EGUsphere, referee comment RC1
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Comment on egusphere-2022-468

Anonymous Referee #1

Referee comment on "Dynamic response and breakage of trees subject to a landslide-induced air blast" by Yu Zhuang et al., EGUsphere,
https://doi.org/10.5194/egusphere-2022-468-RC1, 2022

The paper is addressed to study the dynamic response and the failure of trees subject to a landslide-induced air blast. The study is developed into a framework that includes the eigenfrequency prediction method, tree motion equations and breakage conditions.

The tree is modeled as a flexible variable cross-section beam hinged at ground using elastic support.

The air blast loading is calculated considering the large tree deformations.

Two failure modes (bending and overturning) and the associated failure criteria are defined.

The paper address relevant scientific questions within the scope of NHESS, that is the potential forest destruction of the air blasts.

The paper apply known methods on a specific framework.

The scientific methods and assumptions are outlined clearly and the results are sufficient to support the conclusions. The conclusions present the definition and the evaluation of the dynamic magnification effect of an air blast travelling at 20 m/s and the influence of anchorage properties on the tree eigenfrequency.

Some calculations need to be better explained to allow their reproduction by fellow scientists. For example:

- in eqs. 4 and 5, what is “B” ? please define it;
- in eq 7, what is “F”? please define it and explicit its determinant;
- maybe there is some mistakes in the equations of boundary condition in line 128 (the first one);
- line 158 presents the “w” symbol that is not defined (or is it a typo?);
- please make the velocity and displacement symbols explicit.

About the title, I suggest deleting the sentence after the colon.

The abstract provide a concise, complete and unambiguous summary of the work done and the results obtained. The title and the abstract pertinent, and easy to understand to a wide and diversified audience.

About the figures, I do not really like the graphics of the fig.s 4, 5, 6 (the histograms). In Fig. 2.b, I suggest to put into evidence the “z” and “u” with vertical and horizontal axis, respectively.

The authors give proper credit to previous work, and they indicate clearly their own contribution. The number and quality of the references are appropriate, although not all references are easily accessible by fellow scientists.

The overall presentation is well structured, clear but not so easy to understand by a wide and general audience. The length of the paper is too long: thank you if you can shorten it by removing the various repeated concepts.

The English language is fluent, simple and easy to read and understand by a wide and diversified audience and the technical language is precise and understandable by fellow scientists.

I would ask the authors to make these concepts more explicit in the text:

- are the authors really sure they can use the large deformation hypothesis in this specific case? If so, why? This hypothesis is usually used to study the deformation of

hyper-elastic materials, rubbers, etc. “Large deformations” = Theory of large deformations (I am referring to the non-linear Cauchy model)or Large-displacement or large-rotation theory?

- About the boundary condition at the tree base (continuity conditions, lines 126 - 128), I believe the authors use elastic line theory (i.e. Euler-Bernoulli beam theory), i.e. they refer to a linear model of the beam. If this were true, this passage would go against the hypothesis of large deformations. please explain why you can use these equations.
- it is not clear to me why (in lines 271-274) “to investigate the impact of these factors, we conducted a comparative analysis by simplifying the tree motion model of eq.8 WITHOUT involving the impact of large tree deformation”. so the starting hypothesis is no longer taken into account? we return to the hypothesis of small deformations? Thank you if you can explain this better.