ANALYTICAL DISPERSION MODELLING SUPERCOMPUTER SYSTEM (ADMOSS) - PLAN OF AIR QUALITY IMPROVEMENT FOR OSTRAVA CITY

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Key words: dispersion modelling, air quality management, prediction scenarios

Expanding industrial and agricultural production and increasing intensity of traffic cause increasing pollutant emissions and thus negatively influence air quality. Respecting the limits of natural resources and environmental impact of air pollution has resulted in efforts focused on air quality management and minimizing side effects of human activities.

Management of air quality is currently at the forefront of international environmental protection debates. Impaired air quality causes earth climate changes, biosphere damages and has a negative effect on human health. There are legal regulations which establish pollution limits for a number of pollutants and also require governmental authorities to perform an active air quality management.

Proper use of scientific knowledge and modern computer technologies is of great help in performing an air quality management. Therefore a computer air quality support system was developed. This system was named ADMOSS (Analytical Dispersion MOdelling Supercomputer System). This unique system is based on the interconnection of GIS, mathematical models and supercomputers.

For the first time this system was used as a support for so called "Plan of air quality improvement for Ostrava city". Area of Ostrava city is a territory with impaired air quality. The pollution limits there are overrun, primarily due to high concentration of heavy industry in this area. So the task was to assess the recent air quality status, to identify the most problematic points and to propose effective remedial measures to improve the air quality, together with preservation of regional development. For this the intimate comprehension of emission – pollution relation is essential. The base was therefore a detailed mathematical modeling of pollution distribution processed by ADMOSS. The system served for assessment of current air quality status, performing air quality analyses, as well as to form, model and study "What If" scenarios and so to find out the remedies of the highest effectiveness and the lowest expenses.

Input point pollution sources data were divided to three categories: industrial sources, mobile sources and local heating systems. Data about industrial pollution sources was furnished from REZZO (Register of Emissions and Sources of Air Pollution), data about mobile sources were obtained from special distribution of traffic and traffic intensity and structure information and data about local heating systems were provided by specially developed procedure from Population and Housing Census 2001.

For modeling was the whole area of Ostrava city divided by means of GIS in several sub-regions with similar terrain character and to each sub-region interpolated meteorological data concerned pollution sources and corresponding receptor grid were allocated, as well. These sub-regions were then modeled on a parallel supercomputer cluster. GIS was also utilized for result post-processing. The final results were presented in the form of cartographic outputs.

The whole process contained a number of detail modeling with plenty of variants and "what if" scenarios and large-scale analysis. So the results are supposed to be the effective support for air quality management and could help to improve the air quality in Ostrava region.