

Statistical analysis in climate research: aridity conditions in the Iberian Peninsula - a case study

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Abstract

Researchers in atmospheric sciences often use the popular format named Network Common Data Form (NetCDF) developed by University Corporation for Atmospheric research (UCAR) to create, manage, store and distribute scientific data. It is a platform independent format, available for several operational systems, and it was designed to represent multidimensional, array-oriented scientific data. Usually an array has two dimensions (2D), in atmospheric sciences that can mean a temperature, precipitation or pressure field given certain coordinates: latitude and longitude. Arrays having more than two dimensions, e.g., when to the previous fields it is added altitude (3D) or even time (4D) these arrays are called multidimensional arrays. Programming and work with multidimensional data can be challenging, although NetCDF data is self-describing and support direct access to small subset or larger datasets (since storage is made as arrays). Consequently some common statistical analysis can still be performed in climate research but from another view point [5], [6], [7].

Aridity plays a key role to characterize the climate of a region, since it has a major impact on water resources and human activities. In this case study, several statistical methods are going to be applied to an aridity index, de De Martonne aridity index [4] between 1901 and 2012 in the Iberian Peninsula. Gridded precipitation totals and air temperature datasets are used on a monthly basis to compute this index. Results revealed that climate was subjected to both spatial and temporal variabilities and statistically significant trends were detected [1], [2]. A regional division of the Iberian Peninsula according to aridity

conditions was attained by a hierarchical cluster analysis and is going to be presented. The selection of the clusters following Ward method [5] showed high spatial coherence, and allowed the study of the general spatial behavior of aridity conditions in Iberia during this period. These results are in clear accordance with some outcomes achieved by [2], [3] regarding other climatic indices.

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Keywords

Multivariate Statistics, Climatic indices, De Martonne Aridity Index, Iberian Peninsula.

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