Here we listed our responses to the comments of reviewer 1 in tabular form. The page and line numbers of the referee's comments refer to the original manuscript: soil-2018-40, (https://doi.org/10.5194/soil-2018-40).
Page and line numbers of the Author's reply refer to the revised manuscript.
We want to thank the anonymous reviewer for the valuable input to improve the manuscript.
In behalf of all authors, Jörg Niederberger

Index	Referee's comment	Author´s reply
1.	The English name and abbreviation for the inventory referring to in this study is "National Forest Soil Inventory in Germany (NFSI)".	We replaced GFSI by NFSI
2.	Both "soil P (C, N) contents" and "soil P (C, N) concentrations" and both "foliar P contents" and "foliar P concentrations" have been used throughout the manuscript. Concentrations are defined as mass per volume (e.g., mg l-1); mass per mass (mg g-1) is called a content. Hence, please write "soil P (C, N) contents" and "foliar P contents" throughout the entire manuscript.	Changed and harmonized throughout the whole manuscript.
3.	At some places expressions have been used that are – to my knowledge – not appropriate in the respective context or that have not been adequately explained/defined. For example P2 L8-9 "P cycling" and "intern reallocation (transfer) processes", P2 L14 "nutritional status", P3 L2 "population of inference", P10 L22 "distribution patterns", P12 L27 "distinct fractionation schemes".	We clarified and explained these expressions/concepts (one to three) or reworded them (four to six). Additionally we searched the manuscript thoroughly for ambiguous phrases.
4. P2 L7:	Forest stands in Germany have partially been fertilized. Especially for stand establishment, fertilization including phosphorus has been a common measure in some regions. Additionally, phosphorus has been added in forest soil liming in some regions where total soil phosphorus pools are low.	We clarified this in the text.
5. P2 L10-12:	Not only biomass harvesting is leading to nutrient deficiencies. Nitrogen input to forest ecosystems is also a driver for the establishment of nutrient deficiencies (e.g., increased growth and therewith higher nutrient demand; changes in mycorrhizal symbioses; soil acidification).	We included N deposition and soil acidification as examples of additional drivers of P nutrient deficiencies in the introduction section
6. P2 L14:	Define "nutritional status". From the following text it is obvious that foliar phosphorus contents are used as indicator for the nutritional status, but here it remains open.	We included the definition of "nutritional status" as foliar P content at this point in the text.
7. P3 L8:	Which were the selection criteria for the subset? Why didn't you use all NFSI plots for which foliar phosphorus contents are available?	In our study, we needed to optimize the number of samples to keep the workload associated with the analysis manageable. Here the selection of sites and soil samples followed two distinct steps. Initially, the soils were selected to capture the variation in those properties

