Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2020-42-AC4, 2020
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Earth Surface Dynamics Discussions
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Interactive comment on "Landslides as geological hotspots of CO_2 to the atmosphere: clues from the instrumented Séchilienne landslide, Western European Alps" *by* Pierre Nevers et al.

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Received and published: 18 November 2020

Answer to the Associate Editor comment.

Specific comments:

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

This will be done.

- 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)

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Discussion paper

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Details will be added to these sentences. We will move to this place part of the information provided in the second paragraph of the submitted abstract.

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

This will be done.

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

The creation of favorable conditions for sulfuric acid production (by pyrite oxidation) occurs mainly in the fractures. Reactive surfaces could also be created in the debris it creates but in smaller proportions.

This information will be added:

"As a consequence of the model, we are able to show that the instability creates favorable and sustained conditions within the failure, through the opening of new fractures bringing fresh and reactive surfaces allowing for the production of sulfuric acid by pyrite oxidation".

- 23 – “but” => by?

This will be done.

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

This will be done.

- 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”

We agree, we will change this.

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

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We will add this.

- 38 – is this true (that carbonates are a minor fraction)? I think Hartmann's global maps show sedimentary rocks cover âĹij65% 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.

This is true. We will tone down this statement.

- 108 – consider splitting this sentence.

This will be done as follows: "The high degree of fracturation of the massif and its heterogeneity lead to distinct and complicated hydrological flow paths. Water pathways are characterized by different transit times related to a duel permeability behavior that is typical of fractured rock aquifers where conductive fractures play a major role in the drainage".

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

This cross section is already shown on Fig. 1.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

We apologize, the word "gallery" was not the correct translation of the French term. The correct translation would be "underground tunnel". We will change to:

"An underground tunnel for the production of electricity in a local hydropower plant, named "Galerie EDF", built by Electricité de France (EDF), located at the base of the slope, acts as a major westward drain for groundwater".

- 160 – leach. H2O not H20

This will be done.

- 179 – Sulfur

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This will be done.

- 183 – typo

"Sulfides sulfur" will be replaced by "Sulfur contained in sulfides".

- 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.,)

Notations will be added.

- 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?

Labels (a, b, c, d) will be added. For part d, yes, the silicate end member corresponds to pyrite in terms of d34S. Several values of Sr and S concentrations were tested in order to obtain a hyperbola that best fits the measured values, which correspond to a mixture between the pyrite and gypsum end members. These values were constrained by the defined pyrite and gypsum end members.

Please also note the supplement to this comment:
https://esurf.copernicus.org/preprints/esurf-2020-42/esurf-2020-42-AC4-supplement.pdf

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