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Clustered GWL types: methodology and applications

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The Grosswetterlagen (GWL) classification system is a well-established and useful tool for describing the prevailing synoptic patterns over the European region. The system is based around 29 characteristic circulation types, with day-to-day classifications being made on the basis of the operational experience of expert meteorologists. More recently, James (2007) demonstrated that this subjective classification could be satisfactorily recreated using an automated methodology, thus making it practically possible to identify GWL types in climate model experiments.

The sheer number of GWL types can, however, become rather cumbersome in the context of comparison studies (for example when examining changes in the frequency of occurrence of GWL types for different time periods). To overcome this difficulty while retaining the synoptic nature of the classification system, the authors present a cluster analysis of the 29 GWL types for the winter and summer seasons separately. The base GWL catalog used is similar to that produced by the automated methodology of James (2007).

The decreased number of the new regimes retains much of the synoptic characteristics of their original counterparts and allows for a cleaner analysis. A comparison of the clustered-GWL type frequencies is then made between seven different GCM in the ENSEMBLES project and ERA reanalysis data. The 21st century projections are then compared with their 20th century counterparts to identify the existence of any significant change in the synoptic behaviour over Europe within the future climate. It is found that models tend to overestimate westerly-like types and underestimate blocking-like types if compared to the reanalysis. Similar findings are observed for the 21st century (compared to the 20th century), although the detected differences are less significant.