

Application of dispersion models of ESTE for modelling of the radiological impact of released Cs-137 in a specific urban environment

Abstract:

The paper presents some results of modelling dispersed radionuclide Cs-137 in a specific urban area in front of one of Prague's shopping centres and the nearby university complex. The software ESTE was used to assess the activity of spreading contaminated air in terms of parameters from which radiation exposure of people affected could be calculated. The computer simulation proved a reliable tool for obtaining relevant radiation protection quantities and their dependence on such parameters as the initial source activity, its position, wind direction, and wind velocity. An inevitable condition for appropriate dispersion modelling in urban conditions is the evaluation of urban wind fields for specific urban environments and atmospheric conditions. The urban wind field is calculated in ESTE by solving Navier-Stoke equations to approximate the K-epsilon turbulence model. Dispersion modelling in urban conditions is performed by the software ESTE, applying an assimilated Lagrangian particle urban model. The location, structure and relief of building configurations have been reflected in the simulation of the behaviour and movement of radioactive air. The modelling considers external exposures expressed in ambient dose equivalent and internal exposure leading to committed effective dose. Dispersion models of ESTE proved extremely useful in obtaining essential parameters to predict the impact of the dispersed radioactivity on persons present in the investigated compounds. These data could help introduce efficient protection measures for people present in such compounds where exposure also depends on the configuration of the building structure, which can be taken into account in adopting appropriate measures to minimise the exposure of persons located on the spot or moving around.

Keywords:

ESTE software, dispersion model, Cs-137 release, radiological impact, radiation protection.

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