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Climate of the Past Discussions

Interactive comment on "Early and mid-Holocene climate in the tropical Pacific: seasonal cycle and interannual variability induced by insolation changes" *by* Y. Luan et al.

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We thank the reviewer for the comments and suggestions, which helps a lot to improve the paper. In particular the reviewer suggested to better highlight the new material of this manuscript compared to the Braconnot et al. (2011) paper. We revised the paper according to this comments. The technical corrections are considered in the revised paper. And the specific replies to the comments are listed as follows.

1. The abstract is quite vague in places. For example "...thermodynamics and dynamical processes strengthen the SST response". Firstly, you need to state in what direction the response is strengthened. Secondly where are the thermodynamical pro-

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cesses: the atmosphere, ocean? Furthermore, you state that the simulations show that ENSO strengthens across the Holocene consistent with data. However, this is not discussed in the Discussion and Conclusions Section (it is mentioned in the results section). Indeed you only discuss that ENSO is reduced in the Holocene. I realise that the strengthening is relative being observed between early Holocene and mid Holocene but this might not be clear to the reader. If you are going to include it in the Abstract you should also include it in your discussion since you clearly think it is an important result.

We revised the abstract according to the comments. We highlighted the new findings on the heat fluxes and role of cloud radiative forcing in the differences found between the response to the insolation forcing in the western and eastern parts of the tropical ocean. We also discuss the differences between early Holocene and mid-Holocene and clarify the sentence about the strengthening of the ENSO amplitude through the Holocene. We also include this last point in the conclusion.

2. The introduction is difficult to follow in places with a confusing order mixing discussion of data and previous modelling results. It might also be worth highlighting the new analysis as a series of bullet points so that the reader can see what is new compared with the previous paper.

We reordered the introduction as suggested and better highlighted the questions we address in this paper.

3. I believe the obliquity experiment is a new result. This should be very clearly highlighted. Also, move the discussion of the experiment from Section 5 to Section 2.

We move the obliquity experiment discussion to section 2. The obliquity experiment is a new experiment. We also strengthened the conclusion by stressing that obliquity had little impact on the seasonal timing and that the ENSO is mainly due to precession and to the timing between the seasonal changes in the tropical Pacific mean state and the timing of the development of ENSO anomalies.

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4. There is quite a long discussion of other model's preindustrial climates in terms of the tropical Pacific in Section 3. What is the significance of including this as it does not appear in any further discussion as far as I am aware. Since these results have already been published I would have expected the model's performance to already have been evaluated.

We decided to keep the section to make sure the reader knows about some of the model caveats. However since this material can be found in other publication we reduces its length.

Interactive comment on Clim. Past Discuss., 8, 505, 2012.