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Seasonality and climate change in temperature series of Europe and the United States

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Climate change induces a shift in the seasonal cycle of temperature. The aim of the study is first to better describe this shift according to different geographical locations and secondly to find a way to remove it. Long and homogeneous temperature series have been obtained for Europe through the European Climate Assessment and Dataset (ECA&D) project portal and for the United States through the National Climatic Data Centre of the National Oceanic and Atmospheric Administration (NOAA). For 1950-2009, the mean seasonal cycle of daily maximum temperature is computed over the whole period as well as over different 30-year sub-periods and smoothed through cubic splines. Warming is essentially observed in winter and summer, and its intensity is higher in one of the two seasons, depending on the geographical location: winter for the United States, whereas for Europe, the warming is higher in summer in the western part and in winter in the eastern one, globally. Then, the non parametric trend in mean is removed from the series, but the seasonal shift persists, however in a lower extend. It is necessary to remove the non parametric trend in variance to obtain stationary seasonal cycles. The same analysis will be made for daily minimum temperature. Then, the results will be used to propose a stochastic model of temperature.