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

Reviewer 2' Comments to Author:

This paper developed an automated algorithm for MCC identification and tracking based on the FY-2G satellite data. Such a dataset is valuable for various applications, such as climate change research and disaster risk reduction. The algorithm is proved to be physically sound and can effectively capture MCC occurrence and movement over mainland China. In general, the paper is well written: the method is clearly described, the analysis and discussions are thorough and comprehensible. However, there are some places that either need more clarification or should be revised before it is published. These are listed in the following specific comments and questions.

Question about the method:

In the north China, cases that are "nealy cloud-free or covered by thin cloud" could be miss-identified as MCC (around line 185) . Can this happen for other seasons and in other regions? If so, how can we justify the correctness of the identified MCCs by simply eliminate the winter season?

Reply: Thank you for the valuable comment. MCC was first defined by Maddox (1980) based on cases observed over America during the warm season (March to September). The definition relies on cloud top temperature thresholds (CTT$\leq$ -32°C and/or CTT$\leq$ -52°C), requiring that the cold cloud shield be circular and clustered in shape, and exceed a minimum areal extent (achieving meso-α scale). In winter, however, the application of CTT-based criteria to northeastern China presents challenges. The land surface in this region can become extremely cold, allowing clouds with limited vertical development to exhibit CTT values low enough to meet the MCC thresholds. Moreover, this region is frequently influenced by the Northeast China cold vortex (NCCV) — a synoptic-scale system whose cloud shield often appears round, clustered, and expansive, closely resembling the signature of warm-season MCCs. These factors contribute to a high rate of false positives when the CTT-based algorithm is applied during winter. By contrast, during other seasons, without convection, it is not easy for clouds to attain the necessary vertical development to achieve such low CTT values, or exhibit the organized, meso-α scale structure characteristic of true MCCs. Therefore, in the present work we opted to simply exclude winter months from the analysis to ensure data reliability. Nevertheless, in future versions of the automated identification algorithm, we plan to incorporate additional physical variables (e.g., vertical velocity, stability indices) to improve detection accuracy and reduce dependence on manual intervention, such as the seasonal filtering applied here.

Specific comments and corrections:

1. Line 23: "both in South China and mainland China". People may misunderstand these as two separate regions of China. Maybe it's better to say "both in South China and mainland China as a whole".

Reply: Done, thanks.

2. Line 35: "region of major topographic features" is an ambiguous expression. Do you mean region of large-scale plateau?

Reply: Thanks for the comment. Here "regions of major topographic features" means not only large-scale plateau, but also large mountain range such as the Rockies. To avoid ambiguity, we revised the phrase as "large-scale elevated terrain, such as plateaus and major mountain ranges". Please see the revised text at Lines 35-36.

3. Line 39: The hyphens here should be em-dashes.

Reply: Done, thanks.

4. Lines 96-97 and lines 100-102: These sentences described how manual census reveals the problem of using the original parameters from Maddox (1980) in China. It's better to conjunct these sentences properly to increase the logic fluency and coherence.

Reply: Thanks for this helpful suggestion. We have re-arranged these sentences within one paragraph, by explicitly linking the limitations of the original Maddox (1980) and how to modified the deep-convection core area threshold in order to better apply it in China. Please see the revised text at Lines 98-103.

5. Line 102: please give proper references to the criteria stated here (i.e., CTT<=-52℃ with an area >=50000 km^2). And does the 40000 km^2 criteria brought from previous studies or randomly set in this study?

Reply: Thanks for the comment. The original criteria (i.e., CTT $\leqslant$ −32℃ with area $\geqslant 10^5$ km^2, CTT $\leq$ -52°C with an area $\geq$50000 km^2) are from Maddox (1980), and we have added this reference. Please see the revised text at line 99.

The threshold of 40000 km^2 is set by comprehensive consideration of previous studies (i.e., Augustine, 1991; Fei, 2011) and our examination of several MCC cases in China. We have added this illustration, please see the revised text at lines 100-103.

6. Table 1: Both TBB and CTT are used in this table. Are they different variables? Or just two different expressions of the same variable? If the latter, it's better to use the same expression.

Reply: Thank you for the comment. Physically speaking, TBB (Black Body Temperature) and CTT (Cloud-Top Temperature) are not strictly identical. TBB is the brightness temperature directly retrieved from satellite infrared measurements, whereas CTT is a more general concept that can be derived through various methods, including radiative transfer modeling or multi-channel observations.

In our study, the cloud-top temperature data used are from the FY-2G satellite, and its

official product is named "CTT" by the data provider (National Satellite Meteorological Center, China). In the seminal work of Maddox (1980), the equivalent variable was referred to as "TBB" based on the satellite data available at that time. To ensure data traceability and consistency with the official product nomenclature, and to respect the original terminology used in the referenced literature, we prefer to retain the respective terms in Table 1.

7. Lines 129-130: the hyphen here should be em-dash.
Reply: Done, thanks.

8. Equation 1: The equation and text are inconsistent. The equation actually calculated the total clutter area Si, rather than "the individual pixel area" as stated in lines 141-142.
Reply: Thanks for the comment. We have corrected this place by changing "the individual pixel area" to "area of each cluster". Please see the revised text at line 142.

9. Lines 180-181: this sentence is confusing. a better expression may be "comparative analysis was conducted between two typical algorithm-identified cases, one from this region and the other from southern China, with the latter manually confirmed."
Reply: Done, thanks for this valuable suggestion.

10. Line 182: "the CTT" should be "The CTT". Additionally, please refer to the explicit figure on basis of which the discussion is made.
Reply: Thanks for such an insightful review. "the CTT" is now changed to "The CTT". And we have added figure citation in the proper places to clearly indicate the figure on which the analysis is based. Please see the revised text at lines 184-191.

