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Urban air quality evaluation scenario with the use of inverse modelling and air quality monitoring data

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The performance of the urban air quality evaluation system for the city of Novosibirsk is studied in the scenario approach. Modern nonlinear atmospheric chemistry transport and transformation models require input parameters like emission rates and positions of the emission sources, initial and boundary conditions, etc. In the applications, this information usually is not fully available.
The missing information on the emission sources is complemented by solving the inverse source problems with the city air quality monitoring data taken from in situ concentration measurements [1]. With the use of the adjoint problems, the inverse source problem is reformulated to the operator equation solved by variational methods. To reduce the ill-posedness of the inverse problem, a priori information about the locations and intensities of the sources is used [2]. The constant emission sources locations corresponding to the heating plants and variable sources locations along with their relative intensities describing the traffic emissions are obtained from the available databases. After the emission rates reconstruction, the WRF-Chem model is used to simulate the distribution of pollutants thus providing the air quality estimate in the whole domain. The results of some numerical scenarios and their analysis are presented.

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