

A multiscale modelling approach putting special emphasis on the efficient treatment of urban plumes

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Multiscale modelling approaches have long been recognised as an important assessment tool when it comes to urban air quality. The OFIS model is a conceptually unique Eulerian urban scale model that fits into a broader modelling scheme that entails regional and street scale models. Most importantly, it allows an adequate description of atmospheric dynamics and photochemical transformation processes in the urban plume at a very low computational effort. Recent improvements in the treatment of vertical stratification have advanced further the concept of the OFIS model and proven the suitability of simpler models for the adequate description of air pollutant dispersion and transformation in the urban environment. As a step towards its further evaluation and development, the OFIS model was applied to various European cities within the framework of intercomparison exercises such as CityDelta, aiming to explore the changes in urban air quality predicted by different atmospheric chemistry-transport dispersion models in response to changes in urban emissions

This work presents the advantages and limitations of the OFIS modelling approach versus others, highlighting the issues of performance and computational cost, while at the same time it allows the realisation of a series of sensitivity analysis tests with respect to various model parameters such as the spatial and temporal resolution of the emissions used, the model cell size and the update frequency of meteorological input. More specifically, model applications confirm the importance, in terms of model performance, of using gridded emissions inventories instead of disaggregated ones as well as of adopting 3-hourly values for the meteorological and boundary conditions input that drives the model, instead of daily ones. Additional improvement was achieved with the use of an appropriate parameterisation for wet removal of particulate matter.