

Interactive comment on “Variability of the groundwater sulfate concentration in fractured rock slopes: a tool to identify active unstable areas” by S. Binet et al.

Anonymous Referee #1

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General Comments

The paper studies the effect of mechanical deformation on the groundwater chemistry in landslides. It is a very interesting phenomenon and I certainly recommend publication. However, the paper is difficult to read, in part because of the large number of small errors and a sometimes peculiar use of words. I guess the authors can easily improve on this.

Specific Comments

- It is not clear whether or when an open or closed system is assumed in the phreeqc
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calculations. In case of an open system do you fix the $p\text{CO}_2$ at the atmospheric value ($10^{-3.5}$ atm) or soil value ($10^{-0.7}$ atm)? Assumptions should be clearly mentioned (e.g., in chapter 4.1).

- On page 5429, line 3-7, you conclude that respiration processes did not occur, as $p\text{CO}_2$ values were not disturbed compared to atmospheric values. However, in chapter 4.1 you say that in the soil $p\text{CO}_2$ values of $10^{-0.7}$ atm are measured, which indicate that respiration is important (at least in the soil). Could you explain this apparent contradiction?

- In chapter 5.2, line 14-16, you give some threshold values, which are, in principle, for the studied sites. I think it would be interesting to discuss whether this can be applied to other sites and on what it could depend (e.g., pyrite content or grain size of the fracture filling).

- In the last paragraph of section 5.2 time scales of rock deformation and transport are discussed. However, there also is a time scale for pyrite dissolution. If the dissolution rate is changed, it will take some time for sulfate to reach a new steady state concentration, even in the deformation area. I think this dissolution time scale can be important. At least it should be discussed.

Technical Corrections

- The English should be improved. I attached a pdf file with some (suggestions for) corrections.

- Page 5421, line 3 and page 5422, line 15. The verb "evolve" is used, whereas I think "vary" or "range" is meant. For me, "evolve" refers to a change in time.

- Page 5424, line 22 and page 5429, line 2 and 9. I don't know what you mean with the word "script" in this context. A script is something written down. Please, use another word.

- Page 5428, line 15. According to equation 1, 3.75 moles of oxygen oxidizes two in
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stead of one mole of sulfur.

- Page 5429, line 1. pCO₂ values are superior not inferior to atmospheric pCO₂ values (10^{-3.32} > 10^{-3.5} and 10^{-2.7} > 10^{-3.5}).

- Page 5429, line 14. What do you mean when you say that something explains "more than 90%"? If it refers to some error analysis, explain it. If it just means that it explains something well, give a more qualitative description.

- Page 5432, line 25. I do not understand the expression "to bring clouds about". Please use another expression.

- Table 1. The stoichiometric coefficients of anorthite and pyrite are wrong. Please, correct them.

- Caption of figure 1. The description of map A, B and C do not seem to coincide with the figure.

- Caption of figure 5. This caption says that water is oversaturated with respect to calcite, whereas the text says it is saturated.

Please also note the Supplement to this comment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5415, 2009.