

Biogeosciences Discuss., referee comment RC1
<https://doi.org/10.5194/bg-2022-194-RC1>, 2022
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Comment on bg-2022-194

Anonymous Referee #1

Referee comment on "Reviews and syntheses: Iron – a driver of nitrogen bioavailability in soils?" by Imane Slimani et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2022-194-RC1>, 2022

This article is an exhaustive and detailed summary of the role of iron in nitrogen cycling in soils and addresses both the fundamental and emerging concepts. Minerals are important controls on soil organic matter cycling, but research and published reviews focus largely on carbon. This review is unique with its emphasis on specifically iron-bearing minerals and nitrogen. While the article will be very informative to the readership of Biogeosciences, revisions to the overall structure and writing are needed. The text is repetitive and could be pared down significantly. Details are at times presented in a laundry list approach rather than in a cohesive narrative. Overall, the content is appropriate but revisions to the organization and overall story will greatly improve the quality of this article.

Specific comments:

Lines 33-52: This list of evidence reflects the structure of the paper overall – many sections in the paper are stand alone “chunks” of ideas that do not cohesively tie together. As written, the sections appear as a list of ideas instead of a defined structure with a beginning, middle, and end.

Section 4: It is not clear how the structural role is distinct from the sorbent role. The mechanisms presented in Figure 2 and many described in this section are referring to adsorption/desorption processes.

Sections 7 and 8, in particular, lack an overall structure. A potential solution to the organizational issues with the writing would be to separate the properties and processes into distinct spatial scales: 1) The molecular scale at which sorption/desorption, catalysis, electron transfer occur, 2) the micro-scale, at which iron mediates soil aggregation, and 3)

the meso/ecosystem-scale, at which iron may influence the priming of soil nitrogen in the rhizosphere or the response of SON cycling to global change.