

Anonymous Referee #3

We would like to thank the reviewers for their suggestions and comments. Following the suggestions, we included improvements in the manuscript. Below, point-by-point responses to the reviewer's comments on the manuscript.

Concerning the general comments:

Additional explanations has been added to the abstract (page 1, lines 23-27) to highlight the influence of the meteorological factor on each study sites. A paragraph also has been added on the discussion to precise the physical processes leading to the fall (p13. L3-24)

Concerning the specific comments:

1) *Page 1335, lines 1-3: The cited references concern the rockfall frequency (which depends on the intensity) and then the temporal dimension of rockfalls as the present paper do. So I suggest replacing "rockfall intensity" by "rockfall frequency". The specificity of the present paper is not to deal with the temporal aspect, but with the influence of meteorological factors on the rockfall frequency (rather than probability). So I suggest replacing the sentence "Temporal probability is recognized to be more difficult to assess (Hantz, 2007)" by: "But little work has been carried out to study the influence of meteorological factors on the rockfall frequency."*

We agree with the suggestions, and we made the correction in the text (p2, l.6-8).

2) *p.1335, l.9: I suggest to add the paper by Frayssines & Hantz (2006), which concerns the statistical correlation between rockfalls and meteorological factors (mainly temperature) and presents a similar (but more classical) approach. Reference: Frayssines, M. and Hantz, D.: Failure mechanisms and triggering factors in calcareous cliffs of the Subalpine Ranges (French Alps), Eng. Geol., 86, 256–270, 2006.*

This reference has been added in the text (p2, l.15).

3) *p.1335, l.27: Although the intensity is not considered in the paper, it should be useful to give at least on order of magnitude of the volume of the rockfalls considered. Indeed, the triggering factors could be dependant of the volume. This information will allow a comparison with other studies. Moreover, for the results of the work to be useful in terms of rockfall frequency, it is necessary to give the volume range of the rockfalls considered in this study (as well as the mean height of the rock walls).*

Information about the volume range of the rockfalls as well as the mean height of the rock walls has been added for the three study sites (p.5, l.2-3; p.5, l.12-13; p.5, 17-18; p.5, l.26-28)

4) *p.1336, l.16-19: The proportions given are rather frequencies than true probabilities ("The daily rockfall hazard, which is the probability of a fall on each day, . . . , is close to these proportions"). So I suggest replacing the terms "probability" (line 16) and "proportions" (line 19) by the term "frequency".*

We made the replacement.

5) *p.1337, sections 2.1, 2.2 and 2.3: The information about temperature is not homogeneous.*

Please give for each site the extreme temperatures and the daily temperature range (it is missing in section 2.2).

We added the information to the Bourgogne region (p.5, l.28).

6) *p. 1338, l.20: Please give also the difference in elevation between the weather stations and the studied areas (or the elevation of the stations).*

The elevations of the stations are given p6, l.16-18.

7) *p.1339, l.13 and Table 2: a) The total number of rockfalls in Table 2 doesn't correspond to the number of events in Table 1, for the Bourgogne and Auvergne regions. b) Concerning the sentence "Surprisingly, the maximum average number of rockfalls per day occurs for the lowest amounts of daily rainfall": It is not the "number of rockfalls per day" which is given in Table 2, but the number of rockfalls per interval. Moreover, it is not surprising because the lowest rainfall interval (0-20) has the highest frequency (given in the second column in Table 2). The right comparison should be between the frequency of the rainfall intervals and the corresponding frequency of the rockfalls. I suggest modifying Table 2 for a better classical analysis.*

We modified the Table 2 according to your comments. A correction was also made concerning the sentence "Surprisingly...daily rainfall" (p.7, l.2-3).

8) *p.1340, l.7-8: Please precise what meteorological parameters have been used.*

The precision has been given p.7, l.17.

9) *p.1342, l.11: After reading of the whole section 4.2.1, I suppose that the proportionality coefficient gives the number of rockfalls knowing that there is at least one rockfall in the day considered, and not the mean number of rockfalls (including the days without rockfalls). Otherwise the proportion x should be 100%. This point should be explained.*

The definition of the coefficient of proportionality has been modified based on your comments, to make it clearer (p.10, l.11-15).

10) *p.1343, l.23: It is not visible in Table 5 that the correlation can be identified "even when a rockfall occurs a few days later". This point should be explained.*

We agree that, on Table 5, this point is not visible. We removed the sentence.

11) *p.1344, l.21: Please explain what is this marker of the freeze-thaw activity.*

Done, p12, l.21-22.

12) *p.1345, l.3: I suggest to say "The new approach also allows estimating the conditional probability of rockfall", because it is rather a frequency.*

We agree with the suggestion (p.13, l.26).

13) p.1345, l.23: *The sentence "The probabilities are considerably lower for databases with few rockfalls" is an evidence. I suggest removing the lines 23 to 25.*

We removed the sentence.

14) p.1346, l.4: *The paper which concerns the correlation between rockfalls and meteorological factors is the one mentioned in comment 2 (Frayssines & Hantz, 2006) and not the one cited here (Hantz & Frayssines, 2006).*

Exact. Thank you for the correction.

15) p.1346, l.15: *I don't understand this sentence: "Moreover, the cross-correlation is not helpful when there is no more than one event per day." Could you explain this point?*

This observation is based on the results part. 3.2. The cross correlation is calculated in function of the daily number of rockfalls, and seems not suitable in the case of only one event occurs per day. A precision has been made p.14, l.31 and p15. L.1-2.

16) P.1347, l.18-20: *The sentence "(similar assessments could be made with other combinations of the rate of correlated data and the level of correlation)" is not understandable.*

I suggest removing it from the conclusion.

We removed the sentence of the conclusion.

17) p.1356, Table 6: *The value of the slope of the regression line (proportionality coefficient) is also an important result. It should be presented in Table 6.*

We added the proportionality coefficient in Table 6.

18) p.1359, Figure 2: *The figure concerning the Auvergne site presents some anomalies. a) A freezing period seems to be missing in curve (e) when the minimum of temperature (curve c) is negative. b) The curve (c) clearly shows 4 annual cycles when it should correspond to a 3 year period. It is surprising that the weather could be so different between Bourgogne and Auvergne. This anomaly should be explained.*

The Figure 2 has been corrected in function of your comment. The 3-year period was not the same for the Auvergne region and the Bourgogne region. We take the same for the new Figure 2.

Concerning the technical comments: all the corrections have been made.

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