

This is a well-prepared manuscript. The authors focused on mapping several key plant functional traits in China by integrating three kinds of machine learning algorithms and climate, soil, and vegetation variables. Comprehensive experiments were implemented and all necessary technical details were properly introduced. It could be of great interest to those who are interested in trait ecology, and global vegetation modeling. However, at present, some technical details need to be added and the language of the paper needs to be further improved. In its current form, major revisions are needed before this manuscript could be accepted, thereby further improving the quality and legibility of this manuscript. The main comments are as follows:

- (1) We are aware that the plant functional traits have strong seasonal variability. However, it seems that the issue of seasonality was not taken into account in the synthesized plant functional traits database by the authors. As a result, I don't know which time period of these estimated plant functional trait maps. Could you please provide some additional explanations regarding the temporal information associated with these plant trait maps?
- (2) It is really good you compiled a large plant trait database with more than 50 thousand samples, spanning large geographic regions and species, please present the number of samples for each selected plant functional trait. And how many samples are for model calibration and validation?
- (3) There are many choices of climate variable products and each product carries varying levels of uncertainty. Why did you choose the WorldClim dataset and did you assess the uncertainties of these datasets?
- (4) I found that the time period for bioclimate variables and RAD is from 1970 to 2000, while the AI data is from 1950 to 2000 and the vegetation indices are 2000-2018 & 2002-2011, please explain why the time period of different input variables are not consistent.
- (5) The authors used the nearest neighborhood method to resample all the input data to a consistent spatial resolution of 1 km. It is fine for the original resolution of the data below 1 km to upscale to 1km. However, Downscaling data to 1km resolution using this method is not meant for datasets with spatial resolutions greater than 1km such as MTCI with 4.63 km spatial resolution.
- (6) Did you build separate models for each plant trait, or estimated these traits simultaneously? How did you consider the covariance of these traits when you were modeling?
- (7) For the calculations of community-weighted mean values, you first build the relationships between the observed trait values and the input variables with 1km spatial resolution. I think your predicted values of traits present the values of 1km grid cells,

so my question is how you applied CWM using the abundance of each PFT in each 1km grid cell.

- (8) What is the ensemble model mean? how to merge the results of RF and boosted regression trees as you presented in line 263. Could you please present more details of the ensemble model?
- (9) You just build the models between the 1km spatial resolution data and the field measurement data. Do you think that is there any spatial mismatch between them?
- (10) Please add the units of these traits in Table 2 although you present them in your supplementary table. And I suggest that it is better to use nRMSE in the realm of leaf functional trait estimation ($nRMSE = RMSE/\text{range of estimated plant traits}$).
- (11) When analyzing the spatial patterns of plant functional traits, it is better to have a map to show the readers where the locations you mentioned in the manuscript like Yunnan, Loes Plateau, etc. are.
- (12) For the accuracy of these estimated plant functional traits. The sampling of WD, LPC and SLA is dense, it's reasonable that these three traits have relatively high performance. But LNC and LA also show relatively dense sampling across China as shown in Fig. 5, Could you please tell me why LNC and LA show relatively poor performance?
- (13) I suggest that the authors may consider excluding the plant trait of SM and Height, despite their significance in many terrestrial ecosystem processes. The sampling for these traits seems too sparse to accurately represent the trait variability across the entire region of China. As a result, it becomes difficult for me to place trust in the obtained results.