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Annual course of subseasonal air temperature trends in Europe (1961-2000)

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We use daily maximum and minimum temperature (TX and TN, respectively) and daily temperature range (DTR) at 136 stations in Europe and the Mediterranean in the period 1961–2000 to precisely locate their seasonal and subseasonal trends in space and within the course of the year. Linear trends were estimated using least-squares regression for annual averages of subseasons of length 10, 20, 30, 60, and 90 days, moving with a step of one day. Thus we obtain 365 values of "moving trends" for each station and each variant of subseason length. The day-to-day variability of these "moving trends" is greatest for short subseasons of 10 and 20 days with trend magnitudes of up +3˚C per decade reached in Northeastern Europe for TN in January and March. Trends of the 90-day seasons are the most stable throughout the year but they reach the lowest magnitudes. Cluster analysis of the annual course of "moving trends" reveals relatively well-defined regions with similar trend behaviour. Over most of Europe, the observed warming is greatest in winter. Significant autumn cooling centered on mid-November was found in Eastern and Southeastern Europe for both TX and TN; in many other regions trends are close to zero in the same period. Other clearly non-warming (or even cooling) periods occur in Western and Central Europe in February, April, and late June. Trends of DTR are inconclusive and spatially more heterogeneous. Our results suggest that using different time scales apart from the conventional three-month seasons can uncover the behaviour of climatic trends within the course of the year.