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, CaCO3:POC rain ratio, 3D oceanic velocity field, dust deposition and Redfield C/P ratio on sedimentary d13C, BSi and CaCO3. 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 CaCO3/POC, which the authors suggest is unlikely. They thus decrease the rank to 7, but obtain
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 pCO2. 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 CaCO3/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”