Spatio-temporal changes of drought in Romania (1961-2015), according to atmospheric circulation types and teleconnection indices

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Drought can be determined by climatic conditions (atmospheric precipitation, water supply from soil accessible to the plant, moisture and air temperature and wind speed) but is also induced by environmental aspects some of them related to anthropogenic influences.

In order to monitor the drought and its impact for Romania, four indices were analyzed in the present study (SPI (Standardized Precipitation Index), PNI (Percent of Normal Index), DI (Deciles index), and ZSI (Z-score Index)), through Meteorological Drought Monitoring software, using the total daily amount of precipitation for 27 weather stations in Romania, of which 22 stations for the period 1961-2015, 4 stations for the period 1961-2000 and one station for the period 1964-2015.

Preliminary analyzes resulting from the use of these indices were correlated with 18 GWT (Großwettertypen) atmospheric circulation types of daily mean sea level pressure (SLP). This was done using COST733 class software to evaluate the influence of large-scale mechanisms of atmospheric circulation. Also, four teleconnection indices were used, more exactly AO (Arctic Oscillation), NAO (North Atlantic Oscillation), PNA (Pacific-North American Pattern) and AAO (Antarctic Oscillation) that are recognized for their effect on climatic conditions at European scale, provided by National Oceanic and Atmospheric Administration (NOAA) – Climate Prediction Center.

Therefore, according to the types of circulation, the amount of precipitation produced in certain areas and implicitly the degree of drought severity is influenced. The types of anticyclonal circulation 13, 16 or 18, for example, which occur on average in 46 (12.7%), 14 (3.9%) , respectively 20 (5.4%) days a year, cause less precipitation as known, compared to the types of cyclonal circulation 1, 2 or 17 for example with an average of 12 (3.2%), 12 (3.2%), respectively 19 (4.3%) days a year.

In terms of drought analysis indices, according to SPI, the entire analysis interval for Iasi, located in the northeast region of Romania, was 6 years of "moderately dry", 5 years of "severely dry", and one year of "extremely dry", unlike Cluj, located in the central western region, with two years of "moderately dry", 3 years of "severely dry" and two years of "extremely dry". In Bucharest, located in the southern region of Romania there were 4 "moderately dry" years and 5 "severely dry" years.
In Iasi, according to the ZSI index with the same classifications as the SPI index, there were 3 "moderately drought" years, 7 "severely drought" years and 7 "extreme drought" years, while in Cluj there were 9, 3 and respectively 6 years and in Bucharest 7, 5 and respectively 6 years with the above classification.

According to the PNI index, there were 5 "moderate drought" years in Iasi and Cluj and 6 "moderate drought" years in Bucharest. Also, there were 9 "weak drought" years in Iasi, 3 in Cluj and 5 in Bucharest.

And last but not least, according to the DI index, at all 3 stations there were 5 "extreme drought" years, 6 "severe drought" years and 5 "moderate drought" years.