

## ***Interactive comment on “Different response of surface temperature and air temperature to deforestation in climate models” by Johannes Winckler et al.***

### **Anonymous Referee #4**

Received and published: 22 November 2018

This paper “Different response of surface temperature and air temperature to deforestation in climate models” by Johannes Winckler investigated the discrepancy in the temperature response to deforestation between climate model and observations, and how the deforestation impact differs among temperature variables. The question studied here is important to understand the impact of deforestation on temperature. The paper also presents some interesting new findings on this topic. Therefore, I think the paper is suitable for publication in Earth System Dynamics.

Major comments:

I feel the manuscript needs to be edited to improve the language, especially for the use

C1

of preposition like “the”, and some sentences are difficult to understand.

According to results of this study, is it possible to establish a relationship to link the impact on surface temperature and on near-surface air temperature to reconcile their differences (a statistical model or the ratio 0.5 found in the paper)?

When analyzing the discrepancy, model uncertainty should be always kept in mind. How the results of this study would be affected by such uncertainty?

Specific comments:

P2 L30: It would be better to also provide the submitted manuscript (Winckler et al., 2018) to reviewers to facilitate the review.

P2 L31: I think these studies compared nearby locations between forest and non-forest or between locations with and without deforestation.

P2 L35: Please specify the different mechanisms here.

P3 L6-8 This sentence needs to be revised for clarity.

P3 L16: add “. . . from CMIP5.”

P4: “The local effects are thus the temperature changes that exceed the nonlocal temperature changes that are obtained by interpolation from nearby non-deforested grid boxes”. I don’t understand this sentence.

P4 L2.3 Better specify “CMIP5” models

P5 L9: How about the 2m temperature in other models, is it defined in a similar way and thus have the similar problem? As for 2m temperature from observation, is it the 2m above ground (within canopy), or 2m above canopy?

P5 L31: Why only 30 years for the non-local effect? I realized that this is explained later. Maybe some rearrangements can be done for this.

Figure 1: Since the transition latitude from warming to cooling is discussed in the paper,

C2

it would be useful to have a latitudinal averaged temperature response for different temperature variables (or in a separate figure).

P8 L30-35. If the discrepancy is explained this way by Richardson number, it sounds like such discrepancy is a model-dependent artifact instead of actual phenomenon. The discrepancy can be seen in observations (e.g., Baldocchi 2013), suggesting it is not just the Richardson number reason. I guess that the differences in the magnitude of Tmin/Tmax and seasonal responses could play a role because they cancel out each other at the annual mean scale.

P10: L11-13: I don't understand this sentence.

P10 L15: "all but one model show a surface warming locally" this sentence may cause confusion.

P11 L13-14. The 0.5 ratio is an interesting number. Is it applicable to section 3.1?

P12 L23: With the scale of deforestation in reality much smaller than the model simulation, the non-local effect is negligible and the local effect is dominant, this makes the climate model and observation more comparable.

P13 L9-10: There is a possibility that this is due to in climate model uncertainty, we don't know if the model is able to perfectly simulate Tmax response. Model uncertainty needs to be taken into account when making this statement.

A recent paper by Melo-aguilar (2018) might be helpful.

Reference

Baldocchi D, Ma S. How will land use affect air temperature in the surface boundary layer? Lessons learned from a comparative study on the energy balance of an oak savanna and annual grassland. *Tellus B*. 2013  
Melo-aguilar C, González-rouco JF, García-bustamante E, Navarro-montesinos J, Steinert N. Influence of radiative forcing factors on ground – air temperature coupling during the last millennium: implica-

C3

tions for borehole climatology. *Clim Past*. 2018;1583–606.

---

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2018-66>, 2018.

C4