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SIMULATION OF THE TRANSPORT OF RADIONUCLIDES AFTER A NUCLEAR ACCIDENT USING AN ADAPTIVE EULERIAN GRID MODEL

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An adaptive Eulerian grid model has been developed that is based on triangular unstructured grids and coupled to mesoscale meteorological model ALADIN. It describes the dispersion of radionuclides following the accidental release from a single but strong source to the atmosphere. The adaptive grid means that a finer resolution grid is placed when required in regions characterised by high spatial numerical errors. Therefore, the fine resolution grid automatically follows the high spatial concentration gradients resulting from the passage of contaminated air over a given region. Application of adaptive gridding methods was compared to the application of fixed grids (coarse grid, high resolution nested grid, high resolution fixed grid) for a hypothetical accidental release from the Paks NPP, Central Hungary. Adaptive gridding allows the achievement of resolution of the order of 6 km without excessive computational effort. The adaptive grid approach has been shown to be significantly more accurate than a nested grid approach utilising a similar order of computational effort. Application of the high resolution fixed grid required 18 times more computer time than the adaptive one in the test case. Our results have also illustrated the significant impact of mesoscale meteorological structures such as vertical variations in wind-speed and vertical mixing due to convection on the predicted location of the contaminated cloud at the surface. The results emphasise the importance of coupling a high-resolution dispersion model to a detailed mesoscale meteorological model.