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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modeling root reinforcement using root-failure Weibull survival function" *by* M. Schwarz et al.

Anonymous Referee #1

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Discussion article review – Modelling root reinforcement using root-failure Weibull survival function

General comments

The article is very interesting and looks at the prediction of shear strength derived from fibre bundles based on failure probabilities and also incorporates sinuosity to predictions of strain to failure. There is no doubt that the paper makes advances from existing models and begins to incorporate further complexities of root strength variability within root populations.

Specific comments

One key point to make is that the roots are assumed to be linear-elastic (p 3846, ln 21). This however is not the case as roots are widely seen as being elasto-plastic during tensile failure. It is worth explicitly stating in the article that this is the case. A 'tortuosity co-efficient' is incorporated into the model which is likely to reduce the error in strain to failure from the assumption of linear-elastic root properties. The manuscript would therefore benefit from the inclusion of these points. This is also true later on where within the discussion, p 3854 ln 10-13, further comment is made regarding the importance of root stiffness in force distribution during failure. To date there is limited information specifically relating to the initial slopes (where the Young's modulus is derived from within the elastic region) and the slope within the plastic region. Both the elastic and plastic regions of the stress/strain curves are typically linear (prior to the proportional limit and after the yield point) and may be useful to comment on this from the data collected that has been included in either this or preceding work by the authors. Is it possible that once this is included a better prediction of displacement to failure is derived?

Within the conclusions it may be worth stating that there may be additive affects relating to root reinforcement through interactions and linking of roots from different trees and species. The model described in the paper views roots in a bundle and not a root community. Such interactions have the potential to affect the failure between pull-out and breakage due to increased anchorage associated with roots entwining each other. No models however have addressed this issue and maybe something for further work. Recent work by Loades et al (2013) has also shown the effect of different root type on root biomechanics further highlighting the complexities within root bundles. I would advise that the authors read through the paper again as there are a few grammatical errors which should be addressed prior to final publication. Also, the material cited as being in Appendix A, referenced in the paper, was not available.

References

Loades, K. W., Benough, A. G., Bransby, M. F. and Hallett, P. D. (2013) Biomechanics

HESSD

10, C1045–C1047, 2013

Interactive Comment

of nodal, seminal and lateral roots of barley: effects of diameter, waterlogging and mechanical impedance. Plant and Soil, DOI: 10.1007/s11104-013-1643-y

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