

Interactive comment on “The importance of mineral determinations to PROFILE base cation weathering release rates: A case study” by Sophie Casetou-Gustafson et al.

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Received and published: 21 February 2019

Summary: The abstract is dense, and therefore hard to follow. Hypothesis 1 lacks clarity, owing to incomplete descriptions of the differences between mineralogy inputs into the PROFILE model. Trace highly reactive phases (notably calcite) should perhaps be considered in this analysis.

Details: The topic of this manuscript is fairly straightforward, and yet it is extremely easy to get lost in the details while reading it. The central question is about errors that arise in model-based weathering rate calculations using an assumed regional mineralogy versus a site-specific mineralogy. The authors define a reference “truth” as

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the model-based (using PROFILE) weathering rates calculated from measured quantitative mineralogy (with XRPD) and measured elemental compositions from the field sites. These reference rates are designated W_{XRPD} . They compare these reference “truth” rates with rates determined with PROFILE, but using two different modeled mineralogies. The first modeled mineralogy is apparently based on the same data as the “truth”, but rather than directly using the XRPD and elemental composition data, they run A2M to produce 1000 different mineralogies consistent with the inputs. This is the site-specific case ($W_{A2M-site}$). The second modeled mineralogy is also derived using A2M, but from regional mineralogy descriptions (and the derived rates are designated $W_{A2M-reg}$).

The similarity of the reference “truth” rates (W_{XRPD}) the site-specific rates ($W_{A2M-site}$) is confusing, and could use more clarification. I see this as the most significant matter the authors should address.

I agree with comments of R1 that consideration of possible unmeasured trace phases, such as carbonates, should be made.

The PROFILE model is described as “the most used mechanistic tool to calculate steady state chemical weathering at the interface of soil minerals and their surrounding liquid solution”. I do not think this claim is necessary or useful. It would be better to briefly explain how PROFILE works, and its long history, particularly in Sweden.

Figure 5 would be much easier to read if the order of color blocks in each bar was consistent, at least in right and left panels of the plot, if not across all panels of the plot. For one thing, then only one key would be required per pair of panels.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-522>, 2019.

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