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Climate of the Past Discussions

Interactive comment on "Oceanic response to changes in the WAIS and astronomical forcing during the MIS31 superinterglacial" *by* Flavio Justino et al.

Anonymous Referee #2

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This paper explores the impact of changing astronomical forcing and West Antarctic topography on the climate of the MIS31 super interglacial. The study uses a coupled ocean-atmosphere model, with a relatively coarse atmospheric component. This is an improvement on previous studies that have prescribed ocean heat transport with slab ocean models; more could be made of this novelty in the introduction. The main result is that the astronomical configuration for MIS31 contributes to increased northward ocean heat transport (predominantly in the Pacific Ocean), reduced Artic sea ice cover and warmer northern hemisphere temperatures.

MIS31 is an interesting period to study, however the questions that this study is trying to address are not well defined in the introduction. The records from Lake El'gygytgyn

are referenced in the introduction, with the difficulty in simulating MIS31 warmth given as justification for this study. However it is the exceptional warmth of MIS31 relative to other interglacials (MIS1 and 5e) that is of real interest. It would make for a much more satisfying study if simulations for other interglacials were also included (e.g. for MIS1, 5e and 11, following the experimental design of Coletti et al. 2014). The mechanisms discussed in this paper are interesting, but they could also apply to MIS5e. An anomaly plot of simulations for MIS31 and MIS5e would add greatly to this study.

There is no attempt to make a quantitative comparison between the paleorecords and the model output beyond a warmer/cooler comparison (Fig. 2c), the simulations of Melles et al. 2012 and Coletti et al. 2014 have shown that MIS31 was warmer than modern. Statistical tests on the significance of the differences shown would also be useful.

There are some relevant references that could be added: de Wet et al., 2016, EPSL; DeConto et al., 2012, Global Planetary Change; Villa et al., 2012, Global Planetary Change. Additionally there are a number of statements throughout the manuscript that require references.

Overall the manuscript needs major revisions and careful editing of the revised manuscript, as it is quite difficult to follow in its present form, some minor changes are listed below:

Page (line)

2(28): Although it makes sense to use the same atmospheric CO2 for modern and MIS31 for the purposes of this study, there could be some discussion of uncertainty on the MIS31 CO2 estimates and what role this could play in the exceptional warmth of MIS31. 3(12): "It has to be mentioned that", is informal. There are similar statements throughout the manuscript (e.g. 5(29), 9(16)). In most cases these can simply be removed from the beginning of the sentence. 3(25): Given the importance of OHT to the study it would be useful to include a figure with modern day differences and the dis-

cuss what impact these biases may have on the results. 5(2): “SPEEDO” has not been defined previously. 9(33): It has not been shown convincingly that there is good agreement between the model output and paleoreconstructions. Need references: 1(22); 2(30); 5(2); 5(4); 10(4).

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