

# Comparison of the results of two air quality models in the simulation of a turbo gas cogeneration plant PM emissions

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The aim of this study is to compare the outputs of two different models for estimating PM pollutant concentrations caused by a turbo gas cogeneration plant emissions.

The models used are:

- ADMS-Urban, an advanced quasi-Gaussian model, developed by CERC,
- LAPMOD, a lagrangian particle model, developed by Enviroware srl.

The ADMS-Urban (version 3.0) used in this study is an advanced Gaussian dispersion model with a normal Gaussian distribution in stable and neutral conditions, in which the vertical dispersion is approximated by two different Gaussian distributions in a convective boundary layer. Furthermore, ADMS applies up-to-date physics using parameterisations of the boundary layer structure based on the Monin–Obukhov length and the boundary layer height.

Lapmod is a three-dimensional dispersion model that simulate fall out of pollutant emissions by releasing a large number particle for each source at each time step and following their motion. Particles motion is the resulting effect of the mean wind field and the turbulent diffusion. The particles random walk induced by turbulence is Markovian.

The study has been carried out for a domain that contains Imola (Italy), a medium town (68862 inhabitant) where a combined cycle gas turbine (CCGT), coupled with district heating, has been built. The plant, located in urban area, has a capacity of up to 80 Megawatts of electricity and 80 Megawatts of thermal energy.

The emissions of CCGT plant has been considered as point sources.

Emission rates have been structured in Lapmod by implementing an hour by hour release file from continuous monitoring system data of CCGT. In Adms–Urban an hour by hour temporal variation in total emissions has been calculated from the same data of the continuous monitoring system.

Meteorological input data, for the referring year (2010), has been obtained:

- by CALMET, a mass consistent meteorological pre processor, for Adms-Urban;
- by LAMA (assimilation cycle of the operational meteorological model COSMO-I7) downscaled with a mass consistent high resolution processor CACHI (Cosmo Analysis Calmet-High-resolution-Integrated), for Lapmod.

A grid point over Imola of CALMET domain has been used for the meteo-dataset for Adms-Urban, whilst a 3D meteo dataset has been built for Lapmod.

Output concentrations estimated by both models have been calculated according to a long-term simulation, in which the concentrations have been estimated on the nodes of a grid, formed by 30x30 points, with a 200 meters path, covering the whole 6x6 km<sup>2</sup> domain.

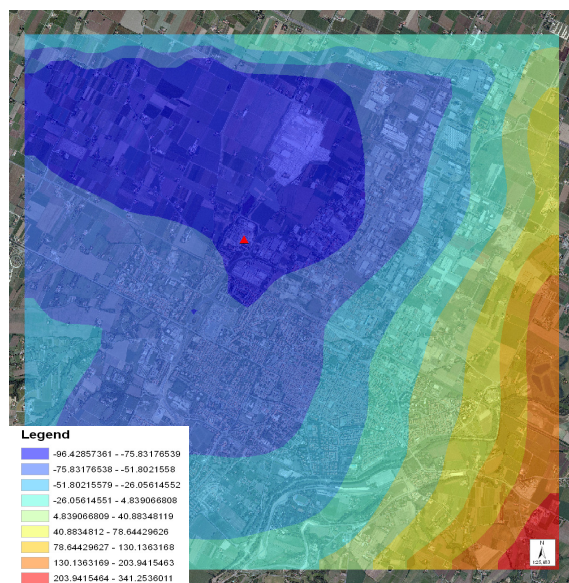


Figure 1. Normalized differences between ADMS Urban and Lapmod

In the map are presented the differences normalized between the two models. Interpretation of the results will be discussed.

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