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Interactive comment on "Evaluating sensitivity of silicate mineral dissolution rates to physical weathering using a soil evolution model (SoilGen2.25)" *by* E. Opolot and P. A. Finke

E. Opolot and P. A. Finke

emmanuel.opolot@ugent.be

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We the authors would like to thank the anonymous Referee #1 for his/her time to review our manuscript. We also appreciate the fact that you are positive about our work. Below we clarify what our hypothesis is as part of the answer to your question. We have subdivided the response into three parts; literature summary, our focus and our findings. Similar discussion is also present in the introduction part of the manuscript that is under discussion. We hope that this brief report will make our study focus clear.

Literature summary: Laboratory silicate mineral dissolution rates are systematically up to 5 orders of magnitude lower than field silicate mineral dissolution rates. These differ-

ences have been attributed to interactive effects of intrinsic (e.g., mineral surface area, mineral composition) and extrinsic factors (e.g., climate, hydrology, biological factors). The complex interaction of these factors is in most cases difficult to capture with laboratory and field experiments. The use of mechanistic soil models therefore becomes handy. However in only a few of the modeling approaches have the interaction of some these factors been considered.

Our focus: Our study addresses the interactive effects of intrinsic and extrinsic effects on chemical weathering, using a mechanistic soil model. We mainly focused on the effects of physical weathering with the hypothesis that physical weathering affects the magnitude of chemical weathering and this could partly be the cause of systematic deviations between lab/field approaches to estimate silicate mineral dissolution rates. To our knowledge, no integrated modelling studies have addressed this.

Our findings: We looked at both direct effects (on mineral surface area) and indirect effects (on hydrology/water flow and thus pH) of physical weathering on chemical weathering and find that indirect effects likely dominate. In line with previous studies we also find that intrinsic factors like mineral composition directly affect silicate mineral dissolution rates. Extrinsic processes like clay migration and nutrient pumping equally influence solution pH and thus silicate mineral dissolution rates.

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