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Biogeosciences Discussions

Interactive comment on "Water limitation may restrict the positive effect of higher temperatures on weathering rates in forest soils" *by* Salim Belyazid et al.

Anonymous Referee #1

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General comment:

The present manuscript describes the use of a model to calculate weathering rates under two different climatic scenarios where temperature and precipitation are expected to greatly vary within some years. The purpose of the study is very interesting since normally the expected increase of temperature is linked to an increase of the weathering rates and therefore availability of base cations to soil, which can contribute to a myriad of pedological and biological processes. However, as it was correctly pointed out by the authors, the weathering rates are dependent of other factors then temperature and soil moisture and in parallel these two parameters will be dependent on other

complex occurring processes. However the study has two main problems. Firstly, no precise information is provided concerning the model used. Authors do not specify if soil moisture is simulated along the soil profile and if the soil is divided into different layers (this is relevant since the first layers are essentially organic). Also, there is no information on the input required for this simulation and how it was obtained such as the organic matter and nutrient concentrations, the different soil types, parent material and also the different occur minerals at different forest sites, the vegetation parameters required to correctly use a vegetation growth model since different trees will have different litter rates and constitution and water uptake dynamics. Finally, authors do not specify how they have calibrate the model for these forest sites and ultimately how did they validate it. Authors should demonstrate that the model is correctly simulating the effects induced by temperature and soil moisture in these places. The second problem of the manuscript is the range of results and discussion achieved. Once authors point out that climatic changes have complex effects on weathering and that several processes are affected by the changes that ultimately can interfere with weathering it would be very interesting to understand what is governing the weathering rates or by other words, which processes are mostly being influenced by these changes and what is causing the results. As it is now the manuscript describes only the correlations between temperature and soil moisture and the weathering rates but we have no clue of what is behind these trends. When using a model, we can focus on specific flows and understand how the different pools are being affected. The manuscript tittle is a good example of the manuscript fail to provide more effective answers. When stating in the tittle that "Water limitation may restrict. . ." when that was already the hypothesis do not show much improvement. As a conclusion, while the study has a valid and significant goal, it fails along the day to deliver the important messages.

Detailed comments:

Line 18 – "decomposition" – Authors often use this term along the manuscript but it would be more accurate to say "organic decomposition".

Line 28 – 32 – this conclusion is general and authors have only simulated what happens in forest sites in Sweden! It is possible that climatic scenarios for different soils, vegetation covers and land uses result in completely different results. Authors should stick to their study cases.

Line 34-35 – This sentence is too radical. It was not the economic activity that caused environmental impacts, but instead the “bad management in that economic activity”.

Line 45 – There is a typo here (Ref).

Line 88 – Which nutrients and which elements? At least the most important.

Line 91-92 – CO2 and H+ are not correctly formatted. There are several typos like these along the manuscript.

Line 94 – Dissolution rate of H+???

Line 125 – What are the differences between the different forest sites: vegetation types? Soil types? Parent materials? Topography?

Line 136 – 140 – “Forest stand history and future management” this was used as an input? How?

Line 170 – This is the first time authors are saying that the parent materials was different and that this affected the results. The clear indication of the different parent materials involved in this study should be in M&M and the effect of these inputs on the weathering rate should be in Discussion.

Line 181-182 – This is a trivial result, since soil temperature will not mimic air temperature die to thermic soil properties. The study should focus on the interaction of the different processes on the weathering rate instead.

Line 187-189 – This is also expectable since in winter the air temperature increase impacts more the soil that can be frozen. This is the case of Sweden but it will be different for sure in other places. These type of reflections should be in Discussion.

Line 215 – The sub-type if very short. Also results are focused too much on summer and winter changes and also too many figures are devoted to these cases. That information can be summarized.

Line 240 -241 – Strange sentence.

Figure 2, 3, 5 and 7 – The colour ramp should be drastic so that we can see better when the most important changes will occur, Variations between green and blue of between different yellows are not different enough.

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