Review NHESS-2018-76

General comments

The manuscript does not make a significant contribution to the understanding of a natural hazard. It mainly deals with one element of a rockfall barrier. In the manuscript a single ring of a net with its deformation properties is analyzed.

In the abstract it is promised that this ring will be exposed to a two-point, a four-point and a six-point stress and these results will be confirmed by experiments. Such results for all three loads cannot be found in the manuscript.

The introduction should be better structured and should be focused on the title of the manuscript. It does not make sense to describe the simulations of complex rockfall barrier if in the title is mentioned "ring net" and in the manuscript only one single ring is analysed under special conditions.

Specific comments

In the theoretical part, the single ring is treated as one element. In reality, however, a ring can be made of different materials (wire bundles, ropes, etc.). The properties of the material used are decisive for the deformation properties of a ring. The manuscript does not address these important differences and therefore is of little interest to design engineers.

A small rockfall barrier may have around 500 individual rings which are hung together. Between the individual rings occur forces and deformations, which must be considered in the simulation of ringnets. These constraints and their influence on the results are not dealt with.
In the manuscript two types of arrangement of rings in protective nets are drawn. This arrangement is crucial in the deformation of ringnets. The diagonal arrangement produces much more deformation than the orthogonal arrangement. This problem is likewise not addressed by the authors.

In a subchapter the influence of the inclination angle of the stone trajectory on the net is simulated. But not the trajectory of the stone is changed, but the inclination of the net. This is fundamentally wrong, since the gravitational force has a smaller influence on the deformation (load) of the ringnet in a flatter trajectory.
Furthermore, it is shown in a simulation that forces are to be orthogonally removed in diagonally arranged rings in the network Twenty years of testing ringnets in Switzerland, France and Italy show the opposite result. Obviously there is fundamental error in the simulation results.

Technical corrections

The introduction is a collection of work done with ring nets and complete rockfall barrier. The simulations of complete protection nets should be omitted and describe the work with ring nets better and more detailed.

Line 40: In Figure 3 (a) a ringnet is shown with orthogonally arranged rings and in figure 4 (a) one with diagonal aranged rings. The different behavior should be explained in the manuscript.

Line 43: In Spadari et al. (2012) no ring nets are treated but wire mesh. Therefore, this reference should be omitted.

Line 46: Thoeni et al. (2013) Also in this publication wire meshs are simulated and therefore this reference does not contribute to a better understanding of ring nets. Omit.

Line 99: The terms EF and CD are to be explained in the text or otherwise omitted.

Line 106: Why are δ and ϕ not drawn in Fig. 5? Please perform.

Line 109: In the whole manuscript must be more clearly distinguished, where a single wire (in the manuscript translated as "coils") and where a ring with many wires is meant. The translation of a single wire with "coil" is wrong.

Line 124: The remarks added above should apply mutatis mutandis to Chapter 2.2.

Line 147: Also in chapter 2.3 the values δ and ϕ are not shown.

Line 171: The results presented in chapter 2.4 can’t be verified because the mentioned China internal publications are not publicly available.

Line 180: With the simple principles presented in the previous chapters, the simulation (Chapter 3) of the experiments (Grassl et al., 2002) can’t be explained. In a simulation must be specified with what forces the rings are attached. Depending on the height of the forces occur larger or smaller deformations of the ringnet. Also, the friction between the rings has an influence on the deformation. These points are not discussed. The results of the simulation (displacement, acceleration, impact time) will be presented and the simulation itself will not be described. Above all, in fig.6 the single ring is loaded orthogonally and diagonally in the simulation.

Line 208: The individual rings are orthogonally interconnected in Fig. 11, although the ring R7 / 3/300 has never been so arranged. The rings should be drawn as in Fig. 10. It should also be indicated how many rings are actually installed.

Line 213: In the simulation with the three boundary conditions, indicate how much the rope is tensioned. In addition, I find it an impertinence for the reader that he should read the results himself from Figures 12 and 13. It is the task of the author to show and explain his results in detail. Here I expect next to the diagrams also a table with the results about the deformation and the braking time of the three simulations.

Line 220: A mass of 830 kg at a velocity of 7 m / s produces a kinetic energy of 20.3 kJ and not a value between 16-20 kJ as shown in Figure 13. Here in Fig. 13, there must be an obvious error. In addition, the position of the mass must be taken into account in an energy analysis. It would be better to represent the energy of the mass with respect to the greatest deformation. In addition to the representation of the deformation, the speed and the deceleration could also be displayed. These additional diagrams would make the simulation more transparent.

Line 231: The specification of the maximum energy with two decimal places are exaggerated. Here are integer values.

Line 239: If the influence of the angle of incidence α is to be investigated in this chapter, then the trajectory of the mass should also be changed in this sense and not the ring net as shown in Fig. 16 should be rotated. The results will certainly be different, because the influence of gravitational acceleration decreases with increasing angle a.

Line 265: The theoretical basics and simulations described in this chapter are extrapolated from the single ring to a net with 6 * 12 rings (Fig.17). At the edge of the rings are attached to ropes and in the ropes energy is reduced. This aspect is not mentioned. It is only claimed that the difference of the energy of the numerical simulation and the theoretical calculation is only 0.71%.

Line 290: Why are not both energies (bending and tensile) added together in the two stripes? Please explain.

Line 321: The correctness of the theoretical results is not confirmed for rings with 6 adjacent rings.

Line 323: The presented numerical model can’t be used to model a complete protection net with supports and ropes, but only a part of a ring net which is stored under certain conditions.

Line 326: It is not the trajectory inclination that has been changed, but the position of the (horizontal) ring net. Therefore, the results should be interpreted with caution.

Line 330: Passive protective nets against falling rocks as shown in Fig. 2 and Fig.3 consist of substantially more elements than described in this manuscript. The most important element of modern safety nets are the brake elements installed in the ropes to limit the forces.

In conclusion: No protective net can be calculated with the methods presented here, not even theoretically. I recommend that the manuscript be withdrawn, completely re-edited and resubmitted.