

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2020-398**

Anonymous Referee #1

Referee comment on "Patterns of nitrogen and phosphorus pools in terrestrial ecosystems in China" by Yi-Wei Zhang et al., Earth Syst. Sci. Data Discuss.,
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General comment

Yi-Wei Zhang et al. presented a data analysis study for terrestrial ecosystem N and P pools over China. The data collection, model fitting, regional and pft level aggregation and analysis are well done. The presentation is smooth. Below are my major suggestions and specific comments.

- **Root N, P and Soil N, P model fitting**

Root and soil N, P models underperformed (e.g., R^2 0.27~0.47), in comparison with models of other plant components (e.g., R^2 =0.56-0.81). I would suggest 1) trying more complex neural network models (more layers or more nodes within each layer) 2) trying different types of ML models (e.g., random forest, support vector regression) 3) including more explaining variables besides MAT, MAP, elevation, and PFT. For example, N/P deposition, land use history, soil order, GPP and so on.

- **representativeness of data for regional extrapolation**

It will be helpful to show 1) a map that includes the location of all data samples 2) MAT, MAP, elevation ranges for data samples, compared with those variables but across China. The purposes are to reveal whether the data samples are spatially representative and whether the data reasonably cover the full range of T,P,Elevation so that the spatial extrapolation is reliable (for each vegetation cover).

- **N, P mass concentration**

This analysis focused on area-based N,P concentrations (gN/m² of land surface), which do not directly link to ecosystem N/P limitations. And given that the vegetation is not evenly distributed, it will be helpful to also present the mass-based N,P concentrations (e.g., gN/g tissue biomass or soil) that could directly reveal the strength of plant and soil N,P limitation.

- **N:P stoichiometry**

From an ecosystem N/P limitation perspective, the ratio of N and P within different plant tissues will be more informative than the individual concentrations. I would suggest also showing N:P stoichiometry, e.g., across pfts, leaf vs fine root.

Specific comments:

L54 independently or jointly

L63 allocated to plant

L167 since the model uses re-scaled predictors (eq. 3), it is important to make sure the training data could represent the full climate envelopes over China.

L226 what is site-averaged?

L238 density varied

L294 "soil N and P are stable" is not a convincing reason why soil models underperformed. In contrast, one would expect that stable N P pools shall be better modeled by long-term climatology, compared with e.g, seasonally changed leaf N/P concentrations.

L309 this section needs more quantitative evidence for drivers that are included in this study (e.g., T, P, elevation) and should consider including potential drivers that are discussed if spatial data are available (e.g., soil age, soil order).