# 確率論的地震ハザード評価における認識論的不確実さの考慮に関する検討
# A study on introducing epistemic uncertainties to National Seismic Hazard Maps for Japan

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After the 2011 great Tohoku earthquake, consideration of epistemic uncertainties in seismic hazard assessment has been one of the most important problems in Japan. In this study we show an example of the probabilistic seismic hazard assessment which considered epistemic uncertainty.
In National Seismic Hazard Maps for Japan published by Earthquake Research Committee of Japan (ERCJ), epistemic uncertainties such as probability of earthquake occurrence, modeling of fault geometry, modeling of earthquake activity are partially taken into consideration, in accordance with the long-term evaluation. If enough information is lack in long-term evaluation, then certain measures should be taken against epistemic uncertainties, by taking complementary information into account. However, the current seismic hazard assessment does not meet such demands. In our study, we show an example of treatment of such uncertainty in modeling the probability of simultaneous activity of multiple segments and resultant seismic hazard.
In the new version of long-term evaluation of active faults by ERCJ, probability of earthquake occurrence caused by simultaneous activity of multi-segment faults are indicated as “unknown”. As to these multi-segment faults events, two models shown below are proposed (Oshima et al., 2015).
Model1: Assign probability of earthquake occurrence for each segment's independent activity to multi-segment faults events.
Model2: Assign occurrence frequency of each segment estimated by average slip velocity to multi-segment faults events.
The model1 takes into account the long-term evaluation saying that “the probability of earthquake occurrence does not become larger than that of each segment’s independent activity”. Thus, the probability for multi-segment faults events that contain the segment with zero-probability of occurrence are also set to zero. However, the activities of neighboring segments have the potential to trigger the event at the segment where the possibility of independent activity is evaluated as “almost zero”. In model2, probabilities for such events are not set to zero.
As to the results of hazard analysis for aforementioned two models, the difference in hazard curves can be seen only in quite low probability range (e.g., exceedance probability of 0.1% in 30 years). Because information on rare events tend to be short and indicated as “unknown” in long-term evaluation, modeling with consideration of epistemic uncertainty is essential to take aim at hazard analysis that calls extremely rare events into account.

キーワード：確率論的地震ハザード評価、認識論的不確実さ、地震活動モデル、全国地震動予測地図
Keywords: Probabilistic seismic hazard assessment, Epistemic uncertainty, Seismic activity model, National Seismic Hazard Maps for Japan

 