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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Induced seismicity risk analysis of the hydraulic stimulation of a geothermal well on Geldinganes, Iceland" *by* Marco Broccardo et al.

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The paper presents a probabilistic assessment of the induced-seismic hazard and risk associated with a geothermal energy extraction project and the hydraulic stimulation of a deep well in the area of the Geldinganes peninsula, Iceland. Similar projects in other places around the globe have induced in the past intense microseismicity, but also larger magnitude events that have caused building damages, injuries and severe economic losses. Taking this hazard into account, the authors present a comprehensive study of the associated hazard and risk prior to the hydraulic stimulation of the well and discuss the mitigation strategies during the implementation of the project. In particular,

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they estimate peak ground acceleration (PGA) and seismic intensities values based on previous induced seismicity data from similar projects and on model-produced synthetic catalogues. In addition, they estimate the seismic risk for the population and buildings, quantify the associated uncertainties and discuss possible limitations. Such studies, based on a multidisciplinary approach that combines the existing knowledge available to the scientific community, are essential for an efficient risk estimation and mitigation, as well as for the sustainability of similar projects. Overall, the paper is well-structured, well-written and presents in a comprehensive way the hazard, risk, their uncertainties and the limitations that the scientific community faces regarding hydraulic stimulation operations and fluid-induced seismicity. Therefore, I strongly recommend its publication to Natural Hazards and Earth System Sciences. However, there are a couple of points that need some clarifications. In the mitigation strategy section, the authors describe the defined alert levels according to the traffic light scheme that was planned for the project and explain the planed actions once anomalous seismicity patterns are identified (lines 203-205). While they set the magnitude thresholds for the different levels of alert and discuss b-values changes that might require further actions, further explanation is perhaps needed for the seismicity patterns in the space-time domain that might be considered “anomalous”. Accordingly, while the authors recommend the use of more sophisticated techniques for operational seismologists in order to identify seismicity patterns that resemble potential faults (lines 210-211), these techniques remain vague in the text.

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