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Increasing trend in the average temperature in Finland, 1847-2012

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The global average temperature has increased by about 0.8 ˚C since the mid-19th century. It has been shown that this increase is statistically significant and that it can, for the most part, be attributed to human-induced climate change (IPCC 2007). A temperature increase is obvious also in regional and local temperatures in many parts of the world. However, compared with the global average temperature, the regional and local temperatures exhibit higher levels of noise, which has largely been removed from the global temperature due to the higher level of averaging. Because Finland is located in northern latitudes, it is subject to the polar amplification of climate change-induced warming, which is due to the enhanced melting of snow and ice and other feedback mechanisms. Therefore, warming in Finland is expected to be approximately 50% higher than the global average. Conversely, the location of Finland between the Atlantic Ocean and continental Eurasia causes the weather to be very variable, and thus the temperature signal is rather noisy.

The change in mean temperature in Finland was investigated with Dynamic Linear Models (DLM) in order to define the sign and the magnitude of the trend in the temperature time series within the last 165 years. The data consisted of gridded monthly mean temperatures. The grid has a 10 km spatial resolution, and it was created by interpolating a homogenized temperature series measured at Finnish weather stations. Seasonal variation in temperature and the autocorrelation structure of the time series were taken account in the DLM models.

We found that the Finnish temperature time series exhibits a statistically significant increasing trend, which is consistent with human-induced global warming. The mean temperature has risen clearly over 2˚C in the years 1847-2012, which amounts to 0.16 ˚C/decade. The warming rate before 1940's was close to the linear trend for the whole period, whereas the temperature change in the mid-20th century was negligible. However, the warming after the late 1960s has been remarkably fast. The model indicates that within the last 40 years the rate of change has been as high as 0.30 ˚C/decade. The increase in temperature has been highest in spring and in late autumn but the change in summer months has not been so evident. The observed warming is somewhat higher than the global trend, which confirms the assumption that warming is stronger in higher latitudes.