

Review on Different aerosol effects on the daytime and nocturnal cloud-to-ground lightning in the Sichuan Basin, by Wang et al.

The study has investigated the impacts of aerosols and dynamics-thermodynamics on cloud-to-ground (CG) lightning activity in the Sichuan Basin. The topic is interesting, however, there are obvious major deficiencies in the scientific analysis. Some conclusions are based on assumptions, rather than on detailed analysis of the corresponding observation results. Additional information, figures and analysis are needed to convince the reader of the validity of the conclusions. Recommendation: Major revisions.

General comments:

(1) The manuscript is in need of careful English language editing throughout, particularly the specific scientific term and the sentence structure. There are too many to spend time providing a full list of typos and language corrections.

(2) The data processing of polluted and clean subsets is not unambiguous (Lines 124-125). What the exact AOD range or value are used in this study? Please clarify.

(3) I still cannot understand how these two periods (Period 1 and Period2, lines 218-220) are chosen. However, these two time periods are the basis for the following analysis and discussion.

(4) How do you define the different time periods in this study? The time periods used in this paper include “nighttime (1800-600BJT)” (line 139), “midnight (2400-0100 BJT)” (line 140), “night (2300-2400 BJT)” (line 188), “midnight (2400-0300 BJT)” (line 170), “midnight (2300-0200 BJT)” (line 171), ..., which is very confusing.

(5) Conclusions are based on assumptions, rather than on detailed analysis of the corresponding observation results. No statistics are presented to prove the points as follows:

(5.1) Lines 193-195: “We speculate that this may be one of the causes for the inconsistent response results of PPCG to aerosol loading in different periods.”

(5.2) Lines 228-232: “Meanwhile, the relationship between aerosols and CG

lightning flashes did not show a similar nonlinear relationship at night time. We speculate that this may be due to the lack of solar radiation at night, weakening aerosol radiative effects.”

(5.3) Lines 253-255: “Thus, we may infer that the thunderstorm system in the period1 is different to that in period2.”

(5.4) Lines 351-353: “Therefore, it can be inferred that aerosols have different effects on lightning at different times in the study region.”

(6) The results show that there are differences in the spatial distribution of CG lightning between polluted and clean subsets (Fig.5). What is the reason of this distribution? Will this influence the following analysis? Before the authors discuss the relationships between CG and aerosols at different periods, a more comprehensive discussion, related to the differences in the spatial distribution of CG lightning between polluted and clean subsets is required.

(7) Lines 240-283, Figures 7-9: How did the samples be sorted? More information about the methods should be provided. Furthermore, your conclusion seems not reliable because of the large standard deviation of each bin.

(8) Lines 256-271: The analysis seems to be completely wrong. The authors claim that “A positive relationship ($r = 0.94$) between them is found in Period2” (line 261, Fig. 8b). However, a negative relationship between them is shown in Fig. 8b.

(9) Figures 10-11: The authors got “564 samples” in total (line 123), however, the total number of samples in Figs. 10-11 is much larger than 564 samples, which cannot convince the reader of the validity of the conclusions.

Technical corrections

(5) Line 69: It should be “research” not “researches”.

(6) Line 139: should be “0600 BJT” not “600 BJT”.

(6) Line 256: should be “TCLW” not “TCL”.

(6) Line 268: should be “TCG” not “TTCG”.

(6) Line 354: should be “updraft” not “uplift”.

- (6) Figure 1: should be “(d)” not “(b)” (line 583).
- (6) Figure 3: where is the spatial distribution of wind field you mentioned on Line 143?
- (7) Figure 4: The caption does not correspond to the figure.
- (8) Figure 8: The legend is completely wrong.
- (9) Figure 9: should be “in (red) period1 and (blue) period2” not “in (blue) period1 and (red) period2”.
- (10) Figure 10-11: See comments above.

More text corrections are left for a later version.