



## **Are recent climatic trends in Europe caused by circulation changes?**

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We have analyzed the effect of changes in the frequency of circulation types on significant seasonal trends of daily maximum and minimum temperature and precipitation at 26 European stations in the period 1961–2000 using 24 objective atmospheric circulation classifications arising from the COST733 Action.

First we have compared the circulation-induced seasonal trends (computed from a “hypothetical” daily series constructed by replacing the daily data by their long-term monthly mean under the specific circulation type) with observed seasonal trends significant at the 95% level. In winter the regional circulation changes explain mostly around 40% and up to 73% of observed warming trends, the link is the strongest in Britain and northern Germany but none in SW Europe and the Balkans. In spring the circulation-caused proportion of observed warming is around 20% for TX and a bit less for TN, the maxima are 58% for TX and 28% for TN at the Alpine station Hohenpeissenberg. In summer the proportion of circulation-caused temperature trends is around zero, with both positive and negative values for individual classifications. In autumn very few stations yield significant temperature trends, and circulation changes can explain only up to 30% of these trends (in Iceland). Precipitation trends are rarely significant at the 95% level. The few significant trends suggest similar relationships between circulation and precipitation changes as resulted for temperature.

Using a different method – decomposition of climatic changes between the first and the second half of the study period into frequency-related part and within-type related part – we arrive at similar results. In winter the frequency-related (circulation-induced) part of climatic changes is even a bit more pronounced than using the first method. On the other hand, most of the climatic changes in spring, summer and autumn can only be attributed to changing properties of individual circulation types (within-type changes).

These results are consistent with the fact that except for winter (and summer in the Mediterranean), very few circulation types yield significant long-term trends in their occurrence.

The research is conducted within the COST733 Action “Harmonisation and Applications of Weather Types Classifications for European Regions“. The Czech participation in it is supported by the Ministry of Education, Youth, and Sports of the Czech Republic, contract OC115.