

An automated classification method of daily circulation patterns for surface climate data downscaling based on optimized fuzzy rules

D. PANAGOULIA¹ and ANDREAS GRAMMATIKOGIANNIS¹

¹*Department of Water Resources, Hydraulics and Maritime Engineering, School of Civil Engineering, National Technical University of Athens*

A method for automated circulation patterns (CPs) definition and classification is presented, based on optimized fuzzy rules. The target of the method is to provide a basis (daily classified CPs) for downscaling of the most common climate data, i.e. precipitation and temperature.

Therefore the presented classification method is objective providing CPs that explain the dependency between the large-scale atmospheric circulation and the surface climate. Thus the downscaling can be done by means of downscaling models with parameters depending on the CPs. The CPs are defined using 700 hPa geo-potential height anomalies. Fuzzy rules are described by the position of high- and low-pressure anomalies. The fuzzy rules are obtained automatically, using an optimization for the performance of the classification. For the precipitation, the performance of the classification is measured by rainfall frequencies and rainfall amounts conditioned on the CPs. Thus, the task is to define wet or dry CPs. For the temperature, the deviation from the average long-term annual cycle is used. In this way, warm or cold CPs are identified. The performance of the CPs is validated using a split-sampling approach. The presented method produces physically realistic CP definitions. With the help of these definitions, the observed (historical) pressure fields can be classified as shown for eleven precipitation stations and four temperature stations inside and around the Mesochora catchment in Greece.