		that were relevant for the development of NIRS models. Specifically, we selected the NFSI soil samples to create NIRS models to predict P pools in mineral soils (compare: Niederberger, J., Todt, B., Boča, A., Nitschke, R., Kohler, M., Kühn, P. and Bauhus, J.: Use of near-infrared spectroscopy to assess phosphorus fractions of different plant availability in forest soils, Biogeosciences, 12, 3415–3428, doi:10.5194/bg-12-3415-2015, 2015). . Since it was not possible to analyze all existing NFSI plot, we tried to capture the major soil parent materials and different main tree species. The analyses of relationships between soil properties and foliage P content was a second step, that we had not foreseen when planning for the soil analyses. Thus we could only use all sites where we had performed a Hedley fractionation and where foliar data from the NFSI were available We clarified this in the introduction and material section. .
8.	Soil extraction methods indicative of the foliar P nutritional status are not only needed since the determination of foliar P contents is laborious and expensive, but also since foliar P contents have a large variability (among trees and among years). This large variability demands sampling of a large number of trees in several subsequent years in order to be able to evaluate the foliar P nutrition (Wehrmann 1959). Unfortunately, during NFSI only three trees in just one year have been sampled per plot. Hence, the NFSI dataset is on the one hand the largest forest soil dataset available in Germany, on the other hand foliar nutrient contents are afflicted with uncertainty due to the sampling design. Both the sampling design and the resulting uncertainty should be stated in the manuscript. This uncertainty in foliar phosphorus contents might be the reason for the small coefficient of determination in the regression analysis.	Thank you for this suggestion, which we included in our discussion as one possible explanation of the weak coefficient of determination in the regression analysis. See chapter 4.2 P12 L23 ff. in the revised manuscript.
9. P3 L23:	In Table 1 the total P content is listed and in the abstract it is written that total P is commonly the only information on soil phosphorus in inventories; here you do not list the total P content as a parameter that was determined during the NFSI and on P4 L22-24 you describe the method used to determine total P. This is a bit confusing for the reader – did you determine total P by yourself or was the parameter provided by others?	Total P content was determined by the NFSI and we determined it in our study as the sum of our Hedley fractionation steps. In some cases we actually found substantial differences in total P contents (sum of all Hedley fractions) determined by us and provided in the NFSI data base. Therefore, we decided to include a nitric acid digestion, which was executed independently from the Hedley fractionation, to measure “total” P by ourselves We found a high level of agreement for our “total” P values and “total P” as the sum of all Hedley fractionation steps (r^2 0.97). (We acknowledge that the nitric acid digestion does probably not extract all P; see our response to comment Reviewer 1, P4 L22). We clarified this in the Material and Method section in our revised manuscript, Chapter 2.3 P 4 L 26 ff.
10. P4 L9-	Beech trees just have current year leaves. Better write that the leaves were	We clarified this in the text (compare response to comment of Reviewer 2 P4, L10)

10:	sampled from the upper crown. It is very uncommon that the most recent whorl is sampled. At least the NFSI samples taken by the Northwest German Research Institute were from the 7th to 12th whorl.	We used current year needles from the 7th whorl and clarified this point in the manuscript Chapter 2.1, P 4 L 13 ff in the revised manuscript
11. P8 L21-28:	What about the negative relationship between foliar P and SOC in the model for *F. sylvatica*?	The negative relationship between foliar P content and SOC was addressed in the discussion section (Chapter 4.2, P 13 L 24 ff. Nevertheless we emphasized this finding in the result section as well (Chapter 3.7, P9 L7ff.).
12. P9 L12-13:	Your results show that soil properties have an influence on Hedley P fractions and pools and that Hedley P fractions and pools do not explain the variance in foliar P contents very well. Hence, from your results, it is questionable if Hedley P fractions represent plant available P fractions.	This is a very valid point. We therefore addressed the issue of indication of plant availability of P in Hedley fractions in the discussion section (P 12 L 30ff.) in the revised manuscript (see also response to comment of Reviewer 1 on P9 L12-13, orig. manuscript)
13. P9 L30:	What do you mean with “within soil depth”? a) within one soil depth, b) within the soil profile	Within the soil profile, we clarified this in the text
14. P10 L21:	Do you mean “DNA and phosphonate were only found in very acidic soils” or “DNA and phosphonate were found in most acidic soils”?	Phosphonates were only found in acidic soils and the portion of DNA found in mineral soils increased with increasing acidity. We clarified this in the manuscript.
15. P10 L30-32:	Later on you discuss the effect of clay on P availability in detail. However, it is missing here, though it is necessary to understand your statement: Increased decomposition should increase labile P; however, many soils with high pH and large decomposition rates and intensive bioturbation probably have low sand/high clay contents leading to adsorption of P to clay minerals and therewith to small amounts of labile P.	We included a short explanation in the discussion sub-chapter 4.1.2 to clarify our statement.
16. P10 L33-P11 L1:	Did you also include clay content instead of sand content in your regression analyses?	Yes, we did. Not surprisingly, the results showed opposite effects of the two predictors, since the increase in finer particles leads typically to a decrease in coarse particles and vice versa. Nevertheless we observed higher predictor strength for sand content than for clay content, therefore we decided to use sand content as a texture based predictor variable.
17. P11 L10-11:	Here and elsewhere you write about SOC, while in the material and methods section only the total C content is mentioned. Did you quantify carbonates in soils, too? Or did you exclude calcareous soils (seems not to be the case according to the pH values presented)?	We only determined SOC and thus have replaced “total C” with SOC throughout the manuscript (see also response to comment 2 und 3 of Reviewer 1
18. P11 L27-28:	Talkner et al. 2009 found a significant relationship between the clay content and organically bound P, too.	Yes, this was referenced in P 12 L 4-6
19. P12 L6-8:	Where is this result shown (not in Table 5)?	The result is shown in Figure S3. We corrected this.
20. P12 L 26:	It was organic phosphorus (not carbon) and clay content that explained the variance in foliar P contents best.	Thank you for pointing this out. We corrected this in the manuscript

