Dear Editor:

Thank you for your careful work. I have included some guidelines in the revised manuscript according to your comments. The response is listed below.

Comment:

Reviewer #2 has given some very helpful and valuable suggestions on how and which reference data should be used for such applications. I hoped that you include some of these guidelines in your manuscript. Instead, you have only updated the numbers of the stations. Thus, please include the suggestions for higher-quality reference products and how to use them into your data section.

Response:

Reviewer #2 provided two useful suggestions in selecting in situ measurements. The first suggestion is that we should pay more attention to the duplicated sites when determining training and validation sites because some sites are included in multiple observation networks. The second suggestion is to ensure the representation and independence of the validation sites, which indeed shows the ability of model in estimating global surface R_n.

With respect to the two suggestions, we have updated the site measurements and corresponding results in the manuscript. Also, some useful suggestions according to Reviewer #2's comments are included in the section 2.1 in the revised manuscript to let other readers know the problems when conducting similar studies.

~~As shown in Fig. 1, the surface R_n measurements from 448 stations were used to train the proposed RCNN model (red circles), while the measurements from the remaining 75 stations (blue circles) were selected as independent test datasets to evaluate the model performance.~~ To well illustrate the performance of the model in estimating global surface R_n, more sites from international observation networks should be determined as the independent validation sites rather than regional observation networks with similar climate regimes (e.g., ARM) to ensure the independence of the test dataset, which avoids overfitting in model training. ~~Similar and comprehensive surface and atmospheric conditions between training and validation sites illustrate the good representations of the training and test datasets (Fig. S1).~~ In this study, ~~More~~ more than 89% of validation sites come from the continental and international networks, including BSRN, FluxNet, CEOP, EOL, AsiFlux, and PROMICE~~, which ensure the independence of the test dataset~~. Additionally, similar and comprehensive surface and atmospheric conditions between the training and validation sites illustrate the good representations of the both training and independent test datasets in global surface R_n variability (Fig. S1), which detects the ability of model in estimating global surface R_n. Note that some current regional and international networks are interconnected, for example, some ARM and all BSRN sites are included in the BSRN networks. When determining the training and validation sites, more attention should be paid to these duplicate sites in multiple observation networks to ensure the independence of the validation sites from the training sites. Finally, as shown in Fig. 1, the surface R_n measurements from 448 stations were used to train the proposed RCNN model (red circles), while the measurements from the remaining 75 stations (blue circles) were selected as the independent test dataset to evaluate the model performance.