



How frequency and intensity of regional heat waves are projected to change in the Carpathian basin?

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Heat wave events are important temperature-related climatological extremes due to their impacts on human health. In the future, they are very likely to occur more frequently and more intensely not only in the Carpathian Basin located in Central/Eastern Europe, but in most regions of the world because of global warming. In order to develop adaptation and mitigation strategies on local scale, it is essential to analyze the projected changes related to heat waves.

In Hungary, three levels of heat wave warning are applied currently. They are associated to the daily mean temperature values. (i) Warning level 1 (advisory for internal use) is issued when the daily mean temperature is larger than 25 °C. (ii) Warning level 2 (heat wave watch) is issued when the daily mean temperature for at least 3 consecutive days is larger than 25 °C. (iii) Warning level 3 (heat wave alert) is issued when the daily mean temperature for at least 3 consecutive days is larger than 27 °C. In this paper, frequency of these conditions is analyzed using regional climate model experiments of models RegCM and PRECIS.

In case of RegCM with 10-km horizontal resolution, the model has been adapted at the Department of Meteorology, Eötvös Loránd University in the frame of the CECILIA EU-project. The model RegCM is a 3-dimensional, sigma-coordinate, primitive equation model, and it was originally developed by Giorgi et al. Currently, it is available from the ICTP (International Centre for Theoretical Physics). The initial and lateral boundary conditions of the fine-resolution experiments have been provided by the global climate model ECHAM for the A1B emission scenario for three different time slices (1961-1990, 2021-2050, and 2071-2100).

The model PRECIS have been also adapted at the Department of Meteorology, Eötvös Loránd University. PRECIS is a hydrostatic regional climate model (HadRM3P) developed at the UK Met Office, Hadley Centre, and nested in HadCM3 global climate model. It uses 25 km horizontal resolution transposed to the Equator and 19 vertical levels with sigma coordinates. Experiments for the Central/Eastern European domain are available for three different emission scenarios: A1B, B2 and A2. For B2 and A2, the last three decades of the 21st century are compared to the 1961-1990 reference period, while in case of A1B a transient run 1951-2100 is completed.

Both the results of RegCM and PRECIS analysis suggest that the different levels of heat wave are likely to occur significantly more often in the future than in the past. Furthermore, not only the frequency is projected to increase but the first appearance is also projected to occur earlier during the year, and the last heat wave is likely to occur later during the year than in the 20th century.