Frequent hot summers in Europe/west Asia and northeast Asia after the mid-1990s

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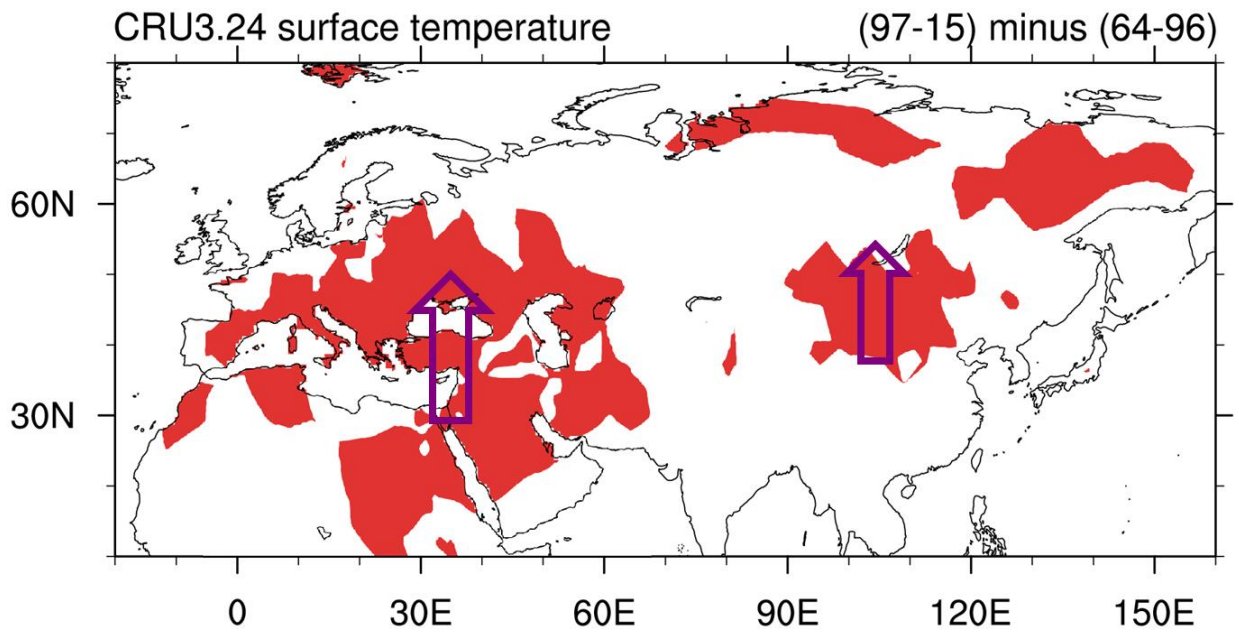

Changes in surface temperature between the averages during 1997-2015 and 1964-1996. Only regions where the temperature increase exceeding 1? are shown (red shading). Vectors indicated regions of the amplified warming. Credit: Xiaowei Hong

After the mid-1990s, the global surface temperature presented a significant warming trend. According to the World Meteorological Organization, the global mean surface temperature of the period from 2011 to 2015 has increased by 0.57° over the period from 1961 to 1990.

This warming trend provides favorable background for occurrence of hot summers, and exacerbates extreme heat events. Based on statistics, the casualties caused by heat events from 2001 to 2010 have increased by 23 times relative to those from 1991 to 2000.

This warming trend is particularly prominent in the boreal mid and high latitudes. Europe's 2003 heat wave, for instance, caused more than 30,000 deaths. In 2010, the maximum temperature of several cities in Russia exceeded 40°, being about twice that of the climatological value (23°). This heat wave led to at least 15,000 deaths and more than $15 billion in economic loss. In the same year, the Mohe country, which is located in the northernmost of China, also set a historical record with a daily maximum temperature of 39.3°. The northeast region of China is a key base for commercial food production. During the past decade, the cultivated land in this domain has extended by more than 30 percent. This somewhat relates to the warming climate and longer duration of summer season in this region.

Against the background of warming caused by climate change, amplitudes of warmth greatly differ between regions. This is an issue to be addressed in the climate change investigation.

A recent research by Institute of Atmospheric Physics, Chinese Academy of Sciences, identified a non-uniform summer warming pattern after the mid-1990s over the Eurasian continent, with a predominant amplified warming over Europe-West Asia and Northeast Asia, but much weaker warming over Central Asia. They suggest that the Atlantic Multidecadal Oscillation may induce this asymmetry in temperature changes through the decadal change of the Silk Road Pattern. The so-called Silk Road Pattern is a wave-like pattern along the upper-tropospheric westerly jet in mid-latitudes. Their results show that the Silk Road Pattern has a strong decadal variability, which can explain about 30% of its total variance.

Considering that the AMO has a cycle of about 65 to 80 years, and has entered into a positive phase since the mid-1990s, there will likely be a strong warming over Europe-West Asia and Northeast Asia in the coming decade. And this would exert great influence on ecological conditions, agriculture, and human life.

More information: Amplified summer warming in Europe-West Asia and Northeast Asia after the mid-1990s, iopscience.iop.org/article/10. … 088/1748-9326/aa7909

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