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ROUZ CODE: CFD APPROACH FOR ASSESSMENT OF RADIATION SITUATION DURING ATMOSPHERE RADIOACTIVITY RELEASES WITHIN AN INDUSTRIAL SITE

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In order to perform calculations for determination of zones of radioactive contamination within a particular urban area one needs to take into account the inhomogeneous wind field and essentially anisotropic turbulence.

According to the state-of-the-art trends in applied computational meteorology a robust CFD model has been developed in the IBRAE RAN in frame of "Codes of new generation"project included into the "BREAKTHROUGH"(or "PRORYV") project. The model, based on the numerical solution of Navier-Stokes equations via RANS approach, yields the realistic estimations of the levels of concentration depending on the geometry complexity, atmosphere stability, inhomogeneous turbulence and the actual wind profile.

The model has been realized in ROUZ, in which calculations of the doses received by population is performed taking into account the arbitrary geometry of a plume and the effect of buildings shielding. Application of parallel programming techniques allows increasing the performance of the dose calculation module by a few orders of magnitude.

Such codes are commonly used in such important spheres as safety assessment, estimation of consequences of terror attacks and city planning. A necessary requirement of applicability of such codes is their validation against experimental data.

The V&V matrix of the ROUZ code contains various data obtained from real emergency cases as well as gathered from experiments conducted in urban conditions and at industrial sites, for example, experiment in Oklahoma City. In addition the V&V matrix includes experiments conducted in laboratory conditions in wind tunnels on the flows around obstacles with geometry of various degrees of complexity, simulating different elements of urban area, and provided by the environmental wind tunnel laboratory of the University of Hamburg.

The ROUZ code calculation results have been compared with those obtained by the foreign analogues. Quality assessment of the results is based on quantitative criteria recommended by the international expert community (project COST 732). It has been obtained via statistical analysis of the results that the empirical probability of a more than twofold exceedance of level of concentration from a measured value is less than 0.22 and for all velocity components it is less than 0.13. Therefore, ROUZ code satisfies the quality acceptance criteria defined by the expert community for models of the same class.

Country/Int. Organization

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