

Regionalization of Europe based on a K-Mean Clustering Analysis of the climate change of Temperatures and Precipitation

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Climate change is a subject whose importance has been growing in several scientific fields such as air quality, agriculture, fisheries, water management, and tourism. Therefore, model-based projections of the future climate are highly relevant. In order to study climate change on a regional scale using Earth System Models, regions with similar climate change patterns need to be defined. The aim of this work is to divide the European domain into regions of similar projected climate changes. In order to do so, we used MPI-ESM-LR r1i1p1 simulations of daily precipitation, minimum and maximum temperatures for the recent-past (1986 – 2005) and long-term future (2081 – 2100) provided by the Coupled Model Intercomparison Project (CMIP5). The difference between the long-term future and recent-past daily climatologies of these three variables was determined. Aiming to objectively identify the grid points with coherent climate changes, a K-Means Cluster Analysis was applied to these differences. This method was performed for each variable independently (univariate version), and for the aggregation of the three vari-

ables (multivariate version). A mathematical approach to determining the optimal number of clusters (K) was pursued. However, due to the method characteristics, a sensitivity test to the number of clusters was performed by analysing the physical consistency of the results, as well as their coherence with the established literature. Note that this procedure is a new approach, since it uses the climate differences (i.e. climate change) of one (or several) variables instead of the values of each variable in each climate. Furthermore, this method allows the determination of regions based on multiple variables. Results from this method are in accordance with results found in the literature, showing overall similar regions of changes. The regions found by this analysis can then be used to perform climate change studies focused on specific European regions.

Keywords

Europe, Climate change, k-means

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