# A Theoretical Strong Ground Motion Prediction Model for Iceland

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The presentation focuses on a theoretical strong ground motion prediction model for Iceland. The model is based on Brune's seismic source model [1] and is extended with an exponential term to account for spectral decay and a geometrical spreading term to account for the varying rate of attenuation with respect to distance from the earthquake fault.

The presented model is a socalled Ground Motion Prediction Equation (GMPE), previously called attenuation equation, and plays a central role in seismic hazard studies. The most widely used GMPEs are socalled empirical models where the model parameters are determinde by regression analysis and do not have direct physical meaning. This type of modelling approach is dependent on having a large amount of data in order to produce robust results. The main incentive for developing a theoretical GMPE for Icelandic earthquakes [2] in contrast with the traditional empirical models, was the limited amount of available Icelandic strong ground motion data, and the fact that the GMPEs from other regions did not provide a good fit to the available strong ground motion.

The theoretical model has been found to give a good fit to the earthquakes ($M_w$6.5 June 17, 21, 2000 an $M_w$6.3 May 28, 2008) that have occured in Iceland since it was originally developed [3] and has been found to outperform recent GMPEs found in the litterature [4]. An advantage of the theoretical model is the fact that the model parameters are physically intuitive and they can be estimated directly from the ground acceleration records. The same model that is used for determening the attenuation of Peak Ground Acceleration (PGA) can also be used for simulating ground acceleration time series, using the stochastic approach [5]. The theoretical model also represents a realistic rate of attenuation of PGA. Future research will be aimed at improving the model, especially in the magnitude range $M_w$5 to $M_w$6.5, and examining regional dependence of ground motion.

## References

[1] Brune, J. N., Journal of Geophysical Research **75**, 4997, (1970).
[2] Ólafsson, S. and Sigbjörnsson, R., Journal of Earthquake Engineering **3**, 287 (1999).
[3] Ólafsson, S. and Sigbjörnsson, R., Proceedings of the 14ECEE, paper no.756 (2010).
[4] M. Power et al., Earthquake Spectra **24**(1), 3 (2008).
[5] D.M. Boore, Pure and Applied Geophysics **160**, 635 (2003).

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