

Russian MEGAPOLIS Project - Latest Achievements



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The Russian MEGAPOLIS project aims to develop integrated technologies of megacities air-pollution assessment based on results of remote sensing and in-situ monitoring for mitigation option. The project is funded in the scope of the Federal Framework Program of Ministry of Education and Science of Russian Federation. The MEGAPOLIS project is a partnership project with the European FP7 MEGAPOLI project (<http://megapoli.info>).

Head organization of the MEGAPOLIS project is "AEROCOSMOS" Scientific Centre of Aerospace Monitoring. The project is carried out together with a group of scientific organizations representing:

- (i) the Faculty of Geography, Lomonosov Moscow State University;
- (ii) the Institute of Atmospheric Physics, Russian Academy of Sciences;
- (iii) Hydrometeorological Centre of Russia (Federal Service for Hydrometeorology and Environmental Monitoring).

MEGAPOLIS project runs for more than a year now. The following results have been achieved during that time:

- Ground and remote sensing data for the Moscow area were collected and analyzed; these included meteorological (temperature, humidity, pressure) and chemical (concentration of ground-level ozone, nitrogen oxide, nitrogen dioxide, sulfur dioxide, carbon monoxide, total hydrocarbons, PM₁₀) data. Statistical analysis of concentration of chemical species distribution over the Moscow area showed that concentrations of some pollutants depend on a distance from pollution sources.
- Studies of snow cover properties in the eastern district of Moscow have allowed getting an objective picture of its pollution, reflecting the atmospheric pollution during the winter season.
- Atmospheric boundary layer and urban surface properties were investigated using ground-based and remote data for episodes of extreme events (such as -30 degrees of frost in the winter of 2010 and the strong heat in the summer of 2010). Results of the data processing confirmed the importance of meteorological conditions and the properties of the underlying surface in the assessment of air pollution in megacity like Moscow, especially in periods of extreme weather conditions.

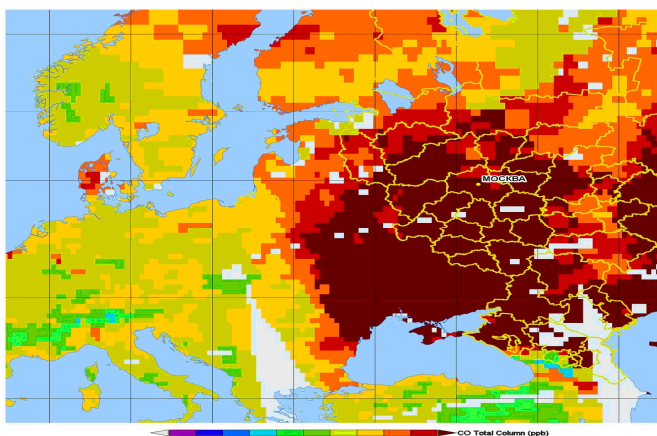


Figure 1: Carbon monoxide concentration at 2-10 km over Eastern Europe, Aqua/AIRS data, 15 august 2010.

- Estimates of carbon monoxide (CO) emissions caused by extreme forest fires during the summer of 2010 were made for the European part of Russia and the Moscow region on the basis of remote sensing data (Figures 1-2).

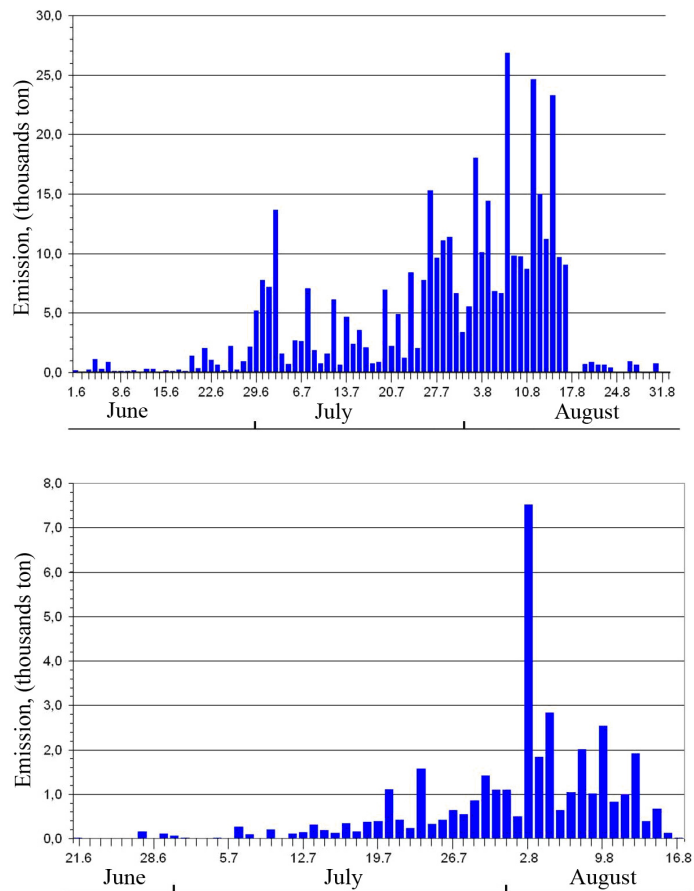


Figure 2: Estimates of CO emissions over European part of the Russian Federation (top) and Moscow region (bottom) in summer 2010 calculated using remote sensing data.

- Advanced approach for megacity air pollution assessment has been developed on the base of Russian and international experience, taking into account the diversity of sources of pollution, specifics of different cities of Russia, and having the potential to improve through the sharing of ground and remote sensing data. Algorithm of calculation of complex air pollution index will allow specifying the representative time range of baseline data and a minimal set of measured components.
- Methodological support of integrated technologies for simulating meteorological and pollution phenomena in the atmosphere of large cities and metropolitan areas was developed on the base of different scale atmospheric models (global spectral model of the Hydrometeorological Center of Russia, the regional model RAMS and the COSMO-RU).
- Preliminary design and technical plan of integrated technologies, and also some software modulus have been elaborated.

Gained experience and results of the European partnership project MEGAPOLI have been taken into account in the MEGAPOLIS research. For instance, the approach to morphological database development for Moscow, assessing the megacity impact using the satellite data, etc. was considered.

The achieved results have been already reported in 4 scientific reports and in a number of journal publications.

References

- Bondur V. (2010): Timeliness and urgency of satellite wildfire monitoring in Russia. //Vestnik ONZ RAN, Vol., 2, NZ11001, doi:10.2205/2010NZ000062.
- Bondur V. (2010): Satellites combat the fire // Rossiysky Cosmos 12.