

Research Project

Urban Climate Study of Bucharest/Romania

Third-party funded project

Project title Urban Climate Study of Bucharest/Romania

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Organisation / Research unit

Departement Umweltwissenschaften / Meteorologie (Parlow)

Department

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Status Completed

The joint Romanian-Swiss Research Project (RSRP) is based on the expertise of two different research areas of the partner universities Basel/Switzerland and Bucharest/Romania: it combines boundary layer meteorology measurements, numerical modelling and remote sensing on the Swiss side (Department for Environmental Sciences – Meteorology, Climatology and Remote Sensing (MCR Lab) University Basel) and regional development, civil engineering as well as Geographic Information System (GIS) and spatial data analysis of satellite data on the Romanian side (Urban Engineering and Regional Development Department, Technical University of Civil Engineering Bucharest). From this starting point the project offers unique possibilities by integrating basic research on the urban climate and air pollution of the Bucharest region, analysis of time series of spatially distributed data from satellites, the application of the results for urban and regional planning, and the transfer and implementation of methodologies and spatially distributed data for local planning authorities.

The main topics are 1.) to investigate how the Romanian Revolution in 1989 has changed the environmental situation and the urban climate in Bucharest over the last 30 – 40 years by means of satellite data analysis, 2.) to study the on-going meteorological processes by direct measurements of radiation and heat fluxes at 3 micrometeorological flux towers within the city area covering different types of land cover. This type of data like heat and CO₂ fluxes has partly never been measured in Bucharest. 3.) A method widely used in many western countries like Switzerland, Germany or in East Asia (Japan, Hong Kong) how to transfer the results of complex meteorological measurements and data into information required and used by local and regional planning authorities. This has never been carried out in Romania and the technique will be implemented at the University Bucharest. 4.) Using numerical urban climate models like ENVI-met potential urban planning scenarios will be simulated to improve urban climate, human comfort, air pollution and health.

For the radiation and heat flux measurements the maintenance of 3 flux towers is planned. The flux towers will be equipped with state-of-the-art instruments for radiation measurements and ultra-sonic anemometers for turbulence measurements using the eddy-correlation method. CO₂ fluxes at the flux tower locations will be measured by an open-gas analyser. Particulate matter (PM10) is planned to be collected by a passive sampling device developed and used by the German Weather Service. This Sigma-2-Sampler will be exposed between half and one week and samples particulate matter (PM10) integrated over the exposure time. This makes it possible to analyse mass concentration as well as type and form of the particles and the chemical composition.

The second branch of the project concentrates on the analysis of satellite data. One aspect are the environmental changes over the recent 40 years from the socialist time, the Romanian revolution in 1989 and the development to a market-oriented economy and member state of the European Union.

Satellite data since 1975 cover this period of change and only by visual control the changes in landscape are dramatic. Since 1984 there are also thermal infrared data from Landsat-TM-4/5 and Landsat-7-ETM+ available and surface temperature distribution can be analysed as input for spatially distributed net radiation and heat fluxes. A change in land use and a massive growth of the city of Bucharest has important consequences for the local micrometeorological radiation and heat budget.

This type of analysis has never been carried out in Romania and the method could become a blue print for further similar studies in other cities of Romania and the new member states of the European Union. One part of this methodology is the integration of numerical models specially designed to simulate urban planning scenarios and improvement of the urban climate situation. The model used and implemented in Bucharest is ENVI-met, which is widely applied in other countries.

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Specify cooperation partners

ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
1838727	Parlow, Eberhard	Petrescu, Florian, Professor. Dr.	Technical University of Civil Engineering Bucharest	01.05.2013	30.04.2016