

Interactive comment on “Impact of different fertilizers on the carbonate weathering in a typical karst area, Southwest China: a field column experiment” by Chao Song et al.

Chao Song et al.

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Referee 2 Comment 1 - The authors did not present very well the process/method of weathering which has been used in this experiment: (1) did the authors perform a leaching of the soil column? How are the fertilizers introduced in the soil column? Are spread mixed with soil or spread in solutions? The lack of explanation of the method used does not allow us to assess the results at their fair value. There is also a lack of discussion and comparison of numerical values obtained in other experiments and in natural and agricultural catchments. The carbonate weathering is only estimated based on the weight of each rock tablets. It is not checked by the geochemistry of both rock tablets and the potential weathering/soil solution. Indeed, it would have been

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interesting to have an estimation of the chemical weathering. Answer: The fertilizer was mixed with soil before filling in columns. Changed in the manuscript: We added a sentence to explain this. The soil was weighed, mixed perfectly with above fertilizer, respectively, and filled in its own column. Comment 2 – To speed up the carbonate weathering, the fertilizers were introduced by increasing their amount by 30 times (Why 30 times?). It is a bit problematic, because the authors changed the soil/fertilizers ratio compared to “natural/anthropogenic” ratio? What is this ratio in the local agricultural catchments? What are the specificities these local catchments compared to national Chinese catchments and worldwide catchments? Answer: Because the added amount of fertilizer can magnify and quicken the fertilization effect in the short-term according to another experiment from us, and can't affect the phenomenon we want to observe in this study. Another paper of ours (in preparation) about a series of different amount of fertilizer addition will discuss this issue. The added amounts of these 11 fertilizers were designed only by the average amount of N, P and K fertilizer in the local practical use. Changed in the manuscript: We have added the amount of N, P and K fertilizer in local practical use in this manuscript like this: (N fertilizer: 160 kg N \hat{A} ha \hat{A} -1; P fertilizer: 150 kg P₂O₅ \hat{A} ha \hat{A} -1; K fertilizer: 50 kg K \hat{A} ha \hat{A} -1) Comment 3 – The variability of the experimental replicates should be shown (average and standard deviations), presented and discussed. This can be presented in Table 2. Answer: We did it. Comment 4 – In general, the authors used limestone and dolostone tablets. They did not discuss the results of dolostone tablets, only those from limestone tablets. In the discussion, the difference or similarity between dolostone and limestone is erased as the authors discuss about carbonates. More attention, or at least an explanation about the use of the general term of “carbonates” instead of the difference between dolostone and limestone should be given. Answer: The difference between limestone and dolostone is not noteworthy, so we use carbonate instead. Yes, we need to give some sentences to explain this. Changed in the manuscript: We added the statement “The result between limestone and dolostone weathering under different fertilization treatment were similar. We will explain the results with carbonates instead of individual

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dolostone and limestone.” in this manuscript to explain Comment 5: In several times in the manuscript (last sentence of the abstract, first paragraph of the results, and the last sentence of the conclusion) the authors used the expression “can aid carbonate weathering”: they should precise if the fertilizers enhance, increase, or decrease carbonate weathering. Changed in the manuscript: The statement that nitrogenous fertilizer can aid carbonate weathering should be replaced by ammonium fertilizer” in this manuscript is not precise. We deleted it. And we replaced the rest aids with the word “increase”. Comment 6: Introduction: - L.43 - The authors should add references showing the relationship between carbonate weathering and climate in addition to Liu et al. (2010, 2011); for example Kump et al., 2000). – Changed in the manuscript: We added it. Comment 7: L.47 - The authors should precise that the disturbance of CO₂ consumption disturbance may be overestimated at a local scale by taking into account Ca²⁺ and Mg²⁺ produced by a natural carbonate weathering and those produced indirectly by anthropogenic activities in the watershed. And what about this disturbance at a global scale? Answer: Here, we are just trying to introduce the potential disturbance at the regional/global scales by summarizing and classifying some references in the 1st paragraph. And the specific disturbances from fertilizer addition were further discussed in the 2nd paragraph. Comment 8: 2.2. Soil properties : - At which depth did the authors sample their soils? - Should precise pH(H₂O) - Precise what OM means: organic matter I suppose. - Precise what ASI method means. - What is the soil typology? Answer: The pH had been listed in Table 1. Changed in the manuscript: The meanings of OM and ASI have been added. We changed the statement “The soil used in this column experiment was sampled from the B horizon (below 20 cm in depth) of yellow-brown soil in a cabbage-corn or capsicum-corn rotation plantation in Huaxi district.” to explain the soil samples and typology. Comment 9: 2.3. Soil column - What is the filter material? Answer: Yes, it is a misleading expression here. Changed in the manuscript: It has been changed into: A Polyethylene net (Ø 0.5 mm) was placed in the bottom of the columns to prevent soil loss. A filter sand layer with 2 cm thickness including gravel, coarse sand and fine sand was spread on the net. Comment 10: What kind

