

## ***Interactive comment on “Effect of vegetation on the Late Miocene ocean circulation” by G. Lohmann et al.***

**G. Lohmann et al.**

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We worked on the presentation of the model results and give now more arguments for our conclusions. We added several pictures describing the wind, hydrological cycle, and temperature response for the experiments. Furthermore, a table summarizes the main experiments.

Comments to the more specific points: 1. We reformulated the introduction starting with: “Here, we examine  $\check{E}$ ”. The first paragraph is also reformulated in our revised version of the manuscript. We followed your suggestion and modified the “low gradient paradox” into the warm climate problem and polar amplification. We clarified this point.

2. In the revised version, we have added a table containing most of the relevant information about the model set-up. Orbital parameters, solar luminosity, and greenhouse

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gas concentrations are set to present values. For the LPJ model, soil textures are specified to present day values. The initial condition in the ocean model is the present day ocean state (Butzin et al., 2005). The 5000-year long integrations ensure equilibrium for the experiments. Starting with an ocean at rest yields no other steady state after 2000 years of model integration. In the revised version of the manuscript, we are more careful and explicit with the description of the experiments.

3. We recalculated the changes in the hydrological cycle and atmospheric circulation. We included the plots for CTRL, TGEO, and TVEG as suggested (Figs. 4, 5).

4. We followed your suggestion and show now the biome plots for the CTRL and TVEG (Fig. 2).

5. Now, we show the values for SST, wind stress, p-e (Figs. 6, 7, 10). The paragraph has been modified accordingly.

6. Our methodology is based on the reconstructed land surface, vegetation, and sea surface temperatures based on Steppuhn et al. (2006) and Micheels (2003). In our hybrid-coupled ocean model, the ocean salinity and temperature is free to develop (see, e.g. Prange et al., 2003, JPO). We reformulated the methodology section accordingly. A fully coupled atmosphere-ocean-vegetation simulation for the Tortonian climate will be performed in the future where the resulting effect of the hydrological cycle and ocean circulation will be analyzed. Our procedure is a first step towards the simulation of the Tortonian circulation and related climate feedbacks. We emphasized this point in the conclusions section.

7. Now, we give the numbers for the hydrological cycle of the Atlantic net precipitation. Furthermore, we present the changes circulation in Fig. 5. The stronger vapour transport in TVEG attributes to the stronger overturning circulation as compared to TGEO.

8. This is a comment on missing effects in the ocean model. Indeed, the ocean heat transport (after Steppuhn et al., 2006) in the AGCM may have already compensated

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for this shortcoming. We included this argument in the text.

9. We accept your interpretation.

10. We removed the typographical and grammatical errors throughout the text.

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