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Climate of the Past Discussions

Interactive comment on "Extreme lowering of deglacial seawater radiocarbon content is recorded by both epifaunal and infaunal benthic foraminifera" *by* Patrick A. Rafter et al.

Patrick A. Rafter et al.

patrickrafter1@hotmail.com

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Response to Referee 3's review by Patrick Rafter (on behalf of all authors).

Our thanks for these useful comments and suggestions including commenting on the revised figures only recently uploaded for this conversation.

Comments 1 & 2. Note that there are other epibenthic 14C dates from the glacial, deglacial, and interglacial periods (refers to page 6, line 11 in original manuscript). Mistakenly implies that the inclusion of Pyrgo spp. 14C measurements impact all mixed benthic measurements.

This comment is echoed by Reviewer 2 and we have clarified text accordingly. Our intention is to state that our record is the only epifaunal benthic foraminifera 14C record that is *continuous* across the deglaciation. We have adjusted the text to:

A further complication to published benthic foraminifera Δ14C observations is that both the epifaunal and infaunal species are typically rare in sediments, leading to the common use of mixed benthic species. The mixed species approach has led, in some rare cases, to anomalously low Δ14C values / old 14C ages by inclusion of anomalously depleted 14C Pyrgo spp. (Magana et al., 2010)âĂŤan anomaly that may not be a global phenomenon (Thornalley et al., 2015). While mono-species epifaunal benthic foraminifera 14C measurements exist (Thornalley et al., 2011, 2015; Voelker et al., 1998), we are unaware of any continuous glacial-interglacial records of mono-species epifaunal foraminifera 14C content.

Comment 3. The depleted benthic foraminifera 14C records from around the globe should not be conflated (same comment as Reviewer 1 / T. Marchitto who referred to a statement in the first sentence of the Conclusions).

We adjusted the text in the conclusions to more accurately reflect the location of our study and the differences in timing between the records.

5.0 Conclusions If the extreme deglacial depletion of benthic foraminifera Δ14C at these northeastern Pacific sites cannot be explained by species or habitat bias, bioturbation, or poor age model control, the remaining explanation is that they reflect a change in seawater DIC Δ14C. The evidence in support of depleted seawater 14C content during the deglaciation (although often with different timing) includes deep-sea coral Δ14C measurements in both the Southern Ocean and North Atlantic (Adkins et al., 1998; Burke and Robinson, 2012; Chen et al., 2015; Robinson et al., 2005), which are often on rocky seamounts, have excellent age model control, and should not be influenced by the same diagenetic processes.

A leading candidate among the potential explanations for these and other intermediate

depth records (Bryan et al., 2010) is the deep-sea sequestration and flushing of carbon through the intermediate depth ocean (Basak et al., 2010; Du et al., 2018; Lindsay et al., 2016; Marchitto et al., 2007). This interpretation is plausibly consistent with 14C records from the deep Southern Ocean (Barker et al., 2010; Skinner et al., 2010) and deep Nordic Seas (Thornalley et al., 2015). However, a box model by (Hain et al., 2011) suggests that matching the observed Δ14C depletions in the intermediate depth, Northern Hemisphere sites requires unrealistic changes in ocean chemistry (e.g., lower surface ocean alkalinity) and ocean dynamics (i.e., mixing).

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