Review of "Tree-roots control of shallow landslides"

The authors present a model for slope stability where hillslope material is discretized using a 2d array of blocks. A factor of safety is computed by determining the resistive and active forces acting across the interfaces that connect adjacent blocks. Using this framework, the authors explore the role of tree spacing and root properties in determining slope stability on an idealized hillslope. Quantifying the effects of tree roots on slope stability has important implications from a geomorphic and hazards analysis perspective, as the authors point out. I think that this paper would be suitable for publication following moderate revisions.

The hydrologic component of the model is lacking, but I think it is sufficient to examine the role of roots in the initial phase of slope failure. The paper would benefit from more clearly defining the range of problems that are applicable for the proposed model and by demonstrating how results improve our understanding of root control on shallow landslides within that context. Also, the authors could more clearly demonstrate why the proposed model is more useful than a model that employs a single value for apparent root cohesion. For instance, in what scenario(s) does a model using only a constant apparent cohesion to parameterize the effect of the root network fail to yield results that are qualitatively similar to those obtained when using the model with a more appropriate representation of the root network? In what cases, if any, would it be reasonable to parameterize the effect of roots using an apparent cohesion?

Abstract: could be condensed. For example, there are 3 sentences regarding the roles of roots with different diameters that could be shortened into one sentence.

Introduction:
Page 2, Line 18: Reference for this time scale? Soil production rates are low enough in many areas that it is extremely unlikely for soil thickness to be in equilibrium in 10-1000 years, even without disturbance.

Page 3, Line 25-27: These interactions are also likely to influence landscapes over time scales of 100,000+ years.

Page 3, Line 21-27: Vegetation influences hydrologic and geomorphic systems in a number of ways. I don't think it is necessary to list them all here. I would suggest focusing on the numerous ways in which vegetation can influence slope stability. Regardless, I also suggest reformatting this like the rest of the text.

Section 1 could be more focused on the specific ways in which vegetation influences slope stability and why it is important to understand root reinforcement rather than discussing the general importance of landslides and vegetation.

Page 4: What is the benefit of a list here? I suggest reformatting to traditional text.

Line 23: Need reference for: "needs to reach values of the order of a few hPa in order to be significant"

Page 6, line 18: Needs a reference.

Page 6, line 26: Specify is this is true only for cases where roots play a large role or if this is a more general statement.

Page 7, Line 7-9: Doesn't this neglect potentially important vertical variations in root network strength and structure?

Page 21, line 1: What is meant by "loading" here?

Page 23, line 31-34: I realize that the focus here is on the importance of roots, but there are important hydrologic implications of initial soil movement that have been shown to influence slope stability. In particular, it has been shown that changes in porosity can lead to increases in pore pressure and therefore lower frictional resistance (e.g. Iverson et al., 2000) after the initiation of motion (phase 2). These complicating factors deserve discussion and a sensitivity analysis to try to assess their impact in the idealized case being modeled. One simple approach would be to prescribe an increase in pore pressure in response to compression to determine what effects it would have (one could then vary the magnitude of this increase and the timescale for increases in pore pressure in different trials).

Page 25, line 1-7: This seems reasonable for modeling what happens up until the point of initial failure (phase 1-2). A more convincing argument needs to be made in order justify the simplifications to the hydrologic component of the model and to demonstrate that the model is able to accurately simulate what happens between phases 2 and 3 in a general set of circumstances.

Page 25, line 12: "Understanding which forces….." Take this opportunity to be specific and provide examples.

Page 27, line 24: Specify earlier that "loading" refers to rainfall.

Figure 5a: This figure is difficult to read, possibly because the colors are obscured by the overlying grid.

References:

Iverson, R.M., Reid, M.E., Iverson, N.R., LaHusen, R.G., Logan, M., Mann, J.E. and Brien, D.L., 2000. Acute sensitivity of landslide rates to initial soil porosity. *science*, *290*(5491), 513-516.