

Point-by-point reply to the comments made on cp-2021-76:

Comments by Referee #1

Recommend acceptance just with some minor typos fixed - see comments in the annotated manuscript uploaded below:

Line 79: this is confusing - from periods (down core) or low CO₂ or in culture expts. that represent low CO₂ conditions?

The phrasing of the sentence was indeed confusing. We thus changed the sentence to read:

“This includes the fact that results are obtained exclusively on monoclonal populations grown in light and nutrient-replete environments, the short duration of culture experiments, which leaves little time for cells to adapt (Lohbeck et al., 2012), and the very few datasets available for vital effect sensitivity to changing CO₂ concentrations in low CO₂ environments (< 10 μmol.kg⁻¹).”

Line 167 : choice of words - “minimal” feels contradictory with this being one of the largest offsets. Do you mean something like “offsets are at least 3 per mil...”?

Thank you for this remark. We changed the sentence to:

“The offset between *G. bulloides* and inorganic calcite δ¹³C, which is at least 3‰, is among the largest measured for foraminifera species, a feature that studies attribute to higher metabolic rates (Kahn and Williams, 1981; Bemis et al., 2000).”

Line 277 : start of sentence - write genus name in full

Done, thank you!

Line 277: no capital

Done.

Line 284: might want to be specific - absolute coccolith vital effects from the foram data.

Done, thank you!

Comments by Referee #2

To resume, I agree with the comments and revision provided by the authors. I would however suggest to the authors to add some information before the concluding remarks to underlined the specificity of their record. As already noticed in my comments (but not considered) the study site (core MD37) has a rather different productivity response during Termination II than other cores located in the North Atlantic (it is discussed in Villanueva et al., 2001). Also the history of Termination II in the North Atlantic is punctuated by a sequence of events (deglaciation, HE 11) which could have modified surface waters productivity and stratification of the water column on short time scales. (all these features might have impacted the vital effects of the coccoliths separately or in a combined way).

Although the original manuscript alluded to the potential impact of oceanographic (productivity, stratification) changes on coccolithophore vital effects over Termination II, we agree that some aspects deserved to be more specific. Therefore, we added a paragraph on productivity changes at site 2037 line 371:

“The records of surface productivity during Termination II report however that coccolithophore productivity likely decreased over the studied interval. Indeed surface

productivity at the location of core MD95-2037 is believed to have been more elevated during glacial times (Naafs et al., 2010; Schwab et al., 2012; Cavaleiro et al., 2018). Studies attribute this glacial increase in primary productivity to a southward migration of the Azores Front during glaciations as a probable response to increasing westerly and/or trade winds (Villanueva et al., 2001; Naafs et al., 2010). The displacement of the Azores Front back to its present-day location during deglaciations could limit coccolithophore growth rates during interglacials, and explain why vital effects generally decrease over the Termination II. However, studies suggest that variations in surface productivity (and thus, coccolithophore growth rates) occurred on millennial timescales in the midlatitude North Atlantic (Villanueva et al., 2001; Schwab et al., 2012). The alkenone concentrations available at this site over Termination II (Villanueva et al., 2001), a proxy for coccolithophore growth rate changes, account for these rapid changes. However, they are uncorrelated to coccolithophore differential vital effects (Fig. S3).”

We also added a line on the impact that these changes could have on air-sea disequilibrium at line 433:

“In the specific case of site MD95-2037, the probable changes in the position of the Azores Front discussed above are likely to have altered the air-sea CO₂ fluxes across the deglaciation.”