# High performance computing for liquefaction hazard assessment with statistical soil models

**†*J. Chen[1], T. Takeyama[2], H. O-tani[1], K. Fujita[1] and M. Hori[1,3]**

[1]RIKEN Advanced Institute for Computational Science, 7-1-26, Minatojima-minami-machi, Chuo-ku, Kobe, Hyogo 6500047, Japan.
[2]Department of Civil Engineering, Kobe University, 1-1 Rokkodai-cho, Nada-ku, Kobe, Hyogo 6578501, Japan
[3]Earthquake Research Institute, The University of Tokyo, Yayoi 1-1-1, Bunkyo-ku, Tokyo 1130032, Japan.

*Presenting author: jchen@riken.jp
†Corresponding author: jchen@riken.jp

## Abstract

Earthquake-induced soil liquefaction poses a great threat to urban areas. Reliable hazard assessment is critical for making sound disaster mitigation plans. Conventional assessment methods, such as FL (factor of safety against liquefaction), tend to overestimate hazards [1].

We recently proposed a more rigorous framework for assessing liquefaction hazard for urban areas based on soil-dynamics [2]. The framework is featured by automatic construction of analysis models from borehole logs and seismic records. For a target site, one deterministic model is constructed and its liquefaction hazard is assessed.

Such deterministic model does not include the uncertainties, which prevail in soil properties, embodied both in the measurements and in the correlations based upon those measurements. Moreover, for some parameters lacking of measurement in the borehole log, their typical values fall into a range, with differences in order of magnitude, e.g. permeability parameters for sand vary within $10^{-2}$ to $10^{-5}$ m/s [3]. It is thus more desirable to consider a set of statistically large number of models instead of one single deterministic model.

In this study, utilizing high performance computing, we extend our liquefaction assessment framework to take into account of uncertainties in soil properties, by analyzing the statistical models rather than a deterministic model of a target site.

**Keywords:** Liquefaction hazard assessment, Statistic models, High performance computing, Soil dynamics.

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