# Responses to RC1

We are grateful to the Editor and the Reviewers for reviewing our manuscript. The comments and suggestions are very helpful and valuable. According to the nice suggestions, we have made point-by-point response to the reviewers' comments.

**RC1：**

Main comments

1 Lines 21- 24. "Compared with the MBR method, the BFE method can obtain a smaller rain cell area, and the filling ratio is better. However, the MBR method can simplify the data storage volume. Consequently, we employed the MBR method to analyze the precipitation structure of two typical rain cell precipitation cases." How is difference in storage between two methods? Is difference of data storage between the two methods the only reason to choose MBR method?

Response：Thank you very much. This paragraph has been deleted. This question is answered in the conclusion of the manuscript: "It must be noted that the difference between MBR method and BFE method is only in the horizontal geometric parameters of the rain cell."[Line 313-314]

The reason why two methods are used is also from scientific considerations, i.e. one more method is better than one. But your question is very good. Let's be clear about our starting point.

2 Fig. 1 shows that there are stratiform, convection and other precipitation. How was this classification made? Is it proved by the used datasets?

Response： Thanks. The identified precipitation types (convective precipitation, stratiform precipitation, other types of precipitation) were provided by the standard data of TRMM PR algorithm, and the three types of precipitation are the basic components of rain cell. The specific algorithm of precipitation type is complicated, which was

discussed in detail in papers listed below. Simply, stratiform precipitation was identified by bright-band, convective precipitation was identified by 40 dBZ threshold, and precipitation outside the two categories was other type of precipitation. Since the precipitation type identification method (V-method, Vertical profile method, H-method, Horizontal pattern method) had been proved correct by many studies (except for the Tibetan Plateau), we do not need to spend time to verify.

Since the defined rain cell was composed of different precipitation types, the characteristics of rain cell and its regional differences, changes in the precipitation process, or climate changes can be studied by analyzing the proportion and intensity of different precipitation types in the rain cell. Therefore, the rain cell data established in this study has important scientific significance for the cognition of the rain cell.

Please look the listed two references:

Awaka, J., Iguchi, T., and Okamoto, K.: TRMM PR standard algorithm 2A23 and its performance on bright band detection, J. Meteorol. Soc. Japan. Ser. II, 87A, 31–57, https://doi.org/10.2151/jmsj.87A.31, 2009.

Fu, Y. F., Liu, Y., Wu, Z. H., Zhang, P., Gu, S. Y., Chen, L., and Nan, S.: A new algorithm of rain type classification for GPM dual-frequency precipitation radar in summer Tibetan Plateau, Adv. Atmos. Sci., https://doi.org/10.1007/s00376-024-3384-7, 2024.

3 For the definitions of the rain cell, it is using a threshold of 17 dBZ. Is that mean that it will miss some weak cumulus cloud, e.g. cumulus without precipitation?

Response：Thank you very much. You asked very good questions! 17 dBZ is the threshold for TRMM PR to identify precipitation, which is determined by the performance of PR wavelength 2.2 cm (frequency 13.8 GHz). For small-scale particles, PR cannot scatter at its wavelength, so PR cannot identify such weak precipitation, so the rain cell we defined does not include such very weak precipitation.

In subsequent studies, we will use FY-3G PMR or GPM DPR data to establish rain

cells, because PMR and DPR have Ka-band radar, which can identify weak precipitation. TRMM PR, VIRS, and TRM were selected to build the rain cell data because they have 15 years of observations.

4 It was noticed that this paper is a data description paper. I agree that the increasing improvement of rain cell characteristics can promote our cognition of the precipitation system. The authors developed a new dataset for the rain cell. I think readers want to know what can we do with the new dataset. That says, in which aspect the new dataset can improve our knowledge of the cloud and precipitation system.

Response：That's a very good reminder. Thank you very much. In the conclusion of the revised manuscript, I have added a paragraph describing the use of the rain cell data: “The new rain cell data in this study can be used to study the peculiarity of rain cell geometric and physical parameters. Although a lot of achievements have been made in this aspect, systematic and in-depth analysis is still needed, such as the regional differences of these parameters and the characteristics of climate change. It can also be used to analyze the relationship between the physical and geometric parameters of rain cell, which also have regional differences. The effective radius of cloud particles, optical thickness, liquid water path and other parameters in rain cell can be obtained by combining retrieval algorithms of visible and near infrared reflectivity, which can analyze the characteristics of cloud physical parameters of rain cell. These parameters such as cloud water and ice water in column, cloud temperature and rain rate in rain cell can also be obtained by using microwave brightness temperature retrieval algorithms, and the relationship among these parameters can be analyzed.” [Line 317-326]

5 The illustration of the new data via cases shown in Fig.1. How do the authors choose these cases and what is special characteristics of these cases? If we want to use the dataset to investigate the rain cell, what should we carefully concern?

Response：Thank you very much. These two rain cells were randomly selected, one had more weak precipitation (stratiform precipitation) and another more strong precipitation (convective precipitation). Usually, we have knowledge of the two kinds of precipitation systems. Compared with the geometric and physical parameters of the rain cell identified in this study, the results were also in line with our inherent cognition on the two kinds of precipitation system, such as the weak rain cell is not deep in the vertical direction with small rain rate, and the strong rain cell is deep with low infrared brightness temperature. The rain cell identification algorithm of this study will be provided to the National Satellite Meteorological Centre of CMA. It is believed that the rain cell data will be available to use in the near future, and detailed explanations will be given. There are no special precautions when using.

Minor comments

1 Line 20. I think word “well” is more proper than “better”.

Response：Changes were made in the revised manuscript. Thanks.

2 The format of Table 1 should be refined. Text of column 2 occupies space of column 3.

Response：Thank you for your nice suggestion. Changes have been made in the revised manuscript.

All the above have been modified in the revised manuscript. Thank you again.