Response to reviewer comments

We are grateful for very positive and constructive comments of the reviewer which led to an improved manuscript. We have considered suggestions and revised the manuscript accordingly. Please find our detailed responses in bold and blue color below the reviewer comments:

Reviewer comments

I believe the authors have addressed the comments from the reviewers in a good way and I only have a few suggestions for improvement before I can recommend that the paper is published.

Line 191-194: Something appears to be wrong with this sentence. I suggest to rewrite to: "All XANES spectral data were baseline corrected in the pre-edge region between 2115–2145 eV and normalized in the post-edge region of 2190–2215 eV. The same ranges were used for the reference P K-edge XANES spectra to achieve consistency in the following fitting analysis (Prietzel et al. 2016)."

Response: We rephrased and rewrote the sentence as proposed (pages 8-9, lines 195-198)

In your reponse letter you write "Yes, the LCF analysis was done to achieve the best fit using all possible combinations with at most four P standards between all references. In this case, the outputs of ATHENA were always the same three standards out of all nineteen P reference spectra". This is useful information that should be indicated in the paper maybe even in the table.

Response: We added the proposed additional information to the headers of tables 2-5: "These best fits were achieved using all possible combinations with nineteen spectra of P reference compounds."

Regarding the LCF analysis in Table 5, I still think you need to elaborate a little on the what you can and cannot conclude. Looking at Table 5 some readers may be tempted to conclude that there is no $Ca(H_2PO_4)_2$ in the control soil and the bone char treated soil and that there is 14% in the bone char^{plus} treated soil. However, it would in my opinion be too much to conclude that. It could very well be another simple calcium phosphate. In line 450 to 451 you write "Besides reducing the $AlPO_4$ and Ca-hydroxyapatite proportions, BC^{plus} particles introduced highly soluble $Ca(H_2PO_4)_2$ to soils in the incubation-leaching experiment". In such an instance I think you need to help the reader understanding that we are not entirely sure that it is $Ca(H_2PO_4)_2$, but could be one of a number of other simple calcium phosphates that have a spectrum resembling the one of $Ca(H_2PO_4)_2$. So please help the readers in these situations.

Response: We added a sentence to support the credible reviewer's comment (page 20, lines 474-478): "However, the date in Table 5 on the presence/absence of $Ca(H_2PO_4)_2$ in soils of ryegrass experiment may have been influenced by small proportions (<10-15%; reliable detection limit by XANES, Beauchemin et al., 2003) of other simple calcium phosphates that have a spectrum similar to the one of $Ca(H_2PO_4)_2$ in LCF analysis."

In this way we expressed the possible uncertainty of the LCF results.

We also modified the conclusions accordingly:

… "This was associated with the addition $Ca(H_2PO_4)_2$ or similar simple Ca-P-compounds to amended soils, as indicated by sequential P fractionation and XANES analyses."

Furthermore – not requested by the reviewer - we have added references on the addition of S for improving P solubility. This has been claimed as precondition for publication permission by the organization of one co-author.