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of carbonate rocks did the authors use for their experiment? Are they reference rocks or rocks from karst area of HuaXi district? Answer: yes, it was collected from karst area of Huaxi district. Changed in the manuscript: We added this information in this manuscript. Comment 11: How did the authors deposit each fertilizer in the column? In liquid or solid form? At which temperature has the experiment been performed? - Did you leach the soil column with a solution? If yes, with which solution? Answer: The soil fertilizer was weighed and mixed with soil before filling in columns. Changed in the manuscript: We added a sentence to explain this. The soil was weighed, mixed perfectly with above fertilizer, respectively, and filled in its own column. Comment 12: - In figure 2: the authors draw 3 rock tablets, while the authors put only 2 rock tablets at the bottom of the column. Should change it. Changed in the manuscript: We have changed this. Comment 13: - Did the authors perform the same experiment without rock tablets if they leach their column in order to observe the leaching solution of the column? Answer: We didn't design that in this study. We didn't collect the soil solution. The leaching depended on the rainfall. Comment 14:- Did the authors put the 2 different rock tablets (calcite and dolomite) in the same column? Answer: Yes, we did. Comment 15: The authors should explain the reason of the fertilizer weight use in the experiment. Answer: Because the added amount of fertilizer can magnify and quicken the fertilization effect in the short-term according to another experiment from us, and can't affect the phenomenon we want to observe in this study. Another paper of ours (in preparation) about a series of different amount of fertilizer addition will discuss this issue. The added amounts of these 11 fertilizers were designed only by the average amount of N, P and K fertilizer in the local practical use. Changed in the manuscript: We have added the amount of N, P and K fertilizer in local practical use in this manuscript like this: N fertilizer: 160 kg N ha⁻¹; P fertilizer: 150 kg P₂O₅ ha⁻¹; K fertilizer: 50 kg K ha⁻¹) Comment 16: 3. Results - L.164-165: Do not repeat Table 2 and Fig. 3. You may write: “The results are presented in Table 2 and in Figure 3. Changed in the manuscript: We have changed this. Comment 17: 4. Discussion - 4.1.: the first paragraph (L. 182-197) is quite general and it would be worthy to move it

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either in the introduction, or at least in the Materials and Methods section. Changed in the manuscript: We moved them to the introduction. Comment 18: 4.1. L.213-219: It is exactly the same text as in the introduction (L. 48-54) The authors may express their idea at least a little bit differently. Answer: Because they are for elaborating different problem, we think we should put one of them another way. Changed in the manuscript: We changed the statements in section 4.2. Comment 19: Information about soils and soil solutions are needed in order to understand their chemical evolution during the carbonate weathering. - Would it be possible to present the chemistry of each fertilizer used in this experiment? This can be added in supplementary information. Answer: yes, it is very important. Most of them have been discussed in section 4.2 and 4.3 so far. And we are doing some further research on that.

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