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Numerical study of the air quality in the city of Sofia - some preliminary results

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Some extensive numerical simulations of the atmospheric composition fields in the city of Sofia have been recently performed.

The simulations were carried out using the following set of models: the model WRF used as meteorological pre-processor; CMAQ - the Community Multiscale Air Quality System – the chemical transport model; SMOKE - the Sparse Matrix Operator Kernel Emissions Modelling System – the emission model.

As the NCEP Global Analysis Data with 1 degree resolution was used as meteorological background, the WRF and CMAQ nesting capabilities were applied for downscaling the simulations to a 1 km resolution over Sofia.

The national emission inventory was used as an emission input for Bulgaria, while outside the country the emissions were taken from the TNO inventory. Special pre-processing procedures are created for introducing temporal profiles and speciation of the emissions. The biogenic emissions of VOC are estimated by the model SMOKE.

The air pollution pattern is formed as a result of interaction of different processes, so knowing the contribution of each for different meteorological conditions and given emission spatial configuration and temporal behaviour could be interesting. Therefore the CMAQ “Integrated Process Rate Analysis” option was applied to discriminate the role of different dynamic and chemical processes for the air pollution formation in the city of Sofia.

Different characteristics of the numerically obtained concentration fields of as well as of the contribution of processes will be demonstrated in the present paper.