

Response to Reviewer

General comments to authors:

The authors proposed a synergistic algorithm based on five months of observation data in China. And through application research and case analysis on different sites, we have seen the application prospects of this method, which I think is a very interesting study. However, before publication, I feel that there are still some areas that can be slightly revised and improved.

Specific comments:

1. Throughout the manuscript, 'lidar' should be 'LiDAR'.

Reply: We have corrected it throughout the paper.

2. The language expression of the authors needs minor revisions, especially in the introduction section where there are too many long sentences, which can confuse and obscure readers.

Reply: We have rephrased the language expression of the paper, especially the introduction section.

3. Some abbreviations that first appear in the manuscript require brief explanations, such as 'SAPHIR', 'MEGHA-TROPIQUES', 'LST', etc.

Reply: We have added the explanations of the abbreviations through the paper.

4. Why are the data samples from three different sites in different regions of China not consistent in Table 3 (3771, 7542, 8110, respectively). Is there any special significance to this? If not, is the sample data consistent and comparable? If not, is the result convincing?

Reply: The data samples are different because of two reasons. Firstly, the data samples from the instruments (LiDAR, MWR, satellite) at three sites are different through quality control. Secondly, after removing precipitation data, the sample numbers also vary. We believe that when the sample size reaches a certain level, such

as thousands, the comparison has a certain representative significance. We have clarified it.

5. To enhance visual harmony, we recommend unifying the dimensions of the subfigures in Figures 6 and 7.

Reply: We have unified it.

6. The authors re-selected the case analysis, but it was not reflected in the final conclusion section. Additionally, the abstract is not concise enough, and I believe it is necessary to rephrase it.

Reply: We have added the explanation of the case result in the conclusion part. We also rephrased the abstract.