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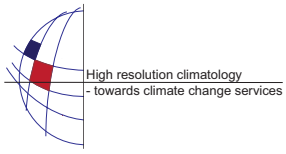

Relations of atmospheric circulation and recent climatic variability and trends in Europe – a comparative approach based on the COST733 classifications database

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In this study we evaluate and compare 24 circulation classifications from the COST733 database version 1.2 according to their ability to stratify daily station climatic data into circulation types, and assess the magnitude of seasonal temperature and precipitation trends in Europe in the period 1961-2000 that can be linked to changing frequency of circulation types in these classifications (as opposed to changing climatic properties of individual circulation types). The selected classifications were created using eight methods, each applied in three variants with fixed numbers of types (9, 18, and 27), which enables us to study how the number of types influences our results. Furthermore, we examine the effect of spatial scale of atmospheric circulation on the links between individual circulation catalogues and local climatic variability and trends, i.e. we compare the results obtained with classifications derived from a large European domain and from smaller sub-domains representing European regions. The skill to stratify climatic data into types (measured by explained variance index) is the highest for maximum temperature, lower for minimum temperature, and the lowest for precipitation. The highest values are generally obtained in winter for classifications with 27 types that are computed on the small spatial domains. Seasonal climatic trends in the period 1961-2000 can be only partly explained by the changing frequency of circulation types, the link being the strongest in winter. In the other seasons, within-type climatic trends are responsible for a major part of the observed trends. Circulation changes in the small domains are usually more tightly connected with climatic trends than those in the large domain except for Icelandic and Scandinavian stations where circulation over the whole Europe explains a larger part of the observed trends. There are large differences between results obtained with individual classifications, which suggests that a comparative approach is highly desirable in such synoptic-climatological studies.