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Study of the meteorological and hydrological drought in Romania

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The study of climate variability is important for better understanding the hydrological processes that lead to drought periods in Romania. The main characteristics of spatial and temporal variability of the precipitation and streamflow were determined by analyzing the precipitation quantities and the monthly average discharges series from 15 meteorological stations and 39 hydrological stations (1931-2003). The analysis of the annual average discharges tendency on the whole country, between 1931 and 2003, emphasizes a decreasing tendency for the southern and eastern part of the country, except the Carpathian curvature, where the discharges slightly increase. The western and northern part of Romania are characterized by increasing tendencies of the annual average discharges. Pettitt test was applied for determining the change points. Nearly all series present an increasing point between 1981 and 1982, followed by a droughty period. The data have been filtered using empirical orthogonal function (EOF) analysis, which provides both principal modes of spatial variability and time efficient series describing the dominant time variability. The first EOF explains the highest fraction of the total observed variance (56,7% for precipitation and 87,5% for discharges). The first EOF patterns show the same sign of variability over the entire country, meaning that a common large-scale process might be responsible for Romanian precipitation and discharges variability. The second EOF patterns show two regions with opposite signs of variability with east-west gradient. The physical reasons for this regional difference could be linked to the geographical characteristics such as orography. Explained variance of second EOF patterns of the precipitation is 5,9% (and 1,9 for discharges). Changes in precipitation and streamflow of Romanian rivers are shown to be associated with the North Atlantic Oscillation (NAO), a large-scale mode of natural climate variability. The drought periods, with reduced precipitation and discharges, are characterized by high index NAO.