DESIGN BLOCK DEFINITION IN THE NEW AUSTRIAN STANDARD FOR TECHNICAL ROCKFALL PROTECTION (ÖNORM B 4802)

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OBJECTIVES

The current ONR 24810 [1] guideline for technical rockfall protection barriers (nets, dams, galleries) in Austria requires the determination of a design block size as a certain percentile of measured block sizes from field observations, preferably at the location of the planned barrier. The percentile (between P95 and P98) depends on the frequency of rockfall occurrence at the affected area. However, a decade of experience with the ONR 24810 and analyses have shown that when fewer than 60 blocks are available, the derived percentiles are not reliable, and even with larger datasets, the percentile gradation is too fine, and the confidence intervals of the four percentiles overlap, sometimes over large ranges. This means that the confidence intervals are too large and the derived design block sizes are not reliable. Because of this statistical unreliability and the lack of reproducibility, the design block concept is being reassessed in the new ÖNORM B 4802 [2]. The measured block size distributions are converted into linear dimensions and fitted using Python to the generalized exponential distribution, which consistently shows the best fit. Fitting allows to generate a comprehensive block size distribution with several thousand blocks from only a few dozen measured blocks, while reflecting reality (and percentiles) as accurately as possible. It resembles a grading curve, as used in soil mechanics, and usually is S-shaped on a logarithmic axis (as shown in the figure). A percentile of the fitted block size distribution is then used in a newly developed formula to determine the design block size depending on the rockfall frequency. This contribution presents detailed statistical analyses of natural block size distributions and proposes an extended statistical–mathematical approach for determining the design block size.

METHODS

- Data sampling in the field
- Statistical analysis of block size distributions
- Mathematical fitting

MAIN RESULTS AND CONCLUSIONS

- Improved statistical validity of the definition of the design block
- Transparent mathematical approach
- Design rules suitable for practical application in the planning of rockfall barriers

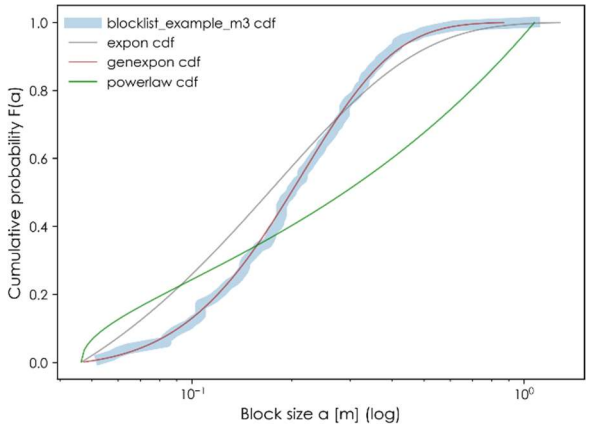

Figure: Example of fitted distribution functions (grey, brown, and green lines) to a block size distribution (blue)

REFERENCES

[1] ONR 24810 (2021) Technischer Steinschlagschutz - Begriffe, Einwirkungen, Bemessung und konstruktive Durchbildung, Überwachung und Instandhaltung (Technical protection against rockfall - Terms and definitions, effects of actions, design, monitoring and maintenance). Austrian Standards, Last release published 2021-05-01

[2] ÖNORM B 4802 (in prep.) Technischer Steinschlagschutz. Austrian Standard in preparation (replaces ONR 24810). Release scheduled for 2027.