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...
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 Cl 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.
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 – it’s not a term I’ve heard before, and other readers may not be familiar with it either

160 – leach. H2O not H20

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?