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Comment

## ***Interactive comment on “Spatial distributions of earthquake-induced landslides and hillslope preconditioning in northwest South Island, New Zealand” by R. N. Parker et al.***

**R. N. Parker et al.**

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We thank P. Meunier and the anonymous reviewer for their very fair, rigorous and constructive comments on our manuscript. We have addressed each of the reviewers' comments and in doing so, undertaken the recommended reanalysis that amounts to major corrections. Each comment is addressed individually in the attached RNParker\_etal\_Author\_Final\_Response.pdf document, and we summarise the major changes made to the manuscript as follows:

We have rerun our analysis using a landslide size threshold of 13,000 m<sup>2</sup>, in order to eliminate uncertainties associated with censoring of smaller landslides due to the

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mapping technique and post-seismic vegetation regrowth.

We have added the variable DIR, which accounts for the location of sites relative to the direction of seismic rupture directivity. This variable exhibits a significant influence on landslide probability and hence features in our probability models.

We have added clear explanation of the process for comparing observed (a posterior values of 0 and 1) and predicted probabilities.

We have added justification for the scale of elevation model resampling and generation of DEM derivatives.

We have added more explanation of McFadden's pseudo-R2

We have added more explanation and justification of the method used to test for a signal consistent with hillslope preconditioning, along with an explicit discussion of the limitations. We also stress that although our result is statistically significant and has important implications for our understanding of the landslide distribution (now discussed), it should be treated as tentative due to unavoidable uncertainties in the available data for these events. Throughout the paper we have changed wording to clarify that this is a tentative, though potentially important, result. We emphasise that, were equivalent data available for more recent earthquakes, the methodology presented here may be used to further test our hypothesis.

We have added a detailed discussion where we consider our results in light of other current work into the temporal aspects of earthquake-triggered landslides. We outline conceptually how the new findings may relate to other observations and are now able to better explore the contribution of this work to understanding distributions of landslides, in terms of the long-term evolution of failure in hillslope (substrate) materials.

The conclusions have been updated to reflect additions to the discussion.

Figures and tables have been updated with the updated results.

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We have added Appendix C, which includes a table of Variance Inflation Factors (VIFs), as part of assessing collinearity between predictor variables.

We have added Appendix D, in which we compare landslide depths to uncertainty in the elevation data, as part of assessing the implications of using a DEM generated post-landsliding in our analysis.

With these corrections, we find that the outcome of our test of hillslope preconditioning is unchanged. We are happy to accept, and emphasise to the reader, that further testing using data from other earthquakes is required to strengthen this finding.

Please note that page and line numbers refer to those in the updated manuscript PDF (RNParker\_etal\_Updated\_Manuscript.pdf) submitted with these comments.

R. N. Parker, G. T. Hancox, D. N. Petley, C. I. Massey, A. L. Densmore, N. J. Rosser  
24 March 2015

Please also note the supplement to this comment:

<http://www.earth-surf-dynam-discuss.net/3/C42/2015/esurfd-3-C42-2015-supplement.zip>

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Interactive comment on Earth Surf. Dynam. Discuss., 3, 1, 2015.

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