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ESTIMATING THE EFFECTS OF AEROSOL, CLOUD, AND WATER VAPOR ON THE RECENT BRIGHTENING IN INDIA DURING THE MONSOON SEASON
by Feiyue Mao, Zengxin Pan, Wei Wang, Xin Lu, and Wei Gong

Recommendation: Reject.

This manuscript examines the effect of aerosol, cloud, and water vapor variations on recent change of surface solar radiation and the associated dimming and brightening during monsoon season in India. Multi-year observations from A-Train satellite constellation have been used. The topic is quite interesting and important for the studied region. However, I have quit a few concerns that the authors need to address before it can be published.

My biggest concern is that the authors failed to accurately present and connect the observational findings and tended to draw conclusions without providing further evidences. I listed some of these in the specific comments, e.g., # 22, 26, 27, 30, and so on.

The second one is about the *Abstract*. It should basically give the readers a clear and concise overview of the manuscript in terms of the aim, main points, and conclusions. However, the *Abstract* of this study is just repeating what's been stated in the *Conclusion*. For example, the first few sentences in Lines 12-17 are exactly the same as those in the beginning of *Conclusion*.

My third concern is that the authors need to provide a more thorough literature review about the global and regional change of surface solar radiation and the underlying mechanisms so that readers can have a better context to understand all the discussions followed.

Another one is related to the uncertainty and limitation of data sources. I suggest the authors to rewrite the section of *Data and Methods*. It would be easier to follow if the authors could specify what variables from each dataset have been used after a general description is provided. And please also provide what are the main uncertainties of such variables, either from instrument/model itself or from the retrieval methods. Instead of just providing a reference, the authors need to expand it more including, but not limited to, how those uncertainties affect the current study.

Last but not least, a terrain map showing the study domain should be provided before any spatial-average results are shown. Also figure and panel numbers are missing a lot when the relevant results are discussed, which had made it difficult for me to follow.

Specific comments:
1. Abstract, 13: Add a sentence illustrating why this transition needs to be concerned. In other words, why is this study important?

2. Abstract, 16: Add '*surface*' before '*solar radiation*'.

3. Abstract, 18: Specify this is the spatial- and temporal-average '*increase*'.

4. P2, 37: Add reference to support this statement.

5. P2, 38: Be more specific: was this reduction global or regional and in what season did it occur?

6. P2, 44: What region was this trend observed over?

7. P2, 53: Add reference.

8. P3, 78-79: Specify why only the changes of aerosols, clouds and water vapor are considered. This is the basis of the current study.

9. P4, 90: Add reference.

10. P4, 114: Write out what CERES stands for.

11. P5, 118: Please be more specific and describe how it's relevant to this study.

12. P5, 131-133: This is a good place to state how CALIPSO data is used in the current study and how the authors combine it with other datasets.

13. P5, 138: Add reference.

14. P6, Sec. 2.4: The authors described a radiative transfer model here. But what is more important is how this model is relevant to this study.

15. P7, 173: Add reference for the ECMWF-AUX product.

16. P7, 195: Add reference.

17. P7, 196: Define what the '*all-sky*' condition is.

18. P8, 207: What is the reference for this equation? Are there any uncertainties and limitations to apply it? If the answer is yes, how does it affect this study?

19. P8, 214-216: Be more specific.

20. P8, 219: Figure 1 shows the time series of the spatial-average AOD. A terrain map with the studied domain should be provided first. Also explain in detail how the spatial and temporal average were done. Provide statistical analysis and show how significant the results are. Please do this for the other relevant results too. Also, the orange lines in Figure 1 are not mentioned in the text at all.

21. P9, 226: Explain why aerosols under clouds are missed by MODIS.

22. P9, 235: Add figure panel number from which the observation is made. The significance of the trend needs to be discussed before this statement can be made.

23. P9, 240-243: I don't follow these two sentences. Please rewrite them.

24. P9, 247-249: The '*distribution*' cannot '*decrease*'! What level is this maximum decrease is associated and what does it indicate?

25. P10, 256-258: Is this consistent with previous studies?

26. P10, 265-266: Provide evidence for this statement.

27. P10, 267-274: This paragraph needs to be expanded. What has caused such spatial variation for different cloud properties? Do the spatial patterns change year by year? How significant are the trends shown?

28. P11, 277: Again, how the '*all-sky*' condition is defined?

29. P11, 278-283: How about the trends above 15 km?

30. P10-P11, 281-283 and 286-288: Please provide evidence for these statements.

31. P11, 284: I cannot see the similarity here.

32. P11, 299-300: Expand this with more details.

33. P12, 311-312: This would be better seen if the difference between the two had been plotted.

34. P12, 314-317: What has caused the spatial variation of PW?

35. P12, 330-332: Describe and compare in more details the direct and indirect effects of water vapor.

36. P12, 333: What do you mean by '*stronger clouds*'?

37. Conclusion: This section needs to be expanded. Can the methodology used in this study be applied for those in other regions? How will the findings benefit the representation of surface solar heating in climate models? Are there any potential implications for climate variations?