

## ***Interactive comment on “Interhemispheric Effect of Global Geography on Earth’s Climate Response to Orbital Forcing” by Rajarshi Roychowdhury and Robert DeConto***

### **Anonymous Referee #1**

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The authors examine the role of hemispheric asymmetry of land masses on the climate response to orbital forcing using a slab ocean model. The main weakness of the paper is lacking of physical understanding. The authors merely describe the model response without any physical interpretation. It makes me to wonder what is the goal of this study. If there is no physical understanding behind, the results are presumably model dependent. In a similar context, the results are likely to be modified when the ocean model is employed, as the authors acknowledge. Then, to be a meaningful work, it is critical to physically understand the findings before adding complexity to a model.

Other minor comments are following: 1. Why are the authors focus on the Positive

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Degree Days (PDD)? In the abstract, the authors need to specifically mention that the impacts on the PDD are addressed among many other climate variables.

2. line 43-48: The asymmetrical land masses can cause hemispheric differences in many features such as albedo, strength of water vapor feedback, cloud distribution, and ocean circulation. Which feature is most important?

3. I think the introduction is separated from the main text. I suggest adding the goal of the present study, which is something like lines 157-167 in Section 3, and making connections to the following results.

4. Line 93: Need to specify the mixed layer depth.

5. Is the land model interactive? Or is vegetation prescribed?

6. Line 137: Omit "defined as"

7. Line 226-230: In comprehensive models, the polar amplification only appears in the Arctic and the warming signal is less distinctive in the Antarctica than in the Arctic. Would this asymmetrical land masses be a part of the cause? The authors may be able to add some discussions about it.

8. Figure 3, and alike: Why is one hemisphere masked out? There could be two way interaction, so I wonder what the response is like in the other hemisphere. Rather than masking out, I suggest showing the global response.

9. Line 204-205: The warming effect in the North Atlantic will weaken the Atlantic Meridional Overturning Circulation. Add some discussions about it.

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