

Changes in the precipitation variability in Romania and its relation to the circulation weather types

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Many studies link the observed changes in local climate to the variations in the atmospheric circulation. A tested method of describing atmospheric circulation is by employing the weather or circulations types. This paper presents an objective classification of the atmospheric circulation affecting Romania, between 1951 and 2010, and its relation to the significant changes in the amount of precipitation after 1980.

A successful approach is the automatic classification based on Lamb's subjective scheme (1950). Originally used by Jenkinson and Collison (1977) for the British Isles, this method was also employed for other regions in Europe by Goodess and Jones (2002), Trigo and DaCamara (2000), Ramos et al. (2010) in Iberian Peninsula; Chen (2000) for the Scandinavian Peninsula; Holobaca (2010) for Romania.

The grid-point data used for the identification of the large-scale circulation patterns are obtained from NCEP/NCAR Reanalyses (Kalnay et al., 1996). These data are available at a resolution of 2.5° by 2.5° latitude/longitude at the four synoptic hours (00, 06, 12 and 18) on a daily basis, since 1 January 1948. Using these data, we calculated the WT variables and LWTs for each day from 1950 onwards producing an analysis for 12 UTC. This method allowed us to define 27 types of CWTs for Romania – two with high vorticity (cyclonic (C), anticyclonic (A)), eight pure directional types, 16 hybrid types and one with light indeterminate flow corresponding to Lamb's unclassified type (U). We chose to objectively define the thresholds for the light indeterminate flow class (U) by using the 0.15 percentile of the F and |Z| ranges. The 27 CWTs were regrouped in 11 basic ones in order to obtain a practical analysis scheme.

We used Barry and Perry's 1973 method in order to decompose the climatic differences between two periods into different parts that are caused by frequency and within the same type changes of circulation. The synoptic characteristics and the frequency of the ten basic circulation weather types are discussed, as well as the amount of precipitation associated with each type. It is shown that the dry types (A, S, SE), although being the most frequent classes, have a rather small contribution to the precipitation amount while the wet types (C, N, NE) have a very important contribution to the annual amount of precipitation. Also, the climatic differences between the two periods were quantified.

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