Exploiting GRID for Model Estimates of Regional Climate Changes and Its Impact on the Air Quality of Bulgaria

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The main objective of the EC FP6 project CECILIA is to deliver a climate change impacts and vulnerability assessment in targeted areas of Central and Eastern Europe. Emphasis is given to applications of regional climate modeling studies at a resolution of 10 km for local impact studies in key sectors of the region. For the purposeq intensive long-term meteorological modeling took place in Bulgarian National Institute of Meteorology and Hydrology, in an attempt to determine climatic values for the main meteorological variables. The climatic version of the operational weather forecast model ALADIN was applied for simulating 3 time slices: 1960-2000 (Control Run, CR), 2020-2050 (Near Future, NF) and 2070-2100 (Far Future, FF), following the IPCC scenario A1B. The calculations are made for an area covering Bulgaria with resolution of 10 km. The created meteorological data base is used for two purposes.

First of all, calculation of the respective modeled climates took place. The comparison between CR results and the available measured climatic values shows in a categorical way that the increase of the resolution increases the preciseness of the simulation. The differences of climatic fields for the 3 periods are presented and interpreted.

The second use of the created meteorological database is to estimate the impact of climate changes on air quality. A respective modelling system was created on the base of US EPA Models-3 System (MM5, CMAQ and SMOKE) for a smaller region with resolution of 10 km covering Bulgaria. The TNO emission inventory for 2000 is used. The chemical boundary conditions are extracted from similar results of 50-km runs over Europe made in Aristotle University of Thessaloniki, Greece. Calculations for the period 1990-2000 (CR), 2041-2050 (NF) and 2091-2100 (FF) are performed, results presented and interpreted in the study. For year 2000, some scenarios are run, results compared with measuring data.

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