Biogeosciences

Discussions

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Interactive comment on "Impacts of Enhanced Weathering on biomass production for negative emission technologies and soil hydrology" *by* Wagner de Oliveira Garcia et al.

Anonymous Referee #2

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General comments

This study explores the potential of enhanced weathering to fill the gap in phosphorus needed in order to sustain negative emission technologies such as afforestation/reforestation and energy production from bioenergy grass. It shows that the deployment of enhanced weathering, in terms of basalt addition to the ground, will have beneficial effects on biomass production by supplying phosphorus and other nutrients, in addition to the direct effect of enhancing the CO2 consumption by silicate weathering. The paper is mostly well written and fits the scope of Biogeosciences. I have a number of comments that should be addressed before the paper is suitable for publi-

cation.

Major comments

A number of uncertainties are considered in the paper, but it seems that a lot of weight is given to some uncertainties, while other potentially large uncertainties are neglected. For example, only a single CO2/climate scenario is considered and for this particular scenario only results from a single afforestation/bioenergy model is used. What was the reason to choose this particular climate scenario? A discussion on the applicability of the conclusions drawn from the paper to alternative scenarios should be included. For the carbon sequestration from afforestation you mention (line 260) that the available estimates of carbon uptake vary between 0.3 and 3.3 GtC/a, while in the paper a value of 2 GtC/a is used. On the other hand, a lot of weight in the uncertainty is given to e.g. the P concentration in basalt (5-95th percentiles). To my understanding it seems that this uncertainty is not so relevant for the present study, as I assume that for the use in EW basalt with relatively high P concentrations could in principle be selected. Would the interquartile range possible provide a more appropriate measure of the uncertainty in this parameter? In general in the paper it is difficult to immediately associate the uncertainty ranges to uncertainty sources.

For AR it seems that the largest uncertainty is related to the geogenic P-supply, with scenario two showing basically no P limitation. Is there really no observation-based evidence to suggest that one or the other scenario is more realistic? This is a fundamental question for the purpose of the paper, because if P limitation is not an issue the benefit of EW in these areas will be limited to the direct CO2 consumption by weathering.

In the main text there are many references to supplementary materials. References to supplementary material should be limited as much as possible for a better readability of the paper, considering also that papers in Biogeosciences are not subject to strict length limitations. Since the main paper contains only relatively few figures, I would suggest to move some of the figures from the supplementary to the main paper. For

example Figs S1,S2,S3 could be merged into one figure and added to the paper. It would help to get an idea of the numbers that could then be more easily compared with e.g. the P gap in Fig. 2. I would also strongly suggest to add Fig. S8 to the main paper.

The results for the N-unlimited scenario, which are not discussed in the main text, could be presented in a separate section in the supplementary material. It is very confusing to find figures from N-unlimited experiments mixed inbetween N-limited figures.

Minor comments

Figures should be numbered progressively according to where they are referenced in the text (i.e. Fig. 1 should be referenced before Fig. 2). This is valid also for figures in the supplementary.

Line 21-22: you need to mention what scenario you are considering here, otherwise the numbers make no sense since they will be strongly dependent on future CO_2/climate evolution.

Line 23: 'K' not defined here

Line 22: it would be helpful if the same unit would be used, either GtC or $GtCO_2$. Otherwise it is difficult to compare the numbers.

Line 95: '...we discuss only the N-limited AR scenario...'

Line 119: please check this sentence

Line 147: are these numbers global averages for the areas with bioenergy plantations?

Line 186: nearest neighbour interpolation does not seem to be a very good interpolation choice for very high resolution input data (e.g. geogenic P release rates). A single 1 km^2 value will not be very representative for a 2x2° cell.

Line 425: where does this number come from?