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Drought variability and its driving factors in the Republic of Moldova

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This study presents a detailed assessment on drought variability and its driving factors in the Republic of Moldova during the second half of 20th century and the first decade of the 21st century. Due to the availability of relatively long continuous series, we chose the Chisinau climatological station as a representative station for testing the Standardized Precipitation Evapotranspiration (SPEI) on various time scales in the Republic of Moldova. The steps followed for the SPEI calculation were: i) the parameterization of potential evapotranspiration (PET) based on monthly minimum (Tmin) and maximum air temperature (Tmax) and extraterrestrial radiation; ii) a simple monthly water balance, calculated as the difference between monthly precipitation (P) and potential evapotranspiration (PET) and iii) normalisation of the water balance into a log-logistic probability distribution to obtain the SPEI series at time scales between 1 and 24 months. In this study, we have also analysed the trends of extreme temperatures (Tmin and Tmax) and precipitation anomalies as helpful factors to assess their influence on drought characteristics.
For all the time scales of SPEI calculation during the warm season of the year (April to September), the longest duration and highest severity was occurring during the 1950s, 1960s and 2000s. These periods correspond to highest temperature and lower precipitation anomalies (i.e. more than 2.5°C associated with precipitation anomalies up to 60% below normal). We found that the largest impact on the water deficit during the last three decades are mainly due to the increase of maximum temperature (+0.7°C decade-1) and minimum temperature (+0.5°C decade-1) associated with decreased precipitation (20 mm decade-1). The increasing trend in extreme temperatures in the Republic of Moldova has particularly affected highest positive deviation of Tmin (from 1.5°C to 3.5°C) during warm season of the year and the increasing water deficit in this season. Although lack of precipitation is the principal driving factor for drought conditions, the rapidly increasing of minimum temperature in this region could also play a notable role in drought through increasing its severity as a consequence of water loss by evapotranspiration.

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