

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 #2

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The manuscript “Variability of the groundwater sulfate concentration in fractured rock slopes: a tool to identify active unstable areas” by Binet et al link the water geochemistry of springs in western Italy and southern France to landslides. The aim of this work as presented was to demonstrate the “changing chemical signature of major ions flowing through gravitational active faults and correlate these signals to the motion of rock” which can lead to monitoring and predicting tool of landslides and seismic events. However, the basis of this work relating groundwater geochemistry to rock movements has been discussed before even by the same authors (see references within the text). Therefore it is not new concept that is presented in this study. As a collection of geo-

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chemical data this manuscript is valuable and can be of use. For the more ambitious goal of this work it is hard for me to see that even on the local scale of the work done for many years in the mentioned sites the geochemical analysis of water can give a major advantage in monitoring landslide or rock movement or predictive tool. Other points that should be considered: On paragraph 2 page 5423 - I don't see the correlation between the sulfate concentration and landslide motion. This is the only place where sulfate concentration is related to movement and it is not clear or fully explainable. As this is the core of the paper this point should be demonstrated in much stronger way. When inverse modeling is considered in page 5426 a set of negative concentration of compounds are provided in tables 2 and 3 please relate and explain. On page 5428 when O₂ saturation is discussed values in table 3 are more than order of magnitude larger that limit of saturation - no explanation is given. The explanation for table 2 that relates to exchange and recharge of O₂ from the atmosphere is not in accordance with the later explanation of CO₂ concentration which is claimed to be low due to no contact with the atmosphere. Specific comments: Abstract (p. 5417): line 8-10 please rephrase sentence (“Potentially.as observed”) - not clear. Line 19 “(a)” please explain Line 20 – prediction (in general) and specifically of catastrophic ruptures not discussed in the manuscript.

Introduction: Line 3 (p. 5418) suggest to replace “durably” with “in turn” Line 5-7 please rephrase sentence - not clear. Paragraph beginning in line 8 not completely clear why heterogeneity makes it especially difficult to monitor movement in physical tools also what about remote sensing? Line 20 suggests to change the sentence to read: “2001). It can generate additional cracks (Scavia, 1995), leading to a porosity” Page 5419 line 1 monitored should be monitoring Line 20 prediction capabilities are not discussed should not be claimed here or anywhere in the text.

M&M Line 8 page 5419 suggest to change “forms “ to shape or control Line 10 should read cubic meter Line 14 m.a.s.l. should be defined first time you use it. Line 17 how many “centimeters” in 2001 are we talking few 10>/50>/100>? Line 20 to 22 please

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rephrase sentence - not clear. Line 10 p. 5420 why the jump from fig.1 to fig 4? (Where are figs. 2 &3?) Line 15 should read analyzed Line 26 please replace an by a Line 2 p. 5421 Fig 1b I couldn't find 35 marks of the springs. Line3 and everywhere else in the manuscript waters should read water Line 12 should read "a seven years survey"

Results Lines 14-15 please rephrase sentence - not clear. Line 20 please begin the sentence with "The water collected" (delete Instead) Line 1 p. 5423 please begin the sentence with " Fig . 2" Line 6 ratios should be ratio Line 7 please delete the second "ratio" Line 14 should read higher than or equal to Line 14 should read low movement period until 1/1996. Line 26 please change to a "A short increase"

Modeling: Line 6 p. 5424 and everywhere in the text please refer to gneiss rock and not just gneiss. Paragraph begin in line 11 pH of 4.5 can't be explained by CO₂ maybe explainable by Eq. 1 and production of sulfuric acid. Line 16-20 please rephrase sentences - not clear. Line 22 should read This open air system Lines 1-4 p. 5425 there is not agreement with table 1 for example anorthite requires 2 H⁺ , albite 4 and Kmica 1 according to table 1. Lines 11-12 please rephrase sentence - not clear. Lines 13-15 sentence is redundant please delete. Line 18 a should be replaced with an Line 20 p. 5426 Ph should be pH Line 25 should read 0.1 mmol of pyrite or from 0.2 mmol/L of

Discussion Line 7 p. 5430 please rephrase sentence - not clear.

Table 2 and 3 SI should be defined Fig 1 no legend is given for 1D Fig 2 legend back symbols should be black

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