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Characterization of Mediterranean large-scale atmospheric circulation based on Jenkinson-Collison Weather Type classification.

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The evaluation of new generations of global climate models (GCMs) with respect to their large-scale circulation features is crucial for model development and has recently been brought into focus by the downscaling community, interested in the suitability of GCMs for downscaling purposes. In such evaluation experiments, additional uncertainties emerge from differences among the reference datasets used for evaluation, typically reanalyses. In this context, weather typing techniques are a useful tool for the classification of the full diversity of data into a few recurrent patterns that can serve as objective characterizations of either global or regional atmospheric circulation. A well-known weather typing classification algorithm is the Jenkinson-Collison Weather Type (JC-WT, Jenkinson and Collison 1977) approach. Although the methodology was originally developed for the British Isles (Lamb, 1972), the JC-WT approach can in principle be applied to any mid-to-high latitude region (Jones et al, 2013). Fernandez-Granja et al (2023) extended the limits of applicability from 23.5º to 80º latitude on both hemispheres, but the suitability of the method is questionable for certain seasons over some areas of the globe, such as the Mediterranean region in summer.

In this study, we first explore the applicability of the JC classification over the Mediterranean by linking the JC-WTs with main northern hemisphere teleconnection indices and blocking conditions. Further, the diversity of JC-WTs and occurrence of the unclassified type are used to examine the suitability of the method. Results show that the application of the JC-WT classification is physically meaningful in large parts of the domain. Secondly, fundamental characteristics of the JC-WTs such as transition probabilities between consecutive types and persistence of the dominant JC-WTs (number of time-steps staying in the same type) obtained for five different reanalyses are compared. Important differences among reanalyses are found, especially in summer, which may bring additional uncertainties when the method is used in model evaluation experiments.

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