

Interactive comment on “Landslides as geological hotspots of CO₂ to the atmosphere: clues from the instrumented Séchilienne landslide, Western European Alps” by Pierre Nevers et al.

Robert Hilton (Editor)

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Dear authors,

Two experts in this field have now reviewed your manuscript. Apologies for the slight delay in the process, a third referee had initially accepted the task and I was awaiting their comments. However, I'm sure you understand the current pressures on people, and so I have decided we can proceed with the reviews in hand.

I agree with the referees that this study will be of interest to the readers at ESurf and provides new insights on this important theme. However, they highlight aspects which

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need more work in a revised version.

Please prepare a revised manuscript that address the referee's comments (and provide a point-by-point reply). Overall, it seems moderate revisions are necessary, focused on: 1) more careful discussion of the assumptions that go into the use of CI for the rain correction (R1); clarifying and better justifying choices of end member compositions used in the mixing analysis (R1); 3) assumptions of conservative nature of ions (R1+R2) and the role of secondary sulfides (R2); 4) clarifications on the rock samples – their bulk geochemistry and presence of key mineral phases (R2); 5) specifics of the hydrological pathways and associated reactions (R2). Please see the referee comments for more details.

I also completed my own review, prior to reading the referees comments, and in addition to the points they raise, I identified a few other comments/edits to address:

14 - Here we use a combination of major element chemistry. . . .

16 – the final two sentences here are very vague – it would be better to use this space to highlight some key results (or examples of being able to do what you say)

20 – Using a mixing model of XXXX(details), we are able to show. . . .

21 – where does it do this – in the failure itself? In the debris it creates? It would be useful to specify here.

23 – “but” => by?

26 – change “instable zones” to “large landslide complexes”

27 – instead of “physical and chemical erosion and climate”, is it clearer to say “physical and chemical erosion and their impact on the carbon cycle and global climate”

36 – and indeed when sulfuric acid mixes with natural waters containing HCO₃ at neutral pH or higher – this can release CO₂.

C2

38 – is this true (that carbonates are a minor fraction)? I think Hartmann's global maps show sedimentary rocks cover ~65% of the earth's surface, and I imagine that carbonates could make up a big chunk of that, especially considering interbedded carbonates and shales, and carbonate cement in siliciclastic rocks.

108 – consider splitting this sentence.

Figure 1 – can you show the cross section (d) location on b or c?

118 – can you explain briefly what the 'gallery' is – its not a term I've heard before, and other readers may not be familiar with it either

160 – leach. H₂O not H₂O

179 – Sulfur

183 – typo

Figure 2 – add the notations to the figure legend so the readers can quickly see the water types (e.g. what is UZ BSZ etc.)

Figure 4 – please add a,b,c,d labels to panels. Can carbonate weathering by sulfuric acid also be identified on part c? on part d, what does silicate end member mean for the x-axis (sulfur isotopes) – I guess pyrite? On d, what was the choice of S and Sr concentrations to make the mixing hyperbola?

Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2020-42>, 2020.