

Assessment of External Doses to the Public after the Fukushima Daiichi Nuclear Power Plant Accident Considering Variability and Uncertainty

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Radiation exposure is one of the most important factors to manage following a nuclear emergency. Actual measurement is the best way to obtain information concerning the dose received by the people in terms of accuracy and reliability. However, in practice, it is difficult to collect measurements from all people affected by nuclear accidents over the whole period of exposure from past to future. Therefore, we tried to develop a dose assessment model based on the experiences from the Fukushima Daiichi Nuclear Power Plant accident. In this development process, we focus on three points: (i) to reflect the behavior patterns of Japanese population, (ii) to explore the effect of decontamination performed after the Fukushima accident, and (iii) to consider the influence from variabilities and uncertainties in the assessment.

To address (i) and (ii), we performed the actual measurement of individual doses and ambient dose equivalent rates inside and outside houses in Fukushima City. A survey of behavior patterns was also performed for the same purpose. In addition, we also developed a probabilistic approach to assess the external doses taking into account the variability due to spatial variability of radioactive contamination and interpopulation differences in behavior patterns, as well as the uncertainty in the model parameters.

Comparisons between the assessed and measured results revealed that the time-dependence of doses and the statistical distribution of doses obtained using the developed models agree well with the results of actual measurements. In addition, we analyzed the influence from the variability and the uncertainty separately on the results of dose distribution. The results demonstrated that the range of dose distribution is strongly influenced by the spatial variability of radioactive contamination and interpopulation differences in behavior patterns as compared to the uncertainty due to the lack of knowledge about the model parameters.

Keywords: *Fukushima Daiichi Nuclear Power Plant accident, External exposure, Probabilistic approach*

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