

Estimating the urban heat island effects of Hungarian and European large cities

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Part of the NASA's Earth Observing System, satellites Terra and Aqua were launched to polar orbit in December 1999, and in May 2002, respectively. In our research, measurements of two satellite sensors have been used to analyze surface temperature of urban areas in Central Europe, and especially, in Hungary. (1) Moderate Resolution Imaging Spectroradiometer (MODIS) is capable of viewing the entire globe daily with 1 km resolution. (2) Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) has very fine spatial resolution (90 m per pixel). Sensor MODIS can be found on both satellites, while sensor ASTER is installed only on satellite Terra. In our investigation daytime and nighttime surface temperature time series measured in Central Europe are analyzed. First, the largest cities of the region are selected and the pixel representations of urban areas and their rural environment are determined. Then, using the selected representative area of these Central European cities we determine the spatial structures of the urban heat island depending on seasons and different macrocirculation conditions. Further analysis are accomplished by identifying special pixels according to the characteristic surface cover (concrete buildings, parks, residential areas, airports, etc.) and evaluate the time series of surface temperature observed by MODIS and ASTER.