

We appreciate all the reviewers for their valuable comments and suggestions, which helped us to improve our manuscript greatly.

Reviewer 1's Comments to Author:

Main comments:

This work developed an automated algorithm for mesoscale convective complex (MCC) identification and tracking, and then composed a long-term dataset of MCC variables over mainland China, based on the FY-2G cloud-top temperature data. MCC is an important type of convective system, often bringing about persistent heavy rain and secondary geologic disasters. Thus, this work has the potential in promoting the monitoring and research on the occurrence of MCC, and helping in disaster alleviation over the region. In general, the algorithm is described clearly, the manuscript is well-organized, and the dataset can be actually downloaded. However, there are some places (see specific comments) that need to be revised before it can be accepted for publication.

Specific comments:

1. At line 37, I think the authors mean “their variation” instead of “their formation”, as the Southern Oscillation, the Madden-Julian Oscillation are not short-term signals.

Reply: Thanks for the comment. We have revised “their formation” to “their variation” at line 37.

2. In lines 46-49, the sentence should be re-arranged to make its means more clear.

Reply: Thanks for the comment. Yes, the original sentence is too long and contains an excess of information, which compromises its clarity. We have restructured the sentence by breaking it into shorter sentences and removing unclear information, please see the revised manuscript at lines 46-48.

3. At line 80, the sentence begins with “Through multispectral sensing in the visible, infrared, and water-vapor bands, ” is not completed. It seems the latter part of the sentence is missed out.

Reply: Thank you for pointing this out. Yes, the latter half of the sentence “cloud-top temperatures are monitored comprehensively” was inadvertently omitted during the revision and saving of the draft. Now the sentence has been reinstated and is complete. Please see the revised manuscript at line 79.

4. In lines 80-83: “The satellite’s longitude has been relocated twice: initially at 99.5° E prior to June 1, 2015, ...” can be modified to be more concise. And I don’t understand whether the operational scan cycle is 30 or 60 minutes, or somewhere in the between.

Reply: Thanks for the comment. Now, the sentence is revised as “The satellite’s longitude has undergone two relocations: it was positioned at 99.5°E before June 1,

2015; then at 105°E from that date until April 16, 2018; and has since been stationed at 99.2°E.”, which is more concise than the original one. The operational scan cycle is one hour during non-flood season and 30 minutes during flood season. We revised the sentence to make this information clearer. Please see the revised manuscript at lines 79-82.

5. Remove the “measurements” in line 85.

Reply: Done, thanks.

6. At line 89, what does the “nominal” mean?

Reply: Thanks for the comment. To avoid ambiguity, we have changed the term “a nominal 5km spatial resolution” to “a spatial resolution of approximately 5 km × 5 km”. Please see the revised manuscript at line 89.

7. At line 96, “reveal” -> “reveals”. And in line 104, “where” -> “with”

Reply: Done, thanks.

8. The sentence in lines 105-108 needs to be re-arranged. For example, what is the link between “ecc criterion is relaxed from ≥ 0.7 to ≥ 0.6 when the cold-cloud shield reaches its maximum extent” and “enabling capturing the full MCC lifecycle” ?

Reply: Thanks for the comment. The original sentence is a little ambiguous. We have revised the sentence to clarify that the ecc criterion is relaxed from ≥ 0.7 at maximum extent to ≥ 0.6 throughout the MCC lifecycle, to accommodate morphological variability. By this, the logical link of the sentence is improved. Please see the revised text at Lines 109-110.

9. At line 110, it is described that “all above morphological and area criteria are satisfied continuously for at least 6 hours”. However, in line 107, it seems that $\text{ecc} \geq 0.6$ is only required when the cold-cloud shield reaches maximum extent. Can the authors re-check and clarify these two places?

Reply: Thanks for the comment. Like comment #8, this conflict is also because that the original sentence in lines 105-108 did not make clear $\text{ecc} \geq 0.6$ is required throughout the MCC lifecycle. After the revision according to comment #8, this conflict can be eliminated. Please see the revised text at Lines 109-110.

