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Local atmospheric dispersion modelling of pollutants issued from a nuclear power plant : a comparison using a CFD code and ADMS with wind tunnel data

E. Demael, B. Carissimo
CEREA (Teaching and Research Centre in Atmospheric Environment), ENPC / EDF R&D, Chatou, France (emmanuel.demael@edf.fr)

In order to evaluate the impact of emission of pollutants on the environment, it has become important to develop models capable to predict accurately the dispersion processes in complex situations involving buildings in close proximity and topography that both may have a strong influence on the flow and pollutant concentration distribution. For *Electricite de France*, such models are necessary to better estimate and then control the impact of industrial releases issued from its power plant on their local environment.

For this purpose, Computational fluid dynamics (CFD) can simulate pollutant dispersion in such geometrically complex situations and can be considered as an appropriate alternative to integral Gaussian-type dispersion models such as ADMS, extensively used in Europe and over the world as regulatory model by the community.

This work proposes a comparison for the modelling of flow and dispersion on the built up area of a nuclear power plant through the study of two types of releases, the first one coming from the chimney of one of the reactors and the second occurring through one of the two reactor buildings.

The first model used is the CFD code *Mercure_Saturne* (developed by CEREA). The simulations have been carried out using a k-ε turbulence closure under neutral conditions. The second model is the quasi-Gaussian Atmosheric Dispersion Modelling System (ADMS-Urban) that can implicitly account for the buildings. The two models are compared with data issued from a wind-tunnel study performed by *Ecole Centrale de Lyon* for the same neutral atmospheric conditions and for two mean wind

directions. The dataset provides both dynamic and dispersion measurements (mean concentrations and fluctuations). A qualitative and statistical treatment of the results is realized, from short distances starting from the release up to two kilometres downstream to highlight the advantages and disadvantages of these two types of modelling. We discuss in particular the inability of ADMS to correctly predict the dispersion process inside the built up area and the difficulty of the CFD code to accurately reproduce the real spread of the plume farther from the source.