21. P12 L33-P13 L1:	Do you mean the negative relationship between SOC and foliar P content?	Yes, this has been modified.
22. P13 L13-15 and L19-21:	Foliar P contents have a large variability (among trees and among years). This large variability demands sampling of a large number of trees in several subsequent years in order to be able to evaluate the foliar P nutrition (Wehrmann 1959). Unfortunately, during NFSI only three trees in just one year have been sampled per plot. Hence, foliar nutrient contents are afflicted with uncertainty due to the sampling design. This uncertainty in foliar phosphorus contents might be the reason for the small coefficient of determination in the regression analyses.	See response to comment 8

Technical corrections

23. Different names have been used for the same thing. For example "foliage P contents" and "foliar P contents". Please harmonize the names. *done*
24. P3 L22: "North-West" -> "Northwest" *done*
25. P4 L28-29: "subject to" seems not to be the right word here. *changed*
26. P5 L4 (and elsewhere): Better write "Hedley P pools", since the word "pools" is also used for masses related to an area (kg ha^{-1}). *changed*
27. At several places (e.g., P5 L4) hyphens occur in the middle of words. *deleted*
28. P5 L5: "Pools" probably has to be "P pools". *changed*
29. P5 L20 (and elsewhere): mg kg-1 -> mg kg^{-1} *done*
30. P8 L2: Delete the "and" at the end of the sentence. *done*
31. P8 L23: "considerably" -> "considerable" *"varied considerably" (adverb!)*
32. P9 L1: (and elsewhere): "regressions models" -> "regression models" *done*
33. P9 L20: "org. C content" -> "organic C content" *done*
34. P10 L5: "microorganism" -> "microorganisms" *changed*
35. P10 L13: "These effect" -> "This effect" *changed*
36. P10 L20: "even if there are" -> "even if there is" *done*
37. P11 L32: "In forest soils of northern Germany" -> "In forest soils of northern and central Germany" *changed*
38. The bibliographical references are sometimes written with comma, sometimes without *corrected*
39. P12 L5: "negative influence of P content in soils" -> "negative influence on P content in soils" *changed*
40. P12 L16: "Pi. abies" -> "P. abies" *changed*
41. P12 L23: "P fertilization lead to" -> "P fertilization leads to" *changed to "P fertilization led to"*
42. P15 L18-19: The reference is incomplete. *The reference is not incomplete, there is just a very unlucky formatting problem caused by a line break.*
43. P15 L33: "soils nutrients" -> "soil nutrients" *changed*
44. P16 L1-2: The reference is incomplete. *changed*
45. P26 Figure 2: "Po ready mineralizable" -> : "Po readily mineralizable" and "HNO3 65% + H2O2" -> "HNO_3 65% + H_2O_2" and "grey boxes indicates" -> "grey boxes indicate" and "dashed line separates" -> "dashed lines separate" *changed*
46. P28 Figure 4: "The column" -> "The columns" *replaced*