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TOWARDS A HYBRID SEISMIC HAZARD MODEL FOR ICELAND

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Probabilistic seismic hazard assessment (PSHA) is the international standard practice for seismic risk management worldwide and is used as the foundation for evaluating the basis peak ground motion parameters used by structural building codes for earthquake resistant design (e.g., Eurocode 8). While the existing PSHA map for Iceland, the Icelandic National Annex to Eurocode 8, has effectively not been updated for more than two decades [1], it still is a more realistic map compared to those that recent European efforts have produced, the ESHM13 and ESHM20 [2]. However, the PSHA map for Iceland requires a robust revision that settles the matter of the inconsistencies of the existing map and the European PSHA efforts for Iceland. In recent years, intense efforts have been undertaken in seismic hazard research in Iceland: These are (1) a new harmonized and long-term earthquake catalogue for Iceland [the ICEL-NMAR catalogue, 3]; (2) A new fault system model for the bookshelf transform zone of Southwest Iceland [4] with a new fault system model for the transform zone of North Iceland being in preparation [5]; (3) The corresponding models of seismic activity rates on those transform zones, that effectively explain the historical catalogue [5,6]; The fault system models enable the generation of synthetic finite-fault earthquake catalogues that are consistent both with the model and the historical seismicity [7]; (4) A new suite of hybrid empirical Bayesian ground motion models (GMMs) [8–10] that include uncertainty handling, sensitivity analyses and new methods e.g. the backbone approach [11] and the quantitative selection of GMMs for PSHA [12]; (5) New frequency-dependent seismic wave amplification functions for the four dominant surface geology classes of Iceland [13] and new maps of site amplification in Iceland [14]; (6) The fault system models of transform zones have led to modelling of earthquake rupture scenarios [15–17]; (7) The effects of the new GMMs on PSHA and its uncertainty have been tested [11,18]; (8) Established ETAS models for earthquake aftershock forecasting and short-term seismic hazard assessment [19,20]; (9) Compared the seismic loss estimation results using local vs. European vulnerability models [21]; (10) Proposed a new and provisional seismic source zonation for Iceland [22]. At present therefore, all the fundamental elements for PSHA for Iceland have been updated based on the state-of-the-art methods and data, and are now in place for a timely, robust and much needed revision of the seismic hazard of Iceland using both physics-based and empirical approaches.

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