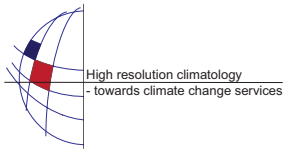
EMS Annual Meeting Abstracts
Vol. 7, EMS2010-480, 2010
10th EMS / 8th ECAC



Multi-step regionalization technique and regional model validation for climate studies

D. Argüeso, J.M. Hidalgo-Muñoz, D. Calandria-Hernández, S.R. Gámiz-Fortis, M.J. Esteban-Parra, and Y. Castro-Díez

Facultad de Ciencias. Universidad de Granada, Física Aplicada, Granada, Spain (ycastro@ugr.es, +34 958243214)

A regionalization procedure is proposed to define affinity regions in Andalusia (Southern Spain) regarding maximum and minimum temperature, and precipitation in order to validate a regional climate model (WRF). In situ observations are not suitable for model validation unless they are somehow upscaled. Therefore, a regionalization methodology was adopted to overcome the representation error that arises from the spatial scale disagreement between site-specific observations and model outputs.

An observational daily dataset that comprises 412 rain gauges and 120 maximum and minimum temperature series all over Andalusia was used. The observations covered a 10-year period ranging from 1990 to 1999 with no more than 10% of missing values. The original dataset composed by 716 series for precipitation and 243 for temperature were employed to fill the gaps using a correlation method.

Precipitation and temperature have been processed separately using the multi-step regionalization methodology formed by three main stages. Firstly, a S-Mode Principal Component Analysis (PCA) was applied to the correlation matrix obtained from daily values to retain principal modes of variability and discard possible information redundancy. Secondly, rotated normalized loadings were used to classify the stations via an agglomerative Clustering Analysis (CA) method to set the number of regions and the centroids associated to those regions. Finally, using the centroids calculated in the previous step and once the appropriate number of regions was identified, a non-hierarchical k-means algorithm was applied to obtain the definitive climate division of Andalusia. The combination of methods attempts to take advantage of their benefits and eliminate their shortcomings when used individually. This multi-step methodology achieves a noticeable reduction of subjectivity in the regionalization process. Furthermore, it is a methodology only based on the data analyzed to perform the regionalization with no a priori assumptions that could influence the classification of the stations.

Several configurations were acceptable, but the simplest one was chosen so that the regionalization obtained was not fragmented in excess. Five regions were identified for precipitation and six for temperature, leading to a coherent distribution of the division according to the local features of climate and the topography of the region.

Since the main purpose of the regionalization technique is to set both observations and WRF outputs to a comparable spatial scale, some results of this comparison are also presented in order to highlight the main differences among the regions.

Acknowledgements: The Spanish Ministry of Science and Innovation, with additional support from the European Community Funds (FEDER), project CGL2007-61151/CLI, and the Regional Government of Andalusia project P06-RNM-01622, have financed this study.