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Interactive comment on “Modelling catchment-scale shallow landslide occurrence by means of a subsurface flow path connectivity index” by C. Lanni et al.

Anonymous Referee #1

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This paper presents a new modeling approach to shallow landslide occurrence and applies it to three experimental catchments. The modeling approach recognizes the fact that perched groundwater dynamics are usually not continuous during the build-up phase of a landslide triggering rainfall event. Instead patches of saturated soil can exist disconnected from each other, even along flow lines, and only once these patches are connected can cause slope instability leading to landslide events. The authors use soil water retention characteristics and measurements of soil depth distributions to model this phenomenon. Local soil storage capacity is quantified using the assumption of hydrostatic pressure distribution in the unsaturated zone, and the pressure head at the

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soil-bedrock interface before the onset of saturation is estimated using the drainable porosity concept of Hilberts et al. (2005). This is a clever way to solve a difficult problem and the authors compare their method with numerical simulations based on HYDRUS-1D, with good results. The model is then combined with an existing slope stability model based on the infinite slope assumption. This may be a conceptual inconsistency with the hydrologic model and I invite the authors to comment on this in their revised version. Perhaps more appropriate slope stability models could have been selected for their coupled model. The authors have applied their model to three experimental catchments in Italy with good results. The need for detailed soil depth measurements should be discussed in the paper. Most areas will not have this information available and methods to overcome this problems need to be discussed. There are several ways to estimate soil depth distributions (e.g. Pelletier and Rasmussen, WRR) and some of these methods could be reviewed to make the new model more appealing to the community. Overall, I enjoyed reading this paper and look forward to see the revised version.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 9, 4101, 2012.

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