Replies to comments of Reviewer 1

Authors would like to express sincere thanks to an anonymous reviewer for his/her valuable comments and suggestions. We carefully revised the manuscript following the given suggestions and comments. Our replies to the comments and suggestions are given below.

1.The advantage of authors' improvement should also be highlighted and investigated.
(a) What is different after considering the cloud thickness into the classification. To what degree can this adjustment improve? A robust comparison between classification of considering the cloud thickness and ones of not considering the cloud thickness is necessary. In addition, is there any good classification results of ASC image which can be used for benchmark value to investigate the author's improvements? (b) I suggest authors shorten the comparison between 4 CNN methods and give the above comparison instead.

As suggested by the reviewer, we tested the classification effect of other methods for cloud image classification on this dataset and compared with our method. Specific results are in the revised manuscript (Page 14, Line 306).

2. The verification process of Eq. (3) should be added in the revised manuscript.
(a) There are so many expressions between α and Gcloud which accord with the principle in line 123 to 127. I believe if author choose another expression (e.g. $\alpha=G_{sky}/G$), the classification results are completely different.
(b) From Fig. 4, I see some thin clouds are also removed, to what degree is it affect final classification results.

We derived an expression for the relationship between α and G_{Cloud} based on the relationship between the two and ensuring the numerical soundness, and verified the feasibility of the method using Figure 4. During this process, we also considered many other expressions, including your proposed $\alpha = G_{sky}/G$. If $\alpha = G_{sky}/G$, then $G_{sky}/\alpha = \alpha G_{sky}+(1-\alpha)G_{cloud}$ according to Eq. (2). We can get $G_{cloud} = G_{sky}+(1/\alpha)G_{sky}$ according to mathematical knowledge, but there can not be a relationship between G_{cloud} and G_{sky} the above relationship. Therefore, the speculation is not valid.
Some very thin clouds are neglected in Fig. 4, and a comparison with the original image shows that this part of the cloud is extremely thin and therefore disappears after processing according to Eq. (4). This part does not affect the telescope observation for the TMT classification criteria, so it has almost no effect.

3. I also doubt the validation of Eq. (6). Following the radiative transfer theory, the transmittancecan be written as: $t = e^{-t}$ where T is the transmittance and τ is optical depth which can use cloud thickness represent. Therefore, the expression between the reflectivity and the cloud thickness is $r = \lambda(1 - e^{-w})$.

Thank you very much for the challenge. After reviewing the information, we learned that your suggestion is more effective, so we have adopted your suggestion. And the experiment has been rerun in the revised manuscript.

Minor Point:

The number of Eq. In section 3.1.3 may be mistaken.

Thank you very much for pointing the mistake. The mistake is corrected in the revised manuscript.

2. The figure caption should be more detailed. For example,

(a) The information of Table. 1 can be merged into the caption of Fig. 2.

(b) In the caption of Fig. 4, what is “superimposed model“ ? I cannot find it in the text.

(c) The means of d*i and f(d*i) should be added.

Thank you very much for your suggestions. We have made changes as you suggested in the revised manuscript.