

Reviewer's Report

I have read the brief communication „Brief Communication: on site data collection of damage caused by flash floods: experiences from Braunsbach, Germany, in May/June 2016” with great interest. I would not recommend the publication of the present work as Brief Communication but the resubmission after Major Revisions as a Research paper

My major concern is that the work presented here is not appropriate for a brief communication. To my knowledge a brief communication should present ground breaking and new results, findings, methods and/or observations usually following an event (in this case the flash flood of Braunsbach) that needs to be communicated to the scientific community as soon as possible (e.g. lessons learnt). In my opinion, the present work should be written and presented as a research paper. In that case, the authors should include a short literature review citing similar work that has been done (not only in the field of floods) as well as existing damage data collection methods but also they should round up their work by explaining how the results should be used. They have to be more precise in describing their motivation to conduct this work and their clear aims. They also need to invest more time and text in explaining why they chose the specific methods (t-test, Spearman's rank correlation matrix) but also the specific variables.

Either way, the proposed revisions should address the following points:

General comments:

1. It is not very clear for which process the research has been conducted for. The title refers to “flash floods”, however, in the text the term “debris flow” is often used for the process under investigation (e.g. p. 2, line 31). Are these two processes identical for the authors? What is the difference of these processes regarding their impact on buildings? Were all the buildings under investigation impacted by the same process?
2. The article should refer to similar studies and their connection to them, for example:

Papathoma-Köhle M., Zischg A., Fuchs, S. Glade T., Keiler M. 2015. Loss estimation for landslides in mountain areas- An integrated toolbox for vulnerability assessment and damage documentation. *Environmental Modelling and Software*, 63,: 156-169

Papathoma-Köhle M. 2016. Vulnerability curves vs vulnerability indicators: application of an indicator-based methodology for debris-flow hazards. *NHESS*, 16(8): 1771-1790.

Thouret et al., 2014. Assessing physical vulnerability in large cities exposed to flash floods and debris flow: the case of Arequipa (Peru). *Natural Hazards*, 73: 1771-1815

Leelawat, N. Suppasri A., Charvet I., Imamura F., 2014. Building damage from the 2011 Great East Japan tsunami: quantitative assessment of influential factors. *Natural hazards*, 73: 449-471.

But also similar studies looking at the connection of social variables to the consequences of natural hazards:

Adger N., 1998. Indicators of social and economic vulnerability to climate change in Vietnam. *CSERGE Working Paper GEC 98-02*

Cutter S. 2003. *Social vulnerability to environmental hazards*

Adger et al., 2004. New indicators of vulnerability and adaptive capacity. Tyndall Project IT 1.11: July 2001-June 2003. Final project report.

Connection to these works is essential for two reasons: first the existing literature review gap will be filled and second the aim of the study will be better understood since the results of the study may have a direct practical application.

3. The authors refer to the implementation of the European flood directive in Germany. This is an interesting point which remains which may be connected to the first comment above: Flash floods and surface water flooding are according to the authors neglected by the directive. How can the presented research fill this gap? Debris flow is actually a landslide type so naturally is not covered by the flood directive. Moreover, it has been often pointed out that during an event more than one processes may affect the elements at risk. See and refer to Totschnig et al (2011) who claim that: "During one individual event, the respective processes in the torrent often change due to the temporal and spatial variability of sediment concentration".

Totschnig R., Sedlacek W., Fuchs S., 2011. A quantitative vulnerability function for fluvial sediment transport. *Natural Hazards*, 58: 681-703.

4. According to the authors, the intensity of the process derives from the following two factors:
 - The inundation depth
 - The exposition of the building in flow direction.

In my opinion the second factor is not relevant to the process and should not be considered in the process intensity (the intensity of the rain is the same either a person holds an umbrella or not, right?). Moreover, the intensity of the "flash flood" or "debris flow" also depends on other factors such as the velocity, the viscosity and the material that the flow contains, their size and percentage in the water.

Specific comments:

Title: The title is too general and does not reflect the content of the paper

Abstract: why is the understanding of damage so important? What can you do with the expected results? Who may use them and how?

Introduction:

Page 2, last paragraph. The authors claim that the aim of this brief communication is twofold, however, they present three aims in the following paragraphs: 1) identifying factors that govern damage, 2) the methods and the analysis of the factors 3) advantages of open source software. Additionally, the practical application of the results should also be included here. The aim of the brief communication is not clear and my feeling is that the authors do or actually present too much for a brief communication but not enough for a full research paper.

Methods:

-In the first paragraph there is a reference to debris flow. Please, clarify what is the process that is investigated here.

-Structural precaution: how can we check the correlation here? Shouldn't each precaution measure be a variable itself with YES/NO?

-Higher ground level: Is the higher ground level always related to low damages? What about the effects of erosion during such an event? In a paper (partly by the same authors) describing

the event (Agarwal et al 2016. Die Sturzflut in Braunsbach, Mai 2016. Eine Bestandsaufnahme und Ereignisbeschreibung) we can see pictures (page 3, figure 1, central photo) showing houses that have been damaged not because of a high debris level but because of erosion. In this case even if the ground floor is elevated the damage is still significant. How do you address this issues here? This also connects to a previous comment. I believe that the choice of variables has to be explained and discussed at the beginning.

Results:

-Page 3, line 30: how is this database unbiased? A large proportion of the characteristics of each variable depends on expert judgement. Why does this have a minor impact (p.4, line 2)?

-page 4, line 22: delete repeated word ("this").

- Why so many methods for the correlation tests? Why these specific ones and not another one (e.g. Mann Whitney U test)? (explain in the "Methods" chapter)

-In subchapter 3.1 reference to Figure 1 is needed.

-p.5, line 3: the authors refer to the intensity of the process which is characterized by the "inundation depth" and the "exposition of building in flow direction". What about other characteristics such as flow velocity or sediment content? Aren't these characteristics related to the impact on buildings? The exposition of the building in flow direction has to do with the orientation of the building itself and not with the process...Is it correct to consider it as a defining factor for the intensity?

Table 1: why do you include categories with no representative buildings? (e.g. Rubber or steel buildings and terraced houses, conservatory, greenhouse, chemical and sewage contamination). Is the list of variables exhaustive?

Figure 1: Are all the variables for table 1 included in the correlation test? If not, why not? What is with the "cellar"? The "estimated construction year"? In page 3, line 27 you refer to 21 variables, yet in Figure 1 there are only 14.

Figure 2: it is not clear how the process intensity map has derived. Is the inundation depth and the exposition of building in flow direction equally important in defining the intensity? Is the intensity lower where there is no building to be exposed to the flow direction? How can this map use and what do we learn out of this map? Please refer to the following:

Fuchs S., Ornetsmüller C., Totschnig R. 2012. Spatial scan statistics in vulnerability assessment: an application to mountain hazards. *Natural Hazards*, 64: 2129-2151.

Fuchs et al. (2012) also detected spatial distribution patterns of loss ratios in four torrent fans in Austria.