

## ***Interactive comment on “Ocean carbon inventory under warmer climate - the case of the LIG” by Augustin Kessler et al.***

**Anonymous Referee #1**

Received and published: 31 July 2018

This paper is a modelling analysis of ocean carbon conditions during the Last Interglacial, with the aim of serving as an analogous to present-day and future conditions under the effect of human climate change.

The authors do a good job at describing their methods and results, although I believe some extra detail has to be included in some parts of the manuscript, as detailed below. If the authors are able to address these issues then the article could be published by Climate of the Past.

Comments

Page 4, lines 1-8: Very little information is given about how the preformed O<sub>2</sub>, TALK, and PO<sub>4</sub> tracers are calculated by the model. Are they independent from one another?

C1

I think a short (one-two sentences) description should be given.

Page 8, lines 20-25: The experiment on the warmer condition produces lower global DIC. But since atmospheric CO<sub>2</sub> is kept constant in each experiment, where is the "missing" carbon of the warmer experiment? Does it get buried by the sediment model? Or does the 125 ka experiment have lower total carbon in all its components? This should be described in the results section.

Page 8, lines starting at 20: I like your detailed analysis of each of the ocean carbon components. I am surprised that you do not link changes in disequilibrium DIC to Southern Ocean sea ice changes. Is this not the case? Please explain briefly in the article.

Page 11, lines starting at 7: The authors interpret their results in terms of d13C in order to compare to sediment core data from the period of study. However, since their model does not directly calculate this tracer, the analysis is subject to misinterpretations. The interpretation of changes in water mass geometry to explain the changes in mid-depth and bottom d13C from sediment cores is plausible. However, is that the only explanation possible? Wouldn't a change in export production affect d13C in a similar way (see Schmittner and Somes, 2016, Paleooceanography)? Also, you talk about the "divergence" between cores JPC8 and Site 983 and Site 1089, it seems that although you are able to explain Site 1089, the increase in d13C in the North Atlantic cores remains unexplained. Do your simulations agree with the two mid-depth North Atlantic cores that show an increasing trend in d13C? If yes, mention in the paper. If not, explain what the missing process could be.

Minor comments:

Title: I think the title should say Last Interglacial, not LIG. I don't think acronyms are good for titles since they leave out people from an outside field to understand the scope of the paper.

C2

Page 7 line 26: There are some typos in the citations.

Page 11 line 11: Replace "an mixture" with "a mixture".

Page 12 line 3: "which corresponds well in absolute magnitude to our findings of -314.1 Pg C". Why is the sign different in Schugers et al. 2006 and your work?

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