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Effects of atmospheric circulation on air temperature in Europe and Russia

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Air temperature variations in Europe and Russia are markedly affected by atmospheric circulation. We present a spatially large-scale investigation of temperature signals typical for major atmospheric circulation types. A newly available global dataset of gridded daily temperature data is used. Three major types, each, of European Grosswetterlagen and the Russian Vangengeim-Girs classification are compared in their spatial applicability on air temperature within the past >100 years (1901-2008). The consistency of spatial patterns in recent decades (1979[U+2012]2008) is investigated and temperature changes in Europe and Russia are interpreted against the background of changes in character and frequency of circulation patterns.

Our results demonstrate that both classifications are able to largely explain temperature variability in Europe and Russia. Spatial patterns are large-scale and strong in both Europe and Russia, especially in winter. Spatial extent and signal magnitude show a clear seasonality with maximum values in winter and minimum ones in summer. During recent decades (1979[U+2012]2008) spatial patterns show little changes in Europe including its Russian part, but the ability to explain temperature variability in Siberia decreased. European winter warming corresponds with increased maritime and decreased continental inflow of air masses, additional to a general warming. Siberian wintery warming is partly explainable by circulation changes in January and February, but not in December. Our results might be used to advance input variables of global climate models to improve their performance in the European-Russian area.