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Interactive comment on "Influence of weak layer heterogeneity and slab properties on slab tensile failure propensity and avalanche release area" *by* J. Gaume et al.

Anonymous Referee #2

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This study combines a finite element model with a statistical material property approach to examine the role of weak layers and slab properties on tensile failure in snow. Critical parameters are defined and discussed then analyzed using a 2D plane stress model. The approach is used to predict where slab tensile failure may be evident and then makes some estimates of avalanche size that may result. One goal is to examine and quantify the role of slab tensile failure in avalanche release and extent. The authors predict that slab tensile failure is always secondary to weak layer shear failures. The paper is well presented and nicely written. It follows a logical progression, but the details of the finite element model are found in other works. The topic is very important and relevant. I have just a few suggestions that may strengthen and

clarify some of the main points of the paper. - In the formulation of the model section, slab and weak layer properties (and their respective ranges) are presented. It may be helpful to connect those properties to actual snow properties through discussion or reference. - Section 2, lines 3-4: that sentence isn't clear - Section 3: Maybe consider carefully offering results prematurely. In lines 13-14 a result is mentioned, maybe consider building the approach followed by results. - While a proxy for tensile strength and young's modulus with density is given in section 4.2, I believe discussion on the relevance of the snow properties used in the model would strengthen the paper. Some properties are given with no link or discussion on their realism. I found myself looking to other references to verify some values, adding it to the paper would help in realism and readability. - Section 4.1.5: The results appear very sensitive to E in very common density ranges (∼200-300 kg/m3). The discussion addresses this, but it seems that the very stark transition with small changes in E with probability of tensile failure is very interesting and may be worth more discussion. - Section 4.2, line 22: Large E (stiff) doesn't not imply "strong" snow. They are not the same thing. - Section 5, lines 9-10: awkward sentence - Section 5, lines 16-17: Could this be discussed more? The physical interpretation seems evident, why not expand the interpretation for the reader? - Section 5: When discussing release area, maybe remind the reader what the coincident probability implications are too.

Interactive comment on The Cryosphere Discuss., 8, 6033, 2014.