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Benchmarking Near-field Radionuclide Dispersion with CFD and Gaussian Model

There is increasing interest in locating small modular reactors (SMRs) closer to potential end users for industrial or district heating applications, which is making it more important to understand the near-field atmospheric dispersion behaviour of routine or accidental radionuclide emissions. Traditional codes have known limitations in predicting nearfield dispersion due to the heavy influence of the size and nature of the built-up features as well as the topology of the near-field area. This work addresses these limitations and complements existing practices by using high-fidelity computational fluid dynamics (CFD) modeling for a realistic assessment of near-field radionuclide dispersion on a complex site. The terrain and building geometries of the chosen site are reconstructed from detailed aerial scans. The CFD results are compared to those from RASCAL, a consequence analysis code which uses simplified Gaussian dispersion models and empirical parametrizations of building wake effects to calculate near-field dispersion. Finally, a discussion on the use of these two approaches, both individually and complementarily, for calculating radiological consequences of postulated SMR accidents is presented.

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Confirm that the work is original and has not been published anywhere else

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