

## ***Interactive comment on “Difficulties in explaining complex issues with maps. Evaluating seismic hazard communication — the Swiss case” by Michèle Marti et al.***

**Michèle Marti et al.**

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Dear Mr Wagner,

Thank you very much for taking the time to review our manuscript and for your thoughtful comments.

Your first major criticism concerns the usefulness of seismic hazard maps to enhance the preparedness of a wider public. This is a very relevant objection, which is partly supported by the results of our study suggesting evaluating other means to communicate seismic hazard.

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However, seismic hazard maps are currently a reality and worldwide used for this purpose. As elaborated in our paper, they are the only accessible information allowing the public to understand if they are threatened or not. They are widely requested and used by the public and decision makers. In contrast to other natural hazards, earthquake hazard is “invisible” as the processes of relevance occur deep underground without any indication at the surface. In addition, seismic hazard is driven by low-probability but high-impact events which occur without warning. Currently, seismic hazard maps are the only established means to make this hazard visible. Thereby, seismic hazard maps play an even more important role in raising awareness compared to other natural hazard maps. Nowadays, the public as well as professionals take them into account to base on any mitigation decision. We consider it therefore as extremely important to test the use and usefulness of seismic hazard maps. We focused on the question if users are able to distinguish between hazardous and less hazardous areas and deduce further information. In this respect, they take on the same tasks as flood or other natural hazard maps.

It is true, that applying seismic design standards is the most effective mitigation measure. For this purpose, experts are needed. Nevertheless, even when strict building codes are in place, their application is often deficient or impeded. Taking Switzerland as an example, where the enforcement of building codes depends in many parts of the country exclusively on non-specialized engineers and architects or knowledgeable building owners. Currently, their only source of information allowing them to understand the seismic hazard of a given area is the information provided in the framework of the national seismic hazard map. This is also applies for home owners, who need to take a decision about contracting an earthquake insurance. This is not exclusively the case for Switzerland, but worldwide, because earthquake damages are largely uncovered. In Switzerland, this deficit is regularly debated in the national parliament and may at some point be decided by a public vote. Here also hazard maps that are understandably, transparently, and fairly portray the hazard are essential to allow the public to take an informed decision. In addition, building codes only set a minimal standard which

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can easily be exceeded by a specific event. Therefore, individual preparedness is essential. In our opinion, earthquake preparedness does not significantly differ from other natural hazards. In any case, a knowledgeable public is needed to enforce existing regulations, to take individual measures, and to seek for professional assistance (e.g. insurance, construction work) to fill in remaining preparedness gaps.

Of course, it can and should be questioned in the future if seismic hazard maps are an adequate means to serve this purpose. Based on this real-world setting, our study is the first of its kind to analyze current approaches and thereby sets a baseline for improved hazard communication. In addition, as you correctly observed, user needs should be carefully elaborated. An aspect which was not in the scope of our study. We therefore highlighted these aspects more clearly in the introduction and discussion sections (see supplement).

With respect to the data analysis we conducted, the parameters tested all derive from peer reviewed publications presented in Chapter 2. Based on these findings, we developed research questions to base on our analyses. In our understanding, this is the common procedure in case of poor theoretical evidence as it is the case for the evaluation of seismic hazard maps. However, based on your useful suggestion, we added and tested two hypotheses where sufficient theoretical evidence is available. In addition, we included an additional research question with respect to the currently unknown factors influencing the understanding of seismic hazard maps and also specified non-significant correlations (see supplement).

Thank you also for the minor remarks which we all considered.

Kind regards,

Michèle Marti (on behalf of the co-authors)

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-112/nhess-2019-112->

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