



The exceptional recent warming signal in a long-term central-German observation site

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The long-term temperature measurements of Frankfurt/Main represent a scientifically highly valuable source for investigating climatic changes in central Germany and beyond. Annual data are available since 1758 and daily observations since 1870. The 258 year long annual time series is homogenised and recalculated to the airport location outside of Frankfurt/Main city. In a first step, impacts of site changes and urbanisation effects are discussed comparing the five different inner-city monitoring points and the airport location after WWII. We show that site changes affect both extreme and average temperatures, and that they may be considerable even for small relocations. Urbanisation effects are visible all year long and stronger for minimum than maximum temperatures.

Annual temperature observations show slightly decreasing temperatures until the 1840s. This development is then replaced by an increasing trend overlain by decadal-scale and yearly fluctuations. Nevertheless, until the 1980s shifting 30-year-means only fluctuate between 8.54 °C in 1829–1858 and 9.58 °C in 1948–1977. However, recent years more than doubled the 1 K spread between the coldest and warmest period, with an average of 10.82 °C in 1986–2015. In addition, this 30-year period was warmer than any single year before 1990. Record-cold calendar days almost disappeared since 1988, while record-warm calendar days appeared about three times more often than statistically expectable. Strong warming was observed year-round, only September and October showed more moderate trends.