

Interactive comment on “Aerosol-induced high precipitation events near the Himalayan foothills” by Goutam Choudhury et al.

Goutam Choudhury et al.

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1. Have you checked the 3 hourly precipitation after the event day? May be it continues increasing in the next days, which can be a reason of low extreme precipitation threshold.

Reply: We appreciate the suggestion of the reviewer. We initially thought the same and checked the 3 hourly precipitation after the event day. We found that it gradually decreased to zero in the next few hours.

2. The value of constants (C_p and L) used in equation-1 should be mentioned in the literature.

Reply: We thank the reviewer for pointing this out. We have mentioned the values in

the revised manuscript in line 103.

3. In line 108, you mention “anomaly of a parameter is calculated by first computing the anomaly for each event day and then averaging over all the events”. Please also include an explanation of how you calculated the anomaly.

Reply: We agree with the reviewer. We have added the following sentence in the manuscript from lines 110 and 111. “The anomaly for an event day is calculated by subtracting the 17 year average value of the parameter from the value of the parameter for that day.”

4. In lines 131-133, while discussing the boundary layer height anomaly, you describe the impact of high humidity values, during high AOD conditions, on the convection growth. This doesn't fit in the paragraph. In lines 191-192, you also explain the possibility of higher AOD due to high relative humidity values. How would you justify the two statements?

Reply: We believe that the hygroscopic growth effect of relative humidity on the AOD values is persistent in highly humid situations like an extreme event. But we cannot disregard the humidity/moisture content as it is one of the most important fuel to every precipitating system. Since the higher MSE values also account for the higher moisture content (humidity - ‘q’ in eq. 1), we have accepted the reviewer's suggestion and removed the following statement in the revised manuscript. “The humidity values are found to be higher during the periods of higher AOD, which support the availability of more latent heat for the convection growth (Lou et al., 2019).”

5. In line 157, what do you mean by "the available air parcel"? Does it mean the air parcel which accumulates moisture and aerosols during day time via AECl mechanism? Please modify it accordingly.

Reply: We thank the reviewer for pointing this out. We have omitted the line 157 in the revised manuscript.

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6. In line 194-195, you mention "we did not have the AOD observations from MODIS at every grid point inside our domain". What I understand is you did not have the MODIS AOD observations at every grid point inside your domain for the individual events and not after averaging or making composite. Please rephrase the sentence.

Reply: We thank the reviewer for this suggestion. We have modified the sentence as follows. "Thus, we did not have the AOD observations from MODIS at every grid point inside our domain for the individual events (supplementary Figure S1)."

7. The conclusion is missing an overall explanation of the AECl mechanism in the context of the Himalayan region. After concluding the findings in four bullet points, please include an overall explanation of how these findings combinedly result in an extreme precipitating event over the Himalayan Foothills.

Reply: We agree with the reviewer. We have included the following in the manuscript from line 202 to 206. "The aerosols accumulate near and within the selected domain starting from two days prior to the event. The low precipitation as seen in Figure 4 before the events may have allowed this build-up of aerosols. By the AECl mechanism, the convection in the lower atmosphere is suppressed during the day time preventing the consumption of the moist static energy. This excess energy, when gets transported towards the orography during night leads to an increase in the magnitude of high precipitation events."

8. The site map depicting the topography of the region can be improved further with higher resolution one. Please consider the higher resolution one in the revised version.

Reply: We apologize for the low resolution topography map. We have included a high resolution one in the revised version.

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