Interactive comment on "The effects of cushion's particle size and thickness on coefficient of restitution under the rockfall impacts" *by* Chun Zhu et al.

Anonymous Referee #2

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The authors' effort to improve the manuscript are acknowledged and do lead to a general improvement of the contribution. However, the main criticism is not addressed. The urge of presenting experimental data alongside with their uncertainties is compulsory for every experimental work. It cannot be stressed enough: The measurement of a physical quantity without specifying its uncertainty is meaningless.

Although the effort of attaining the comprising set of 628 tests is valued, the specified test procedure and its error handling is not evaluated profoundly enough to strengthen the authors claims. The authors themselves state that "if an obviously outlying result was obtained, the test was repeated to reduce the error." In experimental series, a uni-

fied test procedure yields the given results and subsequent data analysis then shows the range of extremal values. The judgment of an "obviously outlying result" does not correspond to a scientifically detached experimental setup and mind setting. Outliers – or at least unexpected measurement results - might hint to unexpected effects and processes, to experimental limitations, to faulty experimental procedures, etc. and are not to be discarded a priori. The authors are urged to rethink their approach to experimental findings and focus on a nonbiased data collection.

The full table of measurement results presented in the appendix do not show the uncertainties, but has to be evaluated by the reader itself. The requirement on a scientifically valuable publication and its figures is to concisely transport the gathered knowledge to the readership. It should serve to showcase the received results together with their experimental limitations – in case they are of significant size. A summary of barely treated raw results is favorable with respect to the data origin point of view, but does not serve the purpose of transporting knowledge to the reader.

As an example for a minimal data treatment, a revised version of Figure 8 is attached with the uncertainties drawn from the presented measurement data. If taken the standard deviation from the attached measurements in Table 1 of the Appendix, then the graph looks the following. It is clear to the reader that the change in COR from 4 cm to 5 cm block size is not apparent within the error bars. Only after such considerations, any conclusion on data quality and/or experimental sufficiency in terms of number of drops per series are possible.

As example for a thorough and concise presentation of similar results, consult for example the article "Geotechnical and kinematic parameters affecting the coefficients of restitution for rock fall analysis" P.Asteriou et. al. (https://doi.org/10.1016/j.ijrmms.2012.05.029). Such data presentation is expected and needed for the COR data to merit possible publication.

Optimization analysis and discussion of test result: Due to the lack of data quality

verification in the first step, the optimization analysis is based on bad ground. However, if amendments are done and the presented search for the leading parameter for COR and damage depth should remain unchanged, the following improvements need to be done:

The presented formula (6) lacks R_y, so the derivation of R_y is not clear. Additionally, it is suggested that instead of 4 it is suggested to state "Number of levels" such that a reader who jumps to the equations is not baffled by this specific number. As the formula is not complete and in Table 3 levels are labelled k_1 to k_4 but in the upper discussion it is only a k_{xy}, it is not clear how to obtain the factors presented in Table 3 for the individual levels. A clarification in notation and procedure is needed.

Furthermore, Figures 12 and 13 show many trend lines. Again, no uncertainties are given with respect to the trend lines. This is mandatory for the reader to judge the significance of the trend. An uncertainty boundary for the trend lines, estimating the error propagation from experiment to statistical evaluation should be included.

A few comments to further authors responses: Orthogonal test theory: The procedure is introduced, but merely as a disclaimer. Orthogonality is a basic concept in Linear Algebra. The labelling, though, has been misused in software testing and in test procedures as describe in this work, where it only should label the treated input factors as "independent". Although an "orthogonal test design" sounds elaborate, it is not to be advertised as "uniformly dispersed, neat and comparable, making it highly representative". A deletion of this text section is requested. Only data quality can judge whether a test procedure lives up to those high expectations. It is strongly suggested not to oversell used techniques. Although a deletion of "orthogonal" is favored, a clear statement of "orthogonal test design meaning changing four input parameters independently" or similar is favored.

Although some improvements in language and readability have been carried out, the text still is full of typos, especially tangled words are ubiquitous. A more careful proof
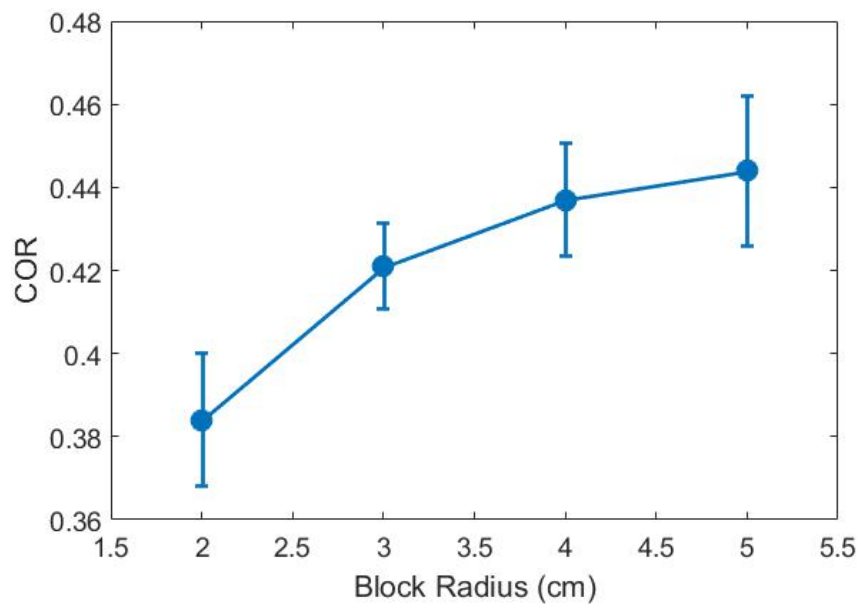
reading of any final submission is mandatory. Special attention should be given to consistent variable labelling, figure layouts, figure captions, page breaks, typos.

Overall the presented work still needs major refurbishments in order to be eligible for publication.

Fig. 1. Revised Figure 8 of the manuscript.

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