Review of "Extreme events in the Amazon after deforestation"
This study employs a global storm-resolving climate model (ICON-Sapphire, 5 km resolution) to simulate the impacts of complete Amazon deforestation on short-duration extreme events. The model captures precipitation, temperature, and wind extremes more realistically than coarse-resolution models. The authors find that while annual mean precipitation remains largely unchanged, the tails of the distributions shift markedly: violent rainfall and no-rain events increase, heat stress intensifies, and extreme winds strengthen. The analysis attributes violent rainfall increases to enhanced moisture convergence, and stronger winds to both reduced surface roughness and storm downdrafts. Overall, the study concludes that deforestation exacerbates climatic extremes. This is an excellent and important paper that provides novel insights into how Amazon deforestation alters extreme events. I have only a few comments, detailed below.

We thank the reviewer for his/her careful reading of our manuscript and valuable comments. We agree that some sentences were unclear and will rephrase those to clarify, and we will also add information about biophysical parameters, which were lacking in the submitted version. Please find below our detailed response, with the comments of the reviewer for clarity.

Major Comments
1. At the bottom of page 2, the authors mention that several biophysical changes following deforestation but do not explicitly discuss the role of surface albedo. Since Table 1 shows a notable increase in albedo after deforestation, please clarify how this factor interacts with evapotranspiration and surface energy fluxes in your interpretation.

We will add a few sentences clarifying the impact of albedo on evapotranspiration and surface energy fluxes at the bottom of page 2. We will add that: Although pasture has a higher albedo that reduces net surface radiation, deforestation shifts the energy partition toward sensible heat as it loses substantial evapotranspiration (Perugini et al., 2017; Duveiller et al., 2018; Butt et al., 2023). The shift in Bowen ratio outweighs the reduction from increased albedo, leading to higher sensible heat flux and higher near-surface temperature. Reduced surface roughness length weakens turbulence heat transport, further contributing to near-surface heat accumulation (Baldocchi and Ma, 2013; Winckler et al., 2019).

2. Page 4: Please clarify what vegetation or land cover is prescribed after deforestation. Relatedly, explain why the leaf area index is still set to 2.7 rather than 0, despite "complete" deforestation.

The pasture values are taken from Gandu et al. (2004), who compiled them from multiple earlier studies, which based their values on observations. Gandu et al. (2004) also used a value of 2.7 for leaf area index. We will clarify the source by adding the table number from Yoon and Hohenegger (2025) and adding the reference to Gandu et al. (2004).

3. Page 7: how about CAPE a few hours earlier? Why was 1 hour selected? Justify why CAPE was calculated only one hour before violent rainfall events. Would the results differ if CAPE were considered several hours earlier

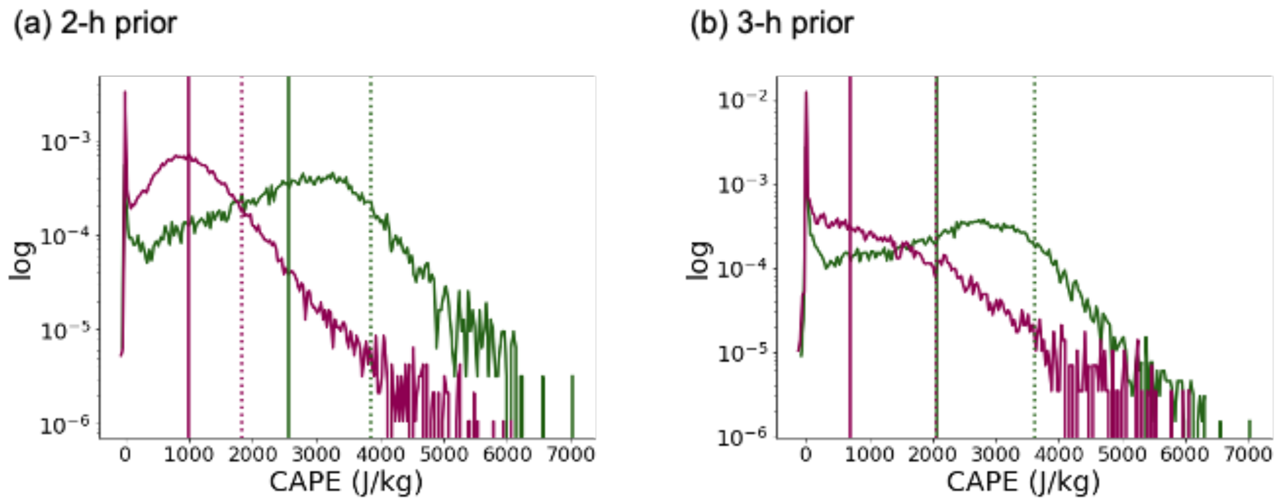

Figure R1. CAPE [J kg^{-1}] (a) two hours and (b) three hours before violent precipitation over the Amazon. The logarithmic probability density function of CAPE is represented with the mean (solid vertical lines) and the 90th percentile (dashed vertical lines). CTL is in dark green and DEF is in dark magenta.

