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THE ASSESSMENT OF RADIATION HAZARDOUS AREAS CONSIDERING THE SPECTRAL ANALYSIS OF THE NEUTRON COMPONENT

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The study provides the improved background for the operational assessment of the radiation hazardous areas with induced radioactivity, based on the analysis of spectral characteristics of the neutron component of the penetrating radiation. The interrelationships between the nuclear munitions explosion parameters, environmental conditions and dosimetric characteristics of the secondary gamma-ray emission from the activated soil are analyzed. The revealed links are used in the methodology of the assessment of the dosimetric characteristics of the radiation hazardous areas.

The improved methodology of modeling the induced radioactivity (IRA) allowed to obtain more accurate estimates of potential scale and magnitude of radioactive pollution after NM explosion. The time dependence of radiation dose rates on the ground depends essentially on the isotope contents of the NM blast products that is predetermined by the NM type. The most intensive IRA production can be expected after the neutron NM explosion, as the resultant fast neutrons most effectively activate certain chemical elements in the soil due to physical parameters of the activation cross-section and neutron fluence. The latter is dependent on the distance from the blast center and neutron energy. That underlines the necessity of the detection of the NM type and neutron spectrum as the primary tasks into the overall assignment of modern radiation surveillance.

According to the results of improved modeling, the population occurred inside the radiation hazardous areas, may accumulate the radiation dose up to hundreds mGy specifically from the IRA within the first 24 h after the NM blast. This source of radiation load should be considered as during the radiation hazard assessment on site and planning the possible routes of people evacuation, as during future medical countermeasures and health risk estimates.

The radiation surveillance should include the IRA assessment in terms of its both spatial distribution and time course considering the real data on the chemical contents of the upper soil layer. The concentration of certain chemical elements, e.g. the ratio of particular isotopes of Al, Mn and Na, has a strong influence on the IRA-produced dose rates.

Therefore the accurate data on the contents of main IRA-dose-forming elements in the soil of all human habitats should be included into the modern databases used in the national or international systems of preparedness and response to radiation emergencies of military origins.