Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-154

Anonymous Referee #1

Referee comment on "Breakdown in precipitation–temperature scaling over India predominantly explained by cloud-driven cooling" by Sarosh Alam Ghausi et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-154-RC1, 2022

The peak structure of the extreme precipitation-temperature scaling curve has been documented by many studies. However, the causes for the peak structure are not understood well. The authors explain this phenomenon from the perspective of the radiative effect of cloud on surface temperature. When the cloud effect is removed, extreme precipitation continuously increases with surface temperature without a break. The authors conclude that the cooling effect of cloud during precipitation dominates the negative scaling at higher temperature. The manuscript is very helpful to better understanding the underlying scheme for the peak structure of the relationship between extreme precipitation and temperature. I recommend accepting for publication with a minor revision. The detailed comments are provided below:

Lines 232-235, Figure 4b: the differences between the two temperatures are positive in most regions. However, “clear sky” temperature is lower “all sky” temperature in the northernmost part (red). Can authors explain why?

The modeled monthly temperature is evaluated in section 3.1. However, the daily temperature is used for the precipitation-temperature scaling. How good is the daily temperature calculated from equation (7)?

The radiative effect of cloud on surface temperature can explain the breakdown of the P-T scaling curve. Can authors provide us with the observation-based cloud information to further validate the statement? For example, the map of cloud over.

Extreme precipitation increases monotonically with temperature when the cloud cooling effect is removed. Is there any implication for the future prediction of extreme precipitation based on the monotonical P-T relationship?

Minor comments:

Line numbers are not continuous.

Line 100: the equation (1) -> equation (1)

Line 121: “Detailed derivation about the same can be found in ……”. I guess that “same” here is a typo.

Line 201: following -> aforementioned

Figure 1: the symbols used for the flux-type variables in the figure are not consistent with the symbols in the text.

Figure 2: in the figure caption, (a) is missing, and (B) and (C) should be lower cases. In addition, 2003 should be placed on the beginning the curve. Otherwise, it gives a wrong impression that the data before 2003 is used in this study.

Appendix A: observed (yellow) and "all-sky" (red) temperatures are mentioned. However, there is no "all-sky" temperature in Figure A1.

Figure A1: it is better to use the actual date instead of days for x-axis in (a), (b), and (c). As such, one can see the seasonal variation of precipitation from the figure more clearly.