10. The caption of Table 1, remove the “the”. And in the table, when a criterion is not used in either Maddox (1980) or this study, probably you can just use “~” instead of “null” or “Not specified”.

Reply: Done, thanks.

11. At line 124, “0.1°grid” -> “0.1° × 0.1°grid”, and “optimizing” -> “to optimize”.

Reply: Done, thanks.

12. At line 150, “lenient parameter” -> “permissive threshold”, “formative stages” -> “early stages”

Reply: Done, thanks.

13. The caption of Figure 2 (line 162), I think $\text{area} \geq 4 \times 10^4 \text{ km}^2$ is not applied in the subplot of b, or it will be repetitive with the subplot of c. By the way, Figure 2 has not been cited anywhere in the text.

Reply: Thank you to the reviewer for such a thorough and insightful review. The “ $\text{area} \geq 4 \times 10^4 \text{ km}^2$ ” is now removed from the caption of Figure 2b. Please see the revised caption of Figure 2 at Line 165. We have also added citations of Figure 2 and its subplots in the revised main text, at lines 129, 131, 153, 155, to integrate the figure properly into the discussion.

14. At line 182, “the” -> “The”. And the citation of Fig. 4 should be put here instead of line 188.

Reply: Done, thanks.

15. The discussions in the two paragraphs of page 9 is a little puzzle for readers. For example, does the seasonally-filtered data mean winter-excluded data; and the unfiltered national data mean data of all seasons? Probably the authors can modify these two paragraphs to make them more clearly. And by the way, please don’t use “green and pink curves” or “black curve” to describe a scientific story.

Reply: Thanks for the comment. The two paragraphs in page 9 have been re-organized to improve their accuracy and standardization. For example, we clarified that the seasonal filtering refers to excluding winter months (December–February), and modified “national data” to MCC cases across China. And all non-standard expressions, such as “green and pink curves”, “black curve”, in the original paragraphs in page 9, have been replaced with descriptions based on physical variables. Please see the revised text at lines 203-221.

16. The caption of Figure 5, “Area Probability Distribution Curve” -> “Probability distribution function of MCC areal extent”. And the description of the three lines in the figure can be more concise.

Reply: Thanks for the comments. During the re-organization of the two paragraphs in page 9 according to comment #15, the full name of PDF is given in the main text, thus the caption of Figure 5 has been revised to “PDF of MCC areal extent ...”, and the description of the three lines is modified to “the full set of cases across China (green line), the validated subset over a selected region ($20^\circ - 30^\circ \text{ N}$, $100^\circ - 120^\circ \text{ E}$) (purple line), and the subset across China after excluding winter months”, much more concise than before. Please see the revised caption at lines 224-225.

17. At line 216, what does the “legitimate climatic signals” mean here. I think here is still about MCC, right? Climatic signals are too ambiguous.

Reply: Thanks for the comment. We replaced the “legitimate climatic signals” with

“true MCC cases”. Please see the revised text at Line 216.

18. At line 217, the “atmospheric divergence” is not precise here to express seasonal variation in weather pattern.

Reply: Thanks for the comment. The sentence with “atmospheric divergence” has been deleted when re-organizing the two paragraphs in page 9 according to comment #15. Please see the revised text at Lines 218-221.

19. The caption of Figure 6, “cluster area” is not precise. Here each marker represents an MCC event, right? Then the marker size must represent the areal extent of the MCC event at some time point, mustn't it?

Reply: Thanks for the comment. It reminds us that this comment is also applied to Figure 3. Thus, we first revised the caption of Figure 3 and give the clear information of each marker and its size as “Each marker represents an individual MCC, with its size proportional to the areal extent ($CTT \leq -52^\circ C$) at the onset of its lifetime.” Then, we revised the caption of Figure 6 as “Same as Figure3, but with winter months excluded.” Please see the revised captions at lines 180-183, and line 248.

20. At line 243, “demarcated in Fig. 6” can not be found in the Figure 6.

Reply: Thanks for the comment. A red box has been added to Fig.6 as the following. Please see the revised Figure 6 in the manuscript in page 12.

