

Interactive comment on “Speciation and distribution of P associated with Fe and Al oxides in aggregate-sized fraction of an arable soil” by X. Jiang et al.

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AC: We thank the referee for the valuable comments which are helpful to improve the quality of this manuscript. It is true that the methodology of P separation developed in this study (the combination of NaOH-EDTA, oxalate, and DCB treatments) has not yet been fully validated using well-defined standard samples. However, the individual methods, i.e., NaOH-EDTA, oxalate, and DCB treatments, are commonly used for the extraction of organic phosphorus, the removal of amorphous Fe oxides or poorly crystalline Fe oxides, and the removal of both amorphous and crystalline Fe oxides, respectively. Additionally, in recent published papers, some researchers (Forsmann

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and Kjaergaard, 2014, Rick and Arai, 2011) also considered ammonium oxalate extractable P as P associated with amorphous or poorly crystalline Fe (Al) oxides in soil samples. We have pointed out in this manuscript that only a small amount of soil Fe (0–1% of total Fe) was dissolved by NaOH-EDTA, which means the amount of extracted Fe/ Fe oxides in the studied system was negligible. In this case, the Fe oxides related P in PN (i.e. NaOH-EDTA extractable P in soil samples) and PN-I (i.e. NaOH-EDTA extractable P in “amorphous FeO-free” soil samples) were most likely attached to the surface of Fe oxides rather than occluded inside of Fe oxides. It is however still possible that oxalate removes some P from P-goethite complexes by ligand-exchange. If so, we probably overestimated the amount of Pa-Fe and underestimated the amount of Pc-Fe. However, Johnson and Loeppert (2006) found that there was actually very little P released from goethite at low initial P levels in spite of high ratio of organic acid to P adsorption maximum. Therefore, although it is possible that there is some P released from P-goethite complexes in our soil samples, the amount is expected too small, or even negligible in the case of our low initial P level soil samples. In spite of these minor issues with regard to the P separation, the current semi-quantitative study provided useful new insights on the distribution of different P on Fe/Al oxides of soil fractions and residual fraction after NaOH-EDTA treatment. Certainly, it is well possible to further validate the methodology for more accurate evaluation in near future.

Revised as follows:

Page 9891 Line 14: It is noteworthy that there was unavoidable P released from P-goethite complexes after oxalate treatment by ligand-exchange, the amount of released P was negligible at low initial P level (Johnson and Loeppert, 2006) as such in our soil samples.

Forsmann, D.M., and C. Kjaergaard. 2014. Phosphorus release from anaerobic peat soils during convective discharge – Effect of soil Fe:P molar ratio and preferential flow. *Geoderma* 223–225: 21–32. doi:<http://dx.doi.org/10.1016/j.geoderma.2014.01.025>. Johnson, S.E., and R.H.

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Loeppert. 2006. Role of Organic Acids in Phosphate Mobilization from Iron Oxide. *Soil Science Society of America Journal* 70: 222-234. doi:10.2136/sssaj2005.0012. Rick, A.R., and Y. Arai. 2011. Role of natural nanoparticles in phosphorus transport processes in ultisols *Soil Sci. Soc. Am. J.* 75: 335-347. doi:10.2136/sssaj2010.0124nps.

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