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Interactive comment on "A process-based approach to estimate point snow instability" *by* B. Reuter et al.

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Please find our response to the reviewer's comments in the supplement.

Interactive comment on The Cryosphere Discuss., 8, 5825, 2014.

Reply to Referee #1 (E.A. Podolskiy) RC C2912

I enjoyed reading this well-written and carefully prepared manuscript proposing an objective instability assessment technique, which is certainly addressing a problem at the core of snow avalanche forecasting. The authors analyze tens of Snow-Micro-Penetrometer (SMP) and Propagation Saw Tests (PST) against finite element (FE) predictions supported by previous analytical solutions in order to justify the proposed methodology, which is making an important step out of observer-dependent instability evaluation.
To me, clearly presented rationale, methods and results, supporting the developed approach, seem convincing and valuable for a wide community of snow avalanche professionals and snow scientists.
Below I am listing only several minor remarks and points requiring, in my opinion, some more details or explanation.

Abstract
Since the failure initiation criterion is a function of additional stress due to skier loading, this should be mentioned in the Abstract. E.g., L18: ". . . method for estimating snow instability {under skier loading}."
Doing so in the title is indeed your own decision.

We agree that the mass of a skier is considered for the failure initiation criterion. However, the crack propagation is not linked to any kind of external loading. As we present two independent criteria, we do not prefer to introduce this limitation in the Abstract.

p. 5827, L15
Provide a reference reporting such field observations.

We will insert a reference to Perla (1977).

p. 5827-5829
Somewhere in your review I advise you to mention a work by McClung (2009), which is strongly related to the domain of your paper.

We will refer to the work by McClung (2009) as suggested.

p. 5829, L29
"force-distancesignal" - missing space

We will change as suggested.

p. 5833, L1-3
Here you describe derivation of the penetration depth and I could not follow which one do you mean. For example, in Fig. 3 the x-axis shows Depth, so that Force=f(Depth).
So, before plotting, you need to cut off air signal from snow signal to get the snow surface? I suggest to specify what are you talking about here. - To indicate better my confusion: you mean that the penetration depth, let's call it D, is obtained from raw force-distance signal: 0.0036=Int(D,0) F(z) dz so this D stands for what? Does this penetration depth correspond to air/snow interface, or is it somehow related to the weak layer through wf? The lower boundary is fixed or sliding?

To improve clarity we will insert the formula and specify that the integration starts at the snow surface.

p.5834, L18
What was the skier penetration depth and how was it evaluated?

Fig. 1.