



## Changes in air temperature extremes over Europe

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Extremes weather events can have profound societal impacts. Since climate change is expected to affect extreme weather events (for example heat waves are expected to become longer, more intense and more frequent) the analysis of changes in extremes is particularly relevant in a climate change context. This work addresses the changes in air temperature extremes over Europe from the analysis of daily temperature records from the ECA&D database. Many studies on air temperature extremes have focused on the temporal evolution of universally accepted indices, but these only describe moderate extremes. An alternative is to use classical extreme value theory, eventually with trends included in the parameters of the extreme value distribution, for looking at events in the tails of the data distribution or even unprecedented in the data record. An intermediate perspective is to consider trends in different quantiles of the data distribution. While the fitting of linear trends is sometimes performed on empirically estimated quantiles, the procedure is very limited and suffers from sampling bias. The alternative is to use quantile regression, which allows to estimate trends in the quantiles of the observed data distribution within a well defined statistical framework. In the present study quantile regression is applied to estimate trends in the upper and lower quantiles of air temperature data distribution. In order to take into account the serial correlation in the data, significance is assessed via a time series bootstrap procedure. The results show statistically significant trends for the period from January 1901 to December 2007 for most of the 32 analysed stations. The easternmost stations, St. Petersburg and Kiev, show the largest slopes in the lower quantiles, while the highest slopes in the upper quantiles are found in stations at high elevations, specifically Saentis, Graz and Sonnblick.