Relationship between heating/cooling period and changing temperature conditions in the urban areas of Hungary

Csende Dian¹, Attila Talamon², Rita Pongrácz¹,³, and Judit Bartholy¹,³

¹Eötvös Loránd, Geography and Earth Sciences, Meteorology, Budapest, Hungary
²Szent István University, Institute of Architecture, Budapest, Hungary
³Eötvös Loránd University, Excellence Center, Faculty of Science, Martonvásár, Hungary

Climate change, extreme weather conditions, and local scale urban heat island (UHI) effect altogether have substantial impacts on people’s health and comfort. The urban population spends most of its time in buildings, therefore, it is important to examine the relationship between weather/climate conditions and indoor environment. The role of buildings is complex in this context. On the one hand UHI effect is mostly created by buildings and artificial surfaces. On the other hand they account for about 40% of energy consumption on European average. Since environmental protection requires increased energy efficiency, the ultimate goal from this perspective is to achieve nearly zero-energy buildings. When estimating energy consumption, daily average temperatures are taken into account. The design parameters (e.g. for heating systems) are determined using temperature-based criteria. However, due to climate change, these critical values are likely to change as well. Therefore, it is important to examine the temperature time series affecting the energy consumption of buildings. For the analysis focusing on the Carpathian region within central/eastern Europe, we used the daily average, minimum and maximum temperature time series of five Hungarian cities (i.e. Budapest, Debrecen, Szeged, Pécs and Szombathely). The main aim of this study is to investigate the effect of changing daily average temperatures and the rising extreme values on building design parameters, especially heating and cooling periods (including the length and average temperatures of such periods).