Biogeosciences

Discussions

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Interactive
comment

Interactive comment on "Estimates of mean residence times of phosphorus in commonly-considered inorganic soil phosphorus pools" *by* Julian Helfenstein et al.

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The estimate of MRT deserves an encouragement, because it provides a fundamental and quantitative insight into the dynamics of P in soil. In this regard, I would like to support the publication of this work. However, before this, I have some concerns for the authors to address. I am curious about why the MRT of HCl-P can be estimated in the way used by the authors. HCl-P is mainly of apatite P in neutral and alkaline soils. The dynamics of apatite P should be unidirectional, that is apatite P is always depleted without a formation during the experimental duration (90 mins). So, an exchangeable between resin P and HCl P is unreasonable at least for neutral and alkaline soils (Fig.

1), although it's possible if HCl P is largely of Fe/Al associated P, as in acidic soils. All the estimates of MRT are obtained based on laboratory incubation. The estimates therefore should be much different from those in field, which can be affected by soil moisture and temperature and many other factors. This limitation and their potential effects on the estimates should be noted. Are the estimates comparable to the estimates of Hou et al. (2019) based on greenhouse experiments? The Figure 1 and the calculation of MRT of NaOH-P and HCl-P are weird. MRT-NaOHP is estimated based on the sum of labile P and NaOH-P (while not only NaOH alone?). MRT-HClP is estimated on the sum of labile P, NaOH-P, and HCl P (while not on HCl P alone?). This will at least confuse readers, which do MRT-NaOHP and MRT-HCl really measure? In Fig. 1. the conceptual diagram differs from many other diagrams, such as Hou et al. JGR Biogeosciences (2019) and Tiessen et al. (1984). The model structure (conceptual diagram) affects the estimate of MRT. I think this should be discussed to let readers know there are other possible exchange pathways among soil P pools that will affect the estimate of MRTs. Give units in Figs. 2 and 5. Give Y axis lab (MRT?) in Fig. 4 In L15, "and call these soil P pools", I think I understand what you mean, but it reads a bit weird. L24-25: which two studies? Does the filled data affect much of the results? I think the data used by the authors are valuable. Why not make the raw data and the fitted m and n values open access?

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