

## ***Interactive comment on “On the importance of initial conditions for simulations of the Mid-Holocene climate” by H. Renssen et al.***

### **Anonymous Referee #1**

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#### General comments

The question addressed in this manuscript is relevant for the understanding on the adjustment of the climate system to external forcing during the Holocene. It also questioned the fact that simulations for key periods in the past with complex coupled general circulation models consider that the system is in equilibrium with its forcing. Since vegetation dynamics and the ocean circulation have long time adjustment, the validity of this assumption needed to be tested. Results of the paper indicate that during the Holocene the system is in quasi equilibrium with its boundary conditions, and that snapshot experiments are relevant as long as the coupled model is run close to equilibrium. This conclusion is similar to the one proposed by Lunt et al. in a companions paper on the cpd discussion web page. This study is worth publishing but the manuscript

could provide more details, figures and discussion on the possible limitation of these simulations. Only a minimum is provided here. I am also not convinced that discussing the possible role of vegetation only looking at Africa is the right point of view for this study. I suggest thus major revision of the paper addressing the points listed below

#### Major comments

1) Additional analyses should be provided on the differences between the different initial states. Numbers provided for the ocean overturning suggest that they only differ in the surface ocean, which could be one of the reasons why there is only a small impact on the final results. This deserves some discussion

2) A figure showing a latitude-depth section of temperature, salinity or density for the initial and final states could be interesting. I have difficulties to figure out that every thing is so similar between the simulations that it is a waste of time to run a long transient simulation on the Holocene, when snap shots on small periods of interest would be sufficient.

3) The simulation do not include the remnant ice sheet. Could the fresh water induced by the ice-sheet affect the ocean circulation in such a way that the 6ka simulation would not be simply in equilibrium with the insolation forcing?

4) Several regions could potentially provide instabilities resulting from abrupt changes in vegetation. The focus of this paper requires a discussion on the behaviour of the vegetation at the global scale. Results for Africa then could be provided as a specific case, but we have first to make sure that the adjustment of the different types of vegetation converge towards the same solution at the global scale, and that other regions do not have spurious behaviours.

#### Other comments

- 1) An additional figure showing the global adjustment of vegetation would be welcome.
- 2) Figure for the ocean (see comment 2 above) also needed.

3) Model and experimental setup. Please provide rapid description of the major differences between model versions, together with the role they have on the simulated climate.

4) Provide a discussion on the limitation of the 9ka simulation compared to the “real world”. Is there some effect neglected that could affect the conclusions (ex ice-sheet).

5) Explain which adjustment of the model is at the origin of the different conclusions for North Africa.

6) The conclusion of the minimum time of adjustment is interesting. This should be better emphasised and discuss. How is this estimation made? What are the important criteria? How long should the simulation be run to have no statistical differences at the surface (I suppose 100 to 200 years). Discuss which time scale in the adjustment is due to vegetation, which time scale is due to vegetation, and how they combine to produce the final result.

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Interactive comment on Clim. Past Discuss., 2, 315, 2006.

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