



Recent severe heat waves: how to view them in a ‘global warming’ perspective?

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The area of western and central Europe has recently been affected by several long-lasting and severe heat waves, particularly in July-August 2003, June-July 2006, and July 2007. The heat waves influenced various sectors of human activities, with enormous socio-economic impacts. With an estimated death toll exceeding 50000 over Europe, the August 2003 heat wave was the worst natural disaster in Europe during the last 50 years, yielding an example of how seriously may also high-income countries be affected by climate change.

The aims of the study are to assess whether recent occurrences of severe heat waves in central Europe were exceptional in the context of past fluctuations, and to estimate their recurrence probabilities under future climate change scenarios. We focus on analogs of the 2006 heat wave which lasted 33 consecutive days in Prague and was the longest and most severe heat wave since the beginning of air temperature measurements in 1775. Probabilities of long and severe heat waves are estimated from daily temperature series generated by a first-order autoregressive model with a deterministic component, incorporating the seasonal cycle and the long-term trend. The model is validated with respect to the simulation of heat waves in present climate (1961-2006) and subsequently run under several assumptions reflecting various rates of summer warming over the 21st century, based on climate model projections.

The return period of a heat wave reaching or exceeding the length of the 2006 heat wave is estimated to be around 120 years in 2006. Due to an increase in mean summer temperatures, probabilities of very long heat waves have already risen by an order of magnitude over the recent 25 years, and they are likely to increase by another order of magnitude by around 2040 under the summer warming rate assumed by the mid-scenario. Even the lower-bound scenario yields a considerable decline of return periods associated with intense heat waves. Although positive socio-economic development, life-style changes and improvements in medical service have resulted in reduced mortality impacts during ‘average’ heat waves recently, adaptation measures and a better preparedness to heat-related risks are needed in order to mitigate impacts of severe heat waves in the near future.

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