Classification of circulation types over Eastern Mediterranean using a Self Organizing Map approach

3x4 SOM of 500hPa geopotential height winter anomalies for 1971-2000

MAP DESCRIPTION

In this study an Artificial Neural Network called Self Organizing Map (SOM) is used in order to classify the synoptic circulation over Europe and especially Eastern Mediterranean during winter, defining the number and frequency of cyclonic and anticyclonic patterns. SOM method is an unsupervised learning process that codifies large, multivariate datasets onto a 2-dimensional array, or map, called the SOM, with the aim of discovering patterns in the data. Here, a 3x4 SOM size was used, chosen according to the quantization and topographic errors and after multiple runs. Consequently, the 12 output maps shown here, correspond to the 12 unique circulation patterns that prevail over Europe during winters of the period 1971-2000, obtained by the SOM methodology. The graph shown below presents the frequency of each SOM node, thus how many days of the original data are classified in each of them. Furthermore, the SOMs are divided in two categories, those that represent the cyclonic patterns (61%) and those that represent the anticyclonic patterns (39%). In the graph, one can see which of the SOM nodes are characterized as such and finally, the total frequency for each kind of pattern.

Concluding, the maps of this paper provide a useful tool since they can be further associated to climatic parameters such as temperature, precipitation, humidity, cloudiness, and used in environmental risk assessment, predicting the occurrence of extreme weather events, such as heavy rainfall that could result in floods, absence of rainfall causing drought, high temperatures and humidity resulting in heat waves, etc.

DATA

Winter daily anomalies of geopotential height at the 500hPa isobaric level of the atmosphere provided by the National Center for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) Reanalysis project on a uniform 2.5°x2.5° grid spacing for the broader Europe area. The time period examined is 1971-2000. The boundary data are obtained from the public domain map dataset Natural Earth available at <http://www.naturalearthdata.com>.

Map Legend

COORDINATE SYSTEM

Geographic Coordinate System: GCS WGS 1984

Scale: 1:70.000.000

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