We calculated CAPE one hour prior to violent rainfall events to capture the immediate pre-storm environment. In the tropics, CAPE can vary substantially on sub-hourly to hourly timescales and is rapidly depleted once convection begins (e.g., Sherwood, 1999; Zhang, 2002). By focusing on the 1-h lead, we ensure CAPE reflects the state of the atmosphere just before storm initiation, which aligns with our objective of testing whether violent rainfall occurs in association with enhanced instantaneous instability. We additionally examined CAPE 2 h and 3 h prior to the events (2 h lead time: Fig. R1a; 3 h lead time: Fig. R1b). While the signal weakens with increasing lead time, the results consistently show the same tendency as for the 1 h lead. This gives confidence that our conclusion does not depend sensitively on the exact choice of lead time, although a 1 h primer is the most conservative representation of the pre-storm environment. We will mention in the manuscript that the results do not depend upon the chosen lead time and that we chose 1 hour as the most conservative representation of the pre-storm environment.

4. On page 10, lines 198–200, the authors state: “The post-deforestation nighttime temperatures become comparable to pre-deforestation daytime values.” What does this mean in practice? Please clarify the significance. Do you mean that the nighttime minimum after deforestation is as large as daytime maximum before deforestation? A clearer formulation would help readers interpret the magnitude and implications of this result.

Yes, this is indeed what we described. We will rephrase accordingly.

5. Wet bulb temperature is a widely used indicator of heat stress. You could use both temperature and humidity changes to represent heat stress. If the sign change of wet bulb temperature differs from other indices, it is possible that the heat stress change is not significant.

