Koki Makita, Kyoichiro Kondo and Izuru Takewaki, 2019, Finite Difference Method-Based Critical Ground Motion and Robustness Evaluation for Long-Period Building Structures Under Uncertainty in Fault Rupture, *Front. Built Environ.*

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Abstract It is known that, while the stochastic Green's function method is suitable for generating ground motions with short periods, the three-dimensional finite difference method (FDM) is appropriate for ground motions with rather long periods. In the previous research, the stochastic Green's function method was used for finding the critical earthquake ground motion for variable fault rupture slip (slip distribution and rupture front). However, it cannot be used for ground with irregularities and for wave component with rather long periods. In responding to this request, the FDM is used in this paper for finding the critical ground motion for structures with rather long natural period. Since the FDM is time-consuming, it seems unfavorable to use it in a simple sensitivity algorithm where an independent response sensitivity is calculated for many design parameters. To overcome this difficulty, the bi-cubic spline interpolation of uncertain parameter distributions (seismic moment distribution in this paper) and the response surface method for predicting the response surface from some sampling points are used effectively in this paper. The uncertainty parameter is the fault rupture slip distribution described in terms of seismic moments. It is found that the critical ground motion for structures with rather long natural period can be found effectively by the proposed method.