

## ***Interactive comment on “Ocean carbon cycling during the past 130,000 years – a pilot study on inverse paleoclimate record modelling” by Christoph Heinze et al.***

**Anonymous Referee #2**

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Heinze et al. use a coarse resolution ocean biogeochemical model to estimate the effect of changes in SST, terrestrial biosphere release, dissolution rate constant of POC and BSi, CaCO<sub>3</sub>:POC rain ratio, 3D oceanic velocity field, dust deposition and Redfield C/P ratio on sedimentary d13C, BSi and CaCO<sub>3</sub>. A linear statistical model is then used to explore the parameter space. The parameters giving the best fit with a range of paleoproxy records are shown.

This is a useful manuscript, which allows the study of a wide range of parameters, but with a “linear response” caveat.

The parameters for the full solution (rank 8) give a large decrease in CaCO<sub>3</sub>/POC, which the authors suggest is unlikely. They thus decrease the rank to 7, but obtain

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too large changes in SST. The final “best” solution is thus the rank 6. But with that solution, there is only little change in atmospheric pCO<sub>2</sub>. Since the basis of the model is to reproduce a range of paleoproxy records, I am a bit surprised that no model-data comparison are shown for the ranks 8,7 and 6. Shouldn't at least correlation coefficients between model and proxy given for the 3 ranks?

There is limited discussion on previous glacial/interglacial studies, particularly for recent studies, granted the approach used here is quite different.

Figures: Some lines fall out of the y axis range in figures 6 and 7. I understand this is to highlight the fact that CaCO<sub>3</sub>/POC and SST parameters are going outside the expected range, but aesthetically it is not the best. Also text and lines are sometimes one on top of each other.

Typos: There are a few typos throughout the text and some sentences could be simplified or rewritten for a better flow. Some typos are listed below: p. 6 “EPICA” p15, L16 “on” iof “om” Legend figure 3: “experiment”

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