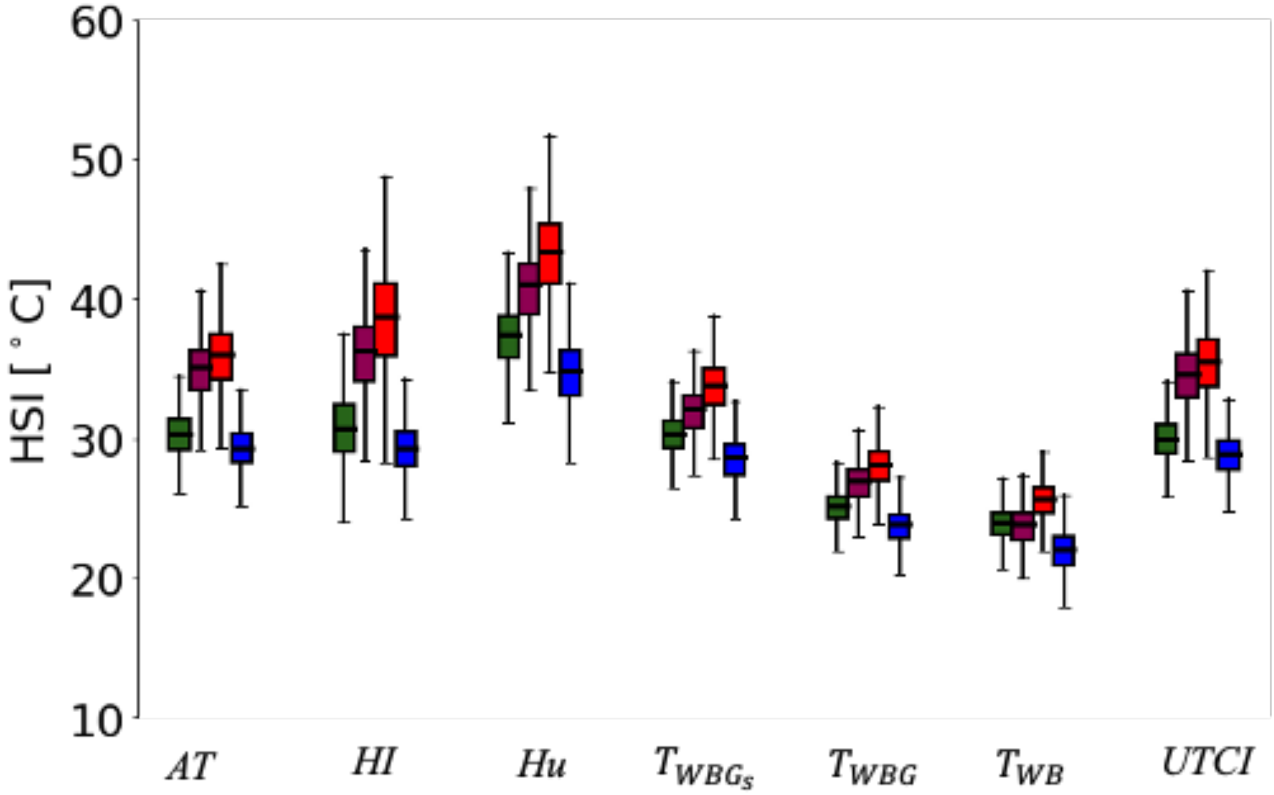

Figure R2. Box-and-whisker plots of heat stress indices (HSI) are the same as Figure 8 for CTL and DEF simulations (green and magenta), additionally with two sensitive simulations: (i) fixing humidity at the CTL values while allowing temperature to change after deforestation (red boxes), and (ii) fixing temperature at the CTL values while allowing humidity to change (blue boxes).

We agree with the reviewer that Twb shows an insignificant impact of deforestation. To further examine the role of temperature and humidity for each heat stress, we conducted an additional sensitivity test (Fig. R2). We calculated each heat stress by (i) fixing humidity at the control (CTL) values while allowing temperature to change due to deforestation (red boxes), and (ii) fixing temperature at the CTL values while allowing humidity to change (blue boxes). The results show that the strongly increased temperature after deforestation leads to high heat stress in all indices, whereas the decreased humidity after deforestation reduces heat stress. Among all indices, Twb is the only one where the humidity reduction (-1.88 °C) manages to compensate for the increase in temperature (+1.64 °C). This follows from the different formulations of the indices and speaks for using more than one index. We will add this discussion and the Figure in the revised version.

6. Page 14: I do not understand: In summary, the relative contributions to the total wind speed anomaly are 60% R/C, 13% D, and 27%. Please re-explain the factor separation results more clearly.

We will rephrase the last two paragraphs of section 3.3 as follows:
We aim to quantify the additional increase in 10 m wind speeds after deforestation that is due to downdrafts associated with violent rain, separating this effect from changes caused by surface roughness and background circulation. We cannot distinguish between the effect of surface roughness and of background circulation, as we do not have simulations with unchanged

roughness at hand. We refer to this factor as R/C and to the downdraft effect as D. To achieve this, we use the Alpert-Stein factor separation method (Stein and Alpert, 1993). We categorize cases into 'no-light rain' (including no rain and light rain) and 'violent rain' in both the CTL and DEF simulations (Table 2). The mean wind during no-light rain in CTL is the baseline case. We then assume that wind changes between no-light rain and violent rain in CTL are due to D. Wind changes in the no-light rain events between CTL and DEF primarily reflect the influence of R/C, whereas wind changes in violent rain events in DEF compared to no-light rain in CTL entail the three components: R/C, D, and synergy between R/C and D.

In CTL, the mean wind speed during no-light rain is 0.92 m/s (see value in Tab. 2). For the violent rain, it is 1.40 m/s. This is an increase of 0.48 m/s, which we attribute to the effect of D alone. By contrast, the mean wind speed for no-light rain in DEF is 3.11 m/s, giving an increase of 2.19 m/s. Hence, the effect of R/C is much larger (f(R/C)=2.19 m/s) compared with D (f(D)=0.48 m/s), showing that R/C dominates the response. In DEF, the mean wind speed during violent rain rises to 4.56 m/s. Compared to the no-light rain in CTL, this is an increase of 3.64 m/s (4.56 – 0.92). Given the contributions of 2.19 m/s for R/C and of 0.48 m/s for D, their synergy account for 0.97 m/s. Expressed in percentage, this gives contributions of 60% from R/C, 13% from D, and 27% from their synergy.

Minor comments

On page 3, please add a map clearly showing the spatial extent of the deforested region in the simulations.
We agree that a reader would like to know the spatial extent of the deforested region. Since the requested area is shown in Fig. 7a and to avoid redundancy while ensuring clarity, we will explicitly refer to Fig. 7a on page 3.

References
Here, we don't mention references that are already cited in my paper.

Gandu, A. W., Cohen, J. C. P., & De Souza, J. R. S. (2004). Simulation of deforestation in eastern Amazonia using a high-resolution model. *Theoretical and Applied Climatology*, *78*(1), 123-135.

Sherwood, S. C., & Wahrlich, R. (1999). Observed evolution of tropical deep convective events and their environment. *Monthly Weather Review*, *127*(8), 1777-1795.

Zhang, G. J. (2002). Convective quasi-equilibrium in midlatitude continental environment and its effect on convective parameterization. *Journal of Geophysical Research: Atmospheres*, *107*(D14), ACL-12.

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