

Suzanne Anderson
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Boulder, CO
UNITED STATES

30 May 2019

Dear Suzanne—

Attached you'll find the revised version of our manuscript 'Reviews and synthesis: Weathering of silicate minerals in soils and watersheds: Parameterization of the weathering kinetics module in the PROFILE and ForSAFE models' by Eric Oelkers, Martin Erlandsson Lampa, Salim Belyazid, Daniel Kurz, Cecilia Akselsson and myself prepared for publication in Biogeochemistry.

We have taken conderation of all of the insightful comments priovided by the reviewers. A detailed list of our response to each of these comments is provided on your website. Notably, we have revised the text for improved clarity, we rechecked all calculations.

From the care of our revisions, we feel this manuscript is improved now ready for publication. We hope you agree.

Thank you in advance for your continued assistance.

Sincerely yours,

Harald Sverdrup
Reykjavik, ICELAND

Response to reviewer's comments.

Reviewer 1: This reviewer suggests publication following minor revision and provided the following suggestions.

1. This reviewer suggests that we add some references to the work of Langan and co-workers to the 'Earlier development' section of the original manuscript. ***We agree and have added a reference to Langan et al. (1996) to our revised manuscript.***
2. This reviewer asks us to clarify the positive and negative feedback loops in Fig1 of the original manuscript. ***We agree and have added text to the caption of Figure 1 to clarify this to the reader.***
3. This reviewer suggests that we add the reference to Sverdrup and Stiernquist (2002) to the manuscript. ***We agree and have added this reference to the revised manuscript.***
4. This reviewer asks that we include some details on the major sources of uncertainty facing both the profile and all other weathering calculations, and notably the quantification of surface area. ***This has been added. Much of the uncertainty in the weathering estimates come as a consequence of how the input data was obtained and is thus external to the actual weathering rate model.***
5. This reviewer asks that we clarify the numerical values in Figs 12 and 13. ***In response to this comment we have revised the text describing these figures in the revised manuscript.***
6. This reviewer asks that we do our best to publish the regression information of those minerals yet to be published in section 4.10 of the original manuscript. ***These are quite many and have no room in this manuscript. This will be taken up in detail in future publications.***

Reviewer 2: This reviewer recommends publication after several minor corrections:

1. This reviewer asks for clarification of how Al^{+3} and SiO_2 are calculated in the kinetic model. ***We agree and have added text to the revised manuscript to clarify this to the reader.***
2. This reviewer asks that we clarify somewhat the use of break functions in our kinetic model. ***We agree and have added text to the revised manuscript to clarify this to the reader***

Reviewer 3: This reviewer recommends publication after several clarifications.

1. This reviewer asks that we clarify up front that one of the goals of this manuscript is to review and clarify the PROFILE approach. ***We agree and have added two sentences to the beginning of the introduction to clarify these goals to the reader.***
2. This reviewer suggests that we discuss in more detail the break functions and how including a break function for OH might affect model results. ***We***

- agree and have added text to the revised manuscript to clarify this to the reader***
3. This reviewer asks that we move all statements on the amount funding sources into the acknowledgement section. ***We agree and have removed the statements on funding from the original manuscript.***
 4. This reviewer suggests we proofread on the manuscript to remove informal statements, some mis-numbered sections, and some grammatical errors. ***This we have done several rounds of proofreading and made a fair number of minor corrections to this revised manuscript.***
 5. This reviewer asks us to clarify why the model begins to fail at greater depths, and if these are related to hydrologic issues. ***We agree and have added text to the revised manuscript to clarify these issues to the reader***
 6. This reviewer suggests condensing the first 8 pages of the text for improved impact. ***We agree and have condensed somewhat this section as suggested by this reviewer.***
 7. This reviewer asks us to clarify the model uncertainty near page 5 of the original manuscript. ***We agree and have added substantial text to the revised manuscript to clarify these uncertainties to the reader.***
 8. This reviewer suggest we rewrite the text somewhat to better connect the results and discussion with the stated purpose of the manuscript. ***We agree and have added text to the revised manuscript to clarify this connection to the reader.***
 9. This reviewer asks that we clarify what we mean by the weathering sub-model does not require calibration. ***The model does not have adjustable parameters, its input is based on initial field observations. We have added text to the revised manuscript to clarify this to the reader.***
 10. This reviewer questions if we could remove section 4.3 of the original manuscript. ***We disagree and have chosen to retain this short section in the revised manuscript.***
 11. This reviewer asks for the source of Table 1. ***The original of this table was the Ystad Workshop. We added text to the revised manuscript to clarify this to the reader.***
 12. This reviewer asks us to clarify the origin of equation 23 and its relation to equation 29. ***Eq 23 is a simplified version of Eq 29. We have added text to the revised manuscript to clarify this to the reader.***
 13. This reviewer asks that we recheck to assure that all the terms of all equations are defined. ***We have gone through the text to verify all symbols have been defined.***
 14. This reviewer asks us to revise the text on pages 20 and 21 of the original manuscript for improved clarity. ***We agree and have revised this section for improved clarity.***
 15. This reviewer asks if the results on Figure 16 are fit to the observations or model calculations. ***The model was run with the parameters found from experiments and then data from the literature was drawn in. We believe this is clear in the revised manuscript.***

16. This reviewer asks that we improve the caption of Fig. 19 to improve its clarity. ***We agree and have revised this caption for improved clarity.***
17. This reviewer asks why there is a part B in Figure 23 of the original manuscript. ***We agree that this is an oversight and will correct this error in the page proofs.***
18. This reviewer suggests we better emphasize the updated database introduced in page 28 of the original manuscript as it is one of the major results of this work. ***We agree and have added text to clarify this to the reader.***
19. This reviewer asks that we better integrate section 5.2 into the revised manuscript. ***We agree and have revised this section somewhat to better integrate it into the rest of the manuscript.***