

## ***Interactive comment on “The distribution of soil phosphorus for global biogeochemical modeling” by X. Yang et al.***

**Anonymous Referee #1**

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Yang et al. provide spatially explicit information on the amount and form of phosphorus (P) in soils on the global scale based on soil P data. Such data based estimates are an important addition to the few model based estimates (Wang et al. (2010), Goll et al. (2012)) and can facilitate model evaluation. The uncertainties in the estimates are discussed in detail. Therefore, this paper is certainly in the scope of Biogeosciences.

Overall, the paper is well written, clearly structured and methodologically sound. However, it does not become clear from the text how the uncertainties are calculated (Page 16358, Line 1 -7). The manuscript may further benefit if the following two points would be addressed in more detail:

1. It is known that biological processes influence the soil P distribution for example by plant uptake, immobilization, biological and biochemical mineralization, biologically

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enhanced weathering etc. These processes are not accounted for in this study and a more detailed discussion on these processes and in what respect the results are affected by them may be beneficial.

2. The Hedley fractionation method does not provide fractions which would not directly translate to physiological fractions, for example labile P is not the same as plant available P (Cross & Schlesinger (1995), Yang & Post (2011)). However, in the few model studies labile P is treated as plant available (Wang et al. (2010), Zhang et al. (2011), Goll et al. (2012)). As this manuscript aims at the modeling community, a few sentences on the interpretation of the here used soil P classification used in this study from a mechanistic/physiological point of view would be helpful.

Minor comments

Please change Durr to Dür.

Page 16350, Line 1: There are a few modeling studies which indicate a need to represent P for simulating the terrestrial C cycle, for example Zhang et al. (2011) (present day), Goll et al. (2012) (21st century). You may want to cite them.

Page 16354, Line 2 +5: The publication was published 2012, not 2011. Line 5 “et al.” is missing.

Page 16354, Line 15. you may add that the term “volumetric soil strain” is discussed later in section 3.3.

Page 16360, Line 13: you may add the estimate on soil organic P by Goll et al. (2012) (5.7 Pg)

Page 16360, Line 22: you may add the estimates on secondary P by Wang et al. (2010) (1.7Pg) and by Goll et al. (2012) (1.3Pg)

Page 16376: Table 4.: Uncertainty estimates would be beneficial.

Page 16378: Figure 3: The coloring can be improved as the concentrations differ

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strongly among the different soil P forms.

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