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# ***Interactive comment on “Debris flow susceptibility mapping using a qualitative heuristic method and Flow-R along the Yukon Alaska Highway Corridor, Canada” by A. Blais-Stevens and P. Behnia***

**Anonymous Referee #2**

Received and published: 24 August 2015

Dear Editor, Please find here below my review of the paper nhessd-3-3509-2015:

Debris flow susceptibility mapping using a qualitative heuristic method and Flow-R along the Yukon Alaska Highway Corridor, Canada

By

A. Blais-Stevens and P. Behnia

This paper presents a susceptibility mapping based on heuristic model and a simple numerical model for debris-flow sources and propagation. The application is performed in a remote area in the north-western Canada. The two models are presented and both

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are compared. It presents the pros and cons.

#### General comments

This paper addresses an interesting problem which is the debris-flow hazard assessment at regional scale in areas where data are lacking. This problem is of great importance in terms of management poorly studied regions and for remote areas. This problem is still not solved scientifically.

It is well written and clear, but some clarifications are needed. It needs a few additional points.

In my opinion instead of using the terms: "Quantitative susceptibility mapping", I would prefer systematic or regional numerical approach. . .

First, the approach of the susceptibility mapping can be a bit more detailed, the equation (1) can be clearly described: is it only dedicated to the source areas? It seems that the propagation is linked to an inventory. Then please detailed the way it is mapped (by one or two sentences), because the reader must know if the map includes the entire fan deposits or not. As a consequence, the difference between true debris-flows and bed load has been made or maybe not. This questions are important because they provide arguments for the discussion. In other words, a model like Flow-R will depends on the present state of the topography (in addition to artefacts of the such DEM), as a consequence, the comparison with a map that take into account all past event will be different (Normally this software cannot provide event oriented simulations like other software like Flow-2D, but Flow-R has limitations). Then the hidden question is: in such map do we consider only the possibility given by a numerical model, which will give results for short term maps or non-extreme events, or shall we extend to the whole fan area. A discussion about this question and the dispersion of Flow-R can be also added.

I am not sure that the full equations for flow-R are necessary as it is already published

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in NHESS, but some aspects have to be presented (see below in specific comments)

The DEM type must be described, how it has been created, and what we can expect from its accuracy.

In the introduction, the authors must insist about the challenge to create such map at regional scale based on documents that are not precise enough to provide really accurate results. This must be discussed as well in the discussion section based on the questions addressed above.

Scientific Significance:

The challenge addressed by this paper is significant as explained above, trying to solve the problem of regional hazard assessment for debris-flow, as such type of susceptibility mapping is not yet solved.

Scientific Quality:

The proposed methodologies are appropriate, but some clarification are necessary in order to highlight the inputs and the remaining issues (see above). References are consistent with the paper content.

Presentation Quality:

The overall quality of the paper is good, but some aspects have to be clarified. Figures are fine, but maybe some supplemental material with larger maps will be nice.

If these problems are addressed the paper can be considered again for publication.

Specific comments

Page 3512, line 6: explain why here the DEM has a resolution of 10 x 10 m, while in the rest of the text it is 5 x 5 m.

Page 3512, lines 6 and 13: see comment above about “quantitative method” (replace).

Page 3512, line 20: Is Denali fault linked earthquake.

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Page 3513, line 13: which type of temperature is it: daily, monthly???

Page 3514, lines 21-22: please add more detail and clarify about the relationships between DEM and heuristic model with respect to the type of maps produced.

Page 3516, line 23-24: Please add a reference for the equation 1.

Page 3518: in the steps you have to introduce what has been used in this study and not the general scheme.

Page 3521 lines 11-15: this can be partly moved to the previous sub-section. In my opinion it would be better to merge section 4.2 and 4.2.1, it will avoid duplication of the Horton's paper, in order to be more specific to this study.

Page 3524 line 25: This point about spreading is important, it has to be discussed as already mentioned above.

Section evaluation: the discussion about what is an event and what is a susceptibility map must be added. Does an event affects the whole fan? But a map must include the whole fan?

Section conclusion: Includes some aspects about the above points, and add what are the remaining problem to solve about such regional "hazard" mapping.

Figure 8: the black lines are map of past events or heuristic susceptibility, clarify if the deposit are clearly showing debris-flow morphology.

Figure 9: draw contours of the past events and/or of the susceptibility map.

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 3509, 2015.

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