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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Study on Mechanical Properties and Dissipation Capacity of Ring Net in Passive Rockfall Barriers" *by* Chengqing Liu et al.

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Dear Referee, Thank you for your comments concerning our manuscript entitled "Study on Mechanical Properties and Dissipation Capacity of Ring Net in Passive Rockfall Barriers" (Manuscript Number: nhess-2018-76). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made correction. We hope these revisions will meet with approval. The main corrections in the paper and the responds to your comments are as follows:

L44ff: Your judgement on the existing research is to general. - There is still more existing research to include in this overview section. Please, intensify your literature

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Discussion paper

research. It is not my part to list all the single research works that exist since the late nineties. For example, the original works of Nicot were not published in 2012 but much earlier in the late nineties and at the beginning of the millenium. Or Volkwein (2004) setup a special discrete element for net rings ("Volkwein, A. (2004). Numerische simulation von flexiblen steinschlagschutzsystemen (No. 289).vdf Hochschulverlag AG."). And much more publications exist..... Response: Thank you for your good advice. the original works of Nicot we quoted was published in 2001. Volkwein (2004) setup a special discrete element for net rings, The specially developed software application Faro simulates the dynamic behaviour of a spherical rock stopped by such a protection barrier in many short time-steps by the central differences method. This enables a detailed view of the dynamics of the modelled barrier and also provides information on its loading and degree of utilisation. The results of the simulations are compared to the field tests carried out within the research project. We have added their research to the paper.

- You wrote that there is barely no difference in the existing research. Please, explain both what is the same between these researches and what is the difference of your research to the existing ones. From my point of view, your research is pretty much the same. Response: Most of the current research focuses on field tests and numerical simulations, in this paper, we analyzed the mechanical properties and energy dissipation of the ring network in the overall protective structure. Firstly, the energy dissipation formula of a single ring is calculated, and then extended to the entire ring network. It is expected to provide certain theoretical basis and guidance for the design of the overall protective structure.

L46: After reading this sentecne I would expect that your article finally brings the adequate mechanics. However, it still lacks a lot (three point tension, comparison with the analytical solution of Nicot (1998/99) etc.). Response: Thank you for your good advice. The problem of three point tension is that we need to study further next.However, this paper mainly studies the mechanical properties and dissipation capacity of the ring net.

The proportion of the 3-point connecting ring is relatively small, which has little effect on the energy consumption of the whole net.

L75: "Grassl hans gerhard" –> "Grassl" Response: Thank you for your good advice. We have revised it in the paper.

L108: Insert "Point" between "Two Tension" (same as in L140). Response: Thank you for your good advice. We have revised it in the paper.

Section2: In your reply to my previous comments regarding 3-point-tensioned rings you stated that the influence of these rings is marginal. However, your calculation examples contain 20-33% of rings that are connected at three and not four points. I would estimated that this number is not small. Please quantify the influence and error induced by this assumption. Response: Thank you for your good advice. However, in the actual calculation process, we mainly calculated the energy consumption of the cross region, and the 3-point-tensioned rings only accounted for a small part of the area. Therefore, we thought the influence of these rings was marginal.

Fig.5: Where are the points CDEF? Are they need anyhow? Do you need ER & CD in this figure? Response: Thank you for your good advice. We have revised it in the paper, the point F has been removed.

L122: Which unit has to be taken for theta? Is it in radians or degrees? Between which values of theta is the formula valid? Response: Thank you for your good advice. The unit of theta should be taken for degrees, at this point, the value of theta is the formula valid.

L122: Please indicate delta in Fig. 5. Response: Thank you for your good advice. δ=BF, We have revised it in the paper.

L125/126: Please, compare the equivalent section radius of a single ring with the one of Grassl (2002). Response: Thank you for your good advice. this paper take the R7 / 3/300 ring as an example, a single ring with a diameter of 300mm is formed by a 3mm steel wire wound around 7 laps. In the actual production process, the single ring may be wrapped unevenly, so we adopt the concept of equivalent section radius, which is also used in the numerical simulation. However, the concept of equivalent radius is not used in Grassl (2002).

Section 2 and regarding my previous comment to your original Page6: You ansered that you did not take into account rebound. This is ok. But my comment had different mean ing not looking at the overall rebound of block in the net. If you take a single ring that previously has been plastically deformed and you cut it in one place, then you can observe an inward snapping of the cut/open ends (see figure 3.6 of https://www.researchcollection.ethz.ch/bitstream/handle/20.500.11850/148332/eth-27491-02.pdf). This shows that a certain amount of elastic energy has been stored within the deformed ring. Please, take this amount of energy into your energy balance to adequately solve the mechanics. Response: Thank you for your good advice. What you said about the elastic energy stored in the deformation ring is the problem we need to study next, which is our next research direction.

Fig.11: - If you remove the boundary conditions parallel to the edges (you can leave a single one for numerical stability) than you get exactly the boundary conditions as you would have in the field with the net supported along a rope. - Remove subfigre 11(a) Response: Thank you for your good advice. In this paper, we simplify the boundary condition and simplify them into three forms: four-sided fixation, two-sided fixation and four-corners fixation.

Figs. 12 & 13: "Both" –> "Two" Response: Thank you for your good advice. We have revised it in the paper.

L247: "by 1m/s, the impact velocity of rockfall is v_lim+1, at this point," –> "to v_lim +1m/s" L358: DANY –> DYNA (also stated in my previous comments) Response: Thank you for your good advice. We have revised it in the paper.

Table 3: Please discuss and compare whether - and if so how - static sag of the net

has been considered in each case. Response: Thank you for your good advice. The problem of static sag of the net is the next problem we need to study, which is our next research direction.

Section 2.4: Add the comparison with Grassl (2002) to your discussion! Response: According to the results of Grassl (2002), the energy consumption of a single ring under four-point tension is about 10kJ, which is quite different from the results we calculated. However, according to the results of wang (Wang, M.: Rockfall impact protection system, Ph. D. Diss, Chongqing, Logistical Engineering University, 2011.), the energy consumption is 0.89kJ. That's pretty close to our calculation, this is an interesting question and we need to study it further.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-76/nhess-2018-76-AC2-supplement.zip

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