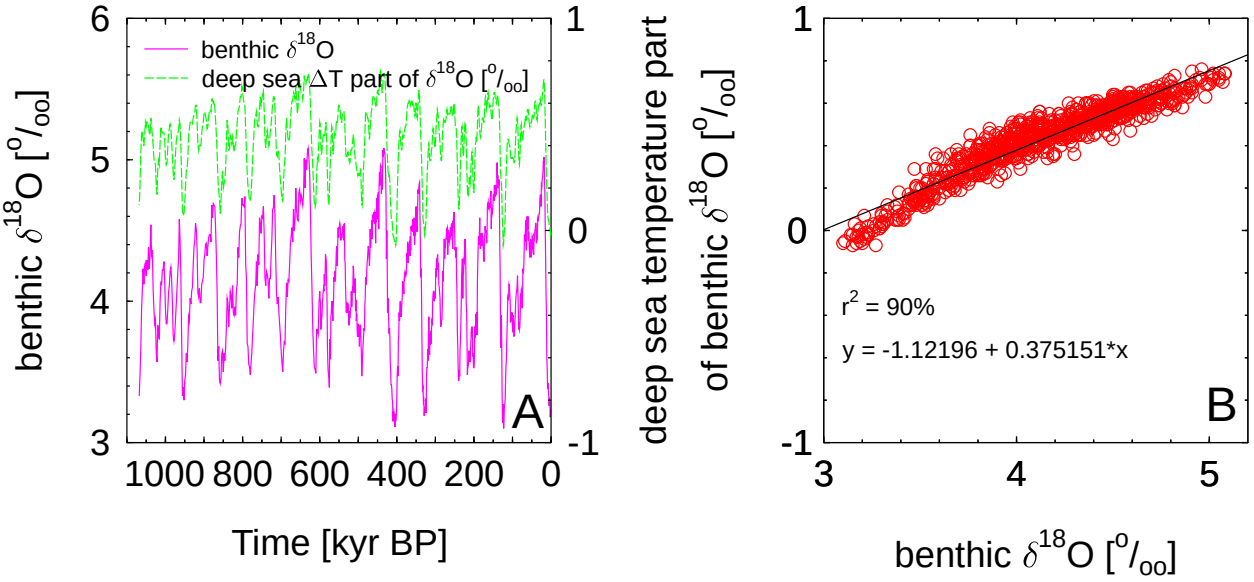

Fig. A3. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with the benthic δ^{18}O part correlated to deep sea temperature changes (Bintanja et al., 2005).

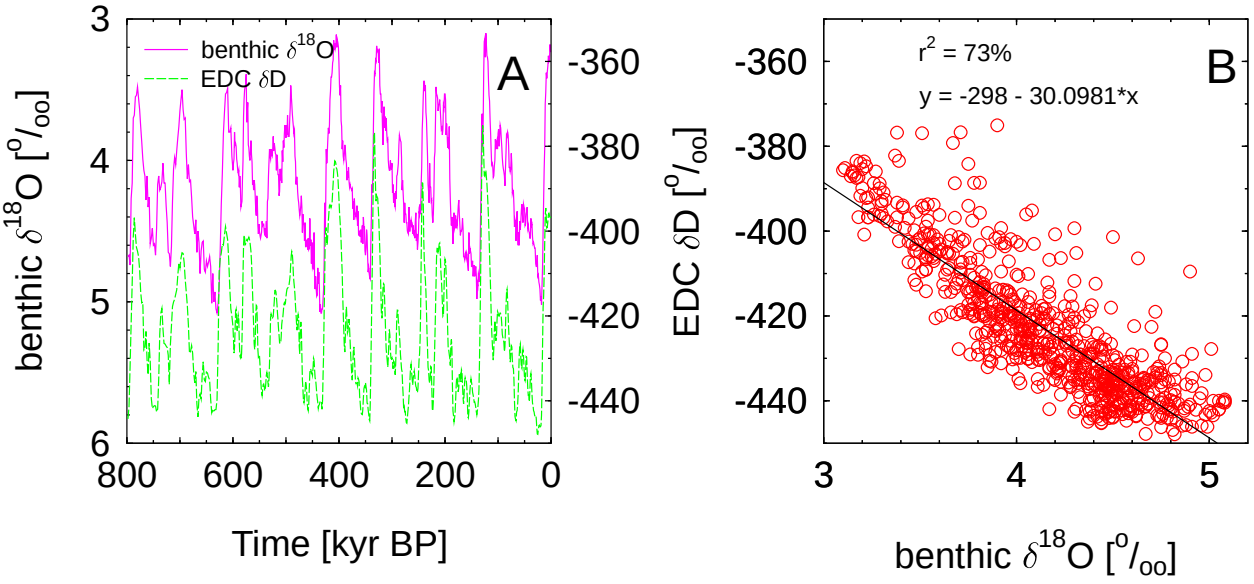

Fig. A4. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with the sea level corrected and smoothed (3 kyr running mean) δD from the EPICA Dome C ice core over the last 800 kyr (EPICA-community-members, 2004; Jouzel et al., 2007) on the EDC3 age scale (Parrenin et al., 2007). Note the reversed scale of the benthic δ^{18}O stack in A.

