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Modelling nuclear dispersion using the TREX model

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Following the Chernobyl accident most European countries have developed national nuclear dispersion or accidental release models coupled to the numerical weather prediction models. In Hungary, for this purpose a multi-layered (32) Eulerian passive tracer transport model has been developed to describe transport and deposition of radionuclides or chemically toxic substances over Central Europe. This transport model has been coupled to the ALADIN meso-scale limited area numerical weather prediction model used by the Hungarian Meteorological Service. The simulations must have a high degree of accuracy and must be achieved faster than real time to use it for decision making strategy. There are several well defined methods and techniques to accelerate the application. One useful solution is the parallelization of source code and the application of the supercomputers, clusters, and Grid systems to solve these tasks. Therefore, computational Grid systems are becoming more and more popular in natural sciences. In such systems, large number of heterogeneous computer resources is interconnected to solve complex problems. On the other hand, there are several numerical models, in which adaptive girding technique is implemented. The numerical algorithm automatically places a finer resolution grid in regions characterised by high spatial numerical errors, therefore the fine resolution grid follows the plume of the air pollutants. In this study, we will show the structure of the model developed, and a spatial semi-adaptive grid algorithm. A statistical description of the effect of a hypothetical nuclear accident at Paks NPP has also been carried out, using the Péczely’s macrosynoptic categorizations.