

Interactive comment on “The oxygen isotope composition of phosphate released from phytic acid by the activity of wheat and *Aspergillus niger* phytase” by C. v. Sperber et al.

Anonymous Referee #2

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The manuscript "The isotope composition of phosphate released from phytic acid by the activity of wheat and *Aspergillus niger* phytase" by Von Sperber and colleagues revolves around the isotope effects of an important process that governs P cycling in terrestrial environments, especially in the plant-soil system. The authors profoundly describe the biochemical basics of phosphate oxygen isotope exchange during degradation of phytic acid, a major pool of organic bound P in soils. The findings are helpful in light of a growing number of studies that aim to interpret phosphate oxygen isotopes as a tracer in soil P cycling.

The study is well thought out, carefully interpreted, and the paper is concise and clear. I recommend publication, but have a couple of minor issues that warrant consideration.

ation. Please find them listed below.

General remarks – This is a very biochemical study, and the paper uses a lot of technical terms and abbreviations that are immediately clear to biochemists, but may be problematic for the ample audience that Biogeosciences aims for. Please consider adding a few lines to the introduction why the phytic acid/phosphate pathway is of wide relevance, and why it is necessary to understand the associated isotope effects. In the same fashion, revise the conclusion and comment on the implications that the finding of rather uniform and temperature-independent isotope effects during soil phosphate hydrolysis has for future research. Is there a relevance for our understanding of soil P cycling beyond isotope mechanisms? Future interpretation of $\delta^{18}\text{O}_\text{P}$ signatures?

Page 5056 Line 4, and Page 5057 Line 1 - Explain the abbreviation "IP6"

Page 5057 Line 4 - Any quantitative information how "dominant" phytic acid can be in the soil organic P pool? A reference would be handy.

Page 5059 Line 3ff - Is this total phosphate yield relevant for the isotope mass balance of the assays? Explain how it is referenced. You pick this up in the Results section 3.2., but it would be good to have the information that it corresponds to the IP6- \rightarrow IP2 pathway before.

Page 5060 Line 22f - Analytical precision or accuracy?

Page 5064 Line 12ff - Please explain the reaction mechanism more detailed. Is it always all the way from IP6 to IP2? Figure 1 only explains the IP6 \rightarrow IP5 step. Would it then matter stochastically if different Pi groups were isotopically distinct, also in light of a potential back reaction that may have equilibrated IP6 isotopically in a natural system ($t \rightarrow \infty$)?

Page 5066 Line 7 - should read "result"

Page 5066 Line 17 - correct to something like "... for the observed positive isotopic fractionation"

Page 5066 Line 18 - I am not sure if the concept of a hidden equilibrium is clear to readers here. You mention a potential back-reaction earlier, but at this point, this concept needs definitely better explanation.

Page 5067 Line 7ff - Is the amino acid pattern (or structure?) of the active sites strictly relevant to their function (which is the reaction mechanism)?

Page 5068 Line 5ff - Though an interesting idea, this paragraph leaves me somewhat baffled. Could you come up with a reason why the C-O-P oxygen should be isotopically lighter than the P-O oxygen?

Interactive comment on Biogeosciences Discuss., 12, 5055, 2015.

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