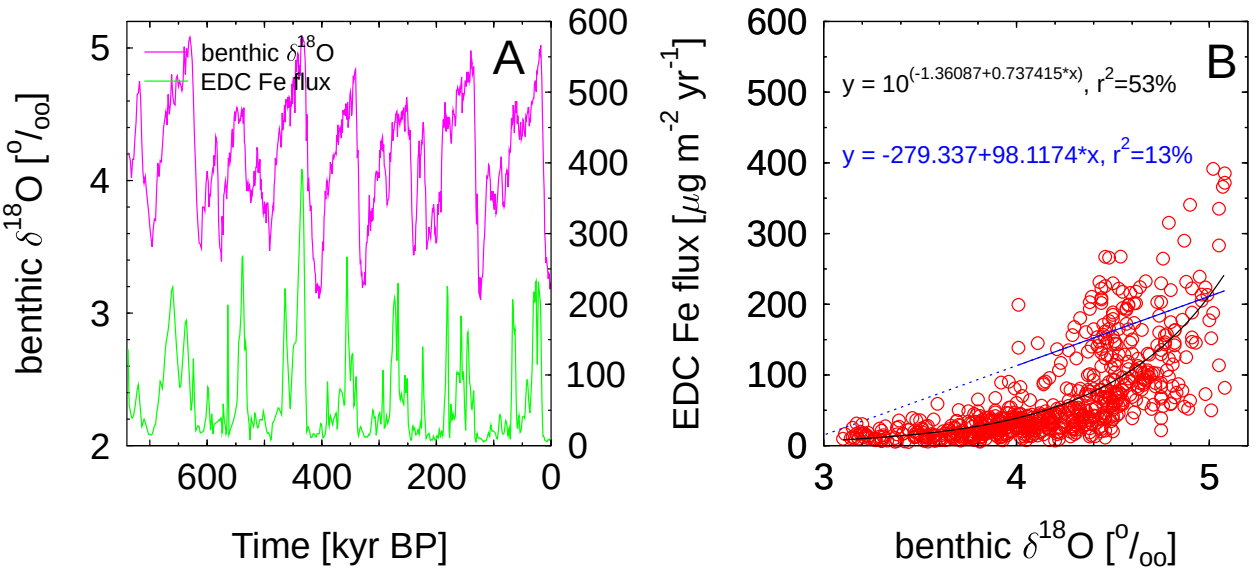

Fig. A5. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with the Fe flux record from the EPICA Dome C ice core (Wolff et al., 2006) on the EDC3 age scale (Parrenin et al., 2007).

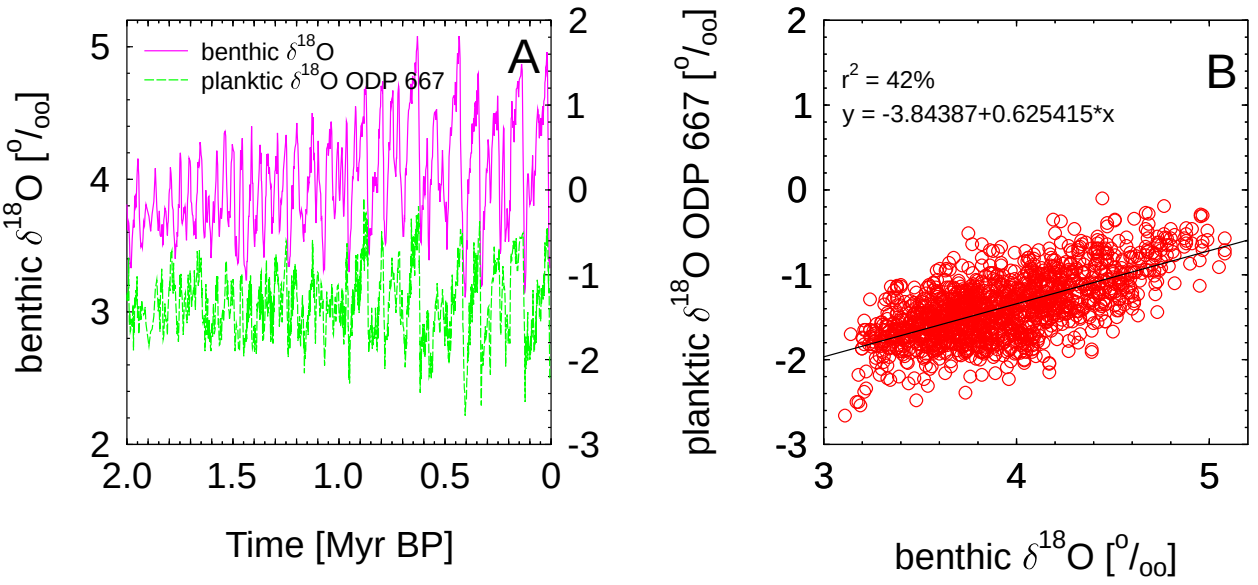

Fig. A6. Correlation of stacked benthic δ^{18}O (Lisiecki and Raymo, 2005) with the smoothed (3 kyr running mean) planktic δ^{18}O record ODP667 over the last 2 Myr (Shackleton et al., 1990).