11. Lines 198-199: Are this statement addressed from figure 5? If so, it's better to move it below to appropriate places, perhaps after line 205.
Reply: Thanks for the comment. The statement at original lines 198-199 is not addressed from figure 5, but still based on preceding analysis of individual MCC cases. To make this background explicit, we revised this place by adding sentences before this statement: "Based on the preceding analysis of individual MCC cases, we found that winter cases automatically identified in northeastern China were likely false positives. To mitigate these spurious detections, a seasonal filtering excluding winter observations was applied." Please see the revised text at lines 202-204.

12. Line 202: The title could be "Data Output", to avoid confusion with the title of section 4.
Reply: Done, thanks.

13. Section 3.4: It is recommended to provide a table here to summarize the key information of the dataset, for instance the variables, dimensions, attributes.

Reply: Thanks for this valuable suggestion. We have added a table in Section 3.4 that summarizes the key information of the MCC dataset, including the variables, their physical meaning, units, and typical dimensions. Please see the revised manuscript at lines 231-233. The table is also presented bellow:

Table 3. Summary of variables in the MCC dataset

Variable name	Description	Units
Time	Time (yyyymmddhh) of each MCC record	~
Area	Areal extent of MCC cold cloud shield (CTT$\leq -52°C$)	km^2
Maj.Axis	Major axis length of MCC	km
Ecc	Eccentricity of MCC	1
Lat	Latitude of MCC centroid	°N
Lon	Longitude of MCC centroid	°E
CTT_Min	Minimum cloud-top temperature within MCC	K

14. Line 230: The phrase "cumulative MCC" is confusing. Are there other types of MCC?

Reply: Thanks for the comment. The phrase "cumulative MCC" was intended to indicate the total number of MCC events over the past decade. We have changed this term to "total number of MCC events" to avoid ambiguity. Please see the revised text at line 237.

15. Line 235: The phrase "extremely large" is ambiguous. Could give a quantitative number?

Reply: Thanks for this suggestion. We have revised the text by replacing the ambiguous phrase "extremely large" with a quantitative description. Based on our dataset, summer MCCs rarely exceed an areal extent of 20×10^4 km^2, which is now explicitly stated in the manuscript. Please see the revised text at line 242.

16. Line 243: It's unclear where the southwest China here refers to. Please consider illustrating the area in the figure, or providing an exact depiction of its extension in the text.

Reply: Thanks for this comment. To clarify the spatial extent of Southwest China, we have added a clear outline of this region directly on the figure 6. Please see the revised manuscript in page 12. The figure is also presented bellow.
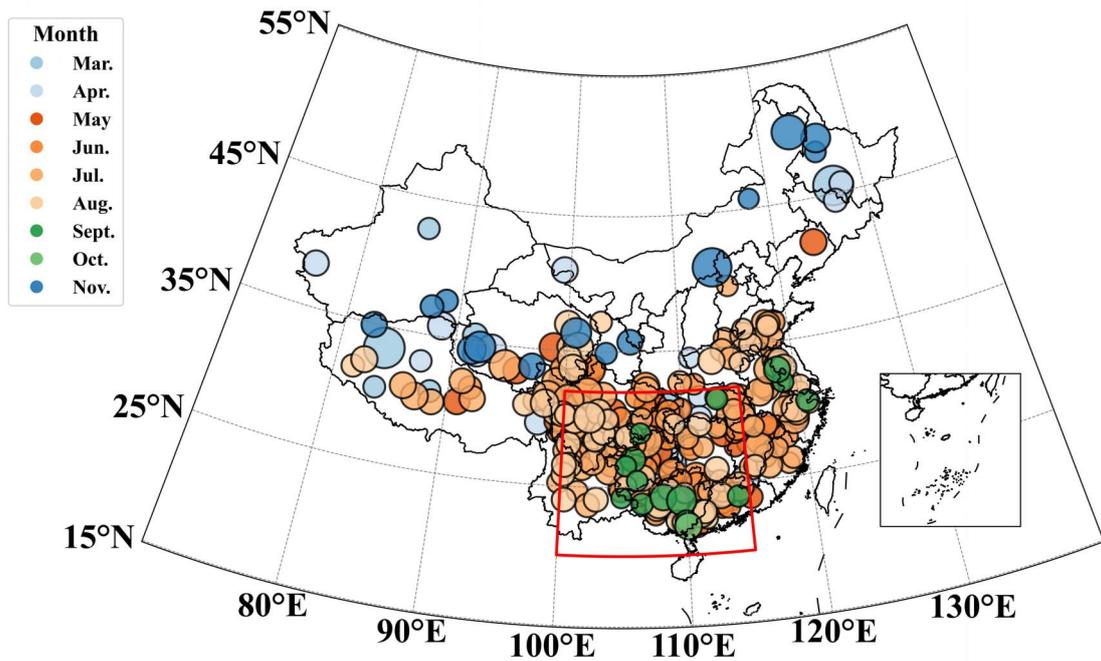
17. Lines 245-248: Please mention figure 7 here when doing description based on the figure.

Reply: Done, thanks.

18. Line 251: "Zhang, 2025" should be "Zhang et al., 2025". "in Figs. 7 and 8" should be "in Figure 7".

Reply: Done, thanks.

19. Line 260: Perhaps "The coherence of the peak in 2020 across..." can be "The coherence of the peak in 2020, as well as the periodicity, across..."

Reply: Done, thanks.

20. Line 281: "2015-2014" should be "2015-2024".

Reply: Done, thanks.

21. Line 282-283: "where cold surface conditions can lead to" perhaps is better to be "where cold surface conditions and thin very high clouds can lead to"?

Reply: Done, thanks.