Comment from Editor:

Greetings. As you can one of the reviewer as raised a query regarding interpretation. Let me know the what you have to say on that. If required make the revision accordingly and also respond to the suggestion.

Submit you final revised manuscript.

Response:

We express our heartfelt gratitude for the editor's invaluable efforts throughout the review process of our paper.

Regarding the referee's query, we acknowledge that our previous response may not have adequately addressed the comment in R(5, 2). However, we want to assure the reviewer that we have provided a comprehensive discussion of the improvements made to our maps in comparison to previous versions in the main text. Therefore, we have not made any changes to the main text.

For more in-depth information, we kindly ask the reviewer to refer to our detailed response to the referee below.

Comment from referee:

Congratulations on the work undertaken in this revision to address the earlier comments.

One point (R2, 5) still strikes me as a problem, however. The Discussion opens with the assertion that your predictions result in significant improvements over earlier estimates. Your response to the initial comment suggests that Figure 6 provides the evidence for this - but that only demonstrates rather weak correlations between two sets of estimates.

I was expecting to see those predictions compared against independent measurements.

What I think you are claiming is that your study draws on a much larger body of data and includes more putative drivers.

Response:

We express our gratitude to the reviewer for their thorough assessment. Upon reflection, we acknowledge that our response in R2, 5 may have been misleading. However, we would like to clarify that in the discussion (Lines 276 – 287 of the final manuscript version), we present compelling arguments supporting why our estimate represents a significant improvement over existing ones. These reasons include: (1) the utilization of an improved soil total P map to predict soil P fractions, (2) a substantial increase in the number of observations on P fractions by an order of magnitude, and (3) the adoption of a mapping approach that effectively captures variation within soil orders, incorporating more putative drivers. The reviewer aptly summarizes our approach by stating, 'What I think you are claiming is that your study draws on a much larger body of data and includes more putative drivers.'

Given the limited number of data points available, we made the decision to utilize all available data for the random forest training and validation, employing a Five-fold cross-validation (Lines 191-192). This approach is commonly accepted when dealing with constrained data scenarios. Nevertheless, we concur that an evaluation based on large-scale gradients would be advantageous. Unfortunately, we encountered challenges in identifying an appropriate dataset for such an assessment. We remain open to exploring this avenue in future research endeavors.