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NO_x dispersion modelling around roundabout in a small city, example from Hungary

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The present paper focuses on the modelling of pollutant distribution and dispersion in an urban region that is located in a moderately industrialized town of Hungary, Székesfehérvár, with a population of 100,000. The study area is located close to the city centre, with different housing styles and different building elevations. High-rise buildings with 10 floors to small houses with gardens are found in the modelled area. The roundabout has 5 access roads; three major ones and two minor ones with different geometries and traffic load. The traffic load of the roads was defined by traffic count, while for the meteorological characteristics wind-statistics were created. Additional input parameters were the ground plan and the elevation of buildings. To simulate the airflow and the dispersion of pollutants a Computational Fluid Dynamics code called MISKAM was used. The background concentration was taken from the dataset of a nearby air quality monitoring station. According to vehicle counting the 5 roads of the roundabout have very different loads from 12 vehicles to more than 412 vehicles/hour. Three different grid systems were applied ranging from half million to 5 million cells. The difference in the results related to grid density was also evaluated. Wind speed distribution, wind turbulence and building wake flow patterns were identified by using the model. With the help of the simulation the NO_x flow and dispersion of pollutants around the roundabout can be estimated and the critical locations with higher pollution concentration are presented. The results of the modelling can be more generalized and used in the design of the layout, development, traffic-control and environmental aspects of roundabouts located in small urban areas.