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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Effects of the impact angle on the coefficient of restitution based on a medium-scale laboratory test" *by* Yanhai Wang et al.

Anonymous Referee #1

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The article presents a laboratory study on the dependence of the coefficient of restitution regarding the impact angle, falling height etc. Based on the results a regression has been formulated to obtain normal and tangential coefficients of restitution. The R^2 are not very high. This – in my opinion – has one main reason: the blocks are not spherical but have edges an corners. Their impact on the ground mains defines the rebound angle and velocity. The model itself cannot reflect this effect because it neglects the rotational movement of the block that has a significant influence. Therefore, the model presented should be reported as being valid only for trajectory simulation codes based on point masses used to simulate the blocks. The model would not work for simulation codes that use folly shaped three-dimensional blocks. This should be stated

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Discussion paper

in the introduction, handled in the discussion and be summarized in the conclusions.

Specific comments:

P1L13: Please, add short term on the kind of rock movements with or without rotation, "jumping" or vertically falling.

P2L4: Outdated references! Apart from the cited codes there are numerous additional trajectory simulation codes around today (E.g. RAMMS::rockfall, RockyFor3D, Pierre 2, ...). Their impact scenarios partly differ from the classical use of normal and tangential COR. Please update your collection of reference. A (also already 7 years old) list could be found in https://www.nat-hazards-earth-syst-sci.net/11/2617/2011 or also have a look at http://www.nrcresearchpress.com/doi/abs/10.1139/cgj-2016-0039#.WucKWhK5-Lo

P2L19: The COR is a model only. In reality it is almost zero. Example: take a spherical rock and let it fall –> it barely jumps.

P4L23, P9L14, P16L8: replace "increases in the impact" by "increasing"

P5L2: Glover also evaluated coefficients of restitution in http://etheses.dur.ac.uk/10968

P5L12: use kg instead of g because it is doubtful that exact this weight is kept.

P7L5: 60fps might not be enough precise to capture the accelerations (during impact = time of the highest acceleration) there are only very small displacements that are not covered by the resolution of the cameras?

P12L8: Of course, if only translational movements are looked at. The hardness of the impact partners involved is not very relevant. The rebound is influenced mainly from the rock's edges and therefore related to its rotational movement.

P13L7: This is a very precise weight....

P16L30: "Assume" –> "Assuming"

P20L9: The presented concept of COR analysis an experimental/laboratory trajectory regarding the block's centre of gravity. The shape of the block does not play any role as well as its rotational movement. The presented model to determine R_n therefore only works if the trajectory model simulates small mass points without rotational movements. As soon as the trajectory code aims to model spatially shaped blocks with edges and corners above data cannot be used. This consequence should be added to discussion and conclusions.

References:

- please unify formatting (e.g. not all journal titles are italic/cursive)
- P21L5: This references misses journal etc.
- P21L18: what does "p.20-1" mean?
- P21L29-30: are 175 and 83 page numbers?
- P21L30: are 149–56